DICTIONARY of CHEMICAL and METALLURGICAL MATERIAL

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DICTIONARY

OF

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Machinery, Appliances and Material

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ELECTROCHEMICAL AND METALLURGICAL INDUSTRY,

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PREFACE.

In issuing herewith for the first time this Dictionary of Chemical and Metallurgical Machinery, Appliances, and Material, the publishers of ELECTROCHEMICAL AND METALLURGICAL INDUSTRY believe they have embarked in a useful enterprise.

The object is not to give a complete directory of the trade, since representation in this Dictionary is limited to the advertisers in Electrochemical and Metallurgical Industry. On the other hand this little book is more than a mere directory or tabulation of the names of manufacturers; the object is to give to prospective purchasers in compact form and convenient alphabetical arrangement, concise and accurate descriptions of the different makes and special features of any class of apparatus.

Our intention is, therefore, to produce ultimately a sort of combination of dictionary and handbook. As nothing of this kind has been done before by others, and as this is our own first attempt, this first edition must be far from perfect, but we believe we have made at least a creditable beginning.

Any alphabetical dictionary arrangement naturally results in heterogeneous articles being brought together on the same page. To relieve somewhat this inevitable heterogeneity, this Dictionary is divided into three parts:

Part I.—Machinery, Appliances, and Material for Chemical and Metallurgical Industries.....page 1 to 132
Part II.—Measuring Instruments and Laboratory Supplies page 133 to 176
Part III.—Professional Directory.....page 177 to 182

Each part is arranged alphabetically and cross-references have been freely employed for the convenience of the reader.

One point of divergency from the ordinary alphabetical arrangement, however, needs explanation. If anyone looks up ball mills, or tube mills, or jaw crushers, etc., he will find in each case a cross-reference to Crushing and Grinding. It seemed to us advisable to bring all crushing and grinding machinery together under one heading and to group them alphabetically under this heading (so that "Crushing and Grinding: Ball Mills" precedes "Crushing and Grinding: Crushers, Jaw" and this again precedes "Crushing and Grinding: Tube Mills" etc.) The advantage is that the alphabetical principle and the convenience of finding a certain machine is maintained, while on the other hand a man who has something to crush or grind, but has not yet made up his mind what machine to use, will find here together in a series of pages all different types of machinery.

This arrangement has been generally made use of in the Dictionary, as under pyrometers in Part II, where this principle of arrangement enables a clean division into a number of prominent general types with distinct special features and limitations of temperature.

The descriptive notes have either been furnished by the advertisers themselves, especially for this purpose, or have been compiled from the trade literature or advertisements of the various firms.

One copy of this Dictionary we are sending, free of charge, to every subscriber and advertiser.

More work, time, and money has been spent in the preparation of this first edition than will appear at first glance. For future editions we ask for the coöperation of all of our friends. We hand this Dictionary to them in the hope that they may use it and find it useful, and that where they find us lacking, they may favor us with their criticisms, which will be carefully considered in next year's edition. Thus and thus only, can we hope to produce a work that conforms to our intentions.

ELECTROCHEMICAL AND METALLURGICAL INDUSTRY.

New York, July 1909.

PART I.

Machinery, Appliances, and Material for Chemical and Metallurgical Industries.

(For Measuring Instruments and Laboratory Supplies see Part II.)

ABBE Tube Mill and Ball Mill. See Crushing and Grinding.

ABRASIVES. See Carborundum.

ABSORPTION TOWERS. System Kypke and Lunge-Rohrmann, complete or in single parts made of acid-proof stoneware for absorption purposes.
—DIDIER-MARCH COMPANY, NEW YORK.
(Other stoneware makers see Stoneware.)

ACETYLENE gas is made from calcium carbide and water. Calcium carbide produced and sold by
—UNION CARBIDE CO., CHICAGO AND NEW YORK.

ACETYLENE CYLINDERS. For storing acetylene, and acetylene generators for welding. See Welding, Oxy-Acetylene.
—AMERICAN FERROFIX BRAZING CO., PHILADELPHIA, PA.

ACETYLENE GENERATOR. Insures a constant supply of acetylene gas at an equal maximum pressure of two pounds for welding purposes. See Welding, Oxy-Acetylene.
—INDUSTRIAL OXYGEN CO., NEW YORK.

ACETYLENE GENERATORS. Of most approved type. See Welding, Oxy-acetylene.
—HARRIS CALORIFIC CO., CLEVELAND, OHIO.

ACETYLENE PRESSURE GENERATOR. Used with the Davis-Bournonville oxy-acetylene process of welding and cutting, will maintain a pressure of 15 lbs. per sq. in., enabling users of the process to pipe the acetylene gas to various points in the factory where the process can be carried on most conveniently.
—DAVIS-BOURNONVILLE CO., NEW YORK.

ACHESON GRAPHITE. See Graphite.

ACIDS. Sulphuric, oil of vitriol, muriatic, nitric. Mixed acids for high explosives.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

ACIDS. Chemically pure. Hydrochloric, nitric, sulphuric acids. Full particulars and prices on request.
—Baker & Adamson Chemical Co., Easton, Pa.

ACIDS. "Baker's Analyzed Chemicals." Every label shows an analysis, and our guarantee provides that the contents of each bottle will conform with that analysis.
—J. T. Baker Chemical Co., Phillipsburg, N. J.

ACID ELEVATORS. Montejus, made of acid-proof stoneware in all sizes. These montejus are tested to resist various pressures depending on the size of vessel. Used to elevate acid by means of compressed air.
—Didier-March Co., New York.
(Other stoneware makers see Stoneware.)

ACID PUMPS. Pipes, fittings, etc., acid bottles, etc., of hard rubber.
—American Hard Rubber Co., New York.

ACID RETORTS, Pans, Lifts, and Stills. See Castings, Chemical. Also stoneware.

ACID SYPHONS, STEAM-JET. Acid syphons, made of lead, stoneware, porcelain, iron and brass for elevating and transferring acid and other solutions by means of steam. Where steam is objectionable, we refer to "air-jet lifts" and "automatic montejus" operated by compressed air. These acid syphons are made in three separate and distinct constructions, according to material, and therefore space here will not permit detailed description, except to say, that the proportions of steam pressure and height of elevation to which our standard machines are constructed is, steam pressure in pounds = 20, 40, 60, 80, 100. Total elevation in feet = 20, 40, 60, 80, 100. Capacities range from 200 to 30,000 gallon per hour. Manufacturers catalogues 2-A, 2-D, 2-H and 2-O give full particulars.
—Schutte & Koerting Co., Philadelphia, Pa.

ACID TUBING. Rubber.
—Revere Rubber Co., Boston, Mass.
—Boston Belting Co., Boston, Mass.

AGITATORS—STEAM-JET. The Koerting agitators offer a means of rapidly and immediately mixing or dissolving chemicals in water or other liquids. This process is generally carried on with mechanical stirrers which frequently fail to give the desired effect. The Koerting agitator is extremely simple in construc-

tion, easy to fix and work, and costs very little and obviates all disadvantages of the mechanical stirrers. The action is based upon the fact that a steam-jet issuing from a small nozzle into a larger one carries along with it the surrounding air and gives this air a velocity sufficient to overcome a pressure of fully 8 feet of water, The air escaping with great force from holes in pipe fixed at bottom of tank causes a violent agitation of the liquid surrounding it and stirs up and drives in all directions any solid matter. This agitator has no moving parts, is easily installed and occupies small space, requires no attention, and is economic in consumption of steam.
—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

AGITATORS AND ELEVATORS OF STONEWARE. For lifting and stirring acids, can be worked either by steam or compressed air; very simple and efficient apparatus.
—J. W. SITTIG, NEW YORK.
(Other Stoneware makers see Stoneware.)

AIR-COMPRESSORS. Steam-driven, belt-driven, electrically-driven, hydraulic-driven.
—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

AIR COMPRESSORS. Designed for 75 to 90 lb. pressure. For use with the air-acetylene blowpipe. See Welding, Oxy-acetylene
—HARRIS CALORIFIC CO., CLEVELAND, OHIO.

AIR-JET LIFT.
—BETHLEHEM FOUNDRY & MACHINE CO., SOUTH BETHLEHEM, PA.

AIR-JET LIFT. The Koerting Air-jet Lift is made of almost any material desired, iron, brass, lead, stoneware, hard rubber, etc., and is operated by compressed air. It works without mechanism; and can be installed (for instance) in drilled or artesian wells. This lift, like all air-jet lifts must be installed as deep under the level of the liquid as corresponds to height of lift. It has three connections; suction at bottom (to which a strainer may be attached if desired), air inlet and discharge connections directly on top. This air-jet lift is to be recommended very highly where dilution of acids by steam is objectionable; also on account of its greater efficiency over steam-jets or piston pump, due to no loss in condensation of steam through long pipes, and as a piston pump cannot always be made of suitable material.
—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

AIR SEPARATION. For grinding mills. See Crushing and Grinding, Raymond Mill, and Stroud Mill. See also Separator, Blast, and Separator, Vacuum.

ALLOYS. "S. A. M. alloy" for producing sound ingots and castings free from blowholes. We also make a special high-speed alloy for tool steel.
—GEO. G. BLACKWELL, SONS & CO., LTD., LIVERPOOL, ENGLAND.

ALLOYS. See also ferro-alloys and other alloys.

ALUM. Natrona porous. Crystal or lump alum. All forms of alum for filtering purposes.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

ALUMINA. Pure, for manufacture of aluminium.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

ALUMINIUM. Of first quality, guaranteed over 99% pure. Ingots, sheets, rods and wire.
—Electric Smelting & Aluminum Co., Lockport, N. Y.

Aluminium. For use as deoxidizing agent in iron and steel industry. Light alloy castings. Aluminium wire, etc.
—C. W. Leavitt & Co., New York.

Aluminium. Ingots, rods, granulated, for use in steel industry.
—Janney, Steinmetz & Co., Philadelphia, Pa.

Aluminium, No. 15 Aluminium Alloy. Contains 82% aluminium. Specific gravity 3.00. A good casting alloy suitable for pattern work, etc.
—Electric Smelting & Aluminum Co., Lockport, N. Y.

Aluminium Bronze. All the different grades of aluminium bronze in ingots.
—Electric Smelting & Aluminum Co., Lockport, N. Y.

Aluminium in Steel. Aluminium is largely used in the manufacture of steel; the amount varying as to the grade of the steel, the amount of occluded gases, the temperature of the molten metal, etc. The amount varying from $\frac{1}{8}$ to $\frac{3}{4}$ of a pound per ton of steel. The advantages of aluminium in steel manufacture are as follows:—(1) Producing ingots with solid tops, thereby greatly decreasing the scrap; (2) Quieting of boiling in molten steel, thereby proving a much needed aid in the handling and control of wild heats; (3) As an aid to homogeneity in steel:—(*a*) By preventing oxidation. (*b*) By a property of rapidly permeating the molten mass, thereby greatly aiding other alloys to combine homogeneously with the steel; this is especially true of nickel. (*c*) By causing steel to solidify more evenly, thereby avoiding segregation of phosphorus and other impurities; (4) Increasing tensile strength without a decrease of ductility; (5) Removal of any oxygen or oxide from the steel (good steel for electrical purposes has been produced using aluminium exclusively to remove the oxidation, thereby giving in the finished product a very low manganese content); (6) Rendering of the steel less liable to oxidation (by stopping boiling in the moulds, thus preventing a continuous exposure of fresh surfaces of molten steel to the atmosphere); (7) Producing ingots and castings of smooth surface, a self evident advantage for the finished mill.

Aluminium is not a hardener of steel and none of its alloys with steel in material proportions have so far proved advantageous. It has been proved that the addition of aluminium just before or during pouring causes the metal to lie quiet, and give off no appreciable quantity of gases, thus producing sounder ingots and castings. Blow holes in steel and iron are partly caused by the presence of carbonic oxide gas in the metal, and this gas is decomposed by the aluminium which unites with the oxygen forming alumina and setting free the carbon which appears as graphite. It also combines in some way with the hydrogen and nitrogen, either absorbing them or rendering them soluble in the steel. Aluminium is the principal dioxidizer known to metallurgists, the next being silicon; their relative effects being shown as follows:—100 parts by weight of oxygen will combine with 114 parts of aluminium or 140 parts of silicon or 350 parts of manganese. Moreover, the aluminium will entirely disappear if there is any oxygen present, and will only be found in the steel after all the oxygen has been absorbed. On the other hand, silicon is found in the steel even with oxygen still present. It is estimated that aluminium is five times as active as silicon in eliminating oxygen. In making ingots too much aluminium causes excessive piping and therefore a large loss from crop ends. Where the ingots are to be forged or rolled, from 2 to 4 ounces of aluminium to a ton of steel have been found advantageous. Larger amounts may be added to advantage where large ingots are to receive only scant working; here it seems to increase the ductility without altering the ultimate strength. Where freedom from blow-holes is the first consideration, *i.e.*, in steel castings, and where excessive piping and contraction in cooling is provided for by large runners and sink-heads, larger amounts are used to advantage. In tests of J. E. Stead one-tenth of 1 per cent. of aluminium added to that steel increased the weight and solidity and reduced blow-holes 23 per cent. Tests have shown that steel to which aluminium has been added will run through small passages without schilling better than ordinary steel; the reason is that the latter foams when in contact with cold surfaces and the flow is impeded to such an extent that the steel chills. The knowledge of this advantage is invaluable in the practice of open-hearth steel casting. The best results are only to be obtained by using a good grade of aluminium which contains no impurities. Scrap aluminium either in the shape of scrap or re-cast into ingots, is likely to contain elements which will be very harmful to the steel, two of the dangerous alloys being copper and zinc. Besides it is doubtful economy to use scrap because there is a very large surface exposed to oxidation before reaching the steel and the loss is correspondingly greater, amounting in cases of thin scrap to 10% or sometimes 25%.

—Janney, Steinmetz & Co., Philadelphia, Pa.

Aluminium Solder, Richards. The only aluminium solder producing reliable joints. Instructions for use: Use no flux, as the solder contains its own flux. Rub the surface of aluminium to be soldered with a stick of solder, applying heat at the same time

with a blow pipe, so that the end of the stick is continually melting. The surface of the aluminium will thus become " tinned " with solder. After " tinning " it is best to rub the solder thoroughly into the surface while still fluid, with a clean metal scratch brush. The durability of the joints depends on the thoroughness of the " tinning," and the scratch brush insures perfect work. To make a lap or butt joint between two sheets, proceed as follows: After the surface has been " tinned " in the manner described there should be melted upon them sufficient solder for sweating the pieces together. It is difficult to get solder to flow into an aluminium joint. It must be put just where it is wanted in the first place. After the pieces have been thus prepared they can be placed in a position and the flame applied long enough to make the solder perfectly fluid, after which the joint is permitted to set, care being taken that the pieces do not move while the solder is still fluid. To make a lock joint the sheet should be coated with solder before it is turned over, or else the solder will not soak into the joint. If it is desired to solder a twisted joint, the wire should be " tinned," before the joint is made, after which the soldering can be done in the ordinary manner. To solder cables into a sleeve or into a switch terminal, clean and " tin " the wires individually. " Tin " the inside of the sleeve, or terminal, with aluminium solder. If a closed terminal is used, insert the cable and heat at the same time, feeding in the solder until the terminal is full, after which allow to cool.
—Janney, Steinmetz & Co., Philadelphia, Pa.

ALUMINIUM SULPHATE. Iron free. In all grades for paper and color manufacturers and dyeing purposes.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

ALUMINIUM WELDING. See Welding, Oxy-acetylene.

ALUMINOTHERMICS. The name given to the discovery made by Dr. Hans Goldschmidt that metallic oxides mixed in suitable proportion with finely divided aluminium, when ignited in one spot, continue their combustion throughout the whole mass without any supply of heat from outside. The temperature so created is extremely high—about 5,000 degrees F.—and is obtained within less than half a minute after ignition. The science of aluminothermics occupies itself with the application and utilization of the forces so created. (See " Welding Outfit—Thermit ", " Welding Solid Iron and Steel Sections by the Thermit Process," " Welding—Thermit," " Pipe Welding by the Thermit Process," " Reinforcing Rods—Welding by the Thermit Process," " Foundry Practice with Thermit" " Steel Castings by the Thermit Process," " Steel—Special," " Thermit," " Thermit Steel," and various metals free from carbon.)
—Goldschmidt Thermit Co., New York.

AMALGAMATING PLANTS. For gold ores. We have been large builders of all classes of machinery for such plants and our designs are based on this experience of many years.
—Colorado Iron Works Co., Denver, Colo.

ANNEALING FURNACES. Built in all sizes for oil or gas fuel and constructed in such a manner that a perfect uniform and controllable temperature may be maintained throughout the chamber.
—ROCKWELL FURNACE CO., NEW YORK.

ANNEALING FURNACES, STATIONARY TYPES. For brass and copper rolling mills, wire mills, aluminium works, malleable iron works, steel foundries, bolt and nut works, cartridge factories, silver ware, mint work, electrical work, automobile parts and material of every kind and shape in all lines of manufacture. Revolving furnace for automatic annealing.
—W. S. ROCKWELL COMPANY, NEW YORK.

ANNEALING FURNACES. REVOLVING TYPE. For all small pieces of like dimensions such as cartridge shells, eyelets, ferrules, buttons, caps, cups, coin blanks, rivets, bolts, etc., three sizes: 500, 1,000 and 1,500 pounds capacities per hour. Catalog 2.
—W. S. ROCKWELL COMPANY, NEW YORK.

ANNEALING FURNACE, ELECTRIC. See Furnace, Electric, Hardening and Annealing Steel.

ANODES. May be of simple form or made up of a number of pieces. Various metals as well as carbon are used for this purpose. In many electrolytic processes this latter element is found to be more efficient when in the graphitic form. Rods, slabs, hollow and solid cylinders, special shapes, etc. containing 99% graphitic carbon are made. These readily lend themselves to the making of both simple and complex forms, since they can be machined in any way desired. Where moderate current densities per unit surface are required, efficiency and economy can be maximized by employing leading-in rods of graphite working at 100 to 150 amperes per square inch, threaded into graphite distributing slabs or blocks.
—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

ANODES, PLATING ELLIPTIC. Cast in all standard commercial metals with square copper wire hooks attached. The great advantage in the use of these anodes is the uniformity of deposit as disintegration takes place from all sides of the anode. They are 2½ inches wide by 1½ inches thick. By the uniform wear of the anodes the solution is constantly kept in good condition. These anodes allow a free circulation of solution and wear as thin as a knifeblade, thus reducing the loss of metal to the smallest possible amount. (See paper by C. F. Burgess, Electrochem. Ind., Vol. I, p. 347.)
—HANSON & VAN WINKLE COMPANY, NEWARK, N. J.

ANODES, PLATING SILVERITE. Made in nickel, copper, and brass. Consist of five vertical rods from a cross horizontal top rod with suspension hooks. Large surface, uniform and even wear. The solution is kept thoroughly saturated with metal and is easily kept in good condition.
—ZUCKER & LEVETT & LOEB CO., NEW YORK.

ANTIMONY. "A. S. P." Brand English star antimony, for Babbitt (8.33% tin, 8.3 antimony, 8.3 copper); antifriction (80 lead, 15 antimony, 5 tin); Britannia (10 antimony, 90 tin); pewter (7.1 antimony, 1.8 copper, 1.8 bismuth, 89.3 tin); electrotype (87 lead, 8.7 antimony, 4.3 tin); linotype (83 lead, 12 antimony, 5 tin).
—C. W. LEAVITT & Co., NEW YORK CITY.

ANTIMONY. Commercially pure. "Ruthlock" Brand.
—MARCUS RUTHENBURG, LONDON.

ANTIMONY, BLACK. Powdered metallic antimony. Needle antimony. Antimony chloride, oxide, sulphide (crude and golden). Japanese ore.
—FUERST BROS. & Co., NEW YORK.

ANTIMONIAL LEAD. See Lead, Antimonial.

ANTIMONY RUBBER BELTING. See Belting.

APPARATUS, CHEMICAL STONEWARE. Made from selected vitreous clays. Special apparatus of every description made from sketches or blue-prints. More than 25 years' experience in manufacturing clay products.
—A. J. WEEKS, AKRON, OHIO.
(Other stoneware makers see Stoneware.)

AQUADAG. An excellent lubricant. Differs from Oildag (which see) in that it is a colloidal solution or suspension of deflocculated Acheson graphite in water instead of oil.
—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

ARC LAMPS, General Electric. For indoor or outdoor service on commercial a.c. and d.c. circuits. Enclosed carbon arc lamps with recessed ceiling or corrugated diffusers. Luminous and flame arc lamps for the lighting of large enclosures. Simple and durable in construction and of high efficiency. All parts readily accessible for inspection.
—GENERAL ELECTRIC CO., SCHENECTADY, N. Y.

ARSENATE OF SODA.
—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

AUTOCLAVE LINERS OF STONEWARE. Very useful. They are cast out with lead or embedded in sand or kieselguhr. Also convenient for putting into calcium chloride baths.
—J. W. SITTIG, NEW YORK.

AUTOCLAVES. Of cast-iron enameled ware. Tested for a pressure of 50 atmosphere.
—J. W. SITTIG, NEW YORK.

BALL MILL. See Crushing and Grinding.

BARIUM-CHLORIDE FURNACES. For the treatment of high-speed steel, etc. These furnaces are built in several sizes of crucible for a wide range of work. Can be fired with oil fuel.
—ROCKWELL FURNACE CO., NEW YORK.

BARIUM BIOXIDE. 86%.
—ROBERTS, EVANS & WOODHEAD, LIVERPOOL, ENGLAND.
—FUERST BROS. & CO., NEW YORK.

BARREL PACKER. See Packer.

BASKETS, DIPPING. Of hard rubber.
—AMERICAN HARD RUBBER CO., NEW YORK.

BATTERIES—DRY.

Batteries, Open-Circuit. An open circuit battery remains out of work during most of its life, therefore it must be able to hold up in this open-circuit condition. Particularly long shelf life, uniformity of current drain and long service life are features of our Columbia brand. Especially adapted to telephones, electric bells, signal service and similar use. Also a complete line of high grade open circuit cells at lower prices than that of the Columbia.
—NATIONAL CARBON CO., CLEVELAND, OHIO.

Batteries, Ignition. This class of service requires a battery that is capable of enduring strenuous work and must also render long service life. We have a number of types of ignition batteries but our leading one is Columbia ignitor. It is known for its efficient and reliable spark and its quick recuperative power which gives it long life.
—NATIONAL CARBON CO., CLEVELAND, OHIO.

Batteries, Waterproof. Among our well known waterproof batteries may be mentioned (1) Autocell, four cells in series, enclosed in a metal case; (2) Multiplex, four cells in series, enclosed in wood case. (3) Series Multiple, various numbers of cells connected in series multiple, in either metal or wooden case. The number of batteries to be connected in series multiple depends on the class of service. (4) Tubular, three cells in series, connected end to end in a metal tube. It is particularly adapted to motor cycle and motor boat service.
—NATIONAL CARBON CO., CLEVELAND, OHIO.

Batteries, Flashlight. Our principal sizes are for the tubular, coat pocket, and vest pocket types. Especially noted for long life, strong current and brilliant light. We also manufacture battery renewals for all types of flashlights on the market.
—NATIONAL CARBON CO., CLEVELAND, OHIO.

Batteries, Ear-Apparatus. We are now prepared to furnish dry battery renewals for every type of ear apparatus requiring batteries. The quality of service to be obtained from an ear instrument depends largely on the quality of the battery used. We have made this particular feature a special study.
—NATIONAL CARBON CO., CLEVELAND, OHIO.

Batteries, Rectangular. Many classes of service require dry batteries that have a rectangular form instead of round. We have a complete line of sizes.
—NATIONAL CARBON CO., CLEVELAND, OHIO.

Batteries, Special and Novelty Batteries. A great many types of apparatus and toys require special dry batteries of odd shapes, sizes, connections, etc. We have a complete assortment of batteries for this class of work.
—NATIONAL CARBON CO., CLEVELAND, OHIO.

BATTERIES—WET.

Batteries, No. 2 Carbon Porous Cup Cells. A sal-ammoniac cell containing a depolarizer of manganese and carbon. A zinc cylinder surrounds the carbon cup and adds to its service and long life qualities. This battery is made in various sizes and is adapted to stationary gas engine ignition, telephones, fire alarms signals, etc. Our leading cell of this type is No. 2.
—NATIONAL CARBON CO., CLEVELAND, OHIO.

Batteries, Carbon Cylinder Cell. Another form of sal-ammoniac cell which contains a carbon cylinder but no depolarizer. The zinc is in pencil form. This battery is for bells, signals and other light drain duties. No. 7 leads all others in this class.
—NATIONAL CARBON CO., CLEVELAND, OHIO.

Batteries, Copper Oxide Cell. A closed circuit cell containing a solution of caustic soda, zinc and a depolarizer of copper oxide. On account of the ratio of the ingredients this cell is capable of remaining in closed circuit for long periods of time without being run down. Particularly adapted to railroad signal service of various forms.
—NATIONAL CARBON CO., CLEVELAND, OHIO.

BATTERY CUPS AND JARS. See Porous Cups and Earthenware.
—JOHN MADDOCK & SONS, TRENTON, N. J.

BATTERY FILLER. Acheson graphite for dry-battery filler is made in two leading grades, "Ba2" and "Bb1," besides any desired size of lump or granular graphites, or any mixture of sizes. "Ba2" is a fine powder, guaranteed 92% graphite carbon. "Bb1" is not quite so finely ground, contains 98% graphitic carbon and is of different texture from the "Ba2." Both are practically free

from iron, of uniform quality, chemically inert, contain no volatile matter, and possess high electrical conductivity.
—International Acheson Graphite Co., Niagara Falls, N. Y.

BAUXITE. For aluminium manufacture and for refractory purposes.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

BAUXITE BRICK. A refractory for steel furnaces, lead refining furnaces, lining for rotary portland cement kilns. See article by A. J. Aubrey, *Electrochem. and Met. Industry*, Vol. IV, p. 52.
—Laclede-Christy Clay Products Co., St. Louis, Mo.

BEET SUGAR MACHINERY. Multiple effects, strike pans, diffusion batteries, crystallizers, heaters, beet wheels and washers, and mechanical filters.
—Swenson Evaporator Co., Chicago, Ill.
—Zaremba Co., Chicago, Ill.

BELTING, GUTTA BALATA. An absolutely seamless belt. Made under Forsyth's Patent. Can be run with either side next the pulleys, and is practically unaffected by oils or grease. Made stapled; also supplied plain without staples. The duck used in this belt is so woven that stretch is reduced to the minimum. A 4-ply Gutta Balata belt is equal to a 5-ply rubber or canvas belt.
—Boston Belting Company, Boston.

BELTING, RUBBER. Made of a specially woven duck of great tensile strength and high-grade rubber. Adapted for use in damp or wet places, either for the transmission of power or conveying of materials. Conveyor belt supplied, when desired, with an extra thick rubber cover to overcome injury to the belt by abrasion. "Boston" and "Niagara" grades especially recommended for satisfactory service and durability. "Imperial" is a stitched rubber belt, in which there are rows of stitches of long stapled cotton yarn running the entire length of the belt, about 1" apart. "Imperial" Stitched Belting is well adapted for hard and severe work.
—Boston Belting Company, Boston.

BELTING, RUBBER. Not affected by dampness, nor by changes in temperature. Absolutely uniform in width and thickness. Our belting being thoroughly stretched in manufacture, the tendency to elongate in service is reduced to a minimum. A three or four ply is equal to a single, and five or six ply is equal to a double leather belt. It can be reversed and either side run next to the pulleys. Seamless belting. Our brands: Giant ("the original stitched belt, and the best belt ever made"), Granite, Beacon, Shawmut. Special brands. Four Ace Matchless, Special Elevator, Silvertown Elevator, Special Conveyor, Shawmut Conveyor, V. Z., Pilot. Conveyor belting, concentrator belts, ore elevator belting.
—Revere Rubber Co., Boston, Mass.

BELTING, ANTIMONY RUBBER. Pure antimony rubber tubing constructed especially for chemical laboratory use, with extra heavy walls. Sizes, $\frac{1}{8}$"; $\frac{1}{4}$"; $\frac{3}{8}$"; $\frac{1}{2}$". Catalog B.
—Buffalo Dental Mfg. Co., Buffalo, N. Y.

BICARBONATE OF SODA. Natrona. For baking powder and drug purposes.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

BISMUTH.
—Roessler & Hasslacher Chemical Co., New York.

BISULPHIDE OF CARBON. See Carbon bisulphide.

BLAST FURNACES. With hot blast. Our catalog "Some details as to smelting practice and equipments."
—Colorado Iron Works Co., Denver, Colo.

BLAST FURNACES. See Smelting Furnaces.

BLAST NOZZLE OR VENTILATOR. Made of hard lead and used for creating draft at the end of the chamber. By installing this nozzle in the flue, the same condition of draft can be had on the burners and in the chambers, independent of variations of the atmosphere. On account of the proper construction and proportioning of the nozzles, the consumptions of steam is very small. These blast nozzles are manufactured in two styles, one with fixed steam nozzle, and the other with removable steam nozzle. The latter has the advantage that the steam nozzle can be replaced without taking the blast nozzle out of the flue.
—Schutte & Koerting Co., Philadelphia, Pa.

BLEACHING. See bleaching powder; bleaching liquor; chlorine; hypochlorite; oxone; ozone; palm oil bleacher; perborate sodium; peroxide calcium; peroxide strontium; sulphur.

BLEACHING LIQUOR. An electrolytic cell for continuous production of sodium hypochlorite (bleaching liquor) from sodium chloride for bleaching, disinfecting, etc. A 4% solution of salt flows by gravity into the cell, while a 110-volt direct current is passed through it. The solution flowing off (bleaching liquor or hypochlorite) contains four to five grams available chlorine per liter. Sodium hypochlorite is a strong oxidizing agent quickly attracting any organic matter in cloth or vegetable fibers. The apparatus is of great convenience for use in laundries and in general where a bleaching or disinfecting operation is to be carried out. The solution contains no free chlorine or alkali, thus being perfectly harmless to fibers. The compounds are readily soluble; therefore, it imparts no harshness to the cloth.
—National Laundry Machinery Co., Dayton, Ohio.

BLEACHING POWDER. Chloride of lime, made from chlorine, produced electrolytically.
—Arnold, Hoffman & Co., Providence, R. I.
—Castner Electrolytic Alkali Co., Niagara Falls, N. Y.
—Development and Funding Co., New York.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

BLOWERS. Positive pressure blowers for handling air or gas up to 10 lbs. pressure. Belt or motor driven. Capacities from 50 to 1,000 cu. ft. per minute. Suitable for air blast for furnaces using oil or gas fuel, sand blasts, exhausting gas from gas producers, etc.
—W. S. Rockwell Company, New York.

BLOWERS. General Electric motor blowers and exhaust fans. Have a special field of usefulness in ventilating buildings. The company manufactures both direct-current and alternating-current motor blower sets adapted to meet given conditions. The motors are constructed with self-oiling and self-adjusting bearings, and renewable dust-proof covers, and are easily accessible for repairs. Can be mounted on the ceiling, floor or wall, as desired. In special cases specifications and prices can be prepared for out-of-ordinary equipment.
—General Electric Co., Schenectady, N. Y.

BLOWERS, ROTARY LEAD FAN. Especially designed and constructed for the chemical industry, and may be placed between the Glover tower and the first chamber, or between two Gay-Lussac towers, or at the end of the system. The body of the fan is constructed entirely of hard lead; the shaft being lead covered. The construction is so that discharge may be had in any of four directions—vertically, top or bottom, and horizontally in either direction; may be belt or motor driven as desired; operated at high or low speed, and is provided with self-oiling devices. Result: Continuous draft, increased production, economic operation. Built in eight sizes, with output of 730 to 6,800 cu. ft. per minute.
—Schutte & Koerting Co., Philadelphia, Pa.

BLOWERS, LEAD STEAM-JET, AND VENTILATORS. For moving gases, etc. in Chemical and allied industries. These blowers and ventilators are constructed on the order of an injector, that is, with a nozzle for the purpose of giving the air great velocity with a minimum steam pressure. They occupy little space in comparison to capacity in cubic feet of air moved per hour, viz.: Capacity 60,000, dimensions 52⅝″ high x 13½″ wide. Standard sizes, are, 8,000, 16,000, 30,000, 60,000, and 120,000 cu. ft. per hour. To give strength and wear to the steam nozzle, the nozzle is lined with platinum or other desirable material to suit requirements.
—Schutte & Koerting Co., Philadelphia, Pa.

BLOWERS. Monarch Rotary Low-Pressure. Constructed capacities up to 350 cubic feet of free air per minute, economical, re-

quire little horsepower. A good suitable article that is well made, guaranteed free from imperfections and of superior workmanship. —MONARCH ENGINEERING & MFG. CO., BALTIMORE, MD.

BLOWERS, Fans. Positive pressure blowers.
—ROCKWELL FURNACE CO., NEW YORK.

BLOWERS and Exhausters. Monogram blowers, Monogram electric fans.
—E. H. STROUD & CO., CHICAGO, ILL.

BLOWING ENGINES.
—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

BLOWPIPE, OXY-ACETYLENE. See Welding, Oxy-acetylene, and cutting, Oxy-acetylene. Also Welding, Oxy-hydrogen.

