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Glossary of Minerals and Mining Terms

For minerals, this glossary attempts to provide information concerning (1) physical characteristics, (2) principal uses and (3) source. In addition, mining terms used in the text of the report are briefly explained in nontechnical language. The glossary is based on Albert H. Fay, A Glossary of the Mining and Mineral Industry (U. S. Bureau of Mines, 1920); and Minerals Yearbook (U. S. Bureau of Mines, issued annually).

Abrasives: substances used industrially for grinding and polishing. Natural abrasives include those composed of silica (diatomite, tripoli, quartz, grindstones, oilstones, millstones, ground sand); silicates (pumice, garnet); alumina (corundum, emery) and carbon (industrial diamonds). Artificial abrasives are of increasing commercial importance, and include silicon carbide, aluminum oxide and metallic substances.

Agate: a variegated, waxy quartz in which the colors are in bands, in clouds, or in distinct groups.

Aggregate: the mineral material, such as sand, gravel, shells, slag, but more usually broken stone, with which cement or bituminous material is mixed to form a mortar or concrete.

Alabaster: a fine-grained, compact variety of gypsum.

Alumina: aluminum oxide. Occurs crystalline in nature as corundum, sapphire and ruby; as a silicate and in combination with other metals it is of common occurrence, especially as clay.

Aluminum: a bluish silver-white metal, malleable and ductile. After magnesium, it is the lightest of the metals in general use commercially. About half our consumption comes from bauxite mined domestically (chiefly in Arkansas); the remainder is imported, especially from Surinam.

Amalgamation: the process by which mercury is alloyed with some other metal to produce an amalgam. Used at one time for the extraction of gold and silver from pulverized ores, now superseded by the cyanide process.

Amphibole: see *Asbestos*.

Andalusite: consists of aluminum silicate, as does dumortierite, in association with which it is found. Used in the manufacture of spark plug cores, and sometimes as a semiprecious stone. Produced in Nevada and California.

Anthracite: see also *Coal*. Consumed largely for domestic heating. Besides being produced in Pennsylvania, anthracite and semi-anthracite are mined in small quantities in Virginia, Arkansas, Colorado and New Mexico. Production from these other states is included in the statistics for bituminous coal.

Antimony: an element of metallic appearance and crystalline structure, tin-white in color, hard and brittle. Used in metallic form in conjunction with lead in the manufacture of storage batteries and antifriction bearings. Antimony compounds are employed extensively in paints and sanitary enamelware. Small amounts of antimony are mined as ore in this country, or are recovered as byproducts in the smelting of other nonferrous metals; but much larger amounts are imported, chiefly from Mexico and Bolivia.

Arrastra or Arrastre: apparatus for grinding and mixing ores by means of a heavy stone dragged around upon a circular bed. Chiefly used for ores containing free gold, which were treated by amalgamation combined with grinding.

Arsenic: a solid brittle element of tin-white to steel-gray color and metallic luster, occurring free and also combined in various minerals. Used almost entirely for insecticides and weed killer. Small amounts are employed in the manufacture of glass and as a wood preservative; less than 1 percent is used in the drug

- trade. Arsenic is recovered in this country entirely as a byproduct of the smelting of other nonferrous metals, but a third to a half of our consumption is imported, chiefly from Mexico and Sweden.
- Asbestos:** a white, gray or green-gray fibrous variety of amphibole, a class of bisilicate mineral. Used for thermal insulation; also as a roofing material and for brake linings. Small quantities are produced domestically, chiefly in Vermont, but supplies come mainly from Canada.
- Asphalt:** a complex of various hydrocarbons, some of which are oxygenated; brown or brownish black in color. Used for highway construction and the manufacture of roofing. Natural asphalt or bituminous rock is produced in Texas, Oklahoma, California, New Mexico, Missouri, Kentucky and Alabama. Asphalt manufactured from petroleum competes with the natural product. Some lake asphalt is imported from Trinidad.
- Ball mill:** a short tube mill (see below) of relatively large diameter, in which grinding is done with steel balls instead of pebbles.
- Barite:** barium sulfate, known also as heavy spar because of its high specific gravity. Used as an ingredient of paint, especially in place of white lead. Mined in Missouri, Georgia, Tennessee and other states.
- Barium:** alkaline earth metal, yellowish-white, somewhat malleable, fusible at high temperatures, burning easily when heated in air. Used in metallic form in small quantities in radio and X-ray tubes.
- Barium minerals:** see *Barite*; *Witherite*.
- Barrel:** liquid measure containing 42 gallons.
- Barytes:** see *Barite*.
- Basalt** or *Trap rock:* includes porphyritic and felsitic rocks consisting of angite, olivine and plagioclase with varying amounts of glassy base which may disappear; and generally all the dark, basic volcanic rocks. Used especially in crushed form for concrete aggregate, road metal and railroad ballast. Produced in most states.
- Bauxite** or *Aluminum oxide:* the principal source of aluminum. Used also for the manufacture of abrasives, as an absorbent in the oil and sugar refining industries and, to a small extent, as a refractory and flux in the steel industry. It is mined chiefly in Arkansas, but almost half our requirements are imported from Surinam.
- Bench:** a single level of operations in quarrying and open pit mining. The mineral is removed in successive layers, each of which is a bench. Several benches may be in operation simultaneously in different parts of the mine.
- Beneficiating:** a term originally signifying the reduction of ores to metal; now employed, especially in the case of iron ore, to mean the breaking and concentrating of the ore before shipment.
- Bentonite:** see *Clay*.
- Beryllium:** a silver-white, malleable metal also known as glucinum; almost as light as magnesium. Used in alloy with copper where resistance to fatigue and corrosion is desired. Obtained from beryl (beryllium aluminum silicate) imported from Argentina and Brazil.
- Bismuth:** a brittle, reddish-white metal. Used in pharmaceuticals and, in metallic form, in conjunction with lead, tin and cadmium as a low melting point alloy which has many technical applications. Small amounts of bismuth are recovered in the smelting of other nonferrous metals, but most of the supply is imported from Peru.
- Bitumen:** a generic name for various solid and semisolid, tarlike hydrocarbons. See *Asphalt*; *Bituminous coal*.
- Bituminous coal:** see also *Coal*. Used as fuel and for the manufacture of gas coke and numerous byproducts. The following states, in descending order of importance, produced more than 10 million tons each in 1940: West Virginia, Pennsylvania, Illinois, Kentucky, Ohio, Indiana, Alabama, Virginia.
- Black lead:** see *Graphite*.
- Block caving:** a method of mining metallic ores in which gravity is used for break-