BOILERS, STEAM (DOPP). The Cookers, also called Caldron furnaces, are provided with fire box, grate and smoke stack and are used for heating, also evaporating, concentrating where steam is not available. The small boilers are designed for low pressure steam to be used for heating steam-jacketed kettles or vacuum pans or for any other purpose, for canning, preserving, cooking hams and making sausage, boiling spray for insecticide. A licensed engineer is not required to operate these boilers, as only low pressure steam is generated. At the same time they are perfectly safe, being tested to two hundred pounds per square inch of hydrostatic pressure.
—H. W. DOPP CO., BUFFALO, N. Y.

BOILER SETTING. Brick.
—HARBISON-WALKER REFRACTORIES CO., PITTSBURGH, PA.

BOILING TUBES. Heating Coils of stone-ware.
—J. W. SITTIG, NEW YORK.
(Other stoneware makers see Stoneware.)

BOILING VESSELS for the manufacture of picric acid of acknowledged quality and greatest durability. Covers arranged for hydraulic seal or ground on.
—J. W. SITTIG, NEW YORK.
(Other stoneware makers see Stoneware.)

BOOKS. All scientific, engineering, and technical books—electrochemical, chemical, mining, metallurgical, electrical, civil engineering, and all other lines, published or carried in stock. We publish the electrical and other engineering books of the *Electrical World*, *Electric Railway Journal*, *Engineering Record* and of the McGraw Publishing Co.; also the chemical and metallurgical books of *Electrochemical* and *Metallurgical Industry*. The machinery, power, mining and metallurgical books of the *American Machinist*, *Power and the Engineer*, *The Engineering and Mining Journal* and of the Hill

Publishing Co., are also now controlled by us. All books sold at one price. "Net" books are not subject to discount. If a book is discountable, purchaser will get the discount whether he asks for it or not, and the rebate will be returned with his receipted bill.
—McGraw-Hill Book Company, New York.

BOTTLES for storing distilled water, round or rectangular form, of acid proof stoneware.
—J. W. Sittig, New York.
(Other stoneware makers see Stoneware.)

BOTTLES. Of hard rubber for acids, etc.
—American Hard Rubber Co., New York.

BRAZING FURNACES. For brass, copper and steel tubing, trolley wire, copper smith's work, etc., all styles and sizes.
—W. S. Rockwell Company, New York.

BRICK. Acid-proof.
—Charles Graham Chemical Pottery Works, Brooklyn, N. Y.
—Didier-March Co., New York.
—Harbison-Walker Refractories Co., Pittsburgh, Pa.
—Laclede-Christy Clay Products Co., St. Louis, Mo.
—J. W. Sittig, New York.
—U. S. Stoneware Co., Akron, Ohio.
—A. J. Weeks, Akron, Ohio.

BRICK. See also fire brick, silica brick, chrome brick, magnesia brick, bauxite brick.

BRIQUETTING PRESSES AND COMPRESSORS. A new type of continuous acting rotary briquetting press. Used largely for compressing small cakes. Can be furnished for briquetting coal, coke, etc.
—F. J. Stokes Machine Co., Philadelphia, Pa.

BUCKETS. Hard rubber.
—American Hard Rubber Co., New York.

BUFF, TRIPLEX FOR ELECTROPLATERS. The feature is the fold, the object being to produce a cross-cutting or diagonal surface on the cutting face of the buff, the buff being made of a succession of folds so formed as to offer a greater surface to the work and at the same time to save composition. The mesh of the fabric crossing prevents the material pulling out or fraying on the working edge. The triplex buff uses up every strand of thread in the wheel. When the wheel is worn down to say 7″, the stubs may be returned and, at a nominal cost, remade into a 12″ wheel of approximately double the diameter of the worn-down wheel, using two wheels so returned to make one new wheel. In this way the user has one and one-half

buffs at the price of one. The triplex buff wears at least twice as long as the ordinary buff, and the saving of composition is as much as 20%.
—Zucker & Levett & Loeb Co., New York.

BUFFING WHEELS. Made of bleached and unbleached cotton cloth, put into different-size diameters and is laid up in sections of 18 to 20 layers. Every other layer is turned so as to interlock the threads, thereby making a much stronger and longer wearing wheel. Buffs are also made from pieces of muslin, varying in size from ⅛ to ½ of the full disc. Sufficient of these pieces are laid to equal about 20 layers of muslin and are sewed spirally from the hub to the periphery. This makes a very hard cutting buff, used for cutting down work.
—Levett Mfg. Co., Matawan, N. J.

BUFFING LATHE. See Lathe.

BURNERS. Fuel oil or gas. For miscellaneous requirements; can be attached to various retorts, cupelling furnaces, or used for annealing and welding, etc.
—Monarch Engineering & Mfg. Co., Baltimore, Md.

BURNERS. For oil or gas. Seven different styles—steam, air or combination. All parts accessible, all interchangeable. Simple, reliable, powerful, durable, economical, suitable for light or heavy oils. More in use than all others combined. Price includes valves and unions complete. Catalog 3.
—W. S. Rockwell Company, New York.

Burners. For welding. See Welding.

BURNISHING POTS. Of acid-proof stoneware, in various sizes, with and without handles.
—Didier-March Co., New York.
(Other stoneware makers see Stoneware.)

BUSHINGS. Bushings, Washers, Discs and other small carbon articles formerly made in molds can frequently be far more economically produced by machining from solid Acheson-Graphite rods. High electrical conductivity, purity (99%), smoothness, lubricating properties, resistance to oxidation and disintegration, and non-arcing properties are important considerations in this connection.
—International Acheson Graphite Company, Niagara Falls, N. Y.

CABLES, OKONITE. "The standard for rubber insulation."
—Okonite Co., New York.

CABLE PRESS. See Press, Lead Cable.

CADMIUM.
—Roessler & Hasslacher Chemical Co., New York.

CALCIUM.
—Roessler & Hasslacher Chemical Co., New York.

CALCIUM CARBIDE. Made in the electric furnace. In contact with water, it develops acetylene gas.
—Union Carbide Co., Chicago and New York.

CALCIUM CHLORIDE.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

CARBONS, ARC LAMPS. A large assortment of sizes in several grades for open and enclosed arcs, flaming arc, moving-picture machines and search-lights.
—National Carbon Co., Cleveland, Ohio.

CARBON BISULPHIDE. Shipped in drums. Made in the electric furnace. Special goods for fine uses. Used for extracting oil from seeds, wool, bones, etc.; as a disinfectant; as an exterminator of insects and small animals; with chloride of sulphur for vulcanizing india rubber, etc. Detailed information on request.
—E. R. Taylor, Penn Yan, N. Y.

CARBON BRUSHES. For generators, motors, dynamos of all sizes, forms and styles of manufacture—in plain form or with any style of connection. We can supply particular grades with reference to conductivity, abrasiveness, lubrication, long life and other special features, when given specifications and operating conditions. Our leading brands are Partridge, Columbia and Laclede.
—National Carbon Co., Cleveland, Ohio.

CARBON ELECTRODES, AMORPHOUS. Especially made for efficiency and long life. We have been supplying these for electric furnaces for the manufacture of aluminium, ferro-alloys, electric steel smelting, and the manufacture of metallic sodium and caustic soda. The above classes of service only constitute a small portion of the possibilities of uses for which our high grade electrodes are used. We can supply these carbons in any size, graphitized or not, as the service requires.
—National Carbon Co., Cleveland, Ohio.

CARBON ELECTRODES, AMORPHOUS. Of best quality and particularly adapted to the manufacture of dry cells. There is also a large demand for special electrodes used in connection with wet cell work.
—National Carbon Co., Cleveland, Ohio.

CARBONS. A general term frequently applied to electrodes and terminals of carbon, whether of the graphitic or amorphous variety.

In electrometallurgical work Acheson graphite carbons allow 125 to 250 amperes per square inch. Readily threaded for connections and for joining to avoid waste ends. Are of pure graphite throughout, hence highly resistant to disintegration. Well adapted to steel furnaces, particularly in reducing atmosphere. Equally applicable in arc or resistance furnace work.
—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

CARBON FLOUR. A complete assortment of carbon flour of first-class quality and in any standard size. Adapted to many uses, among which may be named:—Packing incandescent lamp filaments for baking and in the manufacture of dry batteries.
—NATIONAL CARBON CO., CLEVELAND, OHIO.

CARBON, GLOBULAR. For telephone work and various forms of experimental work, in practically any desired screen sizes.
—NATIONAL CARBON CO., CLEVELAND, OHIO.

CARBON, GRANULAR. A high grade of granular carbon in any degree of fineness, especially adapted for special classes of resistors and in connection with rheostats. A great many experimental laboratories construct their rheostats so as to use granular carbon instead of a mechanical rheostat, as it gives better control over the current.
—NATIONAL CARBON CO., CLEVELAND, OHIO.

CARBON PACKING RINGS FOR STEAM TURBINES. We can turn out the segments in any size, upon receipt of specifications and can assure accuracy of the highest degree. They are smooth in the bearings and form a perfect steam-tight packing. Their life is exceedingly long, as they wear very slowly. By the use of our carbon segments a saving of fuel will be realized as well as a perceptible decrease in lost power and a reduction in the depreciation of machines.
—NATIONAL CARBON CO., CLEVELAND, OHIO.

CARBON RESISTORS. Of many varieties and of good qualities. We can supply practically all sizes and lengths in such forms as strips, rods, discs, etc., used in connection with electric furnace work.
—NATIONAL CARBON CO., CLEVELAND, OHIO.

CARBON SPECIALTIES, AMORPHOUS. Upon receipt of specifications we are prepared to furnish the highest grade of carbon products of any nature. Among our specialties are muffles for electric furnaces, carbon plates, rods, bricks, sticks, small tubes, discs for resistors, contacts, and carbon molded into special shapes.
—NATIONAL CARBON CO., CLEVELAND, OHIO.

CARBON TUBES. A complete assortment of diameters, wall thicknesses and lengths for all classes of service. The largest por-

tion of our tube products are used in making electric furnaces for electrically baking or metallizing incandescent lamp filaments. Also tubes for resistors. Also used in connection with electric furnaces for the insertion of pyrometers, or the conduction of gases, etc. Large stock, and every facility for making special tubes according to specifications.
—National Carbon Co., Cleveland, Ohio.

CARBONIZING FURNACES. For the carbonization of electric lamp filaments, etc. Uniform and controllable temperature to insure perfect results are secured by gas or oil fuel. These furnaces are made in several sizes.
—Rockwell Furnace Co., New York.

CARBOYS. With plain or screw stoppers, all made of acid-proof stoneware.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

CARBORUNDUM. A chemical compound of carbon and silicon, having the formula SiC (silicon carbide.) It is made in the electric furnace from coke and sand and contains 70% of silicon and 30% of carbon, with negligible amounts of iron and aluminium. Specific gravity 3.12. Specific heat .185. Hardness between 9.5 and 10. It is the hardest of all known materials except the diamond. It is infusible at all temperatures except those of the electric furnace and decomposes at about 2250° C. It is insoluble in all acids, but is dissolved in fused alkalies. Its principal use is as an abrasive in the manufacture of grinding wheels and sharpening stones. Carborundum is also widely used as a refractory material and as a substitute for ferro-silicon in the manufacture of steel, and the grade for this purpose contains 62% silicon, 35% carbon and 3% iron and aluminium. It is added directly to the ladle and is a powerful deoxidizing agent.
—Carborundum Company, Niagara Falls, N. Y.

CARBORUNDUM FIRE SAND. Also called amorphous carborundum, made in the outer zone of the carborundum furnace. A greenish granular material having a specific gravity of about 2.9. It is widely used as a refractory, especially in oil burning furnaces. The mixture commonly used is carborundum fire sand 70%, ground fire clay 15%, silicate of soda (52° Beaume) 8% and water 7%. This mixture weighs about 85 pounds per cu. ft. and is used in crucible brass furnaces and oil burning furnaces for melting brass.
—Carborundum Company, Niagara Falls, N. Y.

CASE-HARDENING FURNACES. For engine, automobile, gun and all other lines of work. All sizes and styles.
—W. S. Rockwell Co., New York.

CASTINGS, AIR FURNACE IRON. This iron is used for the finest castings. The sulphur is very low. The lower graphite carbon makes a dense, fine grained iron of great strength. This iron is especially adapted for high-pressure cylinders and pumps and ammonia compressors. This metal has great wearing power, with considerable ductility. The chemical composition can be regulated to produce metal of any degree of hardness or chill.
—Buffalo Foundry & Machine Company, Buffalo, N. Y.

CASTINGS, CHEMICAL. Made from the purest iron, with additions necessary to make the iron resist the action of corrosive chemicals. Special methods of moulding are introduced to insure the longest life to the casting under working conditions. All mixtures are made up from a chemical basis. Chemical castings made by this Company have in many cases greatly reduced the casting cost to customers, on account of the longer life they are able to obtain from their use.
—Buffalo Foundry & Machine Company, Buffalo, N. Y.

CASTINGS, CHEMICAL. Specially designed to resist the action of various acids, such as nitric acid retorts, muriatic acid pans, acetic acid stills, sulphuric acid stills, sulphuric acid evaporating pans, nitre hogs, acid lifts, also a specialty of castings made from blue prints furnished by designers, engineers and superintendents of plants. Plans or estimates furnished for complete acid and chemical plants.
—Bethlehem Foundry & Machine Co., South Bethlehem, Pa.

CASTINGS, GREY IRON. Heavy castings are made of the best quality of pig iron and scrap. The metal is designed for the softest, easily machined casting and also for varying grades of harder, closer grained iron up to mottled or white iron. The chemical composition of each grade is carefully determined. The foundry is equipped with travelling cranes of great capacity so that castings of 200 tons weight may be handled with ease. All fuels, fluxes and pig iron used in the manufacture are tested and the products of the foundry are rigidly inspected. Breaking tests of the various grades of iron are made on a powerful testing machine.
—Buffalo Foundry & Machine Co., Buffalo, N. Y.

CASTINGS, IRON. Large or small, of any form, green sand, dry sand or loam.
—H. G. Trout Company, Buffalo, N. Y.

CASTINGS, SEMI-STEEL. Made by melting soft steel with pig iron and scrap. It may contain small or large amounts of steel according to the demands made upon the metal. It has taken the place of the highest priced charcoal iron for most work. It will give a tensile strength of 30,000 to 40,000 lbs. per square inch. On a transverse strain it shows a good deflection, indicating toughness.

It resists abrasion and shock, and is used for grinding machinery, rollers, etc.
—Buffalo Foundry & Machine Company, Buffalo, N. Y.

CAST IRON ENAMELED. See Enameled Ware.

CASTNER-KELLNER CELL. See Cells, Electrolytic.

CATTON SMELTING FURNACE. See Smelting Furnace, Catton.

CAUSTIC POTS. See Evaporating pots.

CAUSTIC SODA. Caustic potash, liquid and fused. (See Cells, electrolytic).
—Arnold, Hoffman & Co., Providence, R. I.
—Castner Electrolytic Alkali Co., Niagara Falls, N. Y.
—Development & Funding Co., New York.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

CELLS, ELECTROLYTIC. For alkali chloride electrolysis. Produce chlorine (for bleaching powder and other purposes) and caustic soda or potash from common salt (sodium chloride) or potassium chloride respectively.

Castner-Kellner Cell. Mercury cathode. Description in Electrochemical Industry, Vol. I, p. 12.
—Castner Electrolytic Alkali Co., Niagara Falls, N. Y.

Townsend Cell. A diaphragm cell. Description in Electrochemical and Metallurgical Industry, Vol. V, p. 209, 301.
—Development and Funding Co., New York.

Other Diaphragm Cells.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
—Siemens & Halske Co., New York City.

CELLS, ELECTROLYTIC. For electrolysis of sodium chloride, to produce a hypochlorite solution, (see Bleaching Liquor).
—National Laundry Machinery Co., Dayton. Ohio.
—Siemens & Halske Co., New York City.

CENTRIFUGALS, NITRATING. Of the firm of Selwig & Lange of Brunswick, Germany—purveyors to nearly all the European continental Governments, many foreign governments and private factories in the explosive line; recognized to be the most efficient and easiest running machines constructed heretofore. Made in different sizes up to a capacity of 20 kg.—44 lbs. cotton per charge; especially suited for powder and other explosive works.
—J. W. Sittig, New York.

CENTRIFUGAL MACHINES. For separation of liquids from solids by centrifugal force. See description in the second part of this dictionary, on Measuring Instruments and Laboratory Supply.
—International Instrument Co., Cambridge, Mass.

CHEMICAL CASTINGS. See Castings, Chemical.

CHEMICALS. Chemically pure ammonium hydrate, chemical salts, and reagents. Full particulars and prices on request.
—Baker & Adamson Chemical Co., Easton, Pa.

CHEMICALS. "Baker's Analyzed Chemicals." Every label shows an analysis, and our guarantee provides that the contents of each bottle will conform with that analysis. Price lists on request.
—J. T. Baker Chemical Co., Phillipsburg, N. J.

CHEMICALS. "Let Merck make the 'Blank' Test for you. To that end, buy Merck's Blue Label Reagents."
—Merck & Co., New York, St. Louis, Rahway, N. J.

CHEMICALS.
—Arnold, Hoffman & Co., Providence, R. I.
—Bausch & Lomb Optical Co., Rochester, N. Y.
—George G. Blackwell, Sons & Co., Liverpool, England.
—Castner Electrolytic Alkali Co., Niagara Falls, N. Y.
—Development and Funding Co., New York City.
—Eimer & Amend, New York City.
—Geo. D. Feidt & Co., Philadelphia, Pa.
—Fuerst Bros. & Co., New York City.
—Hanson & Van Winkle Co., Newark, N. J.
—Henry Heil Chemical Co., St. Louis, Mo.
—International Chemical Co., Camden, N. J.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
—Roessler & Hasslacher Chemical Co., New York City.
—E. H. Sargent & Co., Chicago, Ill.
—Scientific Materials Co., Pittsburgh, Pa.
—Arthur H. Thomas Co., Philadelphia, Pa.
—Zucker & Levett & Loeb Co., New York City.

CHLORIDE OF LIME. See Bleaching powder.

CHLORINATION PLANTS. For gold ores.
—Allis-Chalmers Co., Milwaukee, Wis.

CHLORINE and chlorine products. (See Cells—electrolytic.)
—Arnold, Hoffman & Co., Providence, R. I.
—Castner Electrolytic Alkali Co., Niagara Falls, N. Y.
—Development and Funding Co., New York.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

CHLORINE GENERATORS—STONEWARE. For production of chlorine by action of acid on common salt. Furnished in various sizes, complete with inner stoneware basket. Made from best chemical stoneware.
—Charles Graham Chemical Pottery Works, Brooklyn, N. Y.

Chlorine Generators of the well known form, fully able to withstand the pressure caused by the development of gas. They are also made with perforated false bottom acid and steam inlet pipes.
—J. W. SITTIG, NEW YORK.

Chlorine Generators. With sieve and ground—on cover made of acid-proof stoneware, in various capacities. Can also be furnished with water lute covers if desired.
—DIDIER-MARCH COMPANY, NEW YORK.
(Other stoneware makers see Stoneware.)

CHROME BRICK. The ideal neutral refractory brick. Practically infusible and dense in structure. Used in basic and open-hearth steel furnaces (as a neutral course between the fire-clay brick on the bottom plates and the magnesia brick forming the foundation for the hearth or furnace bottom; for the floors of ports and the facing of port walls and backwalls of uptakes; also useful for making quick repairs in furnace at working heat, as they are not affected by sudden changes of temperature); in soaking pits (six or eight courses in the bottoms); in coal-fired heating furnaces (along the slag line); in copper smelting and refining plants in the bottom courses and around the tap holes of blast furnaces and in lining settlers (along the slag line and around the tap holes) and in lining converters (next to the shell); in lead softening and refining furnaces and many special furnaces; also in rotary cement kilns.

Chrome brick should be laid in finely ground chrome ore (with the exception of the lining of converters next to the shell, where they should be laid in magnesite cement instead of chrome ore, the former sticking well to iron work). Chrome brick expand slightly at high temperatures. They should not be subjected to excessive weight when hot. Chrome brick are practically unaffected by changes in temperature; at furnace heat they can come in contact with water without breaking or sprawling.
—HARBISON-WALKER REFRACTORIES CO., PITTSBURGH, PA.

CHROME CEMENT.
—HARBISON-WALKER REFRACTORIES CO., PITTSBURGH, PA.

CHROME ORE. Sesquioxide of Chromium, exceedingly refractory, dense and neutral; it is neither acid, basic, reducing nor oxidizing. Used principally in basic open hearth furnaces in such places as along the back walls of stationary and tilting furnaces, on the floors of the ports, and as a protection to the silica brick in the ports and furnace blocks. Chrome ore is generally useful where chemical action and high temperature combined are to be resisted. We can furnish a chrome ore running especially low in silica and containing from 38 to 42 per cent of chromium sesquioxide, and a chrome ore running 50 per cent chromium sesquioxide or over shipping either in lump form or finely ground, as ordered.
—HARBISON-WALKER REFRACTORIES CO., PITTSBURGH, PA.

CHROME ORE. Refractory for furnace linings.
—E. J. Lavino & Co., Philadelphia, Pa.

CHROME ORE. Export.
—A. Champin, Paris, France.

CHROMIUM, METALLIC. Registered trade-mark "Thermit;" free from carbon, made by the aluminothermic method. As it contains no carbon and is of very high and uniform quality, it offers many advantages over ferro-chrome for alloying with steel and avoids the possibility of those unexpected fusions which frequently occur in using the latter, due to irregularities in the carbon content.
—Goldschmidt Thermit Co., New York.

CHROMIUM. Fused, 98–99% pure, carbonless.
—Roessler & Hasslacher Chemical Co., New York.

CHROMIUM. Metallic, free from carbon. Also chrome ore.
—Geo. G. Blackwell Sons & Co., Ltd., Liverpool, England.

CIRCUIT BREAKERS. General Electric circuit breakers, for alternating or direct-current service, in capacities from 1 to 10,000 amps., 650 volts and under; motor, float, solenoid or hand operated; for protection against overloads, underloads, short circuits, low voltage, reverse current, excessive speed, etc.; moderate temperature rise; instantaneous and positive adjustment over a wide range of calibration; easy and positive operation by powerful toggle mechanism; special form of laminated brush insures perfect contact; solid pivoted carbon contacts; no springs or delicate parts.
—General Electric Co., Schenectady, N. Y.

CLASSIFIER. DOW.
—Colorado Iron Works Co., Denver, Colo.

CLASSIFIERS, HYDRAULIC.
—Allis-Chalmers Co., Milwaukee, Wis.
—Colorado Iron Works Co., Denver, Colo.

CLEANER, "CLIMAX." Specially adapted to the rough cleaning of metal work and of such a nature as to prevent iron and steel articles from rusting when exposed to the air even for a considerable time after having been cleaned.
—International Chemical Co., Camden, N. J.

CLEANERS, ELECTRIC. Chemical compounds designed to act chemically on the material to be cleaned in such a way that when connected to an electric circuit gas will be evolved at the work, thus helping to mechanically clean the work. The prevalent mistake made by a great many manufacturers of electric cleaners is that they only get the mechanical advantages and not the chemical.
—International Chemical Co., Camden, N. J.

CLEANING. Small and medium sized work for electroplating. Baird tumbler barrel.
—MEAKER CO., CHICAGO, ILL.

COBALT.
—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

COCKS. Hard rubber.
—AMERICAN HARD RUBBER CO., NEW YORK.

COCKS. Of all descriptions, and sizes, both armored and plain, made of acid-proof stoneware.
—DIDIER-MARCH COMPANY, NEW YORK.

Cocks, Stoneware. Absolutely non-corrosive, for use with nitric, muriatic and sulphuric acids, chlorinated brine, alkalies etc. of any strength. Carefully tested under pressure before shipment and warranted tight. Adapted to lead pipe, cement, hose, metal flange or ground stoneware joints. Twelve sizes made in thirteen different styles.
—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.

Cocks, Stoneware. These faucets are made of specially prepared clay and are used where it is necessary for the faucet to be acid-proof. They are made in several different patterns, straightway—bibb—two-way—block and other styles, plain or threaded, as may be required, ranging from ¼ to 3 inches in size.
—U. S. STONEWARE CO., AKRON, OHIO.

Cocks, Stoneware. Made from selected vitreuos clays. Experience of more than 25 years in manufacturing clay products.
—A. J. WEEKS, AKRON, OHIO.

Cocks, Stop. Of stoneware, of every description, made in sizes of ¼–8′ bore. Plugs ground in absolutely tight and every cock is tested before delivery by means of a compressed air pump; also provided with iron armature or protected by iron or lead mantles.
—J. W. SITTIG, NEW YORK.

Cocks—Stoneware Block Cocks. These are for use in connection with acid pipe lines, for handling muriatic, nitric and sulphuric acids, chlorinated brine, and other corrosive liquids. Are intended for clamping between metal or other flanges without lead burning. The stoneware block cocks are provided on each side with grooves for one or two bolts, passing the cock, and entering flange on each side, a gasket usually being placed between. The strongest form of stoneware faucet made. (See illustration in Electrochemical and Metallurgical Industry, March 1909, adv. page. 20).
—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.

COILS, STONEWARE. For use in condensation of nitric acid, fine pharmaceutical products, etc. Made of best acid proof stoneware. Carried in stock and made to order in various sizes.
—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.

Coils, Heating, Cooling. Acid-proof stoneware, cooling worms system Dr. Plath for condensing nitric and acetic acids, distilling organic acids, distilling by vacuum, heating or cooling acids etc. All coils carried on an acid-proof stoneware frame.
—Didier-March Company, New York.

Coils, Cooling. Worms of stoneware of greatest possible durability, very suitable for all distillations; also for working under vacuum.
—J. W. Sittig, New York.
(Other stoneware makers see Stoneware.)

COILS, HEATING AND COOLING, COPPER. Made from seamless copper, brass, iron, steel or block-tin tubing; can be furnished with flanged, brazed or welded joints. For some purposes welded joints are preferable, thus avoiding any electrolytic action and packing of flanges or hard or soft solder.
—Baeuerle & Morris, Philadelphia, Pa.

COLD GALVANIZING. See Electrogalvanizing.

COMPRESSORS. See Exhausters.

CONCENTRATION. Magnetic. See Magnetic Separators.

CONCENTRATION MACHINERY. Bartlett Simplex Concentrator, most improved design. Also all other machinery for concentration of ores. See our catalog on Concentration Mills and Machinery, containing useful information and practical data regarding the treatment of ores by concentration.
—Colorado Iron Works Co., Denver, Colo.

CONCENTRATOR. OVERSTROM. A diagonal table, the table top being placed diagonal to the line of reciprocation. See description in *Electrochem. and Met. Ind.* Vol. III, p. 318 (1905).
—Allis-Chalmers Co., Milwaukee, Wis.

CONDENSERS. Jet. Barometric.
—Allis-Chalmers Co., Milwaukee, Wis.

CONDENSERS. *A device for condensing of vapors various materials. If desired, materials may be reclaimed in the condenser. They are of the surface and injection type. The surface condenser does not mix the cooling water with the vapors. The injection condenser does.*

Surface condensers of any capacity for reclaiming material if desired. The amount of condensation may also be noted at any time. The reclaiming condensers may be emptied at any time without in any way affecting the operation of same. They may be used in connection with vacuum apparatus or under atmospheric pressure.

Injection condensers of different capacities of the special improved type and adjustable water supplies, whereby the water may be reduced the exact amount necessary to condense the vapors.

No waste of cooling water. May be used as barometric condenser, or attached direct to the wet vacuum pump. No attention required to operate them, self-cleaning and easily accessible to all parts.
—Buffalo Foundry & Machine Co., Buffalo, N.Y.

Condensers, Surface. Our surface condensers are built of any size desired from copper, brass, steel, iron or block-tin depending on service required. Their design gives the highest efficiency possible for cooling water supplied and renders possible the cleaning of cooling surfaces if necessary.
—Baeuerle & Morris, Philadelphia, Pa.

Condensers, Tubular surface, with brass, tin or copper tubes, standard construction. All sizes from 20 sq. ft. condensing surface upwards. Worm condensers, with either copper or block tin worms mounted in iron or wooden tanks.
—F. J. Stokes Machine Co., Philadelphia, Pa.

CONDENSING APPARATUS, STONEWARE. Chemical stoneware condensing apparatus of all sizes for any system. Receivers, coils, stand pipe, towers, etc., etc. Special patterns of any kind to customer's order. Ware guaranteed chemical proof.
—Charles Graham Chemical Pottery Works, Brooklyn, N. Y.

CONDENSING JARS OR RECEIVERS OF STONEWARE. Receivers in sizes ranging from 5 gals to 150 gals. capacity. Can be made with pipe connections to suit purchaser. With or without faucet hole. Faucets can be supplied and ground in if required. Sockets are necessary in order to properly connect the pipes or bends. Great care should be taken to thoroughly glaze these vessels in order to make them acid-proof.
—U. S. Stoneware Co., Akron, Ohio.

CONDENSING TOWERS—STONEWARE. In all sizes. Made of best chemical stoneware guaranteed acid proof.
—Charles Graham Chemical Pottery Works, Brooklyn, N. Y.

Condensing Towers of Stoneware. These towers are in sections, and of various sizes. The cylinders range from 12 x 24 inches to 36 x 36 inches, as may be required. Five pieces usually constitute a tower although more can be added if desired. Perforated plate and distributing cover are necessary to complete tower. Great care should be taken in setting the tower in position so that the base will rest firmly and evenly on a solid foundation.
—U. S. Stoneware Co., Akron, Ohio.

Condensing Towers of Stone-ware in all dimensions, most effective for rapid and perfect absorption, condensation and reaction. Well known Guttmann towers with hollow balls; recognized as the most efficient filling material.
—J. W. Sittig, New York.

CONDENSING VESSELS OR RECEIVERS OF STONE-WARE. For nitric, muriatic acid, made in the usual pear shape or cylindrical form. New condensing or absorbing vessels of great efficiency for muriatic acid plants. Dense and thin material, highly resistant against temperature.
—J. W. SITTIG, NEW YORK.

CONDENSING PIPES OF STONE-WARE. Used in place of receivers.
—J. W. SITTIG, NEW YORK.

CONNECTING PIPES, BRANCHES, ETC., OF STONEWARE. Greatest variety of pipes, branches, bends, etc. Pipes can be made in any size and shape required.
—U. S. STONEWARE CO., AKRON, OHIO.

Connecting Pipes. Of all kinds and sizes made of acid-proof stoneware.
—DIDIER-MARCH COMPANY, NEW YORK.
(Other stoneware makers see Stoneware.)

CONNECTORS, SOLDERLESS. See Dossert Wire and Cable Connectors.

CONTACTS. For frequently interrupting electric circuits, especially where the current is of some magnitude, carbon contacts are essential to economy. Pure graphite has been proven superior to other forms of carbon, because of peculiar non-arcing properties, resistance to disintegration, one-fourth the ohmic resistance of amorphous carbon, infusibility and freedom from condensation of moisture resulting from variations in temperature. Easily machined, and may be threaded into holder. Furnished either plain or copper-plated for soldering. Owing to low resistance can be used for both points of contact, thus avoiding the expensive platinum.
—INTERNATIONAL ACHESON GRAPHITE COMPANY, NIAGARA FALLS, N. Y.

CONVERTERS. Bessemer.
—NORTHERN ENGINEERING WORKS, DETROIT, MICH.

CONVERTERS. Copper.
—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

CONVEYING MACHINERY. For mines and metallurgical plants. Belt conveyors.
—COLORADO IRON WORKS CO., DENVER, COLO.

CONVEYING MACHINERY.
—ALLIS-CHALMERS CO., MILWAUKEE, WIS.
—COLORADO IRON WORKS CO., DENVER, COLO.
—NORTHERN ENGINEERING WORKS, DETROIT, MICH.

COOKERS, STEAM, DOPP. See Boilers.

COOLER, LEAD. Especially designed for use in sulphurous acid plants. The effect of absorbing the sulphurous acid gases is greatly facilitated by cooling the gases down as much as possible. This cooler consists of a number of lead pipes through which the gases pass. A tank surrounds the pipes and the water in the cooler passes up and down in counter current to the gases. In this way the coolest water comes in contact with the coolest gases, thus insuring a proper cooling effect. The cooler is so constructed that the pipes, which are entirely straight, can easily be cleaned by taking off the caps on top and bottom.
—Schutte & Koerting Co., Philadelphia, Pa.

COOLERS, DISC. Patented, made of acid-proof stoneware, put together in sections having an unusually high cooling capacity for the space occupied. Can be extended or reduced at any time.
—Didier-March Company, New York.

Coolers, Disc. Of stoneware, substitute for cooling worms. Discs are exchangeable and easily replaced in case of breakage.
J. W. Sittig, New York.

COOLING COILS. See Coils.

COOLING ELEMENTS. System Rabe, made of acid-proof stoneware for cooling and absorption purposes; these elements are placed between the tower sections and are very efficient. The cooling water enters and leaves these cooling elements through pipes on the side.
—Didier-March Company, New York.

COPPER. For manufacture of copper wire, castings for electrical and other purposes, sheet copper for roofing, etc. Alloys for journal bearings, brass castings, etc.
—C. W. Leavitt & Co., New York.

COPPER ELECTROLYSIS. Copper is recovered from solutions containing iron salts by electrolysis with a moving anode in a diaphragm cell. The ferric salt produced at the same time is available as a solvent of copper from ores, etc. Write for details of tank construction, licenses, etc.
—Anson G. Betts, Troy, N. Y.

COPPER SULPHATE. Bluestone.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

COPPERAS. See Iron sulphate.

COPPERS OR BOILING VESSELS. With flat or curved bottom. Resist temperature exceedingly well, made of stone-ware or cast iron enameled ware.
—J. W. Sittig, New York.
(Other stoneware makers see Stoneware.)

CORE OVENS, MONARCH. Adjusted with portable shelves, heated with oil, gas, coal or coke, automatic. Can pull out all shelves singly or in pairs; size 2′ x 3′ x 6′ inside measurements; asbestos lined; weight 700 lbs. Prompt shipments.
—Monarch Engineering & Mfg. Co., Baltimore, Md.

CORE OVENS. For iron or brass foundries. Large sizes with car service or revolving type for day service.
—W. S. Rockwell Company, New York.

Core Ovens for baking small and large cores.
—Rockwell Furnace Co., New York.

CORKS. Rubber for acids.
—Revere Rubber Co., Boston, Mass.

COVERS. Of acid-proof stoneware, in all manner of shapes and sizes, with and without outlets.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

CRANES. Electric, pneumatic and hand power travelling cranes. Capacities range from 150 tons down to one ton, and spans and lifts are made to suit location. Catalog No. 20.
—Northern Engineering Works, Detroit, Mich.

CREOSOTED WOOD. Conduits, treated by Bethell process. We use nothing but dead oil of coal tar. Creosoted cross-arms, poles, paving blocks, railroad ties, protective casings for gas mains etc.
—Michigan Pipe Co., Bay City, Mich.

CRUCIBLES. For high temperature work, crucibles machined from pure Acheson graphite rods or blocks which are subjected during manufacture to a temperature of 7500° F., are practically indispensable. In a reducing atmosphere they show highest efficiencies. Where the heat is generated electrically or by the Goldschmidt process, and purity of the treated material is essential, such crucibles should be used. Well suited for assaying and for melting the precious metals. Ease of making, inertness, efficiency, refractoriness, good heat conductivity and purity (99% Graphite) are favorable properties. Graphite tubes for the introduction or removal of gases can be threaded in.
—International Acheson Graphite Company, Niagara Falls, N. Y.

CRUCIBLES OF CARBON. Several sizes in stock, special sizes supplied on demand. Our crucibles are especially adapted to baking and melting various substances in small electric furnaces. They can, however, be used in gas furnaces, where the temperature is low, say not exceeding 500° C.
—National Carbon Co., Cleveland, Ohio.

Crucibles. Of platinum. See Platinum.

CRUSHING AND GRINDING. AIR SEPARATION PULVERIZER STROUD. Made in five sizes, power required 8 to 65 h.p., feed ½ inch to 2½ inch cubes, according to size of mill, will reduce the raw material to any desired mesh, from say a 40 x 40 mesh product down to a powder so uniformly fine that every atom of it will, if tested, pass through a brass wire cloth testing sieve of 200 x 200 (40,000) holes per square inch. Make powders far finer than a 200 x 200 mesh when desired of many materials. The mill delivers a finished product direct, without subsequent sieving; does not clog even when fed with materials so damp, that other mills can not work upon them; this is due largely to the use of air (instead of sieves) for separating the finished from the unfinished material during process of grinding, but it is due also to the peculiar construction of the machine; it is easy to clean; mill and its product are always cool; occupies small floor space; and gives a larger output per h.p. of finished product than is possible from other machines doing same class of work. Is used upon animal, vegetable and mineral products of many sorts. Dustless in operation. Write for Catalogue, sending small sample of your material and stating requirements.
—E. H. Stroud & Co., Chicago, Ill.

CRUSHING AND GRINDING, BALL MILL. *This is a revolving cylinder with metal plates and partly filled with metal balls. The degree of fineness of the product is governed in the continuous feed and discharge mill by the fineness of the wire cloth covering the discharge openings, and in the intermittent or enclosed mill by the length of time the mill is allowed to run on each charge of material.*

CRUSHING AND GRINDING: BALL MILL: ABBE. The Abbé Ball Mill is a revolving cylinder lined with steel steps, and contains a charge of steel balls. This type of machine is used extensively for grinding all kinds of materials from lump size down to 10, 20, 30, 40, 50, 60, 70 or 80 mesh, etc. It is the best machine for preparing material for concentrating purposes or for the tube mill. The mill as built by the Abbé Engineering Co. is very simple, compact and effective, requires no high foundations, as it is fed and also discharged at the center. The screening chamber is separate from the grinding compartment, and its screening capacity is ample to handle all the material ground. The usual type of ball mill generally is so constructed that from 25 to 40 per cent of finished material is returned to the grinding chamber, on account of insufficient screening capacity. The discharge of the Abbé Ball Mill is made in the form of a spiral, which delivers the finished product at the center and between these discharge spirals is the screen, also in the form of a spiral, which retains the coarse particles only and delivers them back into the mill again to be reground, by means of a conveyor located at the center, which revolves with the mill and requires no driving mechanism.
—Abbe Engineering Co., New York.

CRUSHING AND GRINDING, BALL MILL, KRUPP.

Dry Grinding—Continuous Feed and Discharge. A machine designed essentially for preliminary grinding (2½" down to 10 mesh—40 mesh) of all classes of refractory materials. It may, however, be adapted for considerably finer grinding. It consists of a cylindrical grinding drum made up of overlapping special high grade cast steel plates mounted between rolled steel side walls, which are lined with special cast steel plates. A charge of forged steel balls grind the material fed to the mill as it is revolved, the ground product being automatically separated so that all coarse material is at once returned to the mill for further reduction. This mill is fitted with an easily adjusted automatic feeder. It has a large capacity with low power and repairs.
—THOMAS PROSSER & SON, NEW YORK.

Wet Grinding—Continuous Feed and Discharge. This mill (Heberle Patent) is a modified form of the dry grinding Ball Mill, but it is designed so as to obviate the large repair account that would be necessary if the standard form of dry grinding ball mill were operated on a wet basis. The general mounting is similar to the dry grinding mill but the grinding plates and screens are specially designed for this class of work.
—THOMAS PROSSER & SON, NEW YORK.

Enclosed Mills—Dry and Wet Grinding. The grinding barrels of these mills are of cylindrical or ellipsoidal form and furnished with balls, both made of proper material for different classes of work. These mills are made in all sizes from laboratory size up.
—THOMAS PROSSER & SON, NEW YORK.

CRUSHING AND GRINDING. BALL MILLS. Also forged balls.
—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

CRUSHING AND GRINDING. BALL MILLS, HARD PORCELAIN OR GRAY EARTHENWARE. For hand or machine power. Very durable and answering the same purpose as the genuine porcelain mills, but not as expensive as the latter.
—J. W. SITTIG, NEW YORK.

CRUSHING AND GRINDING. CHILIAN MILLS.
—ALLIS-CHALMERS CO., MILWAUKEE, WIS.
—COLORADO IRON WORKS CO., DENVER, COLO.

CRUSHING AND GRINDING, CRUSHER, DAY'S LITTLE GIANT. For crushing soft ores, clays, gums and dry colors. It is strong and simple in construction and has a capacity of one to three thousand pounds per hour.
—J. H. DAY CO., CINCINNATI, OHIO.

CRUSHING AND GRINDING.—CRUSHER, FINE. A machine built by the Abbé Engineering Company in five different sizes, from laboratory size with jaw opening 1½ x 3½" to largest size having jaw

opening of 7 x 18". Used for crushing down to 4 mesh, all kinds of materials. The smaller sizes also reduce as fine as 8 mesh, and are therefore especially adapted to preparing material that is to be ground in small pebble mills.
—ABBE ENGINEERING CO., NEW YORK.

CRUSHING AND GRINDING. CRUSHERS, GYRATORY.
—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

CRUSHING AND GRINDING. CRUSHERS GYRATORY. Gates gyratory crusher and Austin gyratory crusher.
—E. H. STROUD & CO., CHICAGO, ILL.

CRUSHING AND GRINDING. CRUSHERS, HAMMER. The secret of fine grinding with a hammer crusher lies in keeping the hammers close to the cage. In "Pennsylvania" crushers, the hammer wear is compensated for by a slight turn of the hand wheel, which raises the cage closer to the hammers. This adjustment is quick and may be made without shutting down, so that there is no excuse for the attendant failing to get the best results and uniform crushing at all times. This patent cage adjustment accomplishes in ten seconds what formerly required two to four hours. Compare this for practical simplicity with other makes of wear adjustment. All-steel frame, forged steel shaft, "ball and socket" self-aligning bearers, steel wear liners, big manholes, rolled steel hammer discs, 6 and 8 rows of hammers giving tremendous execution.
—PENNSYLVANIA CRUSHER CO., PHILADELPHIA, PA.

CRUSHING AND GRINDING. CRUSHERS, JAW ROCK. Powerfully built for brutal service and free from hot boxes, broken shafts and other common troubles. Simple in design, of few parts, and require no expert for repairs. They are thoroughly reliable under trying conditions. The main frame is open-hearth steel, the shafts are high-grade steel forgings. Bearing made to template, are kept in stock by operator and easily replaceable; this saves lots of time compared with old-fashioned babbitting methods.
—PENNSYLVANIA CRUSHER CO., PHILADELPHIA.

CRUSHING AND GRINDING. CRUSHERS, JAW. Blake type with Canda tempered steel jaw plates (for reduction to 1½-inch size). Dodge type (for reduction to a much smaller size).
—COLORADO IRON WORKS CO., DENVER, COLO.

CRUSHING AND GRINDING. CRUSHERS, JAW.
—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

CRUSHING AND GRINDING CRUSHERS, JAW. Blake crusher, Dodge crusher, Austin jaw crusher.
—E. H. STROUD & CO., CHICAGO, ILL.

CRUSHING AND GRINDING, CRUSHERS, ROTARY. For chemicals, coal, limestone, phosphate, shale, gypsum, paint, ores, clay,

lime, oyster shells, etc. On account of the slow speed and peculiar design of the crushing surfaces, the crushing action is gradual and very powerful, while the severe shocks found in crushing rolls are avoided and the crushed product is more uniform. Crushers have removable wear liners. Reduce to ¾ in. and finer. Low in h.p. and repairs, and nearly free from flying dust. Built in capacities 2 to 200 tons per hour.
—Pennsylvania Crusher Co., Philadelphia, Pa.

CRUSHING AND GRINDING, CRUSHER, SINGLE-ROLL. A single roll revolving close to a quickly adjustable breaker plate, in place of two rolls commonly used. Roll is heavily back geared and rigidly held in its bearings to prevent spreading when feeding large lumps. This design is smoother running than the double roll. Bed frame in one piece and very rigid. Different designs of roll teeth are made. Sometimes driven by motor. Moderate h.p., slow speed, low repairs. Adapted for coarse and moderately fine crushing.
—Pennsylvania Crusher Co., Philadelphia.

CRUSHING AND GRINDING MILL. DAY'S THREE ROLL PIGMENT MILL. For printing ink, paints, chocolate, etc. Made with chilled iron rolls either plain or hollow for water cooling or steam heating. The bearings for rolls are fitted in heavy, planed housings and provided with phosphor-bronze bushings of peculiar construction, forming an oil-flooded bearing thus preventing the journals from heating. The scraper apron is adjustable and made to follow the roll when moved in or out. When specially ordered a feed hopper can be attached to the initial roll. Made with rolls 9 x 34 inches and 12 x 32 inches.
—J. H. Day Co., Cincinnati, Ohio.

CRUSHING AND GRINDING, DISINTEGRATOR CAGE. A well known type of grinding mill built by the Abbé Engineering Co., which is used extensively in grinding glue, fertilizer materials, etc. This machine has a number of oppositely revolving cages which beat the material to pieces, and is built in several styles to suit special requirements.
—Abbe Engineering Co., New York.

CRUSHING AND GRINDING: DISINTEGRATOR, DAY'S LIGHTNING. The grinding is done by hardened-steel beaters, riveted securely on a steel disc. The beaters revolve on the face or feeding side of the mill between corrugated rings. They catch the material and beat it against the corrugates until fine enough to pass between the disc and the face of the ring. It is then on the discharge side of the mill and all that is fine enough is driven out. That which is not fine enough to discharge is driven against the screens by the beaters until fine enough to pass through. The screens are made of square steel and present a grinding surface to the beaters.
—J. H. Day Co., Cincinnati, Ohio.

CRUSHING AND GRINDING. DRUG MILL. Small grinding mills used extensively for reducing substances, such as crystals, barks, roots, etc. The mill is adjustable and will deliver any size product from powder of No. 60 fineness to granules the size of rice. The mill consists of only two parts, which can be instantly removed for cleansing. The gears are encased for protection. The capacity varies with the adjustment and weight of the material, delivering about 3 lbs. of granules a minute and ½ lb. of fine powder a minute. Floor space, 15 in. x 24 in. Weight, 100 lbs., pulleys, 10 in. x 2 in. Height, 4 ft., 6 in., speed 300 revolutions.
—F. J. STOKES MACHINE CO., PHILADELPHIA, PA.

CRUSHING AND GRINDING, EUREKA MILLS. Built in three sizes, Nos. 1, 2 and 3 for capacities of 30, 60 and 80 pounds. Composed of porcelain jars partly surrounded by wood and iron.
—ABBE ENGINEERING CO., NEW YORK.

CRUSHING AND GRINDING, EXCELSIOR MILL, KRUPP. This mill belongs to the class of disc mills in which the material is ground to various degrees of fineness by passing the same between the discs. Is used largely in agricultural, chemical, metallurgical and spice and drug works for grinding materials used in the above classes of work. The mill consists of either one set (single mill) or two sets (double mill) of special iron discs either toothed or toothed and fluted, and designed in male and female form. One disc of each pair is stationary while the other revolves and the material having been fed in at the centre of the discs is cut up or ground between the teeth and is thrown out from between the discs by centrifugal force. The mill may be supplied with various attachments in the form of preliminary crushers, feeders, magnetic separators, dust hoods, etc., and is also arranged for either hand or power drive, and may be supplied for either wet or dry grinding.
—THOMAS PROSSER & SON, NEW YORK.

CRUSHING AND GRINDING. FULLER-LEHIGH MILL. For fine grinding and pulverizing. Grinds wet and grinds dry. Large output, economical, dustless. For grinding cements, ores, phosphate rock, lime rock, stone, sand, coal, and all kinds of refractory materials. The Fuller mill is made in two sizes, 33 in. and 42 in., these being the diameters of the dies used in the respective machines. The material to be reduced is fed to the mill from an overhead bin, by means of a feeder mounted on top of the mill and driven direct from the mill shaft. The grinding is done by means of four unattached steel balls, which are propelled by four equidistant horizontal arms or pushers radiating from a vertical central shaft. The material discharged by the feeder falls between the balls and the die and is reduced to a finished product in one operation. Above the die and the balls is a fan which is attached to the yoke propelling the balls. This fan has two rows of fan blades, one above the other. The lower set of fan blades lifts the finished product from the pulverizing zone into the chamber above the die,

where it is held in suspension until it is floated out through a screen by means of the fanning action of the upper row of fan blades. The finished product is then discharged through a spout. The Fuller mill is self-contained and requires no accessory equipment. Neither the 33-in. nor the 42-in. mill requires a greater floor space than 7 ft. square. The material delivered by the mill is a finished product and requires no subsequent screening.
—Lehigh Car, Wheel & Axle Works, Catasauqua, Pa.

CRUSHING AND GRINDING. GRINDING PANS. For regrinding pulp for cyanidation. A continuous feed and discharge pan, specially useful in such cases where small capacity with high efficiency is desired, and for such localities where the transportation of tube mills would be difficult.
—Colorado Iron Works Co., Denver, Colo.

CRUSHING AND GRINDING, HARDINGE CONICAL MILL. A modification of the ordinary tube mill. Instead of a long cylinder, a short cylinder with conical extensions is used, so there are different peripheral speeds at different sections of the mill. There is a sizing of both the pebbles and the particles to be ground, and this results in a very low consumption of power and a very uniform product. Four methods of adjustment for fine grinding or coarse grinding, for sizing while grinding. Requires no spare parts for repairs. Of strong construction.
—Hardinge Conical Mill Co., New York.

CRUSHING AND GRINDING. HUNTINGTON MILLS.
—Allis-Chalmers Co., Milwaukee, Wis.

CRUSHING AND GRINDING, JAR MILLS. Single and double. These jars are encased in galvanized iron cylinders, similar to Jar Mill " B " and also work on a swivel. The single mill has one jar the double mill two. Each jar being capable of grinding up to 25 pounds at a time.
—Abbe Engineering Co., New York.

CRUSHING AND GRINDING, JAR MILL. A, Abbé. Built with one and two jars, each jar capable of handling up to 15 pounds each at a charge.
—Abbe Engineering Co., New York.

CRUSHING AND GRINDING, JAR MILL. B, Abbé. Built with one jar encased in a galvanized iron cylinder. Grinds up to 25 pounds at once. The encased jar is surrounded by a cast iron ring set in a cast iron frame. This encased jar turns on a swivel to facilitate discharging the ground material.
—Abbe Engineering Co., New York.

CRUSHING AND GRINDING, JAR MILL. Improved porcelain. This type of jar mill, is considered most convenient to operate and

requires less room than others. The jars are revolved by friction wheels and are lifted off for charging and emptying. The jars are manufactured from the best porcelain and are impervious to the action of even such substances as ink. They are useful for grinding and triturating all materials which corrode or react when ground in metallic mills, and are the only agency which will deliver a uniform product without bolting. The material is packed in the jars with flint or porcelain pebbles, the reduction being produced by the sliding and rolling of the pebbles upon each other as the jars rotate. Each jar has an average capacity of 25 lbs. They are interchangeable, and extra ones can be supplied. Floor space, 20 in. x 50 in., pulleys, 10 in. x 2¼ in., speed, 50 revolutions.
—F. J. STOKES MACHINE CO., PHILADELPHIA, PA.

CRUSHING AND GRINDING, MILL. Max Mill. Grinds by percussion. Is extensively used for grinding borax ore, coal, chemicals, sugar, etc., etc. It is built in three sizes for different capacities.
—ABBE ENGINEERING CO., NEW YORK.

CRUSHING AND GRINDING. MILLS. Lead and color mills made plain or water cooled and with French Buhr or Esopus stones. The method of adjustment is perfect. Fitted with an adjustable scraper. The steel spindle and heavy gears are cast from cut patterns. The mill is equipped with a 30-inch mixer which feeds the material to the stones, from whence it passes to a cooling pan. These mills can be furnished in any form desired; plain, with mixer or with mixer and cooling pan. Fitted with stones of 20, 24, 26 or 30 inches diameter.
—J. H. DAY CO., CINCINNATI, OHIO.

CRUSHING AND GRINDING, MILL, SAMPLE MILL. A small porcelain jar mill suitable for handling from ½ oz. to 1½ lbs. at a time. Also built with two jars, five jars, etc.
—ABBE ENGINEERING CO., NEW YORK.

CRUSHING AND GRINDING, PANS. Wet and dry. One of the oldest types of reduction machines. Has long been recognized as an able design because of its simplicity, slow speed and reasonable repairs. Powerfully ribbed frame with full extension base counter shaft pedestals cast onto heavy cross beams—steel shafts—outboard pulley bearing—heavy rolls with removable tires—rolls run direct on wear plates, giving maximum crushing. These machines are unequaled where a heavy rugged design is required. Built in more than 30 sizes and styles, with both stationary and revolving bottoms.
—PENNSYLVANIA CRUSHER COMPANY, PHILADELPHIA, PA.

CRUSHING AND GRINDING, PEBBLE MILLS. Built in eight different sizes by the Abbé Engineering Co., for handling from 120 to 4000 pounds at a charge. All equipped with their patented manhole having detachable flanges, which is an important feature of this type of mill.
—ABBE ENGINEERING CO., NEW YORK.

CRUSHING AND GRINDING, PEBBLE MILL, ABBE. Sometimes erroneously called a ball mill. The pebble mill grinds principally by friction, the effect being produced by the sliding, tumbling and rolling inside of the mill of a great number of flint pebbles or porcelain balls, which are mixed with the substance to be ground, and the movement being caused by revolving the mill at a regulated speed. The main part of the machine is either a plain porcelain jar fastened in a frame revolving in bearings, a porcelain jar encased and fastened in a frame that turns, a cast iron drum lined with porcelain brick, or a tank steel shell, having cast iron heads lined with porcelain. Pebble mills grind all kinds of hard and soft materials either, dry or thoroughly wet, such as chemicals, drugs, enamels, glazes ores, talc, feldspar, flint, etc., etc.
—Abbe Engineering Co., New York.

CRUSHING AND GRINDING, POT MILL. This machine is used for both crushing and pulverizing, and is handy for grinding small quantity which could not be reduced economically in a large mill. The grinding is accomplished by heavy iron balls, which crush or pulverize the material, as they revolve. The pot is fitted with a tight cover, preventing the escape of dust and powder. The diameter of the pot is 24 in., capacity 30 lbs. Floor space 24 in. x 42 in. Weight, 400 lbs., pulleys, 14 in. x 2¼ in. Height 4 ft., speed, 50 revolutions.
—F. J. Stokes Machine Co., Philadelphia, Pa.

CRUSHING AND GRINDING. QUARTZ MILL. VAUGHN AUTOMATIC. For free milling concentrating and cyaniding gold ores. Similar to Chilian mill in fine grinding, giving high results in amalgamation in the mortar, without the use of amalgamation plates. The shape of the rolls which work in corresponding grooves in the dies in the mortar, make the operation self-adjusting, so as to get uniform results from the time when the roll-shells are put on new until they are worn out. A very high recovery of free value with a small amount of power, due to continuity of operation. Made in two sizes. Mill No. 3, capacity 25 tons in 12 hours, 20 h.p. 15 to 25 bls. of water for free milling and concentrating heavy service, battery purpose. Mill No. 4, capacity 50 tons in 12 hours, requires but a small amount more power than No. 3 mill with a little more water in proportion to the moisture in the ore. Shipping weight of No. 3 is 21,560 lbs., that of No. 4 is 32,000 lb.
—Vaughn Automatic Quartz Mill Machinery Co., Portland Oregon.

CRUSHING AND GRINDING. RAYMOND MILL. With air separation. Enables one to grind and separate at one continuous operation a powder much finer than can be produced by bolting. A clean grinding room, with a large saving of labor and power. Large saving in raw material by finer grinding, economical separating, elimination of tailings and dust. For grinding and separating graphite, lead ores, zinc, zinc oxide, iron sulphate, manganese ores,

carbon, coal, lime, dry paint colors, etc. Used in many cement works, in the lime grinding industry in the large beet sugar plants, etc. In the mills with air separation, the air enters the mill through a series of tangential openings around the pulverizing chamber directly under the ring die and rollers, and that portion of the material which is reduced to the required fineness by the rollers passing over it once is instantly carried away by the air current, while that which is not fine enough drops down, is caught by the next plow following and carried between the succeeding roller and the ring die to receive like treatment. The mill has a very high capacity, and produces a finished product of uniform fineness.
—Raymond Bros. Impact Pulverizer Co., Chicago.

CRUSHING AND GRINDING. ROLLER-MILL, Raymond. See above Crushing and Grinding, Raymond mill with air separation.

CRUSHING AND GRINDING. Rock and ore breakers.
—Allis-Chalmers Co., Milwaukee, Wis.
—Colorado Iron Works Co., Denver, Colo.

CRUSHING AND GRINDING. ROLLS. Of the most improved design and construction, based on the experience in actual operation. Improved standard wide-face rolls. Improved narrow-face high-speed rolls. Sectionalized crushing rolls. Humphrey rolls. Sampling rolls. Laboratory crushing rolls.
—Colorado Iron Works Co., Denver, Colo.

CRUSHING AND GRINDING. ROLLS.
—Allis-Chalmers Co., Milwaukee, Wis.

CRUSHING AND GRINDING, ROLLS. High-speed rolls with armorplate tyres, grinding device to true rolls while running, and self-oiling journals. Twice the work of stamps with half the power.
—Marcus Ruthenburg, London.
—Brush Electrical Engineering Co., London.

CRUSHING AND GRINDING. SAMPLE GRINDERS. Self-contained, liberally proportioned, accessible, easily cleaned for sampling plants, mills, laboratories.
—Allis-Chalmers Co., Milwaukee, Wis.

CRUSHING AND GRINDING. SCREEN SEPARATION MILL. This machine, which is made in five sizes, power required 6 to 50 h.p. feed ½ inch to 2½ inch cubes, according to size of mill, will shred, or disintegrate, or pulverize, according to its adjustment. It will also make products and powders from a 2 x 2 mesh down to a 200 x 200 mesh according to material and size of mill. Screens of bars in the lower half of the grinding chamber, which are adjustable, regulate the fineness of the product. For uniformly fine and very

fine powders it is better to sieve the product of this mill, but for many purposes the direct product of this mill is satisfactory without subsequent sieving. It is used upon animal, vegetable and mineral products of many sorts. Output, per h.p. used, is very large. Occupies small floor space. Easy to clean. Cost of grinding said to be very low as compared with other machinery. Space forbids further description. Write for catalogue, sending small sample of your material and stating requirements.
—E. H. STROUD & Co., CHICAGO, ILL.

CRUSHING AND GRINDING. STAMP MILLS. We supply blue prints of stamp mills or mills for any combination process according to the most modern ideas. In addition to the building of machinery, a large branch of our business consists in designing and erecting complete milling and smelting plants. We operate a very large and complete ore testing plant. Catalog No. 6-C on Stamp Milling Machinery.
—COLORADO IRON WORKS CO., DENVER, COLO.

CRUSHING AND GRINDING. STAMPS.
—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

CRUSHING AND GRINDING, TUBE MILL. *A revolving cylinder lined with silex bricks, iron, wood or porcelain, partly filled with flint pebbles or steel balls. The degree of fineness of the product is governed in the continuous feed and discharge mill by regulating the amount of feed to the mill, and in the intermittent or enclosed mill by the length of time the mill is allowed to run on each charge of material. The continuous feed and discharge mill is widely used in the cement industry, and more recently largely used for re-grinding gold ore in connection with cyanide process. Tube Mills of both continuous feed and discharge and intermittent types may be designed for either wet or dry grinding.*

CRUSHING AND GRINDING, TUBE MILL, KRUPP.
Dry Grinding—Continuous Feed and Discharge. This mill is specially designed with the object in view of minimizing the amount of attention required for operating as well as for reducing the renewals required. It is a fine grinding or pulverizing machine, and in many instances follows the ball mill as a finisher. The feeder is a sight feeder and is capable of being adjusted without stopping the mill or any portion of the feeding mechanism. The discharge device, which is of the central discharge type, is designed so that it automatically keeps itself free thus allowing a maximum discharge, and all dust is avoided by the use of this type of discharge. All the parts of the mill itself as well as the driving gearing are exceptionally heavy as the service to be performed requires exceedingly substantial construction. When this mill is lined with steel and supplied with steel balls, it is known as a Ball-Tube Mill.
—THOMAS PROSSER & SON, NEW YORK.

Wet Grinding—Continuous Feed and Discharge. This mill is similar to the dry grinding mill in general construction but the feed and discharge are designed so as to permit of the handling of materials carrying a large percentage of water.
—Thomas Prosser & Son, New York.

Enclosed Mills—Dry and Wet Grinding. A closed cylinder or shell with manhole and proper lining, mounted on heavy trunnion bearings and specially constructed to meet the various requirements of this line of work.
—Thomas Prosser & Son, New York.

CRUSHING AND GRINDING: TUBE MILL, ABBE. The Abbé tube mill works on the same principle as a pebble mill, but it is a machine used for larger capacities when a continuous feed and discharge is necessary. The Abbé Engineering Company equip all their tube mills with their patented "Ideal" spiral feed and discharge, which does away with a special drive, being attached direct to the machine, requires no stuffing boxes, enables feeding pebbles into the mill and can also be used to discharge them. This arrangement also avoids all conveyors and enables the loading of the tube mill with pebbles over the center, which increases the capacity of the Abbé tube mill and also decreases the horse power required to drive it, as the loading of the pebbles over the center partially balances the machine. In wet grinding it also enables the loading of the Abbé tube mill with material two-thirds or three-fourths full, practically doubling the grinding capacity and decreasing the power required to operate it by about 40 per cent. Tube mills are generally supported by two end bearings called the trunnion style of mill, but the Abbé Engineering Co. in addition also build a tire style of mill which is supported on four rollers on which two tires revolve, which surround the shell of the mill. This type of machine has the advantage of being more readily accessible, requiring no manhole in the shell, and can also be operated with approximately 25% less power than the trunnion styles of mills of the same size and capacity.
—Abbe Engineering Co., New York.

CRUSHING AND GRINDING. TUBE MILLS. Of heavy, rigid construction, especially for fine grinding in the operation of the cyanide process.
—Colorado Iron Works Co., Denver, Colo.

CRUSHING AND GRINDING. TUBE MILL, GATES. For either wet or dry grinding. In all sizes.
—Allis-Chalmers Co., Milwaukee, Wis.

Crushing and Grinding. Tube Mill. See also above Crushing and Grinding. Hardinge Conical Mill.
—Hardinge Conical Mill Co., New York.

CRUSHING AND GRINDING. Grinding, mixing, and separating machinery designed and manufactured. See Machinery, Special, for New Processes.
—Charles J. Reed, Philadelphia, Pa.

CRYOLITE. See Kryolite.

CRYSTALLIZING PANS OR DISHES. Glazed or unglazed inside with flat or round bottoms of stone-ware or cast iron enameled ware.
—J. W. Sittig, New York.
(Other stoneware makers see Stoneware.)

CRYSTALLIZING VESSELS. Of acid-proof stoneware in various sizes and shapes.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

CUPELS. Hoskins " Brownite " cupels are made in five standard sizes from one inch to two inches in diameter and have the decided advantages of being uniform in composition, superior in absorbing qualities and practically non-breakable. These are packed in boxes of 100. Hoskins bone ash cupels are made up in corresponding sizes and are carefully packed in sawdust, being put up in gross quantities.
—Hoskins Manufacturing Company, Detroit.

CUPEL FURNACES. For assaying and mint work. All sizes.
—Rockwell Furnace Co., New York.
—W. S. Rockwell Company, New York.

CUPOLA, NEWTEN. A modern cupola with a differential adjustable tuyere system and an all-steel air chamber. The areas of tuyeres, blast pipe, and air chamber are designed in the exactly right proportion to the size of furnaces and blower. The main tuyeres are of the expanded type, of ample area to insure the transmission of sufficient air to the furnace. The increase in the area of the greater portion of the tuyeres as they approach the fuel gives a blast of large volume and of moderate pressure nearest the iron, and the wide tuyeres afford nearly a continuous blast opening around the furnace walls. By these means ample blast area is assured even if a portion of the tuyere area is stopped by pieces of coke or other obstructions. Combined with this is the important feature of a differential blast. The main tuyeres each have two supporting ribs, placed at an angle and giving a slightly contracted effect to a small portion of the blast, thus tending to force this portion toward the proportionately smaller area of the center of the furnace, while the expanded blast supplies the larger area nearer the lining, resultine in a differential blast covering the entire area of the furnace. Thg result is a quick melting heat, and fluid metal with a high fuel

economy. The lower tuyeres are adjustable vertically, through several inches, to suit either a deep or a shallow bed of fuel. This adapts the furnace to either coke or coal, or to any change in the inside diameter of the furnace, to suit different classes of work.
—Northern Engineering Works, Detroit, Mich.

CUTTER, ROTARY. A machine composed of a cylinder having attached to it a number of knives revolving in a circular case, against a number of stationary knives set at intervals inside the case. This machine is especially adapted to cutting up all kinds of roots, herbs, spices, tobacco stems, wood pulp, hard fibre, drugs, etc.
—Abbe Engineering Co., New York.

CUTTING, OXY-ACETYLENE. Steel and iron (except cast iron) may be cut by the modified oxy-acetylene process. The ordinary oxy-acetylene flame (see Welding, Oxy-acetylene) is used to heat the surface of the metal, whereupon a pure jet of oxygen is turned onto the heated metal, disintegrating it immediately by autogenous combustion. The cutting blow-pipe differs, therefore, from the welding blow-pipe by an additional supply pipe of pure oxygen. The kerf about $\frac{1}{8}$" wide. By this process bridges, boilers, arches, etc., can be wrecked. Also dies cut out and repaired. Defective parts in steam boilers, containers, etc., can be cut out and replaced. The metal is not changed or injured in the operation.
—American Ferrofix Brazing Co., Philadelphia, Pa.
—Davis-Bournonville Co., New York.
—Harris Calorific Co., Cleveland, Ohio.
—Industrial Oxygen Co., New York.
—Linde Air Products Co., Buffalo, N. Y.

CYANIDES.
—Fuerst Bros & Co., New York.
—Roessler & Hasslacher Chemical Co., New York.

CYANIDE PLANTS. We contract for the erection of complete, strictly modern plants for the treatment of ores by the cyanide process and demonstrate their efficiency by a trial run.
—Colorado Iron Works Co., Denver, Colo.

CYANIDE PLANTS.
—Allis-Chalmers Co., Milwaukee, Wis.

CYLINDERS, SEAMLESS STEEL, COLD DRAWN. See Tanks, seamless steel.

DAY MILLS. See Crushing and Grinding.

DECANTING POTS. Of acid-proof stoneware, in various sizes and shapes, with and without handles.
—Didier-March Company, New York.

Decanting Pots of Stone-ware. In different styles.
—J. W. SITTIG, NEW YORK.