- ing and loading. Each block is undercut over the greater part of its bottom area and the supporting pillars are then blasted out.
- Bog ore:** an iron hydroxide ore from marshy places, much used by the early iron industry of New England.
- Bootlegging:** mining, especially of anthracite, without the consent of the owner of the mineral rights.
- Borates:** see *Boron minerals*.
- Borax or Sodium baborate:** see *Boron minerals*.
- Boron minerals:** used chiefly by manufacturers of heat-resisting glass and vitreous enamelware; also employed as fertilizer. The United States produces 90 percent of the world supply.
- Breaker:** in anthracite mining, the structure in which the coal is broken, sized, and cleaned for market.
- Breast:** section of the coal face in a coal mine.
- BTU:** British thermal unit, the quantity of heat required to raise a pound of water one degree Fahrenheit.
- Bromine compounds:** used chiefly in the production of antiknock gasolines. Derived from sea water at Wilmington, N. C. and from natural brine in Michigan.
- Brucite:** a magnesium hydroxide which has been mined in recent years in Nevada for use as a refractory.
- Bucking iron or Bucking plate:** an iron plate on which ore is ground by hand by means of a muller. Extensively used for the final reduction of ore samples for assaying.
- Cable drill:** see *Churn drill*.
- Cadmium:** a tin-white, malleable, ductile metal, capable of a high polish. Used for electroplating, for the manufacture of bearings and of low melting point alloys (with lead, tin and bismuth). Cadmium compounds are important as pigments and in the chemical industry. From domestic ores cadmium is obtained mainly as a byproduct in the smelting of zinc; substantial quantities are derived from Mexican or other foreign ores.
- Cage:** a frame with one or more platforms for cars, used in hoisting in a vertical shaft. It is steadied by guides on the sides of the shaft.
- Calcine:** to expose to heat, with or without oxidation; to roast. Applied to ores for the removal of water and sulfur, and to disintegrate the mass; to limestone for the expulsion of its carbon dioxide; etc.
- Calcium:** a silver-white, rather soft metal of the alkaline earth group. Employed in metallic form in small quantities for fine-grain alloy steels and for magnesium alloys.
- Calcium chloride:** used in refrigeration and for the control of dust and ice in highway construction. Produced from natural brines.
- Carbon black:** see *Natural gas*.
- Caving:** a system of mining, developed originally in Lake Superior mines. The support is removed from a great block of ore, which then caves or falls, being broken in this manner sufficiently to permit handling.
- Cement:** a substance used in a soft pasty state to join stones or brick, and which afterwards becomes hard as stone; especially a strong mortar made with lime or a calcined mixture of clay and limestone. Being a manufactured product, cement is not treated in this volume. Statistics for cement rock, or limestone used in cement manufacture, will be found in Appendix A.
- Chalcocite:** a copper sulfide, the chief source of copper in the Ray and Miami districts of Arizona.
- Channeling machine:** used in dimension stone quarries for cutting rock where smooth sides are desired. Operates by progressively deepening a groove by percussion.
- Chats:** a waste product obtained in concentrating lead and zinc ores.
- Chert:** a compact, flint-like, siliceous rock used for grinding.
- Chrome ore or Chromite:** a chromate of iron. The steel industry consumes more than three fourths of the supply either in refractories or in the production of chrome alloys, and especially stainless steel; the mineral is used also for tan-

- ning leather and for chemical manufacture. Small amounts are mined in California, but 99 percent of our supply is imported, chiefly from South Africa, Cuba and the Philippines.
- Chromium*: a brilliant, tin-white, comparatively rare metal, hard, brittle and refractory. Occurs chiefly as chromite. See *Chrome ore*.
- Chrysotile*: a form of asbestos.
- Churn drill*, also called *Cable drill* or *Well drill*: portable drilling equipment usually mounted on four wheels and driven by gasoline, electricity or steam. Also applied to a stationary drill operated from a derrick, as in oil well drilling. The drill head is raised by means of a rope or cable and allowed to drop, thus striking successive blows by means of which the rock is pulverized and the hole deepened.
- Cinnabar*: a vermilion-colored mercuric sulfide, the principal ore of mercury, occurring as hexagonal crystals.
- Clay*: a substance which, when finely ground and mixed with water, forms a pasty moldable mass that preserves its shape when air dried; the particles soften and coalesce when highly heated and form a stony mass upon cooling. Clays are composed mostly of aluminum silicate. Statistics for common clay, used for bricks and heavy clay products, were not available until 1939. The five chief varieties of fine clay are: kaolin or china clay, ball clay, fire and stoneware clay, bentonite, and fuller's earth. The first three are used for pottery and stoneware, high grade tile and linoleum manufacture. In addition, kaolin and fire clay are used for rubber and as refractories; kaolin is used as a filler and coating for paper, and in the manufacture of paints and cements; fire clay for architectural terra cotta. Bentonite is used in foundry molding; as a filter and bleaching agent in the oil refining industry, and as mud for the rotary drilling of oil and gas wells. Fuller's earth, like bentonite, is used in the oil refining industry; also for clarifying solvents in the dry cleaning industry.
- Coal*: a carbonaceous substance formed from the remains of vegetation by partial decomposition. The vegetal matter appears to have first taken the form of peat, then lignite, and finally, bituminous coal. The latter by the loss of its bitumen has in some places been converted into anthracite or hard coal. See *Anthracite*; *Bituminous coal*.
- Coal gas*: see *Manufactured gas*.
- Cobalt*: a tough, lustrous, nickel-white metal, related to and occurring with iron and nickel. Used in oxide form by the ceramic industry; as cobalt salts in the paint, varnish and linoleum industries; and as metallic cobalt in alloy steels for drills and cutting tools, and for catalytic purposes. Domestic production is negligible; imports come mainly from the Belgian Congo.
- Coke*: bituminous coal from which the volatile constituents have been driven off by heat, so that the fixed carbon and the ash are fused together. Although occasionally found in nature, coke is commercially available only as a manufactured product, and is therefore outside the scope of this volume.
- Columbium*: a metallic element of steel-gray color and brilliant luster, closely associated with tantalum. Used for special purpose ferrous alloys. Imported from Nigeria.
- Concentrate*: to increase the strength by diminishing the bulk of an ore; to separate metal or ore from the gangue or associated rock. Crushing or grinding is usually the first step, followed by wet or dry physical or chemical processes of separation. The word is used also as a noun to describe the products of a concentration process.
- Concrete*: a mixture of sand, gravel, pebbles, crushed stone, or other aggregate, with cement (or occasionally with tar); used for roads, foundations and other construction purposes.
- Copper*: a common metal of reddish color, ductile and malleable; has its widest application in the manufacture of electrical apparatus. Often mined in association with gold and silver, it comes partly from deep mines (especially in Michigan) and partly from large scale surface workings (as in Utah).