Decanting Pots. Stoneware made with as many discharge holes and of whatever size required, running diagonally on side of pot from the bottom to the top, or less, as required. In sizes ranging from 2 to 200 gals. capacity. Stoneware faucet ground into each discharge tube can be supplied if desired. Glaze with our superior acid-proof glazing to insure best results.
—U. S. STONEWARE CO., AKRON, OHIO.
(Other stoneware makers see Stoneware.)

DIAPHRAGMS. Successful diaphragms for acid solutions are made of asbestos, with the fibres cemented together by sulphur. Such diaphragms do not soften when wet, but retain the stiffness of asbestos sheets and mill board.
—ANSON G. BETTS, TROY, N. Y.

DIAPHRAGMS. Rubber, for pumps, vacuum brakes, steam regulators, for use in paper mills.
—REVERE RUBBER CO., BOSTON, MASS.

DIFFUSION BATTERIES. Leaching cells, digesters, for producing a partially concentrated extract or solution from any material being handled in quantity, in which the solvent is water. Now installed for the lixiviation of " black ash ", extraction by diffusion of sugar from beets, etc. We build single and double line as well as circular batteries of any size and have sold a great many equipments. Shells of steel or cast iron and designed to meet the requirements of each installation. Drop or swing bottom or swinging side door discharge operated by hand, or, in large equipments, with hydraulic closing arrangement. Intermediate heaters if desired.
—SWENSON EVAPORATOR CO., CHICAGO, ILL.

Diffusion Batteries. See also leaching cells.

DIGESTER AND COOKER. Automatic continuous; of the direct steam type, operating continuously. Inside of a cylindrical steel shell is a specially constructed screw conveyor, made up of cut flights, and by its rotation cuts up and thoroughly agitates the material and carries it forward. Steam is admitted through perforations in the hollow shaft of conveyor. Suitable for handling offal from fishing plants, etc.
—AMERICAN PROCESS COMPANY, NEW YORK.

DIGESTERS. See Diffusion batteries.

DISTILLING APPARATUS. See Stills.

DIPPING BASKETS OF STONEWARE. For platers, galvanizers, etc. These baskets are made in size from 6 x 6 inches to 12 x 12

inches, or larger if required. Have perforations from ¼ to ½ inch. Heavily glazed with our specially prepared acid-proof glazing, with a high strong handle.
—U. S. STONEWARE CO., AKRON, OHIO.
(Other stoneware makers see Stoneware.)

DISCS. Discs, bushings, washers and other small carbon articles formerly made in molds can frequently be far more economically produced by machining from solid Acheson-Graphite rods. High electrical conductivity, purity (99%), smoothness, lubricating properties, resistance to oxidation and disintegration, and non-arcing properties are important considerations in this connection.
—INTERNATIONAL ACHESON GRAPHITE COMPANY, NIAGARA FALLS, N. Y.

DISSOLVER, RAPID. Consists principally of a bowl with a stirring wheel at the bottom. The purpose of this machine is to dissolve such substances as chloride of lime, all kinds of salts and chemicals, such as, sulphate of alumina, kaolin, china clay, sulphate of baryta, etc. Owing to the exceedingly rapid action of the stirring wheel the machine has an enormous output with a minimum consumption of power, the largest size for instance taking only about 3 h.p. The machine is made in sizes of 125 to 1250 gallons. The discharge valve is located at the lowest part of the bowl, and the inside of the machine is easily accessible for cleaning, etc. The machine can be arranged so that it can be driven from top or from below to suit local conditions.
—WERNER & PFLEIDERER, SAGINAW, MICH.

DOLOMITE. For furnace linings.
—E. J. LAVINO & CO., PHILADELPHIA, PA.

DOSSERT WIRE AND CABLE CONNECTORS. A method of making splices tap-offs, and terminal connections without using solder. These connectors can be used on both stranded and solid conductors. A skilled mechanic is not necessary; any ordinary workman can apply them in a few minutes. They have a wider area of contact than any other mechanical joint and are electrically and mechanically perfect. The carrying capacity of a Dossert joint when subjected to the action of a fusing current considerably exceeds that of the cable. Made of composition metal of high conductivity, strong and non-corrosive. Melting point 1210° C. (2200° F). In making a joint the cable end, after being stripped of the insulation, is held in a compression sleeve fitting in a compression nut which is screwed up tightly on the nipple part of the connector or terminal, affording perfect contact all around the outside of the cable and having a minimum tensile strength of 40% of the tensile strength of the cable thus joined. Especially useful where high temperatures prevail as in furnace leads, connecting cables to electrodes, electrolytic and electrochemical operations.
—DOSSERT & CO., NEW YORK.

DOWN-DRAFT FURNACE, HAWLEY. Ensures perfect combustion by mixing hot air with the gases of combustion before they strike the cold boilers and from smoke. Poor qualities of coal can be used and as good results obtained as if better coal were allowed to smoke. Increased boiler capacity.
—HAWLEY DOWN DRAFT FURNACE CO., CHICAGO, ILL. AND NEW YORK.

DREDGES. Gold dredges. Dipper dredges. Hydraulic dredges.
—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

DRILLING COMPOUNDS. Materials compounded in such a way that the oils they contain are made soluble in water, so that by diluting this material with water the cost per gallon of the solution used as a lubricant is very materially reduced. The kind of drilling compound used depends largely on the class of work being lubricated. Our New Era Compound No. 2 is more universally adapted to a large variety of work than any other material we manufacture.
—INTERNATIONAL CHEMICAL CO., CAMDEN, N. J.

DRYERS. Revolving for ore.
—COLORADO IRON WORKS CO., DENVER, COLO.

DRYERS. Rotary.
—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

DRYER, DIRECT HEAT ROTARY. The wet material and the furnace gases enter the shell at the higher end. The wet material falls to the bottom of the dryer, is caught by a shelf, elevated to almost the highest point during rotation, and then showered through the gases. This operation is repeated until the material in a dry condition is discharged from the lower end of the cylinder. This material is moved towards the discharge by the slope of the cylinder and by the draft. The material and furnace gases travel in the same direction, so that gases of the highest temperature are in contact with the wettest material. This dryer is suitable for handling all refuse material, such as lime refuse, carbonate and sulphate of lime, offal from packing houses and fish canning plants, etc.
—AMERICAN PROCESS COMPANY, NEW YORK.

DRYER, DIRECT STEAM HEATED AIR. This dryer is similar in operation to the Direct Heat Rotary Dryer above described, except that instead of furnace, heater and fan are used. The air is heated by being blown over steam coils of the heater. The material passes either with or against the blast of air according to the material being handled. This dryer is suitable for handling material that cannot come in direct contact with the gases of combustion or that must be dried at a low temperature.
—AMERICAN PROCESS CO., NEW YORK.

DRYER, ROTARY. Direct steam, hot air and gas-heated rotary dryers for such materials as are not sensitive to heat (such as sensi-

tive must be dried in a vacuum dryer.) The drying is rapid and continuous. These dryers are made to revolve or to not revolve, and are made to suit the conditions at the factory. The non-revolving dryers are placed horizontally, the revolving dryers on a slight angle. Both are rapid in their work and are adapted to such materials as fertilizers, packing house and other by-products, and various granular substances.
—Buffalo Foundry & Machine Co., Buffalo, N. Y.

DRYER, DAY'S RAPID. Consisting of a steel cylinder with a strong steel shaft passing through its centre. Mounted in a setting of brick work which constitutes a furnace for heating. The cylinder is revolved by a sprocket wheel or pulleys attached to the shaft. The furnace is located at one end of the cylinder and is so constructed that the heat and smoke pass underneath the cylinder to the other end and then back through the centre of the cylinder to a smoke stack. A series of spirally arranged buckets on the inside of the cylinder serve to keep the material in constant agitation and continually exposed to the heat. This arrangement also carries the material the entire length of the cylinder and discharges it. It is used for drying gypsum, sand, clay, slag, carborundum, chalk, pyrites, graphite, litharge, and in other work where removal of moisture is desired.
—J. H. Day Co., Cincinnati, Ohio.

DRYERS. SIX TYPES.

Class " A." For materials which may be heated to a high temperature and are not injured by furnace gases. A rotating machine consisting of two concentric cylinders fastened rigidly together at centre and at other points with swinging braces allowing free expansion. Heat from an independent furnace passes through inside cylinder, back between the two cylinders and out through an exhaust fan. Material fed in between the two cylinders at furnace end is lifted by steel flights on inside of outer shell and dropped on heated inner shell; by rotation of machine the material is again dropped to outer shell which process is continued until on account of inclination of machine it is finally delivered dried from rear end. Machine is supported by steel tires resting on eight chilled and ground bearing wheels supported on cast bases and is driven by gear and pinion. This machine develops 75% or more thermal efficiency and is built for a capacity as high as 6000 lbs. of water evaporation per hour.
—Ruggles-Coles Engineering Co., New York.

Class " B " For materials which may be heated to a high temperature but cannot be allowed in contact with furnace gases. A machine consisting of two concentric cylinders similar in appearance and construction to the " A " dryers but the products of combustion after passing through the inner cylinder are taken back through tubes arranged around the inside of outer shell and out through exhaust fan, so they do not come into contact with material being

dried. These dryers will give 50% thermal efficiency and are built for a capacity as high as 4000 lbs. of water evaporation per hour.
—RUGGLES-COLES ENGINEERING CO., NEW YORK.

Class "C." For material which can neither be heated to a high temperature nor come into contact with furnace gases. A machine consisting of a rotating cylinder with steel tires chilled bearing wheels and cast bases similar to "A" dryers, but instead of furnace and inner cylinder there is riveted at one end a steam head connected to which are steam pipes extending to other end. These are so arranged as to drain into steam head and water is automatically removed as fast as formed. This machine gives a thermal efficiency of 72% from steam used. As however steam can only be produced with an efficiency of about 60% the total thermal efficiency of this dryer from coal is about 43%. If exhaust steam is used which would otherwise be wasted the cost of drying is only the cost of maintenance. These dryers are built for a capacity as high as 1000 lbs. evaporation per hour.
—RUGGLES-COLES ENGINEERING CO., NEW YORK.

Class "D." For sticky materials which cannot be heated to a high temperature nor allowed in contact with furnace gases. A machine consisting of stationary steam-jacketed semi-circular troughs, with straight sides and covers. Through the centre is a revolving square shaft with paddles bolted on, which paddles keep the material from sticking to the shell and feed it through the dryer. These dryers will give a thermal efficiency of 60% from steam used and are built for a capacity as high as 500 lbs. of water evaporation per hour.
—RUGGLES-COLES ENGINEERING CO., NEW YORK.

Class "E." For sticky materials which may be raised to a high temperature and which are not injured by furnace gases. A machine consisting of stationary bricked-in semi-circular cast iron trough with straight sides and cover. Through the centre is a revolving square shaft with paddles bolted on, which keep the material from adhering to shell and feed it through the machine. This dryer has an exterior furnace and products of combustion pass under shell and back through drying material. This dryer has a thermal efficiency of 50% and is built for a capacity as high as 2000 lbs. of water evaporation per hour.
—RUGGLES-COLES ENGINEERING CO., NEW YORK.

Class "F." For materials the same as for "A" dryers but in which small capacity is required or economy of operation is not desired. A machine consisting of single rotating shell with lifting flights material being fed through by inclination of machine. A furnace is placed at either end as best suited to material and products of combustion passes through machine and out of stack. The shell has steel tires resting on chilled and ground bearing wheels which are supported on cast iron bases. These dryers will give a

thermal efficiency of 45% and are built for a capacity as high as 1500 lbs. of water evaporation per hour.

Other Types of Dryers are designed and installed when none of the above types are found suitable.

—Ruggles-Coles Engineering Co., New York.

DRYERS, VACUUM, PASSBURG System. Designed to remove water rapidly and at low temperature, especially from such materials which, on account of their sensitiveness to heat, cannot be dried by any other method without altering their chemical composition. It is also a desirable apparatus for drying without injury at a higher temperature, thereby accomplishing a great saving of time, fuel, cost of plant, and working expenses. The dryer consists of a cast-iron or wrought-iron chamber or cylinder which is hermetically closed by doors at one or both ends. The chamber contains a number of closed steam or heating shelves or pipes (also for hot water heating), arranged above each other, in which small pipes for the steam or hot water are fitted. The shelves are, as a rule, made strong enough for the test pressure of 75 lbs., the pipes for a still higher pressure. Upon these shelves are placed iron, copper, or earthenware trays which contain the material to be dried. When the dryer is closed, a high vacuum is created by means of an air pump, and exhaust or live steam or hot water is passed through the heating shelves or pipes. At a very low temperature (about 35° C. or 95° F. or less), the water evaporates and the process of drying is finished in a short time. For aniline and other dyes, alizarine, pastes, glues, soaps, extracts, salts, albumen, starch, gluten, rosins, refined sugar, incandescent mantles, electric cables, armatures and magnet coils, accumulator plates, solutions of gum, india-rubber, white lead and other chemical products. Over 2000 vacuum dryers of the Passburg system in daily use. Special apparatus designed to meet special requirements.

—J. P. Devine Co., Buffalo, N. Y.

DRYERS, VACUUM, SAFETY, Passburg system. A modification of the ordinary Passburg vacuum dryer, to meet the conditions for drying smokeless powder, fulminate of mercury, gun cotton, and other explosives. The apparatus is provided with an expansion chamber and other safety devices for the purpose of receiving in case of an explosion, the expanding gases and of reducing thereby their destructive power.

—J. P. Devine Co., Buffalo, N. Y.

DRYERS, VACUUM SHELF. Consisting of a rectangular or cylindrical vacuum chamber having hinged doors at each end, and containing heated shelves upon which the material is dried. The apparatus includes a surface condenser and receiver for reclaimed solvents and high-service vacuum pumps, capacity 30 to 9000 lbs. per charge.

—F. J. Stokes Machine Co., Philadelphia, Pa.

DRYERS, ROTARY VACUUM. Consists of a cylindrical steam jacket and vacuum chamber in which revolve agitators. The material is fed through openings in the top and discharged through corresponding outlets in the bottom. The apparatus includes dust filter, condenser and high-service vacuum pump. Capacity 100 lbs. to 3000 lbs. per charge. Used for drying salts, starch, feed, etc.
—F. J. STOKES MACHINE CO., PHILADELPHIA, PA.

DRYER, VACUUM ROTARY. A horizontal, cylindrical apparatus, hollow inside and steam heated around the exterior and also in the center. The material is placed in same, tumbled about by revolving medium, and finally, after being dried, is discharged. Steam heated, fire heated and hot air heated vacuum rotary dryers. The material is placed in the apparatus, dried at a low temperature and may be absolutely dried if necessary. A large output with an improved quality; low cost of operation; low steam consumption; simplicity of construction and small floor space are some of the advantages. This dryer is suitable for handling any granular substance, and is very rapid in its operation.
—BUFFALO FOUNDRY & MACHINE CO., BUFFALO, N. Y.

DRYER, VACUUM ROTARY DRUM. Drying solutions, emulsions, and pulps such as dyewood extracts, white lead, glues, milk, acids, chemicals, etc., or any liquid containing solids. The dryer consists of a hollow revolving drum, surrounded by a tightly sealed casing equipped with a device for applying a coating of liquid material to the drum and a corresponding appliance for removing the material in a dry condition and delivering it to suitable receivers. The drum is made of cast iron, bronze or special metals as required for acids or other materials. The casing surrounding the drum will be lined when required; the part of the casing containing the wet material will be lined with metal to withstand the action of the liquids. Agitators are provided for material requiring constant stirring. Steam is applied to the interior of the drum and the latter is revolved at the speed required for the material to be treated. A vacuum pump and a condenser are used in connection with the dryer and the drum rotates in a vacuum while in operation. On account of this vacuum the material is dried at an extremely low temperature, which prevents the overheating of the product. The material is applied at the bottom of the drum and is carried on the drum for three quarters of a revolution of the latter, when it is removed continuously in a dry state and conveyed to one of the receivers. When one receiver is full the action of the conveyor is reversed and the material is diverted to the other receiver. While the second receiver is being filled, the first receiver is emptied of its stock. The valve between the dryer and receiver is closed during the unloading of the receiver, in order to avoid breaking the vacuum in the dryer. The moisture is removed by evaporation, hence no product is lost during the operation.
—BUFFALO FOUNDRY & MACHINE COMPANY, BUFFALO, N. Y.

DRYER, VACUUM SHELF. The shelf dryer is adapted to dry sheet and reclaimed rubber of all kinds, rubber compounds, paints, dies, extracts, pastes, glue, soap, salts, albumens, of all descriptions, starch, glutrin, rosin, vegetables, fruits, sugars, small electrical apparatus, plates, chemicals, various by-products, granular and liquid substances. The dryer consists of a square or rectangular chamber containing hollow steam or hot water heated shelves, placed one above the other, the space between the shelves varying from 2½″ to 4″. The chambers have a door at one or both ends for unloading purposes. The material to be dried being loaded in trays or pans, these are placed on the shelves. The apparatus is then closed up, the vacuum produced and the drying commenced. With the apparatus is furnished a vacuum pump and condenser, which produces and maintains a high vacuum during the drying operation. —Buffalo Foundry & Machine Company, Buffalo, N. Y.

DRYING (VACUUM) AND IMPREGNATING APPARATUS. For drying and impregnating with insulating compound, under vacuum, electric coils, cables, transformers, armatures, insulator pins, wood fillers, and electrical work of all descriptions. The apparatus consists of an impregnating tank, liquor tank, vacuum pump, condenser and auxiliaries. The tanks, connecting pipe and valve are heated with steam, gas or hot air. The material to be treated is placed in the impregnating tank, the moisture being rapidly evaporated and condensed under vacuum. The compound with which the material is to be impregnated is melted (if necessary) in the liquor tank. When the articles to be impregnated are thoroughly evacuated, the gate valve between the tanks is opened, the vacuum in the impregnating tank drawing the liquor into that tank until the articles to be treated are thoroughly covered. The vacuum is then broken and air at 100 lbs. pressure is then put on the liquor, this pressure being maintained until a thorough impregnation takes place. The liquid is then returned to the liquor tank by a slight air pressure, allowing the impregnated article to drain.
—Buffalo Foundry & Machine Company, Buffalo, N. Y.

DRYING, SAWDUST BOXES. Steam-heated sawdust boxes for drying quantities of small work in bulk. Made removable sections. The sawdust compartment is made of heavy galvanized iron and is heated by a steam coil. The stand is made of 1¼ inch angle iron. —The Hanson & Van Winkle Company, Newark, N. J.

DUST COLLECTOR. *An apparatus for collecting floating dust created by various types of machinery, etc., and delivering the same at any convenient point.*

Dust Collector, Osborne Polygonal. Is octagonal in shape, instead of being circular as the ordinary type of cyclone collector is. The polygonal form of the collector gives much better results in the separation of the dust from the air, so that practically all of the material delivered to the machine is collected and saved. This

machine can be used in connection with any convenient system of piping for the removal and collection of all floating dust. It is very frequently used for collecting the fine dust escaping from the discharge end of rotary dryers, etc. When used for this purpose it saves the space otherwise needed for clumsy dust chambers, and at the same time collects a great deal more of the dust than is possible by any other method.
GRISCOM-SPENCER CO., NEW YORK.

Dust Collector, Water. Made of galvanized iron to prevent rusting, is used for removing and precipitating dust, and also for absorbing obnoxious vapors and gases; finds application in mines for collecting precious metal dust, in stoneware and cement mills, paint factories, paper mills, breweries, etc. This dust collector is operated by pressure water, and absorbs the dust, etc., by means of spray nozzles installed therein. The air and dust is forced through the apparatus by means of jet ventilators or rotary fans. The air, gases or dust enters at one end of the apparatus and is discharged at the other end completely cleaned.
—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

Dust Collector. See also "Gas Washer," "Smoke Consumer," "Vapor Condenser."

DYNAMOS. See Generators.

EARTHENWARE. Special goods from vitreous or porous earthenware. We do not carry in stock earthenware apparatus for the chemical industries, but are making special goods according to models or drawings and specifications, especially for experimental work.
—JOHN MADDOCK & SONS, TRENTON, N. J.
(See also Stoneware.)

EARTHENWARE CELLS. Porous for electrochemical purposes, of superior quality, have given general satisfaction wherever used, made in round or rectangular shapes.
—J. W. SITTIG, NEW YORK.

EARTHENWARE TILES. Porous. Of great porosity and durability.
—J. W. SITTIG, NEW YORK.

ELECTRIC STEEL FURNACES. See Furnaces, Electric Steel.

ELECTRODES, ACHESON-GRAPHITE. Made by subjecting the ordinary carbon articles to the graphitizing process in the Acheson electric furnace. Possess four times the electrical conductivity of the amorphous carbon article. Real density 2.18. Contain 98.5% to 99.9% graphite. Tensile strength 850 to 1050 pounds per square inch. Resistance 0.00035 ohm per inch cube. Oxidizing tem-

perature 1150° F. Of low porosity, rendering them highly resistant to chemical disintegrating action. Freedom from hydrocarbons, assures remarkably long life, one to two years, in chloride work. Ease of machining is a valuable and economic characteristic. In electrometallurgical work they have shown six times the efficiency of amorphous carbon electrodes for equal electrode weights. Show marked economy in many electrolytic processes for producing zinc and copper in chloride solutions, chlorine, caustic soda, chlorates, gold and silver from cyanide solutions, etc.
—International Acheson Graphite Company, Niagara Falls, N. Y.

ELECTRODE, CARBON. See Carbon electrodes.

ELECTRO GALVANIZING. Electrogalvanizing, cold process, no royalties. Plants furnished for complete equipments.
—Hanson & Van Winkle Company, Newark, N. J.

ELECTRO-GALVANIZING or plating iron with zinc. The feature of our process is the use of an indestructible, permanent solution of high conductivity and density. No galvanizing salts or toning salts are employed; only water is added from time to time to replace that lost by evaporation. With our solution, zinc is plated directly from zinc anodes and no further attention is required. Owing to the high conductivity of the solution, the voltage is low. The formation of hydrogen gas is practically eliminated. The zinc coating forms a perfect union with the steel, is non-porous, uniform, and free from bubbles, and of good glossy white color. The Meaker solution and apparatus offered for outright sale; no royalties. Our large galvanizing plant is open for inspection.
—Meaker Company, Chicago, Ill.

ELECTRO-GALVANIZING. Machinery, apparatus, and accessories.
—Zucker & Levett & Loeb Co., New York.

ELECTRO-GALVANIZING MACHINE. Continuous process for galvanizing small finished pieces, such as nails, bolts, nuts, screws, etc. The pressure required is 5 volts. Continuous operation so that it is not necessary to stop the machine to remove completed work or to load the machine for another run. Made in three sizes: No. 1 capacity 800 to 1400 lbs. of bolts or nails in 10 hours; No. 2 capacity 1,700 to 2,700 lbs.; No. 3 capacity 5000 to 7500 lbs. Other sizes built to order.
—Meaker Co., Chicago, Ill.

ELECTROPLATING CHEMICALS. Nickel salts, carbonate of copper etc. of highest quality. Compositions, rouges, Vienna polish etc. made in a large variety of grades according to the uses for which they are to be applied.
—Levett Mfg. Co., Matawan, N. J.

ELECTROPLATING CHEMICALS. All chemicals used in the electrodeposition of metals.
—Hanson & Van Winkle Company, Newark, N. J.
—Zucker & Levett & Loeb Co., New York,

ELECTROPLATING CONNECTIONS. Rod and wire connections of all styles and sizes for use in the plating room.
—Hanson & Van Winkle Co., Newark.
—Zucker & Levett & Loeb Co., New York.

ELECTROPLATING, MECHANICAL APPARATUS. These machines are particularly adapted for electroplating large quantities of small work in bulk, saving time, labor and expense. They are being successfully operated with nickel, copper, brass, bronze and zinc plating solutions. Many articles come from the apparatus in a highly polished condition thus doing away with further hand operations.
—Hanson & Van Winkle Company, Newark, N. J.

ELECTROPLATING. See Soaps, Burnishing.

ELECTROTYPING LEADS. To give best results, the "leads" used by electrotypers for moulding and polishing should possess different characteristics in order to prevent sticking or slipping of the work, the moulding lead should be slightly asperous, while polishing lead should be of high purity, in order to insure proper electrical conductivity, and great spreading and covering power. In the past it has been found necessary to "dope" natural graphite to meet some of the requirements of this field, but now the electric furnace process, operated by the International Acheson Graphite Co., makes "leads" that possess the varied qualities, their individual value being obtained through the use of different raw materials. in the production of each lead.
—International Acheson Graphite Co., Niagara Falls, N. Y.

ELEVATORS AND AGITATORS OF STONE-WARE. For lifting and stirring acids, can be worked either by steam or compressed air; very simple and efficient apparatus.
—J. W. Sittig, New York.
(Other stoneware makers see Stoneware.)

ENAMELED IRON GOODS. Steam-jacketed kettles, etc.
—Stuart & Peterson Co., Burlington, N. J.

ENAMELED WARE OF CAST IRON. For chemical purposes, made by the most prominent German manufacturers. The enamel is thoroughly acid-proof and can be subjected to high temperature. Very convenient for all kinds of chemical manufacturers; color and varnish works. The fact that this enamel sticks firmly to cast iron allows of the construction of even the largest apparatus, such as

all kinds of kettles, stills, vats, and stirring apparatus, etc. Catalogs and samples gladly furnished.
—J. W. SITTIG, NEW YORK.

ENAMELING FURNACES. For granite or agate ware, etc. No muffle required. 50 to 80 per cent greater output than ordinary furnaces. High quality.
—W. S. ROCKWELL COMPANY, NEW YORK.

ENGINES. Corliss Steam.
—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

ENGINES. Gas.
—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

EUREKA MILL. See Crushing and Grinding.

EVAPORATORS. *Apparatus usually operated under a vacuum in which all kinds of dilute liquors are economically concentrated by means of steam at low pressure—usually exhaust steam. Built in any number of units or effects, although the practical limit for most liquors has been found to be a quadruple effect. This limit depends entirely upon the nature of the liquor and the amount of steam available. The economy of evaporators lies in the repeated use of the latent heat in the steam, and the amount necessary is approximately inversely proportional to the number of effects. A pound of steam will evaporate (roughly) five times as much water in a quadruple effect as in an open tank. Each effect contains tubular heating surfaces in which the steam coming from the previous effect is condensed. The heat liberated by this condensation produces an equal amount of evaporation and the steam formed is in turn condensed in the succeeding effect. This repeated use of the steam is possible because of the successive reduced pressures and consequently lower boiling points in the successive effects.*

Evaporators, Swenson type, and other styles for concentrating any kind of dilute liquor. Over 500 of our evaporators now in use for caustic soda, black liquor, distilling waste, tankwaters of all kinds, beet and cane juice, glucose, packing house liquors, extracts, glue, " spent " lye and other solutions and liquid waste of many kinds. Designs submitted for any proposition and estimates prepared as to the saving possible through the use of an evaporator. For general purposes, our standard Swenson type is the best known and most widely used equipment. Heavy cast iron, bronze, copper or steel construction with any type of heating surface. Swenson pans have the tubes secured by removable packing plates and elastic gaskets, making it possible to easily make repairs with ordinary labor. No moving parts, such as floats, to get out of order and no tubes to clog up and reduce capacity. The liquor surrounds the tubes which are always completely submerged, thus preventing burning on same. Perfect circulation assisted when occasion demands by properly proportioned downtake. Liquor always in sight and final density easily controlled and maintained at any

desired point. Concentration all effected in one passage through the evaporator. Swenson effects are easiest to keep in a highly efficient condition and to clean and are simplest in operation. Everything easily understood by ordinary labor; "the $1.50 per day" kind being generally employed to run our evaporators. Simplicity in design, heavy construction, and absence of moving parts, all assist in keeping repair expense at a minimum. Special provision made to guard against loss by entrainment or foaming by means of internal or external catchalls and added vapor space. Salts and other solids precipitated or deposited during the boiling, taken care of in the design. Single and multiple effects built for capacities up to 15,000 gallons per hour. Among the advantages of the Swenson system are:—superior efficiency of horizontal heating surfaces—low liquor depth and consequently a uniformly low temperature throughout same—rapid evaporation and short time during which the liquor is in evaporator—no pumping of liquors between effects—accessibility of all working parts—ability to finish a small batch—large boiling surface and vapor space above same, reducing possibility of entrainment losses—positive circulation—higher density than with any other type—steam fully condensed insuring maximum economy, and small head room necessary. Propositions made upon receipt of complete information on quantity and nature of liquor to be handled, impurities in solution or suspension, boiling peculiarities, amount of precipitation limiting densities, etc.
—SWENSON EVAPORATOR COMPANY, CHICAGO, ILL.

Evaporators, Baeuerle and Morris. Multiple-effect vacuum evaporators. Our evaporators are of the short vertical tube type with tubes expanded into tube sheets at both ends and liquor circulating through inside of tubes. By this arrangement of tubes all glands, stuffing boxes and rubber gaskets, etc. are avoided and no trouble from leaking tubes is experienced. Design gives a very rapid circulation of material to be evaporated and if necessary allows for an easy cleaning by mechanical means as each tube is four feet or less long and can be cleaned with a wire brush or scraper. Shells and heating surfaces are made from material best suited for desired service.
—BAEUERLE & MORRIS, PHILADELPHIA, PA.

Evaporators, Buffalo Foundry. Single, double. triple and multiple effect evaporators of cast iron, copper, bronze and of special materials. Steam jacketed, coil type, or both; also with agitators, if desired. Evaporators with a large outlet at the bottom for heavy materials. Our evaporators are fitted with surface, barometric or jet condensers and wet or dry vacuum pumps, according to the conditions they are required to operate under.
—BUFFALO FOUNDRY & MACHINE CO., BUFFALO, N. Y.

Evaporators, Kestner Film. Operates on the principle of film evaporation. The design is such that the film is forced to cling to the heating surface independent of gravity, instead of being forced

away from the hot surface by the steam disengaged. This means a highly effective use of the heating surface and the possibility of concentration to the desired degree in one passage through the tubes. Over 400 pans are at present in successful operation, treating a great variety of materials.
—KESTNER EVAPORATOR CO., PHILADELPHIA, PA.

Evaporators, Vacuum, Stokes. Either copper or iron vacuum pans or stills, from 25 gallons capacity upwards. Single or multiple-effect vertical evaporators for concentrating various solutions.
—F. J. STOKES MACHINE CO., PHILADELPHIA, PA.

Evaporators, Vacuum, Dopp. Consist of cast-iron seamless steam-jacketed kettles forming the bottom half, upon which is mounted a dome, also seamless, the two being bolted together with packing between. By means of a stuffing box, a mixing device can be introduced. By means of a suitable piping, it is connected to a condenser and a vacuum pump. This apparatus is used for evaporating, distilling, refining, mixing and drying a variety of materials in vacuo. They range in size, total contents, from ten to one thousand gallons. (See illustration, Electrochem. & Met. Ind., May, 1909, advertising page 37.)
—H. W. DOPP CO., BUFFALO, N. Y.

Evaporators, Zaremba. The great variety of liquors and of circumstances of concentration met with make imperative the use of particular types of apparatus in particular cases. As evaporator engineers we recommend one of six general types: (1) For ordinary work, round body pan, vertically cylindrical shell, horizontal submerged tubes with steam inside. (2) For continuously removing salt or other precipitate without interruption. (3) Liquors demanding frequent cleaning of heating surface—vertically cylindrical shell, vertical tubes with liquor inside, large outside downtake. (4) Extra high concentration of caustics, (1.8 s. g.) with steam only, all cast iron construction. (5) Foaming and delicate liquors—passed rapidly through horizontal tubes with very short exposure to heat. (6) Salt manufacture in multiple effect without interference from gypsum and without previous treatment. Inquiries with reference to difficult evaporator work are especially solicited.
—ZAREMBA CO., CHICAGO, ILL.

EVAPORATING DISHES. Of acid-proof stoneware, in all sizes and shapes; can be made with spouts and handles if desired.
—DIDIER-MARCH COMPANY, NEW YORK.

Evaporating Pans. Graham chemical stoneware pans for evaporating corrosive solutions are made in various stock sizes and can be furnished to order in any size. Guaranteed chemical proof and of superior heat-resistance.
—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.
(Other stoneware makers see Stoneware.)

Evaporating Pans, shallow or deep form of stone-ware or cast-iron enameled ware.
—J. W. SITTIG, NEW YORK.

Evaporating Pans. See also Castings, Chemical.

Evaporating Pots. These pots as well as retorts and pans for acids and alkalies are made of the purest iron, with additions necessary to make the iron resist the action of corrosive chemicals. Special methods of moulding produce a kettle of great smoothness, which is essential for a large output of caustic material. Pots made by this company have turned out over 2500 tons of caustic soda.
—BUFFALO FOUNDRY & MACHINE COMPANY, BUFFALO, N. Y.

Evaporating Pots. Specially designed to resist the action of caustic or acids. A specialty made of castings from blue prints furnished by designers, engineers, and superintendents. Plans or estimates furnished for complete acid and chemical plants.
—BETHLEHEM FOUNDRY & MACHINE CO., SOUTH BETHLEHEM, PA.

EXCELSIOR MILL. See Crushing and Grinding, Excelsior Mill.

EXHAUSTERS. Of acid-proof stoneware, for expelling gases, can also be used in absorbing and condensing plants. Are driven either by steam power or electric motor. Exhausters tested 50% in excess of their rated speed. In 5 sizes from a capacity of 426 cu. ft. per minute, to 6372 cu. ft. per minute. These exhausters in the larger sizes can be had with armor if desired.
—DIDIER-MARCH COMPANY, NEW YORK.