- Corundum:** natural alumina abrasive, not mined in the United States.
- Cradle:** a wooden box, longer than wide, provided with a movable slide and hopper, and mounted on two rockers. Used at placer workings for washing gold-bearing earths.
- Crosscut:** a small passageway in a mine driven at right angles to the main entry to connect it with a parallel entry or air course.
- Cryolite:** a fluoride of sodium and aluminum, used in the metallurgy of aluminum, the manufacture of glass and enamels, and insecticides. All supplies are imported from Greenland.
- Culm:** the waste or slack of the Pennsylvania anthracite mines, consisting of fine coal of varying purity, and coal dust and dirt.
- Cut-and-fill:** a method of mining in which the excavation is filled with waste material to support the walls and roof.
- Cyanide process:** a method of extracting gold from finely crushed ores, concentrates and tailings by means of potassium cyanide in dilute solutions. The gold is dissolved and subsequently recovered by deposition upon metallic zinc or by other means.
- Cyanite:** see *Kyanite*.
- Derrick:** framework or tower over a deep drill hole, such as that of an oil well, for supporting the tackle for boring, hoisting or lowering. At first made of wood, now usually of steel.
- Diamond:** a very hard, crystalline form of carbon, occurring in nature. Valuable as a precious stone and as an abrasive. Industrial diamonds are imported from Brazil and South Africa.
- Diatomaceous earth:** see *Diatomite*.
- Diatomite:** a powdered form of silica consisting essentially of the remains of microscopic plants called diatoms. Used in the manufacture of dynamite, pottery glaze, abrasives and filters. California and Oregon are the chief producing states.
- Dimension stone:** quarried or cut in accordance with required dimensions. Includes building stone, paving blocks and stone for sea walls and dock facings.
- Dinkey:** a small locomotive used to move cars in and about mines and quarries.
- Dolomite:** a carbonate of calcium and magnesium, often contained in limestone. Used in making refractory materials; also, recently, for the production of metallic magnesium.
- Dragstones:** see *Millstones*.
- Dressing:** originally referred to the picking, sorting and washing of ores preparatory to reduction. The term now includes more elaborate processes of milling and concentration of ores; also the shaping of dimension stone.
- Drift:** a horizontal passage underground. A drift follows the vein; it is to be distinguished from a crosscut, which intersects it, or a level or gallery, which may do either.
- Dry hole:** a well, drilled for oil or gas, in which none is found.
- Ductile:** capable of being permanently drawn out or hammered thin.
- Dumortierite:** a bright bluish, lavender or reddish translucent aluminum silicate. Like andalusite, with which it is found, it is used chiefly for the manufacture of spark plug cores. Produced in Nevada.
- Emery:** natural alumina abrasive, an impure form of corundum, mined in small quantities near Peekskill, N. Y. Supply comes mainly from abroad, and the mineral has lost ground to artificial abrasives.
- Entry:** a passage or haulage way in a coal mine.
- Fatigue:** the weakening of a metal bar by the repeated application and removal of a load considerably less than the breaking weight of the bar.
- Feldspar:** a mineral consisting of complex aluminum silicates. Used in the glass and ceramic industries and in the manufacture of soap and abrasives. Produced in many states. Small amounts are imported from Canada.
- Flint:** a dense, fine-grained, form of silica which is very tough and yields a cutting edge on fracture. Used especially as grinding pebbles for tube mills in the concentration of metallic ores. Chiefly imported from France, Belgium and Den-

- mark, flint pebbles are now being produced in several states in this country.
- Flotation process:** a concentration process for ores of the nonferrous metals which takes advantage of the principles of surface tension and colloid chemistry to separate mineral from gangue. The mineral is induced to float on the surface of water or other liquid, while the gangue is induced to sink through the surface and settle separately. Classified as film flotation and froth flotation.
- Fluorspar:** calcium fluoride; purple, green or white mineral. Chiefly consumed as a flux by the steel industry; also for glass and enamel. Produced principally in Illinois and Kentucky, partly as a byproduct of lead-zinc ores. Small quantities are imported.
- Flush production:** the yield of an oil well during the early period of production.
- Fuller's earth:** see *Clay*.
- Gangue:** the nonmetalliferous, or nonvaluable metalliferous, minerals in an ore; the mineral associated with the ore in a vein.
- Garnet:** a group of silicate minerals used as abrasives. Produced in New York, North Carolina and Vermont.
- Gas:** see *Manufactured gas*; *Natural gas*.
- Gasoline:** see *Natural gasoline*; *Petroleum*.
- Gems:** see *Precious stones*.
- Gold:** a metallic element of characteristic yellow color. The most malleable and ductile of all metals, and one of the heaviest substances known. Today it is purchased chiefly by the Treasury. Mined partly from "lode" or deep mines, and partly from "placer" or surface workings, it comes largely from mixed ores which also contain copper or silver.
- Granite:** a granular igneous rock, composed essentially of quartz, orthoclase or microcline, and mica; also small quantities of apatite, zircon and magnetite. Used commercially, the term includes other compact igneous rocks resembling true granite. As dimension stone, granite is produced chiefly in Pennsylvania, Maryland, Georgia, Massachusetts, Maine, and Vermont. As crushed stone, it is quarried in most states.
- Graphite:** a soft, steel-gray to black, more or less impure, native form of carbon. Called also black lead or plumbago, because it is used for marking, although lead does not enter into its composition. Used for foundry facings and crucibles, especially in the manufacture of copper-alloy castings; also in the manufacture of lubricants and paint. Small production in New York and Nevada; imported from Ceylon and Madagascar.
- Gravel:** small stones and pebbles, or a mixture of sand and small stones; any fragments of rock, worn by the action of air and water, but larger than sand. Used chiefly for construction purposes. Produced in every state.
- Greensand or Marl:** a mixture of clay and sand, sometimes containing chalk; used almost exclusively in water-softening compounds. Produced in New Jersey.
- Grindstones:** made of tough sandstone of fine and even grain, composed almost entirely of quartz (silica), mostly in angular grains. Must have sufficient cementing material to hold the grains together, but not enough to fill the pores and cause the surface to wear smooth. Used for sharpening tools. Produced in Ohio and West Virginia.
- Ground sand and sandstone:** a form of silica used for pottery, porcelain and tile manufacture, and as an abrasive. Produced in Illinois, New Jersey, Ohio, and other states.
- Gypsum:** hydrous calcium sulfate. Used, after calcining, for making lath, wall-board and other building materials. Mined in New York, Michigan, Iowa, Texas, California, Nevada, Oklahoma, and other states. Considerable quantities are imported from Canada.
- Hammer drill:** a development of the piston drill in which the drill steel is not attached to the piston, but remains in the hole, the piston delivering a rapid succession of light hammer blows. The drill steel is frequently hollow so that air or water may be driven through to cool the bit and clean the hole. Rotation of the bit is automatic. Also known as jackhammer.

- Helium:** an inert, monatomic, gaseous element occurring in the atmosphere of the sun and stars, in small quantities in the earth's atmosphere, and in certain minerals and mineral waters. The U. S. Government produces helium from natural gas at Amarillo, Texas, for its own use in meteorological and military balloons; small amounts are sold also for medical and scientific use.
- Hydraulic mining:** a method of mining in which a bank of gold-bearing earth or gravel is washed away by a powerful jet of water and carried into sluices, where the gold separates from the earth by its specific gravity. Also used for other metallic ores, anthracite, phosphate rock. Hydraulic mining has been made unlawful and prohibited in certain river systems where it obstructs navigation or injures adjoining properties, particularly in California.
- Ilmenite** or **Menaccanite:** iron titanium oxide, the principal titanium ore.
- Indium:** a soft, white, malleable, easily fusible metallic element, found combined in very small quantities in many ores. Used for bearing, low melting and dental alloys, to improve the tarnish resistance of silverware, as a glass colorant, and for electrical contacts. Indium-bearing ores have been mined experimentally in Arizona, but current production is chiefly from metallurgical residues.
- Infusorial earth:** a form of silica related to *Diatomite*.
- Iodine:** a black, nonmetallic element, used for photographic chemicals and pharmaceuticals. Produced from sea water in California and imported from Chile.
- Ionium:** a radio-active element, present in Canadian radium ores. Has no current commercial applications.
- Iridium:** see *Platinum metals*.
- Iron:** a silver-white metallic element, malleable and ductile, rusting easily in moist air. It has the widest application of any metal. Most iron ore comes today from Minnesota; other states with iron mines are Alabama, Michigan and Wisconsin.
- Ironstone:** any ore of iron from which the metal may be smelted commercially. The term is usually restricted to stratified ores.
- Jack:** a name given to zinc ores.
- Jig:** a machine in which ore is concentrated, or coal is separated from slate, on a screen or sieve in water by a reciprocating motion of the screen, or by the propulsion of water through the screen.
- Jigging:** separating ores according to specific gravity with a sieve agitated up and down in water. The apparatus is called a jig or jigger.
- Kaolin:** see *Clay*.
- Kyanite** or **Cyanite:** identical in composition with andalusite (aluminum silicate) but differs in crystalline form. Used as a refractory material, and sometimes as a gem. Imports come from India; California and Virginia produce the mineral domestically.
- Leaching:** the process of separating metal from waste by treatment with a solvent. Used especially in recovering copper from oxide ores and old tailings.
- Lead:** a metallic element, heavy, pliable and inelastic, having a bright, bluish color, but easily tarnished to a dull gray. Used for storage batteries, cable covering, paint, roofing, bearings and typesetting. It is mined in association with gold and silver in the Mountain states and with zinc in the Mississippi Valley.
- Level:** a horizontal passage or drift into or in a mine. It is customary to work mines by levels at regular intervals in depth, numbered in order. Rarely applied to coal mining.
- Lignite:** see also *Coal*. Used largely for electric power production in the localities where it is mined. Produced in North Dakota and Texas, and in smaller quantities in South Dakota and Montana.
- Lime:** calcium oxide, a light, earthy, white substance obtained by calcining limestone (calcium carbonate). When made from dolomitic limestone it also contains magnesia. A manufactured product, and therefore outside the scope of this report.
- Limestone:** general term for sedimentary rocks composed essentially of calcium carbonate. Produced for building purposes chiefly in Texas, Indiana and Kansas. Employed in crushed form for lime and cement manufacture, fluxing, concrete aggregate, road metal, railroad ballast, agricultural purposes, and a wide range