Exhausters. Chemical-stoneware exhaust-fans in three sizes, handling 50, 510 and 2600 cubic feet per minute, respectively. Most practical ventilating device for handling corrosive gases, as all working parts are constructed of non-corrosive material. Each fan tested at twice operating speed before shipment. Fans are supplied complete with iron work and tight pulley, ready for operation. Full description in catalog.
—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.

Exhausters. Of stone-ware of the latest and most improved style; especially suited for dealing with large quantities of air and acid vapors, etc. No corrosion; made for belt driving or for driving by electric motors; made in three different sizes for 6, 8, and 12 pipe connection.
—J. W. SITTIG, NEW YORK.

Exhausters and Compressors for Creating Vacuum. Are constructed of lead, brass and iron, with platinum steam nozzle, and used for rarefying creosoting tanks, priming centrifugal pumps, lifting acids (without diluting) oxidizing caustic liquors, agitating

liquors by forcing air into them, distillation of fats, oils, etc. under vacuum, bleaching palm oil, etc. The admissible vacuum and counter pressure to which these apparatus are constructed is a rarefaction up to 20 inches of mercury and above, or a counter pressure up to 1/7 of the steam pressure. This apparatus may be placed horizontally or vertically, discharging upwards, downwards or horizontally. Made in ten sizes ranging in capacity of from 1,000 to 60,000 cubic feet of air per hour.
—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

EXHAUST FANS. See also Blowers.

FEED WATER HEATERS.
—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

FERRO-ALLOYS. General sales agents for products of Electro-Metallurgical Co., New York.
—E. J. LAVINO & CO., PHILADELPHIA, PA.

FERRO-ALLOYS. (Ferro-chrome, manganese, molybdenum, phosphorus, silicon, titanium, tungsten, vanadium.)
—C. W. LEAVITT & CO., NEW YORK.

FERRO-ALLOYS. (Chrome, tungsten, molybdenum, silicon, boron, vanadisum, tantalum.)
—GEO. G. BLACKWELL, SONS & CO., LTD., LIVERPOOL, ENGLAND.

FERRO-ALLOYS. Imported. (Ferro-chrome, silicon.)
—FUERST BROS. & CO., NEW YORK.

FERRO-ALLOYS. Export. (Ferro-tungsten, chromium, titanium, molybdenum, vanadium, silicon). Also export of ores (nickel-chromium, pure tungsten, manganese-chromium.)
—A. CHAMPIN, PARIS, FRANCE.

FERRO-ALUMINIUM. 10% grade.
—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

FERRO-BORON. 20–25% grade.
—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

FERRO-CHROME. 65 to 70% of the usual and of the lowest carbon contents. General sales agents for products of Electro Metallurgical Co., New York.
—E. J. LAVINO & CO., PHILADELPHIA.

FERRO-CHROME. Free from carbon. In nuggets. "Ruthlock" Brand.
—MARCUS RUTHENBURG, LONDON.

FERRO-CHROME. 60 to 70% chromium with 1% or less of carbon; next grade 60 to 70% chromium, 6% maximum carbon; next grade 60 to 70% chromium, 8 to 10% carbon.
—Roberts, Evans and Woodhead, Liverpool, England.

FERRO-CHROME. Ordinary 65–72% Cr, with 4–6%, 6–8%, 8–10% C. Mild X, 60–65% Cr, with ½–1% C. Mild XX, 65–70% Cr, with 1½% C.
—Roessler & Hasslacher Chemical Co., New York.

FERRO-CHROME-NICKEL. 98–99½% Pure. 52–53% Cr, 17–18% Ni 30–31% Fe, with 0.25–0.75% C.
—Roessler & Hasslacher Chemical Co., New York.

FERRO-MANGANESE. Standard 80% grade. Also 85 to 90% carbon less ferro-manganese.
—E. J. Lavino & Co., Philadelphia, Pa.

FERRO-MANGANESE. Our grade contains from 80% to 85% manganese.
—Electric Smelting & Aluminum Co., Lockport, N. Y.

FERRO-MANGANESE. Free from carbon. In nuggets, " Ruthloch " brand.
—Marcus Ruthenburg, London.

FERRO-MANGANESE. 80–85% Mn, with 6–7% C. Lumps, also ground.
—Roessler & Hasslacher Chemical Co., New York.

FERRO-MOLYBDENUM. Regular, 50%, 70–75%, 80–90% Mo, with 3% C. and 0.10% S. Refined X, 75–80% Mo, with 1% C. and 0.05% S.
—Roessler & Hasslacher Chemical Co., New York.

FERRO-MOLYBDENUM. About 80%, carbon 3 to 4%.
—Roberts, Evans & Woodhead, Liverpool, England.

FERRO-MOLYBDENUM. 75 to 85%. Low in carbon.
—E. J. Lavino & Co., Philadelphia, Pa.

FERRO-NICKEL. 25–75% Ni.
—Roessler & Hasslacher Chemical Co., New York.

FERRO-PHOSPHORUS. 15–20%, 23–25% P.
—Roessler & Hasslacher Chemical Co., New York.

FERRO-PHOSPHORUS. 20 to 25%.
—E. J. Lavino & Co., Philadelphia, Pa.

FERRO-SILICON. Our grade contains 50% silicon and is low in carbon.
—Electric Smelting & Aluminum Co., Lockport, N. Y.

FERRO-SILICON. Grades from 50 to 75%. 50% ferrosilicon always in stock for immediate delivery. General sales agents for products of Electro Metallurgical Co., New York.
—E. J. Lavino & Co., Philadelphia.

FERRO-SILICON. Electric furnace make, X, 25–30%; XX, 50–60%; XX, 70–80% Si. Low in carbon, phosphorous and sulphur.
—Roessler & Hasslacher Chemical Co., New York.

FERRO-SILICON. See also Silicon and Carborundum.

FERRO-SILICON-ALUMINIUM. Our alloy contains 42 to 45% silicon and 13 to 16% aluminium, and is a valuable deoxidizing agent in iron and steel work.
—C. W. Leavitt & Co., New York.

FERRO-TITANIUM. 20–25% Ti, with low or high carbon contents.
—Roessler & Hasslacher Chemical Co., New York.

FERRO-TITANIUM. (20–25% Ti.) Registered trade-mark "Thermit". Free from carbon, technically free from iron and used as an alloy for steel.
—Goldschmidt Thermit Co., New York.

FERRO-TITANIUM.
—E. J. Lavino & Co., Philadelphia, Pa.

FERRO-TUNGSTEN. 80 to 85%. Low in carbon.
—E. J. Lavino & Co., Philadelphia, Pa.

FERRO-TUNGSTEN. Regular, 50%, 70–75%, 80–90% W, with 2.50–3.00% C. Refined X, 80–85% W, with 0.15 to 0.50% C.
—Roessler & Hasslacher Chemical Co., New York.

FERRO-TUNGSTEN. About 80% tungsten, 1% carbon. Another grade, containing 80% tungsten, 2 to 3% carbon.
—Roberts, Evans & Woodhead, Liverpool, England.

FERRO-TUNGSTEN. See Scheelite.

FERRO-URANIUM. 30–40% U.
—Roessler & Hasslacher Chemical Co., New York.

FERRO-VANADIUM. Vanadate of iron, containing 60% vanadic acid.
—Vanadium Alloys Co., New York.

FERRO-VANADIUM. 12 to 20% and 40 to 60%.
—PRIMOS CHEMICAL CO., PRIMOS, PA.

FERRO-VANADIUM. 25 to 30%. Carbonless.
—E. J. LAVINO & CO., PHILADELPHIA, PA.

FERRO-VANADIUM. (25% Va.) Registered trade-mark "Thermit." Produced free from carbon by the aluminothermic process. Particularly advantageous for alloying in small quantities with steel, as steel so treated possesses greater power to resist fatigue.
—GOLDSCHMIDT THERMIT CO., NEW YORK.

FERRO-VANADIUM. Pioneer X, 30–35% V, 0.75 to 1.00% Si, Al and C.
—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

FILTER PRESS. *Consists of a series of chambers formed either by recessed plates or by flush plates with frames between them. Is used for the rapid separation of solids from liquids under pressure for the recovery of either or both.*

Filter Press, Shriver. Made in all types, for all purposes. Chambers made of cast iron, bronze, aluminium, hard lead or wood. Jacketed presses for filtering liquids at high or low temperatures. The pyramid drainage surface on plates gives highest efficiency. Quick opening and closing devices saves time in operating. Accurate machine work on the joint surfaces insures tight joints. Highest grade castings used and best workmanship.
—T. SHRIVER & CO., HARRISON, N. J.

FILTER PRESSES. For metallurgical and experimental work. For extraction of gold solutions from slimes. Our hydraulic closing slime press is of the flush plate and division frame type and contains the best features of the foreign type of press so successfully used for the treating and washing of slimes. We also build special filter presses for the separation of precipitates in the chlorination process and for the separation of zinc dust precipitates in the cyanide process; also a press for cleaning up of zinc slimes from precipitating boxes in the cyanide process, and a press for general quick separation of solids held in suspension and drying of same into solid cakes. Filter presses with square plates and frames and with round recessed plates.
—WILLIAM R. PERRIN & CO., CHICAGO, ILL.

FILTER PRESS. Sperry's patent improved filter press is equipped with a plate that differs radically from all others. The radial grooves lead the liquid directly to the outlet. Being deep and rounded where they touch the cloth and of proper cross-section, the hug of the cloth cannot close the passage. They eliminate need of perforated metal. Save 50% in wear of cloths, produce a dryer cake, and are very rapid.
—D. R. SPERRY & CO., BATAVIA, ILL.

FILTER PRESS. Trout. For chemical works, with either iron or wooden plates, hydraulic or hand power. Send us your specifications, and we will give you price on castings and machine work on same ready for use.
—H. G. Trout Company, Buffalo, N. Y.

FILTER PRESSES. For commercial and experimental work.
—J. H. Day Co., Cincinnati, Ohio.
—Swenson Evaporator Co., Chicago, Ill.

FILTERS, SUCTION. Of acid-proof stoneware, in all sizes and shapes, both for manufacturing purposes and laboratory use.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

Filters, Suction. Of stone-ware, cylindrical or conical shape, with tightly ground-in strainers. Have given general satisfaction on account of their suitable construction and great durability.
—J. W. Sittig, New York.

FILTERS, WATER.
—E. H. Sargent & Co., Chicago, Ill.
—Arthur H. Thomas Co., Philadelphia, Pa.

FILTERS FOR MINERAL WATER WORKS. Of acid resisting stone-ware.
—J. W. Sittig, New York.
(Other stoneware makers see Stoneware.)

FINE CRUSHER. See Crushing and Grinding, Crusher.

FIREARMS LUBRICANT. Finely ground, unctuous Acheson graphite, grade "1340," is the only suitable lubricant available for high-power rifles, as it is non-volatile and infusible. It reduces friction and metallic fouling, prevents erosion, assuring greater range and increased accuracy, while greatly prolonging the life of the gun barrel.
—International Acheson Graphite Co., Niagara Falls, N. Y.

FIRE BRICK. For all purposes of the chemical and metallurgical industries. Highest-grade fine-grind and hard-burn fire brick for use in sulphite digesters. Rotary cement kiln linings. Lime kiln linings. Fire brick and chrome linings for nodulizing kilns for iron ore and other material. Fire brick for soda ash furnaces, salt cake and other chemical furnaces. Linings for pyrites roasters. Chrome and fire brick linings for dolomite calcining kilns; magnesia and fire brick for calcium carbide kilns; highest-quality fire-clay brick for brass furnaces. Fire, silica, and quartzite brick for all types of beehive, by-product and Belgian types of coke ovens. Products of the East Chicago works, the Portsmouth Harbison-Walker Co., The Reese Clay and Silica Brick Works, the Clinton

County Fire Brick Works. Special brick for boiler settings. Total daily capacity of all works 1,100,000 brick. See also Chrome Brick, Magnesia Brick, Silica Brick.
—Harbison-Walker Refractories Co., Pittsburgh, Pa.

FIRE-BRICK. Made from selected clays.
—A. J. Weeks, Akron, Ohio.
—U. S. Stoneware Co., Akron, Ohio.
—Laclede-Christy Clay Products Co., St. Louis, Mo.

FIRE CLAY. Ground.
—Harbison-Walker Refractories Co., Pittsburgh, Pa.

FIRE SAND. See Carborundum Fire Sand.

FLOUR MILL Machinery.
—Allis-Chalmers Co., Milwaukee, Wis.

FLUORSPAR. Kentucky and Illinois. Lump; washed gravel; unwashed gravel.
—E. J. Lavino Co., Philadelphia, Pa.

FLUORSPAR. American agents of product of Geo. G. Blackwell, Sons & Co., Ltd., Liverpool, England.
—Penn Salt Mfg. Co., Pittsburgh, Pa.

FORGE FURNACES. For all classes of railroad, ship and miscellaneous forging, welding, upsetting, rivet, billet, bulldozer work.
—W. S. Rockwell Company, New York.

FOUNDRY SUPPLIES. See also different articles.
—Electric Smelting & Aluminum Co., Lockport, N. Y.
—Harbison-Walker Refractories Co., Pittsburgh, Pa.
—Hawley Down Draft Furnace Co., Chicago and New York.
—Laclede Christy Clay Products Co., St. Louis, Mo.
—Monarch Engineering & Mfg. Co., Baltimore, Md.
—Northern Engineering Works, Detroit, Mich.
—W. S. Rockwell Co., New York.
—Rockwell Furnace Co., New York.

FOUNDRY PRACTICE WITH THERMIT. (1) The thermit reaction (see "Aluminothermics") provides a ready means of introducing in an iron ladle a material which will stir up or pole the entire contents of the ladle and at the same time produce an increased temperature. For this purpose the thermit is placed in cylindrical cans with a sleeve in the middle, suitable for passing on an iron rod. The iron rod is held under the surface of the metal, where the reaction takes place. By this means the iron is prevented from getting too dull to pour. It also helps the foundryman to make so-called "semi-steel" castings in the ladle, by assisting him in properly distributing the steel while in the state of fusion.

(2) The thermit reaction offers a convenient means of purifying the iron in the ladle, by reducing the harmful presence of nitrogen in the molten metal. A special thermit, consisting of pulverized aluminium and a titanium iron oxide, is made up in solid form, in cylindrical cans, as described in (1). The titanium set free during the reaction is insufficient to alloy with the iron, but quite adequate to combine with the nitrogen in the ladle, forming a cyanonitride of titanium. During this formation, the entire contents of the ladle are stirred up and give the gases an opportunity to escape. The iron will be somewhat hotter and distinctly more fluid, and the castings made from this iron will be distinguished by greater density of grain, being especially adapted for castings having to stand pressure, such as cylinders, valves, etc. (3) The property of the thermit reaction to increase the temperature of liquid iron or steel under which it is submerged, is utilized to decrease the size of the risers of steel castings. The thermit, placed in suitable cans, is held in the neck of the riser, which is thus kept in a liquid state for a longer time and facilitates the proper feeding of the casting. The same principle is applied very successfully to reduce the size of lost heads of steel ingots.
—Goldschmidt Thermit Co., New York.

FRUE VANNERS.
—Allis-Chalmers Co., Milwaukee, Wis.
—Colorado Iron Works Co., Denver, Colo.

FULLER MILL. See Crushing and Grinding.

—FULLER'S EARTH.
E. J. Lavino & Co., Philadelphia, Pa.

FUNNELS, SAFETY. Made of acid-proof stoneware in various sizes and styles; these funnels are so shaped that liquid poured through them forms a seal.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

FUNNELS AND PERCOLATORS. Of stone-ware in all styles and sizes, also provided with stop cock.
—J. W. Sittig, New York.
(Other stoneware makers see Stoneware.)

FUNNELS. Of hard rubber.
—American Hard Rubber Co., New York.

FURNACE, ELECTRIC STEEL. HEROULT TYPE. Belongs to the class of arc furnaces. With ordinary alternating current there are two electrodes at the top, connected to the two terminals of the electric circuit. The current passes from one electrode in form of an arc into the slag, through the same, and out of it in form of an

other arc into the other electrode. With three-phase currents three electrodes are used at the top. The slag is at maximum temperature and heats the fused steel bath below, which is in automatic agitation. The product is absolutely homogeneous, as low in sulphur and phosphorus as desired, and thoroughly deoxidized. Perfect de-oxidation is possible on account of the neutral atmosphere and perfect refining is possible by means of the slag which is at the highest temperature. Since the electrodes do not come in contact with the steel bath, no contamination of the bath is possible. The furnace has been adopted by the U. S. Steel Corporation to refine converter steel (for rails) and open-hearth steel (for wire, etc.) and by fifteen other European and American steel works. The Heroult furnace is simple and inexpensive in construction and free from complication and repairs. Basic patents covering electric furnace and process for electric smelting and transfer of molten steel from ordinary furnaces into electric furnaces for thorough purification and refining.

—R. H. Wolff, New York (representative for U. S.)

—R. Turnbull, St. Catherines, Ont. (representative for Canada).

FURNACE, ELECTRIC STEEL. GIROD TYPE. Belongs to the class of arc furnaces. One or more electrodes (all of the same polarity) suspended from the top are connected to one terminal of the electric circuit. The current passes from this electrode or these electrodes in form of arcs into the slag, then into the molten steel bath below and then into soft-steel blocks embedded in the bottom of the furnace and water-cooled from the outside. These steel-blocks form the other terminal of the electric circuit and are very durable. Since the carbon electrode at the top does not come into contact with the fused metal, and since the bottom terminal consists of soft-steel, no contamination of the bath is possible. Special advantages of this furnace are ease of regulation of arc and ease of thorough insulation, due to low voltage. Used in the manufacture of high-speed steels, alloy steels, special steels, and all sorts of steel castings.

—C. W. Leavitt & Co., New York.

FURNACE, ELECTRIC STEEL, STASSANO TYPE. Belongs to the class of arc furnaces. Arcs are formed between the ends of the electrodes above the bath and heat the metal bath by radiation. The furnace is closed air-tight. The smelting chamber is slightly inclined and revolves during operation, to provide for thorough agitation. The furnace is suitable for production of highest grade steels from cold or molten charges of ordinary steel. Since the atmosphere in the furnace is chemically neutral, and the operation may be carried out at will for any length of time, the metal may be nearly entirely freed from all impurities without the risk of pernicious oxidation. In the Stassano furnace it is also possible to convert ore into malleable iron or steel of desired composition, in one operation.

—Forni Elettriciti Stassano, Turin, Italy.

FURNACE, ELECTRIC STEEL. INDUCTION furnace according to the invention of Colby and Kjellin. The heat in the charge is produced by electric currents, induced in the charge from the outside primary coil. There are no electrodes, hence there is no possibility of any contamination of the bath with any impurities, especially with carbon. The atmosphere of the bath is neutral. The composition of the product can be exactly controlled by correctly proportioning the charge. The furnace is especially suitable for melting high-grade steel, brass, etc. The furnace is built in four standard sizes for the following contents in tons: 0.1 to 0.15, 0.8, to 1.6, 2.5 tons; the maximum power required is 60, 150, 225, and 350 kw. respectively. The frequency of the alternating current for the operation of these four types is 60, 25, 16, and 14 periods per second respectively; the corresponding power factor is 0.76, 0.70, 0.65, 0.58.

—American Electric Furnace Co., New York.

FURNACE, ELECTRIC STEEL. COMBINATION furnace of the Roechling-Rodenhauser type. A combination of the simple induction furnace with the use of pole-plates through which the current is introduced into the working hearth. As these pole-plates are not of carbon and are protected by the refractory lining, there is no possibility of contamination of the bath. The atmosphere in the furnace is neutral. In contradistinction to the simple induction furnace which is essentially a melting furnace the combination Roechling-Rodenhauser furnace permits easy and thorough refining of the steel; it can be built for large capacities with a good power-factor for ordinary commercial frequencies. Largest capacity in the past (1908) 8 tons; new furnaces will have 16 tons capacity. For producing rail steel and high quality steel. Three men per shift can easily handle a furnace capable of producing from 15,000 to 18,000 tons of high-quality steel per year. Temperatures of 1700 and 1800 degrees Centigrade have repeatedly been obtained, and the temperature can be easily controlled within wide limits.

—American Electric Furnace Co., New York.

FURNACE, ELECTRIC SMELTING. With removable tilting hearths, water-cooled electrodes, 90% of the carbons being usefully consumed. For reduction smelting of iron ores; for matte smelting of copper ores; for smelting of manganese ores; for smelting of combined lead and zinc, silver ores; for smelting of chrome ores; for smelting of tin ores (one slag only for discard); for melting of iron and steel scrap for steel castings, tools, etc.; for making ferro alloys; for making copper alloys.

—Marcus Ruthenburg, London.

—Brush Electrical Engineering Co., London.

FURNACE, ELECTRIC, HARDENING AND ANNEALING STEEL. Consists of a crucible containing metallic salts which are reduced to a liquid state by low-voltage alternating currents. Material to be

tempered is placed in bath where it remains until properly heated. Temperature is varied by changing amount of current passing through bath. Oxidation cannot take place as material does not come in contact with air. Any temperature from 250° to 1350° C. can be obtained and held constant. Particularly adapted for tempering of dies or other small steel parts. (See illustrated description in Electrochem. & Met. Industry, Vol. VII, p. 95.)
—General Electric Co., Schenectady, N. Y.

FURNACE, ELECTRIC. Quartz-lined, which permits to heat it up quickly without danger of cracking its interior, for hardening small tools, determining the recalescent points of steel and general laboratory work. Used preferably in connection with the Bristol recording pyrometer.
—Bristol Co., Waterbury, Conn.

FURNACES, STATIONARY. Single or double compartment, arranged for various capacities, heated with oil or gas and air. Very efficient, and save 50% over old style methods.
—Monarch Engineering & Mfg. Co., Baltimore, Md.

FURNACES. See also Annealing, Barium chloride, Brazing, Carbonizing, Case-Hardening, Converters, Core ovens, Enameling, Forge, Galvanizing, Heating, Melting, Mint, Muffle, Open-Hearth, Refining, Regenerative, Retort, Reverberatory, Rivet, Roasting, Singeing, Smelting, Soft-metal, Tempering, Tinning Furnaces.

FURNACES, SMALLER SIZE. Such as specially designed for experimental work or for use in the laboratory, are described in the second part of this Dictionary, devoted to Measuring Instruments and Laboratory Supply.

FURNACE LININGS. See Bauxite, Carbon, Carborundum, Chrome Brick, Chrome Ore, Fire Brick, Graphite, Magnesia Brick, Magnesite, Silica Brick.

GALVANIZING FURNACES. For all classes of work.
—W. S. Rockwell Company, New York.

GALVANIZING. See Electrogalvanizing.

GAS ENGINES. To operate on natural, producer or illuminating gas in sizes from 100 to 1000 h.p. Special engines for operating electrical generating apparatus. Complete power installation undertaken. Correspondence solicited with concerns desiring a reliable plant of the highest efficiency with one half the fuel cost attached to steam engine power.
—H. G. Trout Company, Buffalo, N. Y.

GAS ENGINES. Producer gas. Economy guaranteed from the coal pile to the switchboard. The largest builder of gas engines in

the world, furnishes complete gas power plant equipments including generators of its own design, and will install, in connection with the engines, producers of the type best adapted to the conditions.
—Allis-Chalmers Co., Milwaukee, Wis.

GAS PRODUCER. See Producer, Morgan Continuous Gas.

GAS SCRUBBERS. See Gas Washers.

GAS WASHER. *A machine of suitable construction for washing the gases from smelting furnaces, chemical plants etc., so as to dissolve as large an amount of the gases as possible, and thus purify the escaping gases.*

Gas Washer, Osborne. Will collect the gases from chemical plants, etc., and wash the same so that practically all of the soluble gases will be reduced to solution. This is accomplished by drawing the gases through a fan of suitable size and discharging them into our water spray machine, where the gases are brought into contact with finely divided sprays of water. These machines are also provided with paddles which beat the gases, thereby causing all the particles to be brought into contact with the moisture and effect a thorough washing of the same. These machines are especially valuable for washing gases from copper and brass smelting furnaces, where the sulphurous oxides are usually a source of great annoyance. By the use of these machines the sulphur oxides will be reduced to a weak solution of sulphuric acid.
—Griscom Spencer Co., New York.

Gas Washer. See also "Dust Collector," "Smoke Consumer," "Vapor Condenser."

GASKETS, RUBBER. Any size or shape. Either pure rubber, or with cloth, wire or sheet metal insertion. Made to order at short notice; to withstand all conditions of service.
—Boston Belting Company, Boston.

GASKETS, RUBBER. Made of pure rubber, or with cloth or wire insertion. The Eastern, New York, or Western shapes carried in stock, any other style or shape on short notice. In ordering, send template when possible; otherwise give inside measurements and width of flange and thickness desired. Gaskets and rings also made of Black Hawk, Usudurian, Giant Red Crescent, Black Cross.
—Revere Rubber Co., Boston, Mass.

GENERATING SETS, General Electric. A complete line of small direct-connected, engine-driven generating sets in capacities from 2½ kw. to 75 kw. Designed originally to meet the severe conditions of marine work, which demands light, compact and durable sets with close regulation and quiet operation, they are also widely used for both power and lighting in isolated plants and as exciters for alternating-current generators. Generators are of compact

design, conservatively rated, and will carry considerable overloads for short periods without overheating. Single-cylinder engines up to 50 kw. capacity are built for 80 lbs. non-condensing, but can be operated on pressures up to 100 lbs. either condensing or non-condensing. Special cylinders can be furnished for lower steam pressures than 80 lbs. per square inch. The company also makes single-cylinder engine sets with forced-feed lubrication as well as tandem-engine sets of the same compact type as the single-cylinder sets. The ratings of the tandem-compound sets are based on 125 lbs. steam pressure condensing or 140 lbs. non-condensing.
—General Electric Co., Schenectady, N. Y.

GENERATORS, ELECTRIC. Bullock. Alternating Current and Direct Current.
—Allis-Chalmers Co., Milwaukee, Wis.

GENERATORS, ELECTRIC. Direct-connected in sizes from 25 kw. to 150 kw. Direct-connected engine-type generators. Slow-speed generators in sizes from 30 kw. to 150 kw. Also special generators for electroplating, electrotyping, and general electrolytic work.
—Jantz & Leist Electric Co., Cincinnati, Ohio.

GENERATORS. General Electric generators. Manufactured in all sizes, voltages and types, including belt-driven and direct-driven. The provision of direct-current generators with commutating poles, greatly increases their service reliability by practically eliminating sparking fluctuating loads. Stationary armatures of alternating-current generators mounted on rails, exposing field coils for easy inspection or repair. Armature coils of both alternating-current and direct-current generators readily replaceable. Generators are compact, efficient, neat in appearance and have ample overload capacity.
—General Electric Co., Schenectady, N. Y.

GENERATORS, ELECTRIC SMELTING. Special design for use with electric furnaces, 100 to 3000 kw.
—Brush Electric Engineering Co., London.
—Marcus Ruthenburg, London.

GENERATORS, ELECTROLYTIC. General Electric electrotyping generators are generally of special design, inasmuch as large currents at low voltage are required. With this arrangement the commutator of single-commutator machines may reach such a proportion that unless one of abnormally large dimensions is used the voltage drop in the commutator segments from the armature winding to the extreme end brushes may be excessive. It is therefore advisable in many cases to make double commutator machines, each commutator having a separate winding in order that the loads will be properly balanced. An additional advantage in this type of machine is that the commutators may be run either in series

or in multiple, giving double the current at half voltage or half the current at double voltage, the kilowatt output remaining the same.
—General Electric Co., Schenectady, N. Y.

GENERATORS, ELECTROLYTIC. Giving low voltage for electrotyping, electroplating, and electrochemical processes in general, manufactured in twelve sizes, 60 to 500 amperes, 5 to 6 volts are of the bipolar type. Above 500 amperes they are multipolar 4 to 14 poles. The machines are solidly constructed well ventilated and of up-to-date design. In multi-polar types they have two commutators with large brush surface. Wound for single, double and three voltages arranged for two or three-wire systems, also wound for special voltages for experimental work. Machines fitted with copper gauze or carbon brushes.
—Chas. J. Bogue Electric Co., New York.

GENERATORS, ELECTROPLATING. Low-voltage, shunt-wound standard machines wound for 5 or 6 volts, in eleven different sizes to give a current from 50 to 3000 amperes. Larger and special machines for all purposes built to order.
—Zucker & Levett & Loeb Co., New York.

GENERATORS, ELECTROPLATING. Low-voltage dynamos for electroplating purposes in various sizes ranging from 800 to 6000 amperes on the three-wire system, also dynamos from 50 to 8000 amperes on two-wire system.
—Hanson & Van Winkle Company, Newark, N. J.

GENERATORS. Electrogalvanizing, for 5 to 6 volts, in six sizes for currents ranging from 800 to 3000 amperes. Compound wound.
—Meaker Co., Chicago, Ill.

GENERATORS, ELECTROPLATING. Low-voltage, and for general electrolytic work. Belt driven or direct-coupled motor drive, with either direct or alternating-current motors.
—Eager Electric Co., Watertown, N. Y.

GENERATORS, ELECTROPLATING. Built from 60 to 10,000 amperes, 5 to 15 volts. They are shunt or separately excited and are made for either belted or direct-connected sets. Built so as to easily stand a 25% overload.
—Levett Mfg. Co., Matawan, N. J.

GENERATORS. Electroplating and electrolytic. See also Motor-Generators.

GLUE POT HEATERS, Dopp. Consist of a one-gallon cast-iron seamless steam-jacketed pot with flat bottom and stand on three permanent legs. The water in the pot is heated by the steam in the jacket, and the glue pail is placed in the water. The jackets of the

pots have an outlet at the bottom for the drip, and are tested to one hundred pounds hydrostatic pressure. They are largely used in furniture and other woodworking factories and are very practical. By means of suitable piping, a long line of these pots can be set up, so that each workman has his own equipment right at his bench.
—H. W. Dopp Co., Buffalo, N. Y.

GRAPHITE. By proper selection of raw materials, graphites of widely different characteristics are produced in the electric furnace. This obviates the necessity of " doping " the graphite to impart certain properties for special purposes, a practice sure to result in loss of other valuable qualities. Hence the increasing popularity of electrically-produced graphites for such purposes as dry-battery filler, paint pigment for steel and iron, electrotyping leads, lubrication, either dry or mixed with oil or grease, powder glazing, pipe-joint compound, furnace lining, lamp-filament paste, stove polish, lead pencils, recarbonizing steel, and all electrical purposes.
—International Acheson Graphite Co., Niagara Falls, N. Y.

GRINDING. See Crushing and Grinding.

GRIZZLEYS. Ore.
—Colorado Iron Works Co., Denver, Colo.

HAMMER CRUSHER. See Crushing and Grinding.

HARDENING FURNACES. Stationary types. For saws of all kinds, springs, tools, dies, cutters, needles, plow parts, cutlery, automobile and engine parts, high speed tools. All styles and sizes.
—W. S. Rockwell Company, New York.

HARDENING FURNACES. Revolving types. For all small pieces of like dimensions such as steel balls, saw teeth, screws, rings, springs, nuts, caps, cups, punchings, etc. 3 sizes—500, 1,000 and 1,500 pounds capacities per hour. Catalog 2.
—W. S. Rockwell Company, New York.

HARDENING FURNACE, ELECTRIC. See Furnace, Electric, Hardening and Annealing Steel.

HARD RUBBER ARTICLES. Acid pumps, piping and fittings for conveying acids, alkalies, corrosive liquors, dyes, brine, etc. Also hard rubber cocks, buckets, measures, acid bottles, tanks dipping baskets, funnels, etc.
—American Hard Rubber Co., New York.

HARDINGE CONICAL MILL. See Crushing and Grinding.

HEATERS. For Heating Liquids by direct steam. The Koerting " noiseless heater " is made of lead, iron, brass, etc., and can be

used for heating up various liquids where diluting is not objectionable. The apparatus is in the form of an inverted cone, one of the discs or cones being perforated and the other plain. It will heat the liquid to any desired temperature, according to steam pressure and at the same time gives powerful agitating effect. The disturbing noises and destructive effect on open tanks (as for instance, when steam is introduced through perforated pipes) is entirely obviated by attaching the noiseless heater to the end of steam pipe.
—Schutte & Koerting Co., Philadelphia, Pa.

HEATERS. For heating liquors of all kinds by exhaust steam or by use of other sources of waste heat, as vapor or hot water. Ordinarily consists of long, cylindrical shell, fitted with tubular heating surface. No stock apparatus used, but designed expressly to suit the conditions. Produces a decided saving in fuel, at times from the most unpromising sources.
—Zaremba Company, Chicago, Ill.

HEATERS. A form of surface condenser for utilizing the heat from exhaust steam to raise the temperature of dilute or concentrated liquors. Designed primarily for heating the liquor, they contain a suitable amount of tubular heating surface so arranged as to get the liquor at a maximum temperature. Construction entirely dependent upon the nature of the liquor and other conditions. We are prepared to build heaters of any capacity and where used in connection with evaporators, the saving in fuel is considerable besides relieving the evaporator of this work and so increasing its capacity.
—Swenson Evaporator Co., Chicago, Ill.

HEATERS, PORTABLE, MONARCH. For heating foundry ladles, firing up the cupolas, drying of molds, heater arranged on portable trucks, fully equipped with sectional hose, oil tanks, burners, etc.
—Monarch Engineering & Mfg. Co., Baltimore, Md.

HEATING COILS. See Coils.

HEATING FURNACES. For copper and steel billets, ship plates and angles, bulldozer work, etc.
—W. S. Rockwell Company, New York.

HEATING FURNACE. ROTARY. This furnace is the latest development in the art for the rapid, accurate and controllable heating of large quantities of similar objects. Lined with refractory material. It revolves on roller bearings with provision for tilting the furnace at any desired angle to facilitate the forward movement of the contained charge. Any desired temperature may be maintained and the time during which the material treated remains in furnace is adjustable and under perfect control. Oil or gas fuel may be used.
—Rockwell Furnace Co., New York.

HOISTING ENGINES and hoisting machinery.
—Allis-Chalmers Co., Milwaukee, Wis.
—Colorado Iron Works Co., Denver, Colo.

HOISTS.
—Northern Engineering Works, Detroit, Mich.

HOSE. Revere acid hose. For conducting the various acids used in chemical factories, sulphite plants, die works, print works, galvanizing works, tanneries, laboratories, etc. This hose has an unusually heavy lining of fine Para rubber. The uniformity of Revere construction obviates any defects that invariably cause the destruction of the fabric in the old style hose. The continuous length feature disposes of unnecessary couplings that are usually affected by acids. Revere hose may be recommended for the most trying conditions.
—Revere Rubber Co., Boston, Mass.

HOSE. Of rubber; or cotton, rubber-lined; or linen, unlined; for acids, air, chemicals, fire protection, gas, oil, pneumatic tools, steam, suction, vacuum, water, etc. Unsurpassed facilities for the prompt production of any kind of hose for any specific purpose. Forsyth braided hose for many uses is a particularly meritorious article, combining flexibility, great strength, and lightness to a remarkable degree.
—Boston Belting Company, Boston.

HOSE, OIL. For unloading tank cars. Has car and pipe couplings. Standard length 6 ft. Internal diameter 2 in. Spiral lined. Larger sizes made to order. Catalog 3.
—W. S. Rockwell Company, New York.

HOT-BLAST SMELTING. Our catalog "Some details as to smelting practice and equipments."
—Colorado Iron Works Co., Denver, Colo.

HUMPHREY CRUSHING ROLLS. See Crushing and Grinding Rolls.
—Colorado Iron Works Co., Denver, Colo.

HYDROFLUORIC ACID.
—Baker & Adamson Chemical Co., Easton, Pa.
—Fuerst Bros. & Co., New York.

HYDROGEN generation. See Hydrone.

HYDRONE. A sodium-lead alloy, which upon contact with water furnishes 100% pure hydrogen gas (free from arsenic). One pound hydrone yields 2.6 cu. ft. hydrogen gas. By increasing the sodium percentage of the alloy, a higher yield of gas can be obtained, which is, however, too inflammable for ordinary uses.
—Roessler & Hasslacher Chemical Co., New York.

HYPOCHLORITE. See Bleaching liquor.

IMPACT SCREEN. See Screen, Impact.

INCANDESCENT FILAMENT BLOCKS. Blocks and forms of any desired shape can be readily machined from solid Acheson-Graphite rods or slabs. 99% pure graphitic carbon, without bond. Free from volatile or fusible matter. All shapes made to special order without moulds.
—International Acheson Graphite Company, Niagara Falls, N. Y.

INJECTORS. Made of acid-proof stoneware, and accurately ground, in various sizes and styles, to be operated either by steam or air.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

Injectors. Of stone-ware. To increase the draught in condensing and regenerating plants.
—J. W. Sittig, New York.

INSTRUMENTS, ELECTRIC. General Electric electrical measuring instruments. Portable ammeters, voltmeters and wattmeters for both alternating-current and direct-current service. Switchboard ammeters, voltmeters, wattmeters, ground detectors, power factor, frequency and synchronous indicators. Curve-drawing ammeters, voltmeters, wattmeters and power factor indicators. Integrating watt-hour meters for both alternating and direct-current service in switchboard, portable and house types.
—General Electric Co., Schenectady, N. Y.

IRON, ENAMELED. See Enameled Iron.

IRON GOODS. Plain Cast Iron and Enameled. Kettles, stills, vacuum pans, tanks, etc. Special goods to order.
—Stuart & Peterson Co., Burlington, N. J.

IRON SULPHATE. Copperas.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

JAPANNING FURNACES. For all classes of work.
—W. S. Rockwell Company, New York.

JAR MILL. See Crushing and Grinding, Jar Mill.

JAW ROCK CRUSHERS. See Crushing and Grinding. Crushers.

JIG, HANCOCK. Especially suited to very large capacities, a single machine handling from 200 up to 600 or 700 tons per day. Will handle an unsized product ranging from five-eighths to one-

eighth inch in one machine, on a consumption of one-half the water required by the Hartz jig or even less.
—Colorado Iron Works Co., Denver, Colo.

JIG. Allis-Chalmers Hancock. A jig with a reciprocating motion of sieve. Handles all kinds of concentrating ores. No sizing trommels required. Handles unsized product ranging from ⅜-inch to finest size profitably jigged. Large capacity, 400 to 700 tons of ore per day. Uses one-half the water required by Hartz jigs.
—Allis-Chalmers Co., Milwaukee, Wis.

JOINTS. See Welding, Oxy-acetylene; Welding, Thermit; Dossert Wire and Cable Connectors.

JUGS, ACID. Of acid-proof stoneware, cylindrical or conical shape or jug shape with and without handles, large and small capacities.
—Didier-March Co., New York.
(Other stoneware makers see Stoneware.)

KETTLES. Of all kinds.
—Baeuerle & Morris, Philadelphia, Pa.

KETTLES, JACKETED. Day's improved steam jacketed kettle is strong and heavily made of steel plate, with a two-inch steam space all around. It is provided with an improved cock for kettle outlet, safety valve, inlet and outlet for steam and mounted on removable iron legs. Made with a capacity of 50 to 500 gallons.
—J. H. Day Co., Cincinnati, Ohio.

KETTLES. For boiling, made of acid-proof stoneware, in various sizes and shapes, with flanged rims and socket rim.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

KETTLES, SEAMLESS STEAM-JACKETED, DOPP. (See illustration, Electrochemical & Metallurgical Industry. May issue, 1909 advertising page 37.) Each is a piece of metal formed in a mold, without seams, rivets or bolts. The inside surface is very hard and smooth. The steam jackets are tested to 150 lbs. Hydrostatic pressure. This type of kettle is very durable and more resistent to chemical action than wrought iron or steel. They are used for heating, boiling, evaporating, cooking, (also for cooling) a great variety of chemicals, food products, and technical products in general. They are supported on removable legs or on lugs in the case of the larger sizes.
—H. W. Dopp Co., Buffalo, N. Y.

KETTLES, JACKETED. Steam-jacketed kettles of copper in all sizes from 5 gallons upward, with block tin lining, if desired.
—F. J. Stokes Machine Co., Philadelphia, Pa.

KETTLES, MIXING. Steam-jacketed. Made of copper in all sizes from 25 gallons upward, with block tin lining, if desired. Mixer operated by belt, either single or double acting, and with scrapers to prevent the contents from burning.
—F. J. STOKES MACHINE CO., PHILADELPHIA, PA.

KETTLES. Seamless steam-jacketed kettles in cast iron, plain and enameled; copper, plain or tinned; aluminium as well as sheet steel. Made in a large number of standard types for all purposes. Kettles with mixers. Catalog No. 216.
—STUART & PETERSON CO., BURLINGTON, N. J.

KETTLES. Large cast iron kettles a specialty. We will make patterns to your drawings, or use patterns furnished by you. Special formula of cast iron to meet needs of each casting.
—H. G. TROUT COMPANY, BUFFALO, N. Y.

KNEADING AND MIXING MACHINE, UNIVERSAL. For use in almost any industry in one or other of its varieties. Made in a number of sizes or capacities and in various types to suit the requirements incident to the material which it has to handle.

Type I. Made in sizes up to two gallons, chiefly for laboratory purposes. The machine although comparatively light is strong enough to handle materials of the consistency of putty and if desired it can be supplied with steam-jacket.

Type II. Made in capacities of 2, 4½ and 9 gallons. This machine has a cast iron trough which is tooled and finished on the inside. The trough can be taken apart so as to facilitate the removal of the agitators and thereby allowing thorough cleaning of the machine. The machine is especially adapted for mixing and kneading pill masses and all putty-like material.

Type IV. Called "Masticator" and is especially adapted for working very tough masses, such as, India rubber and gutta percha. The machine is provided with steam jacket and heatable blades. Where required, steam and cold water can be turned on alternately. The machine cannot be tilted but discharging of the material is effected by raising a flap door in front of the machine. This type of machine is made in sizes of 10 and 46 gallons capacity.

Type II–V and II–VI. Called the Nitro-type as it is used in the manufacture of all kinds of smokeless powder and other explosives. This machine is in use in great numbers by nearly all the governments of the globe as well as by a large number of private gunpowder manufacturers. Made in sizes of 20 and 50 gallons. The trough is of cast iron, tooled and polished on the inside. For heating or cooling, as the case may be, the bottom part of the trough has a jacket. The trough can be taken apart similar to type II so as to

allow removal of agitators and thorough cleaning. The machine can be provided with an air-tight cover so as to prevent loss of solvent or escape of noxious vapors. The machine once charged with the ingredients can be left to itself until the kneading and mixing process is completed. The driving axle of the machine is provided with a safety-lock which makes it impossible for the machine to get accidentally started. The machine is perfectly safe to handle. As far as we know no explosion ever occurred in a mixing room where our machines were used.

Type V and VI. Made in sizes from 20 to 250 gallons. The type V and VI being practically identical with this difference, that type V is made for hand tilt, whereas type VI is tilted by power. The machine is suitable for almost every kind of work and is used principally in the manufacture of macaroni, vermicelli, paints, putties and a large variety of chemical products.

Type IX. Made in sizes of 50, 100 and 150 gallons capacity. The trough of the machine is provided with steam jacket and heatable agitators and the machine is tilted by power. All our steam jackets are guaranteed to stand a working pressure of up to 100 pounds per square inch or seven atmospheres. This machine is especially adapted for work where high, low or varied temperature is required, as for instance in the manufacture of such materials as chocolate, cocoa, chewing gum, linoleum, electric carbon, etc.

Type X. The distinctive feature of this type of machine is, that they cannot be tilted; discharge of the material being effected by means of flaps or valves at the bottom of the trough. The larger machines are usually supplied with four openings. This type of machine is built in sizes of from 100 to 2650 gallons capacity. They are chiefly used for mixing or stirring liquids, semi-liquids, granulated materials, dry powders or colors which offer comparatively little resistance.
—Werner and Pfleiderer, Saginaw, Mich.

KNEADING MACHINERY of other makers see under Mixers and Mixing Machines.

KOSTICO. A dry granular salt used in making a solution for removing grease and cleaning work in all plating operations. Makes a clear solution and has no surface scum to cling to the work.
—Hanson & Van Winkle Company, Newark, N. J.

KRUPP MILL. See Crushing and Grinding.

KRYOLITE. Pure ground, from Greenland. For glass makers, hollow-ware manufacturers, and enamelers.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

LACQUERS. All grades for all purposes, both dip and brush lacquers. All colors, bright and dull blacks. Also the finest gold colors for use on brass.
—HANSON & VAN WINKLE COMPANY, NEWARK, N. J.

LADLES. Geared foundry ladles, for capacities from 2000 to 60,000 lbs. Of strongest construction, with a very large factor of safety employed in all parts. The standard gearing on all sizes is an improved worm or screw gear, with the operating wheel carried well out to the side, where the operator can oversee his pouring. Absolutely self-locking at every point. There is no jerking or unsteady motion in tipping. We also build spur-geared ladles for rapid pouring as in pipe foundries; also bottom tap ladles; tin kettle ladles; truck ladles; reservoir ladles, etc.
—NORTHERN ENGINEERING WORKS, DETROIT, MICH.

LAMPS, INCANDESCENT. General Electric lamps:—Edison incandescent lamps are produced at our lamp works which have a capacity of fifty to sixty million lamps annually in all types of carbon, gem, tantalum and tungsten lamps. The Edison gem or metallized-filament lamps (consuming 2½ watts per candle power) form very high candle-power lighting units in combination with holophane reflectors. The General Electric tantalum lamps (2 watts per candle-power) give 25 per cent. more light at from 20 to 30 per cent. less energy than the ordinary carbon lamps. The General Electric tungsten lamp (1¼ watts per candle power) takes approximately one-third the current of the ordinary carbon lamp of equal candle power, gives an illumination of intense brilliancy and a quality of light superior to any other incandescent unit in its nearness to natural daylight and can be used on either direct or alternating current.
—GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

LAMP-FILAMENT PASTE. For securing the filaments of incandescent lamps to their leads and anchors a paste using pure Acheson graphite as a base has proven remarkably successful. Grades "1310" and "1340" as applied to this purpose are practically chemically pure, free from metallic oxides, contain no volatile matter, are ground extremely fine, and are excellent electrical conductors.
—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

LANTERNS. Of acid-proof stoneware, for observing and regulating the flow of gases in towers. These lanterns are provided with a perforated grate plate, the holes of which are closed by little balls. The draught can be regulated from the outside by moving the balls away to the side.
—DIDIER-MARCH COMPANY, NEW YORK.

Lanterns. Made of the very best clay material and covered with acid-proof glazing in order that the liquid condensation can go on

uninterruptedly. The slots in which the panes of glass are inserted should be of proper construction to insure a proper fit.
—U. S. Stoneware Co., Akron, Ohio.

LATHE. Hampton zinc lathe for making zinc shavings from sheet zincs.
—Colorado Iron Works Co., Denver, Colo.

LATHE, POLISHING AND BUFFING LATHE. Independent spindle polishing and buffing lathe. Practically two lathes combined in one machine. Saves time and expense. Workman at either end of spindle can change wheels without stopping the machine. If the polisher at one end stops to change wheels, the other may continue with his work without interference. No countershaft required with this machine.
—Hanson & Van Winkle Company, Newark, N. J.

LATHE. The "IXL" for grinding and polishing. Detachable spindle, strong, efficient. Belt runs to shaft overhead or through floor.
—Zucker & Levett & Lobb Co., New York.

LAVOISITE. See Oxygen Generator.

LEACHING CELLS. (Also called Diffusion Batteries). For lixivation of black ash etc., and for the extraction by diffusion process of sugar from beet chips, etc. Shells of cells of steel or cast iron with lining of lead, cement, etc., where necessary. Automatic feed if desired. Discharge through drop bottom-cone, or swinging side door; also through swinging bottom with hydraulic closure. Cells proportioned to suit the material handled. Batteries in single- or double-line or circular arrangement.
—Zaremba Company, Chicago, Ill.

LEACHING CELLS. See also diffusion Batteries.

LEAD, ANTIMONIAL. Used in Babbitt mixtures, etc., coffin hardware, etc.
—C. W. Leavitt & Co., New York.

LEAD REFINING. Raw lead containing silver and other impurities is now refined on a large scale by the electrolytic process with advantageous results, both as regards costs, and clean work, and high metal recoveries. Complete information on application.
—Anson G. Betts, Troy, N. Y.

LEAD-BURNING Apparatus. See also Welding, Oxy-Hydrogen.
—Buffalo Dental Mfg. Co., Buffalo, N.Y.
—Linde Air Products Co., Buffalo, N. Y.

LEAD-LINED or covered pipe. See Pipe.

LEAD SULPHATE.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

LIGHTNING ARRESTERS. Tips made from solid graphite blocks retain their firm sharp edges and corners. Possess peculiar non-arcing properties. Ease of drilling and threading assures reliable contact with metallic conductor. Contain no volatile or fusible material. Economically produced without moulds.
—International Acheson Graphite Co., Niagara Falls, N. Y.

LINING TILES OF STONE-WARE. For large collecting vats for floors in Laboratories, acid chambers, etc.
—J. W. Sittig, New York.
(Other stoneware makers see Stoneware).

LIQUID AIR. Linde process. Consulting engineers and manufacturers of machines for the liquefaction of gases and separation of gaseous mixtures. By liquefying air, oxygen and nitrogen are produced for all purposes. Oxygen for welding and cutting (see Welding, Oxy-acetylene, and Cutting, Oxy-acetylene.) Oxygen guaranteed free from hydro-carbons, the oxides of carbon and other deleterious impurities.
—Linde Air Products Co., Buffalo, N. Y.

LUBRICANTS. The lubricating properties of graphite have long been recognized, but their adoption has beyond question been materially retarded by the fact that all natural graphites contain a greater or less quantity of impurity detrimental to bearings. Now, however, a soft, unctuous graphite, guaranteed at least 99% pure, is being manufactured in the electric furnace, and this gives assurance that graphite lubrication is destined to rapidly increase. The product referred to is Acheson graphite, grade "1340." Being amorphous, it is reduced to an impalpable powder, in which form it easily works into the minute irregularities of both bearing and shaft, reducing friction to the minimum and preventing wear of the parts. It can be mixed with grease or oil.
—International Acheson Graphite Co., Niagara Falls, N. Y.

LYE. Lewis 98%. Powdered and perfumed. American. Saponifier, Greenwich.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

MACHINERY, SPECIAL FOR NEW PROCESSES. Many new and valuable processes, especially chemical and metallurgical processes, fail of commercial success because their economical working requires machinery that is not on the market, that does not exist and cannot be devised by the owner or inventor of the process. Many such processes, when operated by hand labor, lose their chief value. Twenty years of experience in designing and building special machinery for an endless variety of purposes enables one to solve

almost any problem of this kind in the simplest manner and to do it on contract.
—Charles J. Reed, Philadelphia, Pa.

MAGNESIA BRICK. The ideal basic refractory brick. For use in basic open-hearth steel furnaces (where a number of courses of magnesia brick are used in making the foundation for the bottom; in building the sidewalks to a height of about 15 inches above the bottom of the charging doors; around the door jambs and tapping holes, and to face the furnace blocks as a protection to the silica brick; also in the bulkheads of the ports; and in six or eight courses of magnesia brick as the top courses in the gas checkers); in the construction of soaking pits (six or eight bottom courses); in metal mixers (along the slag line); in billet and bar furnaces running on producer or natural gas (in the bottom and on the bridge wall); in copper reverberatories (in the bottom, side walls and on the bridge wall to take the splash of the metal); in copper converters (which are, next to the shell, lined with one course of magnesia brick laid in magnesite cement); in special types of furnaces, such as silver slimes, dross, and bullion furnaces; electrical smelting, heating welding, and melting furnaces; calcium carbide kilns, etc.; in rotary cement kilns (in the burning zone). Magnesia brick is indispensable for lining electric ferro-alloy furnaces. In electric steel furnaces a lining of magnesia brick permits the use of a highly basic slag to completely desulphurize the metal. In chemical industries magnesia brick is indispensable, wherever the best basic refractory is required.

Magnesia brick should be laid in magnesite cement. They are very good conductors of heat, and where this heat conductivity would injure the plate work they should be backed up with some other high-grade material which is a poor heat conductor. They expand slightly at high temperatures. They are better conductors of electricity than porcelain at 2,000 degrees F. or over; at low temperatures their electrical conductivity is less than porcelain. The best results are obtained from magnesia brick in furnaces where continuous heats are used. Great variation of temperature, exposure while hot to currents of cold air or to contact while hot with water or oil, will cause them to shatter and sprawl. Magnesia brick should not be subjected to excessive weight when hot.
—Harbison-Walker Refractories Company, Pittsburgh, Pa.

MAGNESIA, ELECTRICALLY CALCINED. Especially valuable as a heat and electric insulator when used in furnace packing etc.
—National Carbon Co., Cleveland, Ohio.

MAGNESIA, ELECTRO. Supplied in powder or granular form or as articles molded from it, such as tubes, crucibles, pyrometers, basins, pipes, muffles, plates and triangles. Our electro-magnesia is highly infusible and will stand a temperature of 1900° C. It is especially valuable for heating and melting alkaline substances.
—National Carbon Co., Cleveland, Ohio.

MAGNESITE. The ideal basic refactory. Dead-burned or grain magnesite, for making the bottoms in basic open-hearth steel furnaces. A more limited use of magnesite is to make bottoms in mechanical puddling furnaces, heating furnaces, and tamped in the side walls of copper reverberatories to take the splash of the metal.
—Harbison-Walker Refractories Co., Pittsburgh, Pa.

MAGNESITE CEMENT.
—Harbison-Walker Refractories Co., Pittsburgh, Pa.

MAGNESIUM. Metallic. Practically pure, made by the electrolytic process in stick form; valuable deoxidizing agent for iron, steel, copper, aluminium, brass, bronze, nickel and zinc mixtures. Specific gravity 1.74, melting point 649° C. (1200° F.).
—C. W. Leavitt & Co., New York.
—Fuerst Bros. & Co., New York.

MAGNETIC SEPARATORS. For separating from each other, materials of different magnetic permeability. These machines solve many problems in metallurgy, ore concentration and industrial economy, for instance: Eliminating iron from brass and other metal turnings and fine scrap; recovering iron from foundry refuse; removing scrap iron from coal, grain, drugs, etc., where any piece of iron is liable to injure the crushing or grinding machinery; concentrating ore, such as iron, copper sulphides, zinc blends, nickle, tin, tungsten, monozite, corundum, energy, etc.; removing magnetite from materials because of chemical objections; removing iron and recovering abrasive material from grinding refuse, etc. We have been building magnetic separators for years and our extensive experience is at the service of our customers. Preliminary tests made without charge.
—Dings Electro-Magnetic Separator Co., Milwaukee, Wis.

MAGNETIC SEPARATORS. Designed and manufactured for metals, ores, paper stock, grain, fertilizers, and all purposes. See Machinery, Special, for New Processes.
—Charles J. Reed, Philadelphia, Pa.

MAGNETIC SEPARATORS. Any capacity. For concentrating poor iron ores in crushings from 1″ down; for separating from raw crushings ores of copper, manganese, zinc, lead, molybdenum, nickel, cobalt, wolfram, tin, monazite sands, chromium, gold, silver, and platinum.
—Marcus Ruthenburg, London.
—Brush Electrical Engineering Co., London.

MANGANESE. Registered trade-mark "Thermit." Free from carbon, made by the aluminothermic method. As it contains neither carbon nor iron, it is especially useful as a deoxidizing agent

in the copper, brass and nickle industries; also for the manufacture of high-class steel. Melting point, 1245 degrees C. (2273 degrees F).
—Goldschmidt Thermit Co., New York.

MANGANESE. Fused. 98–99% pure, carbonless. (Traces of iron).
—Roessler & Hasslacher Chemical Co., New York.

MANGANESE.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

MANGANESE ORE.
—E. J. Lavino & Co., Philadelphia, Pa.

MANGANESE OXIDE.
—Fuerst Bros. & Co., New York.

MANGANESE-COPPER alloy.
—E. J. Lavino & Co., Philadelphia, Pa.

MANGANESE-COPPER. (30-70%) Registered trade-mark "Thermit." Offers the same advantages as a deoxidizing agent for copper, brass and nickel, as pure manganese. Is produced by the aluminothermic method. The melting point of manganese-copper being lower than that of pure manganese, however, makes this alloy more convenient to use. It is free from carbon and technically free from iron.
—Goldschmidt Thermit Co., New York.

MANGANESE-COPPER. Made in the electric furnace from the pure oxide of manganese. Contains from 25% to 30% manganese and is practically free from iron and other impurities. Used for making manganese bronze and for introducing small amounts of manganese in copper alloys.
—Electric Smelting & Aluminum Co., Lockport, N. Y.

MANGANESE-COPPER NO. 2. Contains 25% manganese and about 3% iron. Used for making manganese bronze.
—Electric Smelting & Aluminum Co., Lockport, N. Y.

MANGANESE-TIN. (50-50%) Registered trade-mark "Thermit." Made with pure metallic manganese, free from carbon, produced by the aluminothermic method. Is technically free from iron and the melting point being lower than that of metallic manganese, makes this alloy more convenient to use as a deoxidizing agent.
—Goldschmidt Thermit Co., New York.

MANGANESE-ZINC. (20-80%) Registered trade-mark "Thermit." Made with pure metallic manganese, free from carbon, produced by the aluminothermic method. Is technically free from

iron and the melting point being lower than that of metallic manganese, makes this alloy more convenient to use as a deoxidizing agent.
—Goldschmidt Thermit Co., New York.

MARIOTTE BOTTLES. With outlets for water gauge and outlet for ground-in cock at bottom, made of acid-proof stoneware in various capacities.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

MARIOTTE DROP FLASKS OF STONE-WARE. With two water gauge sockets, bottom outlet, ground in cock.
—J. W. Sittig, New York.
(Other stoneware makers see Stoneware.)

MATS AND MATTING, RUBBER. Moulded rubber mats, Treads, Perforated rubber mats of any shape or size, Corrugated matting in all thicknesses up to 72″ in stock or made to order. This material makes a splendid floor covering as it does not absorb dust or dirt. It decreases noise, and is invaluable as a floor insulation in front of switch-boards, etc. We use only such stock as will insure maximum wear.
—Boston Belting Company, Boston.

MATS AND MATTING. Perforated mats, knob matting, combination or checker-board matting, corrugated and cross-corrugated matting.
—Revere Rubber Co., Boston, Mass.

MAX MILL. See Crushing and Grinding. Mill.

MELTING FURNACES. With oxy-acetylene, air-acetylene, and air oxy-acetylene burners for metallurgists, jewelers, chemists, etc.
—Harris Calorific Co., Cleveland, Ohio.

MELTING FURNACE. Reyelbec Tilting Coke Crucible Furnace. In all sizes for all non-ferrous metals and for steel. For gold and silver precipitates. Less than ¼% loss on brass mixtures carrying 10% zinc. Less than 3% loss on brass mixtures carrying 30% zinc.
—Hawley Down Draft Furnace Co., Chicago and New York.

MELTING FURNACE, SCHWARTZ. For melting and refining brass, copper, bronze, gray iron, malleable iron, steel, etc. The fuel used is crude oil, fuel oil, or gas. Built in sizes ranging from 300 to 6000 lbs. per heat. Lined with high-grade fire-brick tile for brass melting, and silica brick for iron and steel melting. No crucible required; cost of labor and melting less than one half of the old crucible practice. Special furnaces for melting large pieces.
—Hawley Down Draft Furnace Co., Chicago and New York.

MELTING FURNACES. Stationary types. For brass, copper, bronze, gold, silver, aluminium, etc. Built above or below floor level. Sliding or swinging covers. Simple tile lining. Best stationary furnace made. In use United States, Canadian and Mexican mints. Sizes suitable for all crucibles.
—W. S. ROCKWELL COMPANY, NEW YORK.

MELTING FURNACES. Tilting. For brass, copper, bronze, gold, silver, aluminium, steel additions, etc. Metal always clean. Castings sound and strong. Lowest possible shrinkage. Cover tilts with furnace. Fire may be continued while pouring. Cover on also. Crucible lasts longer than in any other furnace. Always hot at bottom. Simple and inexpensive tile lining. Costs little. Melts much. 4 sizes—200, 400, 800 and 1,600 pounds capacities. Oil or gas fuel. Catalog 4.
—W. S. ROCKWELL COMPANY, NEW YORK.

MELTING FURNACE. CRUCIBLE TILTING. STEELE-HARVEY. Constructed to operate entirely above ground; fuel for melting oil or gas and air; crucibles of various sizes are retained within the furnace while pouring the metal. The cover is arranged to tilt with the furnace or to swing aside as may be desired. Combustion chamber so arranged for holding heat at the bottom. Burner adjusted so that the benefit of free air is retained, fuel consumption is reduced, metal is melted as rapidly as consistent, avoiding loss by overheating or oxidation. Output of one furnace equivalent to three old-style furnaces; labor reduced, cost of melting reduced one-half, operated with high or low air pressure, results a saving of 50% in cost of melting metal and can melt any class of metal desired, especially arranged for cyanide precipitates of gold and silver, or miscellaneous ores, nickel, cobalt, brass, bronze, aluminium, iron, ferro-alloys, etc. Guaranteed high economy and efficiency.
—MONARCH ENGINEERING & MFG. CO., BALTIMORE, MD.

MELTING FURNACE. SIMPLEX. For brass, bronze, copper, grey iron, etc. Made with horizontal cylindrical shell, resting on cast iron stands and revolves on roller bearings. The lining may be carborundum, ganister, fire brick, or other suitable material. No crucibles are used. Some of the advantages are low first cost, quick heats, little floor space, small fuel consumption. Oil or gas fuel may be used.
—ROCKWELL FURNACE CO., NEW YORK.

MELTING FURNACE. TILTING CRUCIBLE. For melting aluminium, brass, copper, steel, manganese, etc. The crucible is not removed from the furnace chamber, the metal being transferred to ladle by tilting the entire furnace. A fan blast of 12 oz. pressure is sufficient for air supply and as the burner is placed at top of furnace and flame directed against bottom of the chamber, the crucible is not subjected to uneven temperature. Some of the advantages

of this furnace are cleanliness, quick heats, little noise, long life of crucible and no metal to run on floor if crucible breaks.
—Rockwell Furnace Co., New York.

MELTING FURNACE. LIFT-OUT CRUCIBLE. For making special alloys, melting precious metals, analytical work, light castings, etc. It is compact and the heat is under absolute control of operator. An air blast of from 2 to 5 pounds is adequate, which may be supplied by small positive blower. Oil or gas fuel may be used.
—Rockwell Furnace Co., New York.

METALS. See the different metals, ferro-alloys, and other alloys.

METALLURGICAL EQUIPMENT of any kind for works for the recovery of precious metals, copper, lead from their ores.
—Allis-Chalmers Co., Milwaukee, Wis.
—Colorado Iron Works Co., Denver, Colo.

MILLS, CRUSHING AND GRINDING. See Crushing and Grinding.

MINING MACHINERY. Of every description. See also the different machines, furnaces, also Crushing and Grinding, etc.
—Allis-Chalmers Co., Milwaukee, Wis.
—Colorado Iron Works Co., Denver, Colo.
—Prosser & Son, New York, (Krupp).

MINT FURNACES. For melting, cupelling, gold boiling, annealing, sweep reducing, refining, die hardening, tool dressing, etc. In use United States, Canadian and Mexican Mints.
—W. S. Rockwell Company, New York.

MINT FURNACES, CRUCIBLE. Used in mint work and in making fine bars and anodes. These furnaces have hoods with sliding doors and have flues for withdrawing the fumes. Very economical, can be operated by oil or gas fuel.
—Rockwell Furnace Co., New York.

MIXERS. See also Kneading and Mixing Machines, page 77.

MIXERS. Various kinds.
—Abbe Engineering Co., New York.

MIXERS. For mixing materials, either dry or wet, or wet and dry together. The mixers combined with evaporators for mixing solutions and emulsions, or keeping material in suspension. The same machine may be used for evaporating the liquid after it is mixed, if desired. These machines are used in connection with condensers or any type or may be used without condensers. If desired

may be steam heated, fire heated, or heated with hot gases or any kind. Are very rapid in their operation in both mixing and evaporating the mixed product made in large and small openings and to suit any conditions or requirements.
—Buffalo Foundry & Machine Co., Buffalo, N. Y.

MIXER CHASER. Consists of a strong iron pan in which travels a roller followed by scrapers which serve to keep the material on the floor of the pan and position to be passed over by the roller. It is used for mixing mortar, putty, white lead, heavy pastes and similar materials. Also for crushing glass oxide of copper and other material in a dry or semi-dry state.
—J. H. Day Co., Cincinnati, Ohio.

MIXER, DAY'S IMPERIAL. Especially strong and made for mixing heavy pastes. It is also made with steam jacket for heating material while mixing.
—J. H. Day Co., Cincinnati, Ohio.

MIXERS, DAY'S. The tank is made of wrought steel bolted to cast iron ends. The shafts of the mixer are steel and the bearings made of gun metal. Stuffing boxes are made of gun metal in the form of a sleeve which fits over the shaft, effectually preventing the material coming into contact with the bearings and oil. Day's mixers are made in over fifty forms. Each machine being perfectly adapted for its particular purpose, with tank capacities ranging from fifty to five hundred gallons, and with mixing arms or agitators made for the work for which the mixer is intended.
—J. H. Day Co., Cincinnati, Ohio.

MIXING MACHINES. Dopp, consist of the cast-iron seamless steam-jacketed kettles, equipped with agitators of various types, see illustrations May issue, 1909, Electrochemical and Metallurgical Industry, advertising page 37. The agitators are operated either by hand or by belt power, and in the smaller sizes, can be easily and quickly raised out of the kettle and swung to one side. The choice of the type of agitator is governed by the nature of the liquid or semi-solid materials to be mixed, ranging from light watery fluids to thick doughy pastes. One type of agitator scrapes the entire inside surface of the kettle to prevent the overheating of the materials.
—H. W. Dopp Co., Buffalo, N. Y.

MIXERS. Of stoneware, for thorough mixing of chemical solutions. Non-corrosive. Any size or style.
—Charles Graham Chemical Pottery Works, Brooklyn, N. Y.

MIXER, PONY MIXER. This machine is used for mixing plastic substances or liquids. The can revolves in one direction and the beaters in the opposite direction. The beaters can be raised with rack and pinion, which allows the can to be readily removed for

emptying. The can is made of heavy galvanized iron. Capacity, 25 gallons. Floor space, 46 in. x 30 in. Weight, 400 lbs., pulleys, 18 in. x 4 in., height, 4 ft., 3 in. Revolutions, 25.
—F. J. STOKES MACHINE CO., PHILADELPHIA, PA.