- of other uses, and produced for these purposes locally in practically all states.
- Litharge:** lead monoxide, made by heating lead moderately in a current of air. It is straw-yellow, and is used as a pigment, in making storage batteries and insecticides, and for glazing pottery.
- Lithium minerals:** used in glass making and ceramics. Mined in North Carolina and South Dakota.
- Lithopone:** a mixture of zinc sulfide and barium sulfate, used extensively as a pigment, and in the manufacture of linoleum and rubber.
- Lode:** a vein of metalliferous material. A deposit of ore with more or less definite boundaries, fixed in place between deposits of nonmetalliferous rock and so distinguished from a placer deposit. As originally used the term meant simply a formation by which the miner could be led or guided (from the verb "lead"). The meaning is now restricted to the ore body itself.
- Long ton:** measure of weight containing 2,240 pounds.
- Magnesia:** magnesium oxide, a light, earthy, white substance. A constituent of lime made from dolomitic limestone.
- Magnesite:** magnesium carbonate. Used as a refractory and in the manufacture of cement and fertilizers; also, recently, for the production of metallic magnesium. Mined in California and imported from Asia.
- Magnesium:** a silver-white metallic element, malleable, ductile and very light in weight (specific gravity, 1.74). In metallic form it is now used chiefly as an alloy metal in aircraft construction; also in the manufacture of incendiary bombs, tracer bullets, and flares for military use. Until recently it was produced entirely by the electrolysis of magnesium chloride obtained from brine, but magnesite and dolomite now also supply the metal. Brine is pumped from wells (as in Michigan) or is simply sea water (as in Texas). No magnesium is imported.
- Malleable:** capable of being shaped by beating or rolling.
- Manganese:** a hard, brittle metallic element having a grayish-white color tinged with red. Rusts easily like iron. An essential constituent of open-hearth steel. Although there are large deposits of manganese ore in the United States they are mostly of low grade, and practically the whole supply is imported. Cuba, India, the Gold Coast, Russia and Brazil are the chief sources of supply.
- Manufactured gas:** a mixture of gaseous hydrocarbons produced from coal or oil; not discussed in this volume, which excludes manufactured products.
- Marble:** strictly a metamorphosed and recrystallized limestone; used commercially for any limestone which will take a polish. Produced as dimension stone chiefly in Vermont, Tennessee and Georgia.
- Marl:** see *Greensand*.
- Meerschaum:** a clay used for smokers' pipes which has not been mined in the United States since about 1914. Several tons a year are imported from Turkey.
- Menaccanite:** see *Ilmenite*.
- Mercury** or *Quicksilver:* a heavy, silver-white, liquid, metallic element. Used for the manufacture of detonators; in antifouling paint for ships; for high temperature boilers; and for various types of lamps. The metal is mined in many states, but especially in California, Oregon and Nevada. In normal times considerable quantities are imported, chiefly from Spain and Italy.
- Mica:** a hydrous silicate having a very fine basal cleavage that renders it capable of being split into thin, tough, transparent plates. Used for electrical insulation. Produced in North Carolina, Connecticut, New Hampshire and other states. Largely imported from India.
- Milling:** the process whereby metallic ores are ground, concentrated, separated and otherwise prepared for the smelter.
- Millstones:** usually a form of sandstone, used for grinding cereals, cement rock (limestone) and other materials. Quarried underground in Virginia; also produced in New York and (of granite) in North Carolina.
- Molybdenum:** a metallic element of the chromium group, malleable, white in color. It is one of the foremost steel hardening materials, and, owing to abundant domestic supplies, has been largely substituted for nickel and tungsten. It is also

used in ceramics. Besides coming from the molybdenum mine at Climax, Colo., it is obtained as a byproduct in copper mining.

Monazite: composed mainly of cerium phosphate, but containing up to 18 percent of thorium oxide. Formerly monazite was valued for its thoria content, used in the manufacture of gas mantles. Recently salts of cerium and the other rare earths have found application in glass; searchlight, motion picture and therapy lamp carbons; and for water- and mildew-proofing. Monazite was mined in the United States from 1893 to 1910 and from 1915 to 1917. About 1 ton was produced in Florida in 1925. At present the mineral is imported from Brazil and India.

Natural gas: a mixture of gaseous hydrocarbons found in the earth, chiefly in association with petroleum deposits. Used as fuel for domestic purposes, power production, cement manufacture, and other industrial purposes; also as a raw material for the manufacture of carbon black used in the rubber industry. The following states, in descending order of importance, each produced more than 100 billion cubic feet in 1940: Texas, California, Louisiana, Oklahoma, West Virginia.

Natural gasoline: a mixture of liquid hydrocarbons produced from natural gas. Used for mixing with refinery gasoline. In descending order of importance, Texas, California, Oklahoma and Louisiana each produced more than 100 million gallons in 1940.

Nickel: a hard, malleable, ductile, metallic element of the iron group, nearly silver-white, capable of a high polish and resistant to oxidation. Used for alloy steels and for plating. Produced in insignificant amounts in the United States (as a byproduct of froth flotation of talc); practically the whole of our supply comes from Canada.

Oilstones: natural stones, usually of silica, used for sharpening tools. Produced in Arkansas, Indiana, New Hampshire and Ohio.

Opal: a hydrous form of silica. When opalescent it is regarded as a precious stone.

Open pit, or open cut, mining: a form of operation designed to extract minerals that lie near the surface. Waste, or overburden, is first removed, and the mineral is then broken and loaded, as in a stone quarry. Important chiefly in the mining of ores of iron and copper.

Osmium: see *Platinum metals*.

Overburden: the waste which overlies the good stone in a quarry, or the ore in an open pit mine. Stripping is the operation of removing the overburden prior to the working of the mineral.

Palladium: see *Platinum metals*.

Paraffin-base petroleum: crude oil which carries solid paraffin hydrocarbons and practically no asphalt.

Peat: see also *Coal*. A dark brown or black residuum produced by the partial decomposition and disintegration of mosses, sedges, trees and other plants that grow in marshes. Consists principally of carbon, hydrogen and oxygen in varying proportions. Because of its high carbon content, it will ignite and burn freely when dry. Used almost entirely for soil improvement and as fertilizer; small quantities are also used for packing fragile articles. It is not produced commercially in this country for use as fuel.

Pennsylvania anthracite: see *Anthracite*.

Pennsylvania rottenstone: see *Rottenstone*.

Petroleum: an oily, inflammable, liquid mixture of numerous hydrocarbons, chiefly of the paraffin series, found in the earth. The petroleum found in different areas vary widely in composition and appearance. They occur naturally, oozing from crevices in rocks, floating on the surface of water, or in subterranean deposits. When crude petroleum is refined the principal resulting products are as follows: gasoline, kerosene, fuel oil, lubricating oil, wax, coke, asphalt, still gas and road oil. The following states, in descending order of importance, each produced more than 10 million barrels of crude petroleum in 1940: Texas,

- California, Oklahoma, Illinois, Louisiana, Kansas, New Mexico, Wyoming, Arkansas, Michigan, Pennsylvania.
- Phosphate rock:** a sedimentary rock containing calcium phosphate. Produced almost entirely in Florida and Tennessee, it is used for the manufacture of superphosphates (fertilizer) and, to a lesser extent, as raw material by the chemical industry.
- Piston drill:** a percussive drill in which the cutting steel is attached to a piston actuated back and forth within a cylinder by compressed air. The drill usually provides for automatic rotation of the bit. Now superseded by varieties of the hammer drill.
- Placer:** a place where gold is obtained by washing; an alluvial or glacial deposit, as of sand or gravel, containing particles of gold or other valuable material.
- Platinum:** a heavy, almost silver-white metallic element, ductile and malleable, but very infusible and resistant to most chemical reagents. Used in the chemical industry, especially as a catalyst, and for handling corrosive liquids; in the manufacture of electric lamp bulbs, temperature measuring instruments, spark plug electrodes and magneto contacts; and by jewelers and dentists. Some platinum is recovered from placer mines in Alaska and in California. Most of the supply is imported from Canada and Colombia, or as scrap from the United Kingdom.
- Platinum metals:** the group of metallic elements which in their chemical and physical properties resemble platinum. They are rhodium, ruthenium and palladium, whose specific gravities are about 12; and osmium, iridium and platinum, whose specific gravities are over 21. The other five metals are used for similar purposes, either alone or alloyed with platinum. They are also found in the same deposits.
- Plumbago:** see *Graphite*.
- Polonium:** radio-active element, used in small quantities for spark plug alloys. Extracted from Canadian radium ores.
- Porphyry:** any igneous rock in which relatively large conspicuous crystals are set in a finer-grained and glassy groundmass. Colloquially the word is used to mean almost any igneous rock, occurring in sheets or dikes, particularly one that is spotted, soft, or light colored.
- Potash:** used as fertilizer and as a raw material for the chemical industry. Produced from natural brine and saline deposits in California, New Mexico and Utah.
- Precious stones** (chiefly of the agate family): produced domestically in Oregon and Washington. Some turquoise is produced in Nevada and Colorado. Most precious stones used in making jewelry, and for industrial purposes, are imported. See also *Diamonds*.
- Pulpstones:** very large grindstones, up to 72 inches in diameter, employed in pulp mills for crushing or grinding wood into fiber. Artificial pulpstones of silicon carbide and aluminum oxide are sometimes used. Natural pulpstones are quarried from sandstone in Washington and West Virginia. See also *Grindstones*.
- Pumice:** an excessively cellular, glassy lava, a sort of solidified volcanic froth, composed of silicates. Generally light gray in color; will float on water. Used as an abrasive, and for the manufacture of acoustic plaster, lightweight concrete block and roofing tile. Produced in many Western states.
- Pyrite:** a hard, heavy, shiny, yellow sulfide of iron, generally in cubic crystals. Used for making sulfuric acid and produced in Tennessee and other states.
- Pyrophyllite:** a hydrous aluminum silicate, similar in character and uses to talc, with which its production statistics are combined. See *Talc*.
- Quartz:** a crystalline form of silica. Amethyst and rock crystal are varieties. Used as an abrasive. Produced in California and many other states.
- Quicksilver:** see *Mercury*.
- Radium:** a radio-active element derived ultimately from uranium. Used (in minute quantities) for medical purposes, luminous paints and metal radiography (the examination of castings and forgings). United States consumption is supplied entirely from Canada and the Belgian Congo.
- Raise:** a mine shaft driven from below upward.
- Rank:** the degree of metamorphism through which coal has passed from its original