MIXING TANKS. Graham chemical stoneware tanks in all sizes, for mixing corrosive liquids containing acids, alkalies, chlorine etc. Furnished in either round or square pattern with inlets, outlets, etc., according to needs of customer. Guaranteed to be chemical proof.
—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.
(Other stoneware makers see Stoneware.)

MIXING Kettles, Tanks and Machinery. Queen mixing kettle, plain or porcelain lined; any style or size to order. Golden Crown mixing machine, porcelain lined, double mixer, capacity 15 gallons.
—STUART & PETERSON CO., BURLINGTON, N. J.

MIXING, Grinding and separating machinery designed. See Machinery, Special, for New Processes.
—CHARLES J. REED, PHILADELPHIA, PA.

MOLYBDATE OF AMMONIA.
—PRIMOS CHEMICAL CO., PRIMOS, DEL. CO., PA.
—YORK METAL & ALLOY CO., YORK, PA.

MOLYBDENUM. Registered trade-mark "Thermit". Manufactured by the aluminothermic process. Of very high and uniform quality and free from carbon.
—GOLDSCHMIDT THERMIT CO., NEW YORK.

MOLYBDENUM. In powder form, highest grade on the market and practically free from carbon. Purity and uniformity guaranteed. Also molybdate of ammonia, pure, in powdered form.
—MINERAL PRODUCTS MANUFACTURING CO., WILMINGTON, DEL.

MOLYBDENUM. Fused, 98–99% pure, carbonless. Also powder 90–92%.
—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

MOLYBDENUM metal. Low carbon.
—PRIMOS CHEMICAL CO., PRIMOS, DEL. CO., PA.
—YORK METAL & ALLOY CO., YORK, PA.

MOLYBDIC ACID.
—YORK METAL & ALLOY CO., YORK, PA.

MOLYBDIC ACID. For phosphor determinations. Chemically pure 100% MoO_3, free from ammonia. Commercially pure 80% MoO_3, with 2½ to 7½% NH_3, but free from other impurities.
—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

MOLYBDIC ACID. C. P. and 85% pure, very easily dissoluble in water and ammonia, without leaving residue. Free from phosphorus and arsenic.
—Mineral Products Manufacturing Co., Wilmington, Del.

MONTEJUS, AUTOMATIC. An apparatus for lifting acids automatically and continuously by means of compressed air or steam. It takes the place of the old style "Acid Egg." For description as to general appearance and construction see catalog 2-O. This Montejus can be placed anywhere; takes up little space; requires no attention whatever; works continually. The pressure of compressed air or steam can vary between 30 and 70 pounds per square inch, without interfering with the regular working of the apparatus. The great advantage of this apparatus is the possibility to work it economically at pressures higher than actually required by the height of lift and specific gravity of acid.
—Schutte & Koerting Co., Philadelphia, Pa.

MONTEJUS, AUTOMATIC.
Bethlehem Foundry & Machine Co., South Bethlehem, Pa.

Montejus, Automatic. Of stoneware, new design, simple construction, and very efficient; made in various sizes, capable of lifting acids in quantities up to 2600 gallons per hour.
—J. W. Sittig, New York.

Montejus or Acid Eggs of Stone-ware, acid proof, exceedingly tough material, highly resistant against pressure.
—J. W. Sittig, New York.

Montejus, Automatic. System Dr. Plaths, made of acid-proof stoneware, in various sizes. Work automatically. The valves are ball valves accurately ground.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

MORGAN Continuous Gas Producer. See Producer.

MORTARS. With pestle, made of acid-proof stoneware, in various sizes.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

MOTORS, ELECTRIC. Bullock. Alternating Current and Direct Current.
—Allis-Chalmers Co., Milwaukee, Wis.

MOTORS, DIRECT CURRENT. General Electric. Two lines of small direct-current motors for power purposes known as C Q and C R motors. Both types have cylindrical cast-steel frame with rigid adjustable bearing brackets which are bolted to the motor

frame. The C Q motors range from ¼ to 20 h.p. capacity and are for constant-speed duty. The C R motors are especially adapted for machine-tool drive, where variable speed is essential and they range in capacity from ½ to 40 h.p. This type of machine may be mounted on brackets or bolted direct to the machine tool. They combine rigidity, compactness, and simplicity. For heavier duty, the company builds commutating pole motors, ranging in size from 5 to 130 h.p. and known as type C Q C and C L C. These machines are particularly designed for heavy machine tool drive, hoist work and similar classes of service requiring considerable speed variation, large capacity and at the same time compact motors.
—General Electric Co., Schenectady, N. Y.

MOTORS. Electric. Slow-speed motors in sizes from 30 kw. to 150 kw. Slow-speed enclosed motors in sizes from 1½ to 40 h.p. Slow-speed multipolar motors in sizes from 1½ to 40 h.p. Slow-speed motors with removable perforated covers in sizes from 1½ to 40 h.p.
—Jantz & Leist Electric Co., Cincinnati, Ohio.

MOTORS, INDUCTION. General Electric. The skeleton frame motor put on the market in 1905 has been uniformly successful. The open construction facilitates cooling by exposing the hottest parts to the air. The use of straight slots in the stator permits of thorough insulation of coils before placing in slots. The sliding base is adapted for use on floor, wall or ceiling. Motors of 35 h.p. and larger have adjustable end shields to provide for bearing wear. The smaller sizes are designated as riveted frame motors, in which the open construction is further carried out. Economies in manufacture have brought this motor within the reach of all small power-users.
—General Electric Co., Schenectady, N. Y.

MOTOR-GENERATORS. General Electric motor-generator sets for all sizes and voltages. For changing alternating current to direct or vice versa. Mechanical construction of these sets is result of special consideration of the requirements and not a mere coupling together of standard motors and generators. Bases are substantial yet light, and preference is given to design with minimum number of bearings in order to economize space, material and losses.
—General Electric Co., Schenectady, N. Y.

MOTOR-GENERATORS. Of low voltage for electroplating, electrotyping, and general deposition of metals. Gives the direct current needed for such purposes from an alternating-current supply network. Designed with full large hard rolled copper commutators for carbon brushes at low voltage. Generator and motor in full accordance with the most advanced practice and from the very best material and workmanship, therefore of highest efficiency and reliability. Built in stock sizes from 400 to 3000 amperes capacities.
—Jantz & Leist Electric Co., Cincinnati, Ohio.

MOULDS. Where formerly iron moulds were used for casting metals, such as gold and silver, graphite moulds made from solid Acheson graphite blocks 99% pure are now employed with increased success. Oxidation of the mould is very slight, and the ingot surface is smooth and bright, showing the reducing action of the graphite on the molten metal. Ease of machining renders economical the production of moulds of various forms. Used with success in the glass industry.
—International Acheson Graphite Co., Niagara Falls, N. Y.

MUFFLE FURNACES. A combined crucible and muffle furnace especially adapted for assay work. Operated with coal gas, natural gas, gasoline gas or kerosene oil, with forced air blast by means of a foot or power blower. Also plain draft muffle furnaces which require no air blast, operated with coal gas, natural gas, or gasoline gas, with range of temperatures up to 2400° F. Write for Catalog B.
—Buffalo Dental Mfg. Co., Buffalo, N. Y.

MUFFLE FURNACE. For assaying, scorifying and cupelling. This is a rapid furnace. The retort can be heated in fifteen minutes and sixteen assays of silver have been taken out in twenty-two minutes.
—Rockwell Furnace Co., New York.

MUFFLE FURNACE. For all purposes including enameling, cupelling, etc. All sizes.
—W. S. Rockwell Company, New York.

MUFFLES. Plumbago, a combination of pure ceylon plumbago and Klingenburg clay, two of the highest heat resisting substances known. Sizes 3″ x 4″ x 2¾″ high to 6″ x 8½″ x 4¼″ high. Clay, made of the finest clay procurable in same sizes as plumbago. Write for Catalog B.
—Buffalo Dental Mfg. Co., Buffalo, N. Y.

MUFFLES. For extremely high temperature work, 99% pure graphite muffles electrically produced at a temperature of 7500° F., hence highly refractory, are essential to secure stable service. Easily machined, threaded and cut. All sizes up to 8″ diam. made to order.
—International Acheson Graphite Co., Niagara Falls, N. Y.

NICKEL METAL.
—Fuerst Bros. & Co., New York.
—Roessler & Hasslacher Chemical Co., New York.

NICKEL-ALUMINIUM. One of the strongest light aluminium casting alloys. Contains 93% aluminium, the hardening ingredients being nickel and copper. Specific gravity 2.75. Suitable for automobile castings and other work requiring a light alloy of maximum strength.
—Electric Smelting & Aluminum Co., Lockport, N. Y.

NICKEL ANODES. Made under a special process in almost any shape that may be desired, and made to contain almost any desired percentage of nickel. The usual anode contains about 90 to 92%, which percentage insures the best possible results, even better than the highest percentage of nickel, as the metals used in alloying this nickel assist the anode in giving up its nickel more freely when in operation.
—Levett Mfg. Co., Matawan, N. J.

NICKEL-CHROMIUM ORE. Export.
—A. Champin, Paris, France.

NICKEL SALTS. For nickel plating. Free from impurities. Sample analyses; nickel ammonium sulphate (double salt); 15% nickel, trace iron, no arsenic or insoluble matter. Nickel sulphate (single salt); 21% nickel, no arsenic, traces of iron and insoluble matter. Made by the Mond Nickel Co. of England. Sole agents.
—Fuerst Bros. & Co., New York.

NITRATING CENTRIFUGALS. See Centrifugals, Nitrating.

Nitrating Pots. Of stone-ware; in different forms and sizes.
—J. W. Sittig, New York.

Nitrating Pots and Kettles. Made of acid-proof stoneware for manufacturing gun cotton, artificial silk, cellulose, picric acid, etc., in various sizes and shapes.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

NITROGEN. From the atmosphere, by liquefying the air. See Liquid Air.
—Linde Air Products Co., Buffalo, N. Y.

OILDAG. An ideal lubricant, consisting of deflocculated Acheson graphite in colloidal suspension or solution in oil. Professor C. F. Mallory in a report, reaches the following conclusions. "For the same load carried on a journal with and without graphite the consumption of oil using graphite may be reduced at least one-half. The reduction of friction is at least 25% when using Oildag with an equivalent saving in power. The low coefficient of friction shown by the fuel oil, gravity 35° suggests the wide use of fuel oils as lubricators." Two special committees of the Automobile Club of America found " that Oildag added to the lubricating oil in suitable proportions and the other Acheson preparations, increases the efficiency af the engine; decreases the smoke from the exhaust; decreases the quantity of lubricating oil; retains compression in cylinders; causes the engine and gears to run more sweetly; decreases the liability of burning out bearings; increases the life of all bearings."
—International Acheson Graphite Co., Niagara Falls, N. Y.

OIL HOSE. See Hose, Oil.

OIL PROCESS, RUTHENBURG. For treating sliming sulphides by gravity, no flotation, making savings as high as 98%.
—MARCUS RUTHENBURG, LONDON.

OIL STORAGE TANKS. See Tanks, Oil Storage.

OKONITE. "The standard for rubber insulation." Okonite insulation for wires and cables is not affected by extremes of temperature, commercial acids or alkalis, is flexible and tough, and made to give uniformly high and satisfactory service. Okonite wires. Okonite tape. Manson tape. Candee patented potheads. Candee weather-proof wires.
—THE OKONITE CO., LTD., NEW YORK.

OPEN-HEARTH Furnaces.
—MONARCH ENGINEERING & MFG. CO., BALTIMORE, MD.

ORE TESTING. See Testing of Ores.

OXONE. A solid non-brittle mass of fused sodium peroxide, cast into moulds of various shapes. Contact with water liberates oxygen gas of 99.6% purity, the impurity being moisture. On account of its capacity to absorb carbon dioxide and, while in the state of reaction, to destroy germs, it is also being used for the purification and regeneration of air. Also used for bleaching textile fabrics and straws.
—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

OXONE PRESSURE GENERATOR. Also in the market under the name Goodyear Generator. Smallest size holding 3 lbs. oxone or producing about 7 cu. ft. of the gas. Larger types. The pressure is created atuomatically. Is ordinarily adjusted to standard of 3 lbs. Is able to automatically work up, however, to 30 lbs.
—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

Oxone Generator, Portable. Low pressure; used principally for medical purposes and in laboratories.
—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

OXY-ACETYLENE PROCESS. See Welding, Oxy-acetylene, and Cutting, Oxy-acetylene.

OXYGEN. For sale in oxygen cylinders. Oxygen cylinders recharged. See Welding, Oxy-Acetylene.
—AMERICAN FERROFIX BRAZING CO., PHILADELPHIA, PA.

OXYGEN. For all purposes. Guaranteed free from hydrocarbons, the oxides of carbon, and other deleterious impurities. Special terms for welding. Made from liquid air. We also manufacture machines for the production of oxygen.
—LINDE AIR PRODUCTS CO., BUFFALO, N. Y.

OXYGEN GENERATION. See Oxygen Generator, Lavoisite. Liquid air. Oxone. Oxygenite.

OXYGEN GENERATOR and compressor. Oxygen gas can be produced about 97 to 98% pure with the chlorate of potash process in any oxygen plant and compressed into cylinders. The maximum pressure 300 lbs. per sq. in.
—Davis-Bournonville Co., New York.

OXYGEN GENERATOR, LAVOISITE. Water is admitted to Lavoisite in the generator causing an evolution of oxygen gas, which passes to the scrubber and thence to the receiving tank. As this generator can be shipped to any point and set up, and as the Lavoisite is shipped in drums, pure oxygen can be produced on a large scale at small cost and without danger. Specially useful in connection with acetylene for oxy-acetylene welding and cutting. See Welding, Oxy-Acetylene.
—H. W. Dopp Co., Buffalo, N. Y.

OXYGENITE. A product of an electrolytic process, in the form of a grey pulverulent mass resembling fine sand, partially soluble in water, and possessing the property of releasing by incineration in a closed vessel all the oxygen it contains, amounting to about 5½ cubic feet per lb. It can be ignited by ignition powder or other means. Oxygenite burns slowly and without flame. The residue of the combustion is a friable slag, which makes a valuable fertilizer. Oxygenite can be kept for an indefinite time without deteriorating; it is not affected by the action of even moist air.
—Industrial Oxygen Co., New York.

OZONE. Siemens ozone apparatus for air and water sterilization. For houses and hospitals. For city water works. Movable apparatus for army.
—Siemens & Halske Co., New York.

PACKER, RICHMOND BARREL. Made with an adjustable bracket support for driving shaft by means of which the packer can be driven from either side or at any angle in front. It has a slide or cut-off valve for shutting off material from bin while changing tubes, and an automatic attachment for throwing out of gear when barrel or sack is full. An improved method is used in attaching the friction brake. No weights are used on the brake lever.
—J. H. Day Co., Cincinnati, Ohio.

PACKER, DAY'S LIGHTNING. For quickly and accurately filling packages of from a half ounce to 6 pounds. It will fill cans, wide mouth bottles or packages of any shape and has a capacity of from two to twelve thousand per day. The material is forced out and does not depend upon gravity, the packages may be loosely or compactly filled as desired. It is made with or without automatic feeder.
—J. H. Day Co., Cincinnati, Ohio.

PACKINGS. Usudurian (Turtle Brand) is an unvulcanized, self-vulcanizing rubber sheet packing for any kind of steam, hot air, or hot water joints. This packing applied in its unvulcanized state readily accomodates itself to any unevenness in the surfaces between which it is placed. When steam comes in contact with it, Usudurian becomes vulcanized. It is not affected by contraction or expansion and can be used on what is called a vibrating joint. Particularly adapted to packing steam-chest covers and all superheated steam joints; can be made with wire insertion. Black Hawk sheet packing; a high-grade red compound with a plumbago-treated surface. Joints made with Black Hawk can be broken and remade many times without spoiling the life of the packing. Not affected by ammonia and therefore suitable for ice-plants. Not affected by liquors, steam heat, or alkalies. Giant Red Crescent Sheet Packing for high-pressure steam packings. Black Cross Packing a combination of Usudurian and Giant. Ammonia rings for ice machines.
—Revere Rubber Co., Boston, Mass.

PACKINGS, FLANGE & JOINT. We manufacture a line of packings, either pure, or with cloth, wire or sheet metal insertion that will make perfect joints when used in connection with air, steam, water, oil, ammonia, alkalies, etc.
—Boston Belting Company, Boston.

PACKINGS, PISTON & VALVE ROD. We supply in round or square lengths, also in spiral or ring form, packings made from the best material for packing piston rods and valve stems of steam, gas and air pumps; steam, gas and air engines, etc. Also packings for hot water and hydraulic purposes.
—Boston Belting Company, Boston.

PACKING MACHINES. The Daisy Packer is made for filling sacks and kegs from eight to ninety-eight pounds in weight. Used for flour, cement, dry paints, whiting and similar material. It is made with an iron frame for the purpose of keeping the gears in position. Tubes and gears of different sizes are furnished according to requirements. The machine is 7 feet 4 inches high and the width of the frame 23 inches.
—J. H. Day Co., Cincinnati, Ohio.

PAINTS, INSULATING.
—Fuerst Bros. & Co., New York City.

PAINT PIGMENT. Graphite as a paint pigment for steel and iron is unexcelled. As such it is of value directly in proportion to its graphitic carbon content and fineness. Acheson graphite is the purest offered, and, being amorphous, is capable of the finest grinding. Being chemically inert, it is unaffected by atmospheric conditions, gases, fumes and moisture, while it is a non-carrier of oxygen, thus affording real protection to the iron. Works easily under the brush, but does not brush out too thin.
—International Acheson Graphite Co., Niagara Falls, N. Y.

PALM OIL BLEACHER. Bleaching of palm oil is successfully accomplished without chemicals with the Koerting palm oil bleacher, by means of oxygen in the air. This apparatus consists of a closed iron vessel, on the top of which is installed an exhauster. In the vessel is a copper heating coil, and at the bottom an annular air distributing pipe with a large number of holes connected to an air inlet pipe. The liquid is admitted to the bleaching vessel, and the vessel then closed and steam admitted to the copper coil until the oil has reached 212 deg. F. Exhaust er is then started and air drawn through the oil, thus utilizing the oxygen of the air for bleaching. The natural properties of the oil is in no way affected. Bleaching process takes about two hours, and no attention is required after starting until the process is completed. Manufacturers' catalog 4-E fully explains.
—Schutte & Koerting Co., Philadelphia, Pa.

PANS, VACUUM. Of any form, size or weight. We will make patterns to your drawings, or use patterns furnished by you. Send us your specifications, and we will quote price on castings, and machine work on same.
—H. G. Trout Company, Buffalo, N. Y.

PANS, VACUUM. Built in all sizes and capacities from sheet or cast metal best suited for desired service. If necessary inside of pans can be lined with block tin or sheet lead. For reducing solutions to solids pans are furnished with stirring arrangement.
—Baeuerle & Morris, Philadelphia, Pa.

PANS (VACUUM) AND EVAPORATORS. Either copper or iron vacuum pans or stills 25 gallons capacity upwards. Single or multiple-effect vertical evaporators for concentrating various solutions.
—F. J. Stokes Machine Co., Philadelphia, Pa.

PANS, VACUUM. Plain or porcelain-lined. Without or with mixers. Catalog 216.
—Stuart & Peterson Co., Burlington, N. J.

PANS, VACUUM.
—H. W. Dopp Co., Buffalo, N. Y.
—Kestner Evaporator Co., Philadelphia, Pa.
—Swenson Evaporator Co., Chicago, Ill.
—Zaremba Co., Chicago, Ill.

PAPER PULPING MACHINE, UNIVERSAL. As its name indicates this machine is built on the lines of our " Universal " Kneading & Mixing Machine (see Kneading) but is especially adapted for tearing up and pulping all kinds of paper, such as, dry broken, wet broken, sulphite fibre, ground wood, old paper, paper shavings, folding box, box board cuttings, scrap, etc., all classes of paper-stock which has no linen or canvas lining. The chief advantage of

this machine is that it preserves the fibre as the material handled is subjected to a tearing not cutting action. The trough of this machine is made of cast iron of sufficient weight to withstand the hard usage it is subjected to. The saddle of the trough is toothed and removable. The cast steel agitators are provided with toothed steel plates which can be easily adjusted. This machine is made in two sizes of 160 to 210 gallons capacity respectively.
—Werner & Pfleiderer, Saginaw, Mich.

PEBBLE MILL. See Crushing and Grinding.

PERBORATE MAGNESIUM. Averaging 8% available oxygen. White powder.
—Roessler & Hasslacher Chemical Co., New York.

PERBORATE SODIUM. $NaBO_3$ $4H_2O$. Average 8 to 10% available oxygen. A white powder which on solution in water forms hydrogen peroxide and borax. For bleaching panama hats, fine laces, silk and ostrich feathers.
—Roessler & Hasslacher Chemical Co., New York.

PERBORATE ZINC. Formula not determined. Averaging 7 to 8% available oxygen. White powder, soluble in acid medium, insoluble in water.
—Roessler & Hasslacher Chemical Co., New York.

PERCOLATORS. Of acid-proof stoneware, in various sizes and shapes with loose sieves.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

PERCOLATORS. Porcelain-lined.
—Stuart & Peterson Co., Burlington, N. J.

PERFORATED METALS. For all purposes.
—Allis-Chalmers Co., Milwaukee, Wis.
—Colorado Iron Works Co., Denver, Colo.

PEROXIDE CALCIUM. 70 to 80% CAO_2. Averaging 17% available oxygen. Balance $CA(OH)_2$ and $CACO_3$. Cream color powder. Soluble in acid medium. Suspended in water more stable than magnesium peroxide. Very slowly dissociates active oxygen. For bleaching oils and therapeutic purposes.
—Roessler & Hasslacher Chemical Co., New York.

PEROXIDE MAGNESIUM. 20–30% MgO_2. A compound consisting of magnesium perhydroxide, magnesium hydroxide and constitutional water. The available oxygen averages 7 to 8%. Tasteless white powder. Soluble in acid medium. Suspended in water slowly, dissociating its available oxygen.
—Roessler & Hasslacher Chemical Co., New York.

PEROXIDE STRONTIUM. 80 to 90% SrO_2. Averaging 12% available oxygen. Balance strontium hydroxide. Impalpable white powder, soluble in acid medium. Partly soluble in water. For bleaching oils and therapeutic purposes.
—Roessler & Hasslacher Chemical Co., New York.

PEROXIDE ZINC. 50 to 55% ZnO_2. Averaging 9% available oxygen. Balance zinc oxide and free moisture. A fine yellowish white color. Soluble in acid medium. Insoluble in water.
—Roessler & Hasslacher Chemical Co., New York.

PHOSPHORIZERS. Phosphorus charges are used for introducing phosphorus into phosphor-bronze. Usually made of graphite. Are readily machined from solid Acheson graphite rods 99% pure graphite, and in this case are free from the siliceous bond always present in the moulded article. Thus no injurious impurities are introduced and the carbon in this pure form aids in freeing the molten bath from oxides by reducing them.
—International Acheson Graphite Co., Niagara Falls, N. Y.

PICKLING VATS. Of stoneware for the use of wire drawers, brass foundries, etc., of cylindrical shape, made of the very best acid-proof clay and glazed with superior acid-proof glazing. Are extra thick and can be provided with faucet ground in if desired. Size to suit purchaser.
—U. S. Stoneware Co., Akron, Ohio.

PICKLING VATS. For brass foundries, platers and similar works, of especially thick and highly acid-proof stone-ware material.
—J. W. Sittig, New York.
(Other stoneware makers see Stoneware.)

PIPE. WOOD PIPE. Wyckoff machine-made wood stave pipe, made out of Canadian white pine lumber, wood shell 1¾" 1¾" or 2¾" thick according to size of bore. Pipe wound with No. 14, 16 or 18 gauge 2" wide flat steel hoop, according to the pressure. Joint, socket and tenon style, tenon being 4" long, socket 4" deep, which simply has to be driven together when laying. The steel hoop is coated as it is being wound on the pipe. When the pipe is complete, it is coated on the outside with imperishable asphaltum-cement. This coating runs about ¼" thick. The lengths are from 4 ft. to 8 ft. The pipe is acid-proof, not effected by electrolysis, will carry 15% more water, equal diameters, than any metal pipe.
—A. Wyckoff & Son Co., Elmira, N. Y.

PIPE. "IMPROVED" WOOD PIPE. For conveying water and acids. Protected on the exterior by imperishable cement and preserved by the liquid which fills the pores of the wood in the shell, this pipe will last and remain in perfect condition practically indefinitely. Our "improved" wood mine and acid pipe resists the

action of acids and alkali solutions and is especially suitable for mines, collieries, acid and alkali works, mineral waters, tanneries, distilleries, etc. We also make steam-pipe casings for covering steam pipes laid underground.
—Michigan Pipe Co., Bay City, Mich.

PIPE. LEAD-COVERED pipes and coils of either brass, copper or iron.
—Lead-Lined Iron Pipe, Wakefield, Mass.

PIPE. LEAD-LINED IRON PIPE. In all sizes, either flanged or coupled, for any corrosive waters or acids. The lead lining on these pipes is fused onto the iron and the two metals cannot become separated, either by hot liquids or hard usage. Very largely used for pumping mine waters or salt water. Also for conducting all kinds of acids, hot or cold; for a hot acid a hardened lead is used. For pulp and paper mills we make a pipe that can be cut out to sketch, for either wrought iron, cast iron or spiral riveted pipe, flanged or screwed joints.
—Lead-Lined Iron Pipe Co., Wakefield, Mass.

PIPE. TIN-LINED IRON PIPE. For house plumbing, where the water is conducted from springs; for carbonating plants, dairies, creameries, and wherever a superior pipe for conducting pure water is desired; also for wineries, for paraffine works, etc.
—Lead-Lined Iron Pipe Co., Wakefield, Mass.

PIPE OF CHEMICAL STONEWARE. Made from selected vitreous clays.
—A. J. Weeks, Akron, Ohio.

Pipes. Of stoneware. Perfectly straight and round, made in any diameter and up to lengths of 118″ in one piece; also branch pipes, tees, bends, etc.
—J. W. Sittig, New York.

Pipes and Fittings. Flanged, conical flanged, or sockets, made of acid-proof stoneware, in all sizes and lengths. The pipes can also be had with a cast-iron mantle, making them very durable and strong.
—Didier-March Co., New York.

Pipes and Connections. Graham chemical stoneware pipe is furnished in all sizes from ¼″ to 48″ inside diameter. Best and only safe material for handling corrosive liquids such as acids, alkalies, etc., as well as gases and acid fumes. Pipe provided for all kinds of joints (clay lute, water lute, flanged etc.) Fittings of every variety such as elbows, tees, Y branches, traps etc. to correspond. Warranted chemical proof.
—Charles Graham Chemical Pottery Works, Brooklyn, N. Y.
(Other stoneware makers see Stoneware.)

PIPES AND FITTINGS. Of hard rubber. For conveying acids, alkalis, corrosive liquors, dyes, brine, etc.
—AMERICAN HARD RUBBER CO.

PIPE AND FITTINGS. Lead-lined.
—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

PIPE WELDING BY THERMIT PROCESS. A means of making a pipe joint as strong as the pipe itself, without increase of diameter inside or outside of the pipe, with the enormous advantage of the work being done after the pipe is in place; that is to say, in the ditch or on the roof of a factory, or wherever it may be necessary to do such work. Especially valuable for ammonia service lines. For description of the process see " Welding—Thermit." For necessary outfit see " Welding Outfit—Thermit," " B.")
—GOLDSCHMIDT THERMIT CO., NEW YORK.

PITCHERS. Graham chemical stoneware pitchers for handling acids, alkalies etc. in every strength. Two styles made and all sizes from one pint to five gallons capacity. Ware guaranteed chemical proof. Pitchers can be furnished extra heavy or extra light at no increase of cost.
—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.

Pitchers. Stoneware acid pitchers are made in sizes to suit customers, from ½ gal. to 10 gals. capacity. Have a good, strong, properly shaped spout, are thoroughly glazed, and will hold acids without fear of contents percolating through the body of the pitcher. Are regularly made with one handle. Two handles if desired.
—U. S. STONEWARE CO., AKRON, OHIO.
(Other stoneware makers see Stoneware.)

" PLATERS' COMPOUND." These are special soaps combined with chemicals and cover a class of products that are particularly adapted to the removal of buffing compositions, such as Tripoli, Rouge, Crocus, Vienna Lime, etc., from metal work without detrimentally affecting the finish of the work.
—INTERNATIONAL CHEMICAL CO., CAMDEN, N. J.

PLATINUM. See second part of Dictionary, devoted to Measuring Instruments and Laboratory Supply.

PLUMBAGO. By proper selection of raw materials, graphites of widely different characteristics are produced in the electric furnace. This obviates the necessity of " doping " the graphite to impart certain properties for special purposes, a practice sure to result in loss of other valuable qualities. Hence the increasing popularity of electrically produced graphites for such purposes as dry battery filler, paint pigment for steel and iron, electrotyping leads, lubrication, either dry or mixed with oil or grease, powder glazing, pipe-

joint compound, furnace linings, lamp-filament paste, stove polish, lead pencils, recarbonizing steel, foundry facings, and all electrical purposes.
—International Acheson Graphite Co., Niagara Falls, N. Y.

POLISH. Victor white. For imparting a fine lustre to nickel-plated work.
—Zucker & Levett & Loeb Co., New York.

POLISHING. Buffing and Grinding Machines, column and bench with either direct-current or alternating-current motors.
—Eager Electric Co., Watertown, N. Y.

POLISHING LATHE, See Lathe.

POLISHING WHEELS, WOOD. Covered with best grade of oak tanned leather. Made from ½" thicknesses of kiln-dried white wood each section being laid cross-grained to the other, glued together, and then carefully trued so that the wheel balances perfectly. These wheels are usually used with emery for cutting down heavy hardware work.
—Levett Mfg. Co., Matawan, N. J.

PORCELAIN WARE. For chemical purposes, of the Royal Berlin Factory and other well known manufacturers. Made in any form or size. Further particulars cheerfully furnished on application. This imported ware is known all over the world for its superior quality and great resistance against temperature.
—J. W. Sittig, New York.

PORCELAIN JAR MILL. See Crushing and Grinding, Jar mill.

POROUS CUPS. Cylinders, tubes, plates of vitreous earthenware. We are making special goods according to models or drawings or specifications, especially for experimental work.
—John Maddock & Sons, Trenton, N. J.

POROUS EARTHENWARE. See Earthenware.

POTS, JARS, TRANSPORTING VESSELS. Of acid-proof stoneware, from 13 gal. to 528 gal. capacity, with and without outlets, in all shapes, conical, cylindrical or oval shape.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

POT MILL. See Crushing and Grinding, Mill.

POTASH. American—Greenwich.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

POTASH COMPOUNDS. This consists of potash combined with various other ingredients which exercise a marked difference upon

the potash, making it more efficient than when potash is used alone. This is particularly true where the materials are to be used for cleaning various kinds of metal work. For example, one potash compound would clean steel work very satisfactorily but would be absolutely useless and destructive to a piece of zinc, or aluminum.
—INTERNATIONAL CHEMICAL CO., CAMDEN, N. J.

POTASH ("KEMICAL FIRST SORTS"). The proper grade of pot-ash to use for various purposes depend entirely on the class of work for which it is intended. Chemical potashes have a distinct advantage over wood ash potashes, inasmuch as the ingredients can be varied to meet special conditions for which they are intended. To a layman chemical analysis does not always determine the value of this material for any given purpose. By specialization and long experience the manufacturer learns that certain grades are best for certain kinds of work. Very often he is in a better position to know what is right for a particular class of work than the consumer himself.
—INTERNATIONAL CHEMICAL CO., CAMDEN, N. J.

POWDER JARS. Of acid-proof stoneware, glazed inside and outside, with ground-in stoppers, in various capacities, from ¼ gallon to 6½ gallons capacity.
—DIDIER-MARCH CO., NEW YORK.
(Other stoneware makers see Stoneware.)

POWER TRANSMISSION Machinery. Belt tighteners. Boxes Couplings, Gears, Hangers, Pulleys, Rope sheaves, Shafting.
—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

PRESSES. *Machines for exerting or transmitting pressure by means of steam, pneumatic, hydraulic or other power, for the purpose of condensing or compressing various materials into various forms or shapes, and also for extracting liquids.*

Press, Lead Cable, Krupp Hydraulic. A horizontal press (Huber Patent) by which all sizes of cables are covered with a suitable lead covering. The cables are fed through a hollow mandrel and the lead is pressed upon same by two hydraulic cylinders on opposite sides of the press. The hollow mandrel and matrice are situated in the middle of the lead cylinder. This type of press gives a more uniform thickness of lead coating than one can depend upon obtaining with presses having only one cylinder, and has a larger capacity per unit of cost than single cylinder presses.
—THOMAS PROSSER & SON, NEW YORK.

Press, Metal, Krupp Hydraulic. For making round bars or bars of any section, of brass, aluminium, or other metals or metallic alloys. Owing to the simple locking means of the press, the latter can be rapidly charged with red-hot metal blocks and rapidly set into operation. The metal blocks do not get cool and the pressing operation takes place regularly. The press is a horizontal press

having a double acting hydraulic cylinder. The use of this press is especially advantageous when sections are desired that cannot be rolled, and under any conditions a more compact product is obtained by pressing than by rolling.
—THOMAS PROSSER & SON, NEW YORK.

Press, Automatic Continuous Screw. This press is of a continuous screw type and consists of a horizontal tapered screw, built up on a hollow perforated shaft, arranged so as to allow of admitting steam to the material while under pressure, if desired. The screw fits closely inside of a similarly tapered slatted curb and rotates. The gradual decrease in size of the screw and its curb causes the pressure. Drainage is both internal and external. Suitable for handling offal from slaughter houses, fish plants and similar material.
—AMERICAN PROCESS CO., NEW YORK.

PRODUCER. Morgan Continuous Gas. Highest economy attained, often saving 50 per cent of fuel and labor in the production of gas for roasting, refining, heating, and melting. The special feature is the automatic feed, which insures almost absolute uniformity of both quantity and quality of gas produced.
—MORGAN CONSTRUCTION CO., WORCESTER, MASS.

PULVERIZERS. See Crushing and Grinding.

PUMPS. Chemical stoneware plunger pumps, single action. Capacity about 19 gallons per minute at 40 revolutions. Supplied complete with all iron work, including tight pulley, ready for operation. All working parts non-corrosive, being made from best vitrified stoneware. Blue print and price upon application.
—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.

Pumps for Fluids. Vertical plunger or horizontal, made of acid-proof stoneware, hand power or belt drive to suit conditions, in various capacities, single or double cylinders.
—DIDIER-MARCH COMPANY, NEW YORK.

Pumps. Of all kinds for hand, steam and electric power. Excellently adapted for use in chemical factories, as all parts coming in contact with the liquids are made of the best acid resisting stoneware. Centrifugal pumps for raising large quantities of acids.
—J. W. SITTIG, NEW YORK.

Pumps for Gases. Plunger, made of acid-proof stoneware, for conveying gases etc., in various sizes and capacities.
—DIDIER-MARCH COMPANY, NEW YORK.

Pumps, Centrifugal. Of acid-proof stoneware, capacity up to 39600 gallons per hour. Tested to 50% higher speed than listed.
—DIDIER-MARCH COMPANY, NEW YORK.
(Other stoneware makers see Stoneware.)

Pumps, Acid. Chemical Stoneware.
—U. S. Stoneware Co., Akron, Ohio.
—A. J. Weeks, Akron, Ohio.

PUMPS. Hard rubber centrifugal for acids, alkalis, corrosive liquors, dyes, brine, etc.
—American Hard Rubber Co., New York.

PUMP, ACID. H. & V. W. patent acid pump to replace all previous crude contrivances, simple to operate and quick to act, reduces the danger of handling acids, to a minimum.
—Hanson & Van Winkle Company, Newark, N. J.

PUMPS. General Electric pumping sets. Both piston and turbine types. The direct-current motors on piston pumps are wound for low speed so that they can be belted without interposition of noisy gearing. Induction motors can also be used to drive this type of pump. The turbine pump is direct connected to the motor, thus making a neat self-contained apparatus. Alternating-current equipments can also be supplied. The General Electric Company is prepared to furnish an automatic device for starting and stopping motors when used in connection with storage tanks for pumping plants.
—General Electric Co., Schenectady, N. Y.

PUMPS. Frenier Sand. For raising sand and water in stone sawing works and for handling pulp in concentration and cyanide works.
—Colorado Iron Works Co., Denver, Colo.

PUMPING Machinery. Centrifugal pumps. Elevator pumps. Fire service pumps. Geared pumps. "High-duty" pumping engines. Hydraulic transmission pumps. Mine pumps. Multistage, high-lift centrifugals. Screw pumps.
—Allis-Chalmers Co., Milwaukee, Wis.

PUMP, ROTARY FORGE, DAY'S. For pumping oil, paint, grease, acids and hot or cold water. Made for hand or power. Made in bronze for pumping acids and for hot liquids it is provided with a metallic check valve. It is made in various sizes having a capacity of 13 to 55 gallons per minute.
—J. H. Day Co., Cincinnati, Ohio.

PUMPS, VACUUM. Single, two stage, three stage, horizontal or vertical, steam, belt or motor driven. Any size or capacity. Of an improved design. The valves remain on their seats without the use of springs. The highest obtainable vacuum guaranteed on all our pumps. All parts are adjustable and complete. All pumps built on the straight line principle, thereby doing away with necessity of placing rocker arms and various devices for moving the

valves etc., as these are all done away with on our pumps.
—Buffalo Foundry & Machine Co., Buffalo, N. Y.

PUMP, VACUUM, ROTARY. The Abbé Rotary vacuum pump is built in such a way that the blades or gates are in constant contact with the casing or cylinder. The shaft is set eccentric and carries the drum, which in turn receives the blades or gates and permits them to slide back and forth as it revolves. This pump is built in various styles and sizes to meet different requirements.
—Abbe Engineering Co., New York.

PUMP, VACUUM FOR LABORATORY. Especially intended for chemical laboratories, to create a high degree of vacuum with a small amount of steam or pressure water, as desired; termed size No. 4, (See Manufacturers' catalogue 4-P) and has a capacity (with 20 pounds water pressure) of ½ cu. ft. displacement per minute of air at atmospheric pressure; and is supplied complete including vacuum pump, vacuum gauge, connecting tee, and two cocks. Universities use it extensively in their laboratories in conducting experiments. With 20 pounds water pressure a vacuum of 29½" mercury can be had on a 1 gallon vessel in 5 minutes.
—Schutte & Koerting Co., Philadelphia, Pa.

PUMPING SYSTEM, FUEL OIL. For pumping oil from storage tank to burners. Heats the oil with the exhaust steam. Delivers it to burners under uniform pressure. Will handle light or heavy oils. In no way governed by gravity. Absolutely safe. Approved by underwriters. Simplest and best system made. 5 sizes—100, 200, 300, 500 and 900 gallons capacity per hour. Catalog 3.
—W. S. Rockwell Company, New York.

PUMPING ENGINES.
—Allis-Chalmers Co., Milwaukee, Wis.

PURPLE ORE. Blue billy, containing over 68% metallic iron free from phosphorous.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

PUTTING-ON TOOL. With the oxy-acetylene welding torch (see Welding, Oxy-acetylene) metal can be added to worn parts of castings. Weak places can be strengthened. Shafting etc., cut too short, can be lengthened. Small parts missing or broken off, can be added. Patterns sometimes shaped.
—Davis-Bournonville Co., New York.

QUARTZ MILL, VAUGHN. See Crushing and Grinding.

RAIL JOINTS, THERMIT WELDING. Rail joints made by the thermit process have the special advantage that through the lightness and portability of the outfit, a small number of joints can as economically be welded at one time as a large. The outfit (see

" Welding Outfit—Thermit "), sufficient to pour one or two joints, can be transported on a hand truck. The joint is made by surrounding the rail ends with a refractory mold and igniting the thermit in a crucible placed over the gate of the mold. At the end of the reaction of the thermit, the crucible is tapped from the bottom and superheated liquid steel runs into the mold, surrounds the base and web of the rail, with which it fuses on account of its very high temperature, and in cooling makes one solid steel shoe, about 3″ wide and about ¾″ thick at the thickest part. This weld combines increased electric conductivity with all the advantages of a continuous rail. An alternative method can be employed, by which not only the web and base of the rail, but also the head are welded. For particulars see special pamphlets of instructions.
—Goldschmidt Thermit Co., New York.

" RAPID DISSOLVER." See Dissolver.

RARE MINERALS and Ores.
—Geo. G. Blackwell, Sons & Co., Liverpool, England.
—A. Champin, Paris, France.
—De Golia & Atkins, San Francisco, Cal.
—Eimer & Amend, New York.
—E. J. Lavino & Co., Philadelphia, Pa.
—C. W. Leavitt & Co., New York.
—Primos Chemical Co., Primos, Pa.
—Roessler & Hasslacher Chemical Co., New York.
—Vanadium Alloys Co., New York.

RAYMOND MILL. See Crushing and Grinding.

REAGENTS. " Baker's Analyzed Chemicals." Every label shows an analysis, and our guarantee provides that the contents of each bottle will conform with that analysis.
—J. T. Baker Chemical Co., Phillipsburg, N. J.

REAGENTS. Chemically pure. Full particulars and prices on request.
—Baker & Adamson Chemical Co., Easton, Pa.

REAGENTS. " Let Merck make the " Blank " Test for you. To that end buy Merck's Blue Label Reagents."
—Merck & Co., New York, St. Louis, Rahway, N. J.

RECTIFIER ELECTRODE. In conjunction with aluminium as used in cells for rectifying alternating current, solid graphite electrodes show advantage over the elements heretofore used, in that they minimize the heating effect. In mercury rectifiers also pure graphite electrodes are used as anodes. Made at a temperature of 7500° F., they are free of all volatile matter.
—International Acheson Graphite Co., Niagara Falls, N. Y.

REFINING FURNACES. For copper, gold, silver and other metals. All types and sizes.
—W. S. Rockwell Company, New York.

REFINING FURNACES, ELECTRIC STEEL. See Furnace Electric Steel.

REFRACTORIES. Divided for general purposes into three classes: acid, basic, neutral. Silica is the typical acid refractory; lime, magnesia, dolomite, bauxite, are typical basic refractories. Carbon (graphite) and chromite are neutral. See Bauxite, Carbon, Carborundum, Carborundum Fires and Chrome Brick, Chrome Ore, Fire Brick, Graphite, Magnesia Brick, Magnesite, Silica Brick.

REGENERATIVE FURNACES. Built for producer gas, natural gas or oil fuel, for the economical and uniform heating of billets, ingots, steel melting, scrap melting, brass melting, etc. Usually designed and built to meet special requirements.
—Rockwell Furnace Co., New York.

REINFORCING RODS—WELDING BY THERMIT PROCESS. The operation is in all particulars identical with that of pipe welding, which see.
—Goldschmidt Thermit Co., New York.

RESISTANCE WIRE. Krupp's.
—Thos. Prosser & Son, New York.

RESISTORS, ELECTRICAL. *Materials used for controlling and regulating electrical current.*

Resistors, Krupp Resistance Wire and Material. For rheostats arc lamps, heating apparatus, moving picture machines etc. This is the original high-resistance material and has a specific resistance only about 10% lower than mercury. It is a special high-grade nickel-steel showing a high resistance and may be loaded permanently up to a temperature of 600° Centigrade (1112° Fahrenheit) without undergoing any alteration of structure.
—Thomas Prosser & Son, New York.

Resistor, Granular Carbon. When granular carbon is used for high temperatures, electric furnace graphite is desirable because of its high purity and infusibility. It is easily granulated and graded, and since it has been raised to the highest attainable temperature during manufacture, its resistivity is not permanently altered by successive heatings. Made in various degrees of hardness, all pure graphite. Peculiar non-arcing properties reduce variation to a minimum.
—International Acheson Graphite Co., Niagara Falls, N. Y.

RETORTS. Samson Retorts, with hinged drop bottom, fastened with clamps, for chemical and other uses where contents are to be solidified and then forced out of the bottom. Golden Crown Retorts, porcelain-lined, for dentists, chemists, physicians, etc. Vienna Vacuum Retort, porcelain-lined.
—STUART & PETERSON CO., BURLINGTON, N. J.

RETORTS. Of any form, size or weight. We will make patterns to your drawings, or use patterns furnished by you. Special formula of cast iron to meet needs of each case.
—H. G. TROUT COMPANY, BUFFALO, N. Y.

RETORTS OF STONE-WARE. With ground in stoppers.
—J. W. SITTIG, NEW YORK.
(Other stoneware makers see Stoneware.)

RETORT FURNACES. For gold and silver mills.
—COLORADO IRON WORKS CO., DENVER, COLO.

REVELBEC Tilting Crucible Furnace. See Melting Furnace, Reyelbec.

REVERBERATORY FURNACES. For melting quantities of brass and copper scrap. For refining copper. For granite or agate ware enamel mixtures and other purposes. All capacities.
—W. S. ROCKWELL COMPANY, NEW YORK.

REVERBERATORY FURNACE. Melting and Cupelling. For reducing by-products in electrolytic refineries, mints and jewelry establishments. This furnace is water-jacketed, insuring comfort to the workman and preserves the life of lining. Oil or gas fuel may be used.
—ROCKWELL FURNACE CO., NEW YORK.

RHEOSTATS. Tank rheostats, H. & V. W. underwriters patent, for controlling the current flowing into the tanks, made in many sizes to suit requirements, especially for electroplaters.
—THE HANSON & VAN WINKLE CO., NEWARK, N. J.

RHEOSTATS. Very nice gradations in ohmic resistance can be maintained by varying the pressure put upon a pile of discs or washers machined from solid Acheson graphite rods, inserted in the electric circuit. The discs may be held in insulating tubes, or the washers centered on an insulating rod, and variable pressure applied by means of a cam. Uniformity, non-arcing and infusible properties, as well as resistance to oxidation and economy of machining are valuable adjuncts.
—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

RICHMOND BARREL PACKER. See Packer.

RIVET FURNACES. Portable and stationary types. Rockwell portable forges for railroad, bridge and ship work. Stationary forges for car, boiler and other shop work.
—W. S. ROCKWELL COMPANY, NEW YORK.

ROASTING Plants, Continuous. Oxland cylinder.
—COLORADO IRON WORKS CO., DENVER, COLO.

ROASTING FURNACE. McDougall. Simple, economical, and practical. Low cost of installation and maintenance. For roasting all classes of ore, especially where external heat is required. Uses wood, coal, oil, or gas for fuel. Discharges from 30 to 100 tons of " Sweet " roasted product per day, depending upon the nature of the ores. A maximum capacity per square foot of hearth area with minimum fuel.
—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

ROASTING FURNACES. Mechanical. For the roasting of pyrites, pyrrhotite and sulphide ores, etc., in size and capacity up to 34 feet diameter and with any number of hearths desired. Hearths can be muffled if the roasting problem makes it desirable. Concentrate containing as low as 13.6 sulphur has been successfully desulphurized down to 2.26 per cent sulphur without the use of fuel. Write for catalogue and Bulletin " B."
—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA.

ROLLERS, RUBBER COVERED. We are the originators of rubber-covered rollers, and make a specialty of furnishing such rollers complete and also recovering rollers with rubber. The use of a proper consistency of high grade rubber, which our long experience has shown to be best adapted for specific purposes, produces results not otherwise obtainable. Rubber covered rollers of our manufacture are used with perfect satisfaction for sheet iron galvanizing.
—BOSTON BELTING COMPANY, BOSTON.

ROLLING MILL ENGINES.
—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

ROLLS, Crushing. See Crushing and Grinding.

ROLLS, RUBBER COVERINGS. A perfect union between the rubber cover and the iron roll, with freedom from blisters and soft spots, true surface, exact crowning and correct density. For paper mills, leather factories, bleacheries, printing and dye works, etc.
—REVERE RUBBER CO., BOSTON, MASS.

ROTARY CUTTER. See Cutter.

ROTARY CRUSHER. See Crushing and Grinding.

ROTARY DRYER. See Dryer Rotary.

ROTOPLATER. A revolving automatic plating apparatus, consisting of a wooden tank, in which is inserted a revolving non-metallic hexagon cylinder containing the articles to be plated. The rotation of the cylinder polishes the work while it is being plated. Made in different types and sizes.
—Zucker & Levett & Loeb Co., New York.

RUBBER. See also "Belting," "Gaskets," "Hose," "Mats," "Packings," "Rollers," "Springs," "Tubing," "Valves," "Books."

RUBBER GOODS. For mechanical use. "The policy of this company is to make only the highest grades of mechanical rubber goods. In the manufacture of these goods we use the finest grades of rubber, the latest improved and special machinery of our own design, and our experience, dating back to the infancy of the rubber industry."
—Revere Rubber Co., Boston, Mass.

RUBBER GOODS, MECHANICAL. The original and largest manufacturers of all classes of high grade rubber goods for mechanical and manufacturing purposes.
—Boston Belting Company, Boston.

RUBBER INSULATORS. See Okonite.

RUBBER SOLUTION MACHINE. See Solution Machine, Rubber.

SAL SODA.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

SALT. Wyandotte. Glanbers.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

SALT CAKE. Refined for glass makers.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

SAMPLING MACHINERY, Automatic.
—Colorado Iron Works Co., Denver, Colo.

SAWDUST BOXES. See Drying.

SAW MILL MACHINERY.
—Allis-Chalmers Co., Milwaukee, Wis.

SCHEELITE. Calcium Tungstate. Concentrates, guaranteed 65% tungstic acid minimum; shipments have averaged (600 tons) over 70% WO_3. For the manufacture of tungsten metal, ferro-tungsten, tungsten-lamp filaments, and tungsten salts.
—De Golia & Atkins, San Francisco, Cal.

SCHWARTZ MELTING and Refining Furnace. See Melting Furnace, Schwartz.

SCREENS. Cylindrical and conical revolving screens or trommels. Octagonal revolving screens.
—Colorado Iron Works Co., Denver, Colo.

SCREEN, IMPACT. This excellent mill screen has effectually solved the problems of wet and dry screening between four and one hundred mesh, having immense capacity and producing almost absolutely clean products. Concerning the valuable patented features upon which its high efficiency depends, see our Bulletin 21.
—Colorado Iron Works Co., Denver, Colo.

SCREENS. Revolving screens. Shaking screens.
—Allis-Chalmers Co., Milwaukee, Wis.

SCREENS. Of every description for use in chemical works, cement plants, oil mills, rock crushers, fertilizer factories, plaster mills, etc.
—E. H. Stroud & Co., Chicago, Ill.

SCREENS, RUTHENBURG. Made of solid wedge steel rings for screening fines from coarse crushings without wear. Roll breaker breaking to 1″ cube, gives 20% through 30 mesh screen. Coarse roll set to ¼″ gives 45% through 30 mesh. Why crush further making slime?
—Marcus Ruthenburg, London.
—Brush Electrical Engineering Co., London.

SCREEN, VIBRATING. For screening mineral, clay, sand, fertilizer and other material of similar nature. Intended for heavy work. The sifting is done by a vibrating or shaking movement. The sifting box is mounted on rollers and the vibrating motion is imparted by a large eccentric. The frame in the bottom containing the sieve cloth is removable. Made in three sizes with sieve 24 x 48, 24 x 72 and 24 x 96 inches. Also made with a feeding attachment when required.
—J. H. Day Co., Cincinnati, Ohio.

SCREEN, SUPERIOR REVOLVING, DAY'S. Made to screen clay, sand, fertilizer, etc. It consists of a steel shaft with arms reaching out to the circumference. To these arms are attached the iron bands and frame which hold the wire cloth. The feed end has a flange to prevent a back flow of material. Operated on a slight incline.
—J. H. Day Co., Cincinnati, Ohio.

SEPARATION of gaseous mixtures. We are consulting engineers and manufacturers of machines for the production of oxygen and

nitrogen from the atmosphere, for the liquefaction of gases, and the separation of gaseous mixtures.
—Linde Air Products Co., Buffalo, N. Y.

SEPARATING. Machinery, mixing, grinding, separating, designed and built. See Machinery, Special, for New Processes.
—Charles J. Reed, Philadelphia, Pa.

SEPARATOR, BLAST. *A machine used for separating pulverized materials by means of an air blast, instead of by screening or bolting. The pulverized material as it comes from the mill is fed to the machine, and the air blast regulated so as to blow out the material of the required degree of fineness, while the coarse particles are returned to the mill for re-grinding. The grinding efficiency of any mill is greatly increased by the use of a separator, as it takes the material from the mill as fast as it is ground and removes the finished product, thus saving the mill from doing unnecessary work on finished material.*

Separator, Osborne Pneumatic Blast. The pulverized material being fed to the machine falls upon a rotating disc which scatters the material into the air blast. The area of the machine and the strength of the air blast are regulated so as to carry off only the material of the required degree of fineness, while the coarse material drops out at the bottom of the separator to be returned to the mill for re-grinding. The fine material is blown into the dust collector and there separated from the air. The dust passes out through the bottom of the collector, while the air returns to the fan to be used over again. This forms a closed circuit, and by using the same air over and over, prevents the escape of any dust. The volume of air used remains practically constant, no matter what grade of material is being separated, which insures large capacities even on very fine materials. These separators will deliver from 3½ to 10 tons per hour of finished product that will screen 95% 100 mesh fine. Material can be separated up to 200 mesh fine.
—Griscom-Spencer Co., New York.

SEPARATOR, VACUUM. *An apparatus for separating pulverized materials by means of an air current working on an exhaust or vacuum. The pulverized material from the mill or grinder is fed to the machine and the air current is regulated to suck out the material of the required degree of fineness, and allow the coarse particles to return to the mill for re-grinding. Vacuum separators use the same medium as blast separators for effecting the separation, namely air, but they operate on a directly opposite principle.*

Separator, Osborne Vacuum. In this machine the material falls on a revolving disc which scatters it and allows it to roll down the surface of a deflecting cone. As the material slides over the edge of this cone it is caught up by the suction of the air, and the finer particles drawn through the fan and discharged into the dust collector, while the heavier particles fall to the bottom of the machine

to be returned to the mill for re-grinding. This type of machine is adapted for attaching to high speed mills, thereby forming a suction in the mill and relieving same of its excess of air, and thus preventing the escape of the dust which is so often a source of annoyance in the grinding room. It will separate material to any degree of fineness desired up to 200 mesh fine.
—Griscom-Spencer Co., New York.

SEMISTEEL CASTINGS. See Castings, Semisteel.

SEPARATORS, MAGNETIC. See Magnetic Separators.

SEPARATOR. Air separation, for grinding mills. See Crushing and Grinding, Raymond Mill, and Stroud Mill.

SHELLS, SEAMLESS STEEL, COLD DRAWN. See Tanks, seamless steel.

SIFTER, HUNTER'S LIGHTNING. Made in many sizes and forms for various use, either for hand or for power. Sieves interchangeable.
—J. H. Day Co., Cincinnati, Ohio.

SILICA BRICK. Of highest quality. The ganister rock used in W. Star, our East Chicago brand, comes from the Wisconsin deposits. W. Star in every way is a high-grade silica brick for open-hearth furnaces, glass furnaces, or for any purposes where the best silica brick are required. 20 standard shapes, other shapes made to order.
—Harbison-Walker Refractories Co., Pittsburgh, Pa.

SILICA CEMENT.
—Harbison-Walker Refractories Co., Pittsburgh, Pa.

SILICON. A metallic crystalline body of dark silver lustre. Compared with metals, it is quite brittle and has a hardness between 6 and 7. Specific gravity 2.34. Melting point 1,430°. Heat of oxidation 215,692. Silicon metal is made in three grades carrying 90%, 95% and 97% silicon respectively. The principal impurities are iron and aluminium. It carries about 0.20 carbon and is free from phosphorus and sulphur. Its principal use is in the refining of steel where it replaces the higher grades of ferro-silicon, being added directly to the ladle. It is a very powerful deoxidizing agent. Silicon is also used as a reducing agent in the manufacture of ferro alloys and is cast into rods for the manufacture of electrical resistances. Silicon is also used as a wireless detector.
—Carborundum Company, Niagara Falls, N. Y.

SILICON. Metallic Silicon.
—Electric Smelting & Aluminum Co., Lockport, N. Y.
—Roessler & Hasslacher Chemical Co., New York.

SILICON. See also Ferrosilicon.

SILICON-CALCIUM-ALUMINIUM. Our alloy contains 47 to 57% silicon, 15 to 25% calcium, 2½ to 6½% aluminium, and is of value both as a deoxidizing agent and for the desulphurization of iron and steel mixtures.
—C. W. LEAVITT & Co., NEW YORK.

SILICO-CHROMIUM. Our alloy contains 10% silicon, 50% chromium, 4% carbon, for use in the manufacture of high-speed steels, etc.
—C. W. LEAVITT & Co., NEW YORK.

SILICO-COPPER. 10%, 15% and 25% silicon. Used principally as a flux or deoxidizer for making pure copper castings. Its action is more vigorous and pronounced than phosphorus. Produces solid castings of copper and tin bronze, free from blowholes.
—ELECTRIC SMELTING & ALUMINUM CO., LOCKPORT, N. Y.

SILICON-COPPER. For brass foundries.
—C. W. LEAVITT & Co., NEW YORK.

SILICON-COPPER.
—GEO. G. BLACKWELL, SONS & Co., LIVERPOOL, ENGLAND.

SILICON-COPPER alloy for copper and brass foundries.
—E. J. LAVINO & Co., PHILADELPHIA, PA.

SILICO-MANGANESE. An alloy of silicon, manganese, and iron. A product of the electric furnace, from the direct smelting of a highly silicious manganese ore. A powerful deoxidant and remover of occluded gases and oxides from steel. Used in the open-hearth acid or basis process and in the basic Bessemer process. Economical in use, since the silicon protects the manganese from oxidation, and the loss of the latter is, therefore, much less than when ferro-manganese only is used. It permits the addition of silicon and manganese to steel in one operation, in smaller bulk, and with less iron than when ferro-silicon and ferro-manganese are both added. Practically free from carbon, 70 to 75% manganese with 20 to 25% silicon. Also 50 to 55% manganese with 20 to 25% silicon.
—ROBERTS, EVANS & WOODHEAD, LIVERPOOL, ENGLAND.

SILICO-MANGANESE-ALUMINUM. A very valuable deoxidizing agent for iron and steel work in the armor plate work and steel of that nature.
—C. W. LEAVITT & Co., NEW YORK.

SILICO SPIEGEL, SILICO MANGANESE AND SPIEGELEISEN.
—C. W. LEAVITT & Co., NEW YORK.

SILVER-BRONZE. An alloy containing about 18% of manganese, having four times the electrical resistance of German Silver.
—ELECTRIC SMELTING & ALUMINUM CO., LOCKPORT, N. Y.

SILVERITE ANODES. See Anodes, Silverite.

SINGEING FURNACES. For cotton goods, single or multiple plates. In use throughout United States.
—W. S. Rockwell Company, New York.

SINKS. Of acid-proof stoneware, for laboratories, hospitals, physical and bacteriological institutions in various sizes and styles.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

SMELTING FURNACES. Blast furnaces for smelting copper lead, silver, and gold ores. We were pioneers in the building of such furnaces and have made this a specialty for many years. Our designs will meet the most exacting requirements. See catalog.
—Colorado Iron Works Co., Denver, Colo.

SMELTING FURNACES. For copper, lead, etc., ores of most improved design.
—Allis-Chalmers Co., Milwaukee, Wis.

SMELTING FURNACE, CATTON. " Gives a concentration equal to that obtained in blast-furnace practice. The cost of fuel per ton of ore smelted will not exceed 35% of blast furnace cost. The separation made is at least equal to that made in any blast or reverberatory furnace. A charge resulting in a 50% silica slag can be maintained without danger of freezing. No flue dust is made during the smelting operation, and the loss by volatilization is practically nil."
—State Mining and Smelting Co., Seattle, Wash.

SMOKE CONSUMER. *An apparatus in which the gases from furnaces, etc., are passed through the machine for the purpose of removing the solid matter contained in them, and for purifying the gases as much as possible. Largely used for power plants and chemical works for collecting solid matter contained in the gases.*

Smoke Consumer, Osborne. Will remove the gases from any type of furnace etc., and by means of the water sprays in the machine will collect practically all of the solid matter contained in them, while the soluble gases will be reduced to solution, thereby allowing the gases escaping into the atmosphere to be practically free from all impurities. This type of machine may also be used for the collection of very fine dust in cases where the regular type of dust collector will not collect a sufficiently large percentage of the material.
—Griscom-Spencer Co., New York.

Smoke Consumer. See also " Dust Collector." " Gas Washer."

SOAP MACHINERY, Dopp. A complete line of soap machinery. Kettles for boiling and saponifying, crutchers, tanks, soap frames, soap and lye pumps, chippers, cutting tables, slabbers, soap presses,

soap grinders, and whatever else is required for the manufacture of toilet soap, laundry soap, textile soap and sand soap. Prepared to supply designs and estimates for complete plants.
—H. W. Dopp Co., Buffalo, N. Y.

SOAPS, BURNISHING. Special soaps used in tumbling barrels for polishing up metal work, such as brass, nickel-plated work, etc., mechanically instead of treating each piece separately on a wheel. They are only applicable to small work and to only such forms that would roll over in tumbling barrels, exposing new edges and new surfaces to one another.
—International Chemical Co., Camden, N. J.

SODA ASH.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

SODIUM. Metallic. Produced by electrolysis.
—Roessler & Hasslacher Chemical Co., New York.

SODIUM NITRATE.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

SODIUM PEROXIDE. See Oxone.

SOFT-METAL FURNACES. Lead, tin, babbitt, and other pot melting. For every purpose. All styles and sizes.
—W. S. Rockwell Company, New York.

SOLUTION MACHINE, RUBBER. Built in sizes of 20 and 50 gallons, capacity. The machine is chiefly used for dissolving India rubber, and is for this purpose equipped with two speeds, fast and slow as well as with air-tight cover so as to prevent loss of solvent. The bearings of the agitators are provided with stuffing boxes, which can be easily attended to.
—Werner & Pfleiderer, Saginaw, Mich.

SPITZKASTEN.
—Colorado Iron Works Co., Denver, Colo.

SPRAY NOZZLES. For injecting water in chambers of sulphuric acid plants, absorbing gases, cooling gases, collecting dust, atomizing liquids, ventilating, re-cooling water, spraying oil on wood, suppressing suds on paper machines, humidifying cement and fire-clay, washing crude oil in refineries, atomizing liquid lead. The Koerting centrifugal spray nozzles are made of iron, brass, glass, lead, platinum, hard rubber, etc. Manufacturers catalogs 6-A, B & C gives detailed illustrated description of these spray nozzles and their various applications.
—Schutte & Koerting Co., Philadelphia.

SPRINGS, RUBBER. Springs of any shape and size, of various consistencies of stock, which are adapted for use in connection with all purposes for which rubber springs are employed.
—Boston Belting Company, Boston.

STEAM ENGINEERING SPECIALTIES.
—Schutte & Koerting Co., Philadelphia, Pa.

STEAM SHOVELS.
—Allis-Chalmers Co., Milwaukee, Wis.

STEAM TURBINES. See Turbines, Steam.

STEEL CASTINGS BY THE THERMIT PROCESS. In foundries where it is of importance to occasionally make a steel casting in a hurry, the thermit process offers a ready means of doing so by burning down the necessary quantity of thermit with an admixture of steel punchings. This, when ignited in the crucible, can be readily poured into molds of properly refractory material.
—Goldschmidt Thermit Co., New York.

STEEL CASTINGS. Special for chemical works. See castings, Chemical.

STEEL, SPECIAL. For experimental purposes, steel of any grade can be made by means of the thermit reaction, which develops sufficient heat to thoroughly melt up small portions of even the most highly refractory metals. The thermit steel being practically free from carbon, can be changed to high carbon steel by the addition of cast iron shot and offers a ready means of experiments on a small scale. Thermit can be obtained in 50 and 100 lb. drums.
—Goldschmidt Thermit Co., New York.

STEEL FURNACES. See Furnace, Electric Steel.

STILLS. With flanged rim or socket rim, all made of acid-proof stoneware, in various sizes and shapes.
—Didier-March Company, New York.

Stills. Of stoneware, or made of cast iron coated with acid proof enamel.
—J. W. Sittig, New York.

Stills. In various sizes. Made of best vitrified stoneware, guaranteed proof against action of nitric, muriatic and sulphuric acids, chlorine etc. For use in distillation of corrosive compounds.
—Charles Graham Chemical Pottery Works, Brooklyn, N. Y.
(Other stoneware makers see Stoneware.)

STILLS. In all sizes. Portable stills for laboratory and experimental work. Stills, without or with mixers, for large-scale industrial work. Catalog 216.
—Stuart & Peterson Co., Burlington, N. J.

STILLS. Copper or iron. With surface or worm condensers all sizes from 5 gallons upward.
—F. J. STOKES MACHINE CO., PHILADELPHIA, PA.

STILLS. Manufactured in all sizes and capacities for manufacture and recovery of alcohol and solvents of all descriptions. Made from copper, brass, cast iron, steel plate, etc., to suit service required and designed for economical and convenient operation. Lead and block-tin lined if desired.
—BAEUERLE & MORRIS, PHILADELPHIA, PA.

STILL, WATER. An automatically-fed steam-heated water still in sizes having a capacity from 5 to 100 gallons an hour. By a patented construction ammonia is largely liberated from the water before it is fed to the still, which insures a pure ammonia free distillate. As the raw water is heated in condensing the distilled water, little extra steam is required. The cost of producing one gallon of distilled water is one eighth of a cent.
—F. J. STOKES MACHINE CO., PHILADELPHIA, PA.

STILLS FOR WATER. Multiple effect for economically producing pure water for industrial or drinking purposes, or for manufacture of ice. No treatment necessary. Work done with exhaust steam. Tubular heating surface with water inside of tubes. Scale deposits can be readily removed in large apparatus without stopping operations.
—ZAREMBA COMPANY, CHICAGO, ILL.

STILL, WATER. Sargent's Automatic. A well-balanced apparatus for the continuous production of distilled water for laboratory or domestic use where a high degree of purity is desired at a minimum cost. Made in two sizes to produce ½ and 1 gallon per hour. Equipped with gas or gasoline burners or with steam coil. Also automatic stills heated by steam only having capacities of 5 gallons per hour up to any capacity required.
—E. H. SARGENT & CO., CHICAGO.

STILL. WATER. Distilled water apparatus of all sizes and capacities for laboratory and industrial uses. Apparatus to operate under a vacuum with a minimum amount of steam, made from steel plate, sheet copper tinned or block tin.
—BAEUERLE & MORRIS, PHILADELPHIA.

STILLS. For laboratories