- deposition to the present. Corresponds, in a rough fashion, to the concept grade of ore in metal mining.
- Red lead:** an oxide of lead, used as a pigment.
- Rhodium:** see *Platinum metals*.
- Riffle:** from the Danish "riffle," a groove or channel in the bottom of an inclined trough or sluice, for arresting gold contained in sands or gravels. Also describes the lining of the bottom of a sluice, made of blocks or slats of wood, or stones, arranged in such a manner that chinks are left between them. The whole arrangement at the bottom of the sluice is usually called "the riffles." In smaller gold-saving machines, as the cradle, the slats of wood nailed across the bottom are called "riffle-bars," or simply "riffles." See also *Sluice*.
- Rig:** a derrick, with its engine house, etc.; used for boring, and afterwards pumping, an oil well. The term refers also to the derrick itself.
- Riprap:** nondimension stone used for foundations and sustaining walls.
- Road metal:** rock suitable for surfacing macadamized roads and for foundations for asphalt and concrete roadways.
- Rocker:** a short trough in which auriferous sands are agitated by oscillation, in water, to collect their gold. Used at placer workings.
- Rolls:** cast-iron cylinders, either plain or fitted with steel teeth, used to break coal and other materials into various sizes.
- Room and pillar:** a system of mining in which the distinguishing feature is the winning of 50 percent or more of the coal or ore in the first working. The material is mined in rooms separated by walls or pillars left to support the roof. The material in the pillars is obtained by subsequent working, in which sections of roof are successively allowed to cave. The first working in rooms is an advancing, and the winning of the ribs or pillars a retreating, operation. This method is applicable to coal, iron ore, lead and zinc, where the mineral occurs in flat deposits.
- Rottenstone:** a soft, light, earthy substance consisting of fine-grained silica, resulting from the decomposition of siliceous limestone. Usually combined with tripoli for statistical purposes.
- Rubble:** water-worn or rough broken stones, usually with only one good face, used for foundations and coarse masonry. Commonly classed as a form of dimension stone.
- Ruthenium:** see *Platinum metals*.
- Rutile:** titanium dioxide; see *Titanium*.
- Salt:** sodium chloride. Used in the food industry and for livestock. Produced from brine (especially in Michigan) and mined also as rock salt.
- Salt cake:** sodium sulfate, used primarily in paper manufacture. Obtained from brine by solar evaporation in California, and manufactured from various materials by the chemical industry.
- Sand:** any hard, granular rock material, finer than gravel and coarser than dust. Common sand is used mainly for building purposes. Special sands are glass sand (98 percent silica) and molding or foundry sand, for glassmaking and casting metal, respectively. Produced in every state. See also *Ground Sand and sandstone*.
- Sandstone:** an indurated sedimentary rock formed of coherent or cemented sand. As dimension stone it is produced chiefly in Ohio, New York and Pennsylvania. As crushed stone it is used for refractory purposes, concrete aggregate, road metal and railroad ballast, especially in Pennsylvania, and in most other states as well. See also *Ground Sand and sandstone*.
- Scabbling:** the removal of surface irregularities from dimension stone.
- Scythestones:** see *Oilstones*.
- Selective mining:** a method whereby mining is deliberately confined to the richer portions of a mineral deposit; commonly at least a partial separation between broken mineral and waste occurs in the mine itself, rather than in a processing plant on the surface.
- Selenium:** an element related to tellurium and sulfur. Used in glassmaking, to im-

- prove the machining qualities of copper, and in the manufacture of rectifiers. It is obtained domestically as a byproduct in the electrolytic refining of copper; some is also imported.
- Shale:** a fine-grained sedimentary rock, rather fragile and uneven in character, yielding a somewhat splintery fracture. Often incorrectly called slate.
- Shale oil:** a crude oil obtained from bituminous shales, especially in Scotland, by subjecting them to destructive distillation in special retorts.
- Short ton:** see *Ton*.
- Shrinkage stoping:** a method of mining in which part of the ore is used as a support for the walls and as a working platform.
- Silica:** silicon oxide; especially quartz, flint, opal, diatomite, sandstone.
- Silicates:** salts of the silicic acids. One of the largest classes of minerals, and of very common occurrence, e.g., as clay. As pumice and garnet, silicates are used as abrasives. See also *Talc*; *Pyrophyllite*; *Soapstone*.
- Silicon:** next to oxygen, the chief elementary constituent of the earth's crust. It has industrial applications as ferrosilicon in the manufacture of steel alloys: as silica (silicon oxide) it is a natural abrasive, and as silicon carbide it is an artificial abrasive.
- Silver:** a white metallic element, ductile, very malleable, and capable of a high degree of polish. Used for jewelry and decorative purposes, and for coinage. Mined in association with gold, copper, lead and zinc, it can frequently be described as a byproduct of the output of other metals.
- Skip:** a large hoisting bucket, constructed of boiler plate, which slides between guides in a shaft, so arranged that it may be automatically dumped at the surface.
- Slate:** a dense, fine-textured metamorphic rock whose separate minerals are indistinguishable to the unaided eye, and which has an excellent parallel cleavage, so that it breaks into thin plates or pencil-like shapes. Used for roofing, electrical insulation, sanitary construction, grave vaults, blackboards, billiard tables, school slates and flagstones. Produced chiefly in Pennsylvania and Vermont.
- Sluice:** a long, inclined trough, usually on the ground, for washing auriferous earth. In gold mining such a contrivance is paved with riffles to hold the quicksilver for catching the gold. See also *Riffle*.
- Soapstone:** a metamorphic rock composed of talc and related minerals. See *Talc*.
- Soda ash:** sodium carbonate; used chiefly in glass making and in the manufacture of caustic soda. Obtained both naturally and from chemical sources.
- Sodium carbonate:** see *Soda ash*.
- Sodium chloride:** see *Salt*.
- Sodium sulfate:** see *Salt cake*.
- Spelter:** the zinc of commerce, more or less impure, in slabs, plates or ingots cast from molten metal.
- Square set:** a set of timbers, used to support the roof and walls of a mine, composed of a cap, girt and post. These members meet so as to make a solid right angle. They are so framed at the intersection as to form a compression joint, and join with three other similar sets. The posts are 6 to 7 feet high, the caps and girts 4 to 6 feet long.
- Stone:** see *Basalt*; *Granite*; *Limestone*; *Marble*; *Sandstone*; *Slate*; also *Precious stones*.
- Slope:** an excavation from which the ore has been extracted, either above or below a level, in a series of steps, especially where veins are inclined. Frequently used, perhaps incorrectly, as a synonym of room, which is a wide working place in a mine where the veins are nearly level.
- Strip mining:** see *Open pit mining*.
- Stripping:** the operation of removing the overburden prior to working the mineral in a quarry or open pit mine.
- Strontium minerals:** used in the chemical and rayon industries, and occasionally for metallurgical purposes; also for railroad and military flares. Known chiefly as celestite. Domestic production has been unimportant.

- Sublevel caving:** a method of mining whereby intermediate levels are opened at short distances above the main level, and the ore is won by caving; the ore body is worked from the top down in successive slices.
- Sulfur:** a nonmetallic element occurring naturally in large quantities either native or in various sulfides. Native sulfur occurs in yellow orthorhombic crystals, in masses, crusts, and powder. It is the chief ingredient of sulfuric acid, a heavy chemical used as raw material for the manufacture of fertilizers, refining of petroleum, pickling of steel, processing of textiles and manufacture of explosives. Sulfur is mined in Texas and Louisiana.
- Tailings:** parts of any incoherent or fluid material separated as refuse, or separately treated as inferior in quality or value. In metallurgy, the part rejected in washing an ore that has passed through the screens of a stamp mill; the worthless slimes left after the valuable portion has been separated by dressing or concentration.
- Talc:** a hydrous magnesium silicate, which has a greasy or soapy feel and is easily cut. Used in paint, ceramics, roofing, paper, rubber and toilet preparations. Produced in New York and many other states. Talc also is imported, mainly ground, from Italy, France, Canada, China, and other countries.
- Tantalum:** a rather brittle lustrous white metal, closely associated with columbium. Alloyed with tungsten it is used in fountain pens, alloyed with nickel in radio tubes. As metal it is also used for corrosion resistant apparatus in chemical plants; as carbide it is employed in wire drawing dies and steel cutting tools. Imported from Australia, Brazil and the Belgian Congo.
- Tar:** a thick, brown-to-black viscous liquid, obtained by the distillation of wood, coal, peat and other organic materials.
- Tellurium:** an element related to selenium and sulfur. Occasionally found native as a crystalline substance of tin-white metallic luster, but usually in combination, as with gold and silver. Used in small quantities to toughen rubber, lead and copper, and in vapor form in "daylight" lamps.
- Terneplate:** a variety of tinplate coated with an alloy of tin (one third) and lead (two thirds).
- Tin:** a soft, lustrous white, crystalline metal, malleable at ordinary temperature but brittle when hot. Used for tinplate (especially in the manufacture of food containers); as solder, for bearings, and in the manufacture of brass; and for collapsible tubes and foil. A few tons of tin are mined annually in Alaska, but practically none in the continental United States. Before its occupation by the Japanese in 1942, Malaya supplied most of our tin; with the construction of a smelter in Texas, it is expected that an important part of our supply will be derived from Bolivia in the form of concentrates.
- Titanium:** a metallic element found in nature in combined form only, and isolated as an infusible, iron-gray, crystalline powder. Used extensively as ilmenite (iron titanium oxide) and rutile (titanium dioxide) for pigments, ceramics, paper-making and cosmetics. Metallic titanium is used in conjunction with vanadium in steel alloys. Ilmenite comes from India; rutile is mined in Virginia and Arkansas, and is imported from Australia.
- Ton:** measure of weight containing 2,000 pounds. See also *Long ton*.
- Trap rock:** see *Basalt*.
- Tripoli:** an incoherent, highly siliceous sedimentary rock composed of the shells of diatoms or radiolaria. Used as a polishing powder, and for filters. Produced in several states, especially Illinois.
- Tube mill:** a revolving cylinder nearly half filled with glacial or water-worn flints, used for fine grinding of ore prior to concentration.
- Tungsten:** a metal of the chromium group, found combined in certain minerals as wolframite and scheelite, and isolated as a hard, brittle, white or gray metal. Used for making high-speed tool steels and electric light filaments. Substantial amounts of tungsten ore are produced domestically (chiefly in California and Nevada); but, like the rest of the world, this country is in part dependent on imports from eastern Asia, particularly China. Because of this dependence, there

has been some tendency to substitute molybdenum for tungsten in alloy steels, but there is apparently nothing that can well be substituted in the manufacture of lamp filaments.

Turquoise: hydrous aluminum phosphate, colored by traces of copper. Produced in small quantities in Nevada and Colorado.

Uranium: a heavy, hard, nickel-white metal of the chromium group. It does not at present have commercial applications, but has been proposed as a source of atomic power. Obtainable as a byproduct of vanadium.

Vanadium: a grayish-white metallic powder; does not occur in native form, but is combined in several ores. Used as a steel-hardening material, especially in conjunction with molybdenum in tool steels in which tungsten has been replaced by the latter; also in small quantities as a catalyst in the manufacture of sulfuric acid; and in the ceramic industries. Although vanadium ores (which often also contain uranium) are mined in this country, chiefly in Colorado, a substantial portion of our supply has to be imported, mainly from Peru.

Vein: an occurrence of ore, usually disseminated through a gangue, and having a more or less regular development in length, width and depth. When metaliferous, a vein is described as a lode.

Vermiculite: a hydrated silicate related to mica, used for heat insulation and as a refractory. It has been mined in this country since 1924, chiefly in Montana.

Walking beam: an oscillating beam or lever for transmitting power, especially from engine to drill tool in a cable or churn drill of the sort used for drilling oil wells.

Water level: the level at which, by natural or artificial drainage, water is removed from a mine or mineral deposit.

Well drill: see *Churn drill*.

Whetstones: see *Oilstones*.

Whim: a large capstan or vertical drum turned by horse or steam power, for raising coal, ore or water from a mine. Called also whimsey, whim gin, horse gin.

White lead: a pigment composed of approximately 75 percent lead carbonate and 25 percent hydrated lead oxide.

Windlass: a roll or drum with handles, used in winding or hoisting from shallow pits.

Witherite: mineral composed of barium carbonate. Uses same as for barite. Small quantities are mined in California.

Zinc: a bluish-white, crystalline, metallic substance, used chiefly for galvanizing and the manufacture of brass. Mined in association with gold and silver in the Mountain states and with lead in the Mississippi Valley.

Zirconium: a grayish, crystalline metallic element found in combination only. As zircon (zirconium silicate) used in refractories, specialized porcelains and heat resisting glass; other compounds are used as enamels. In metallic form zirconium is used in flash bulbs, radio tubes and electrodes for welding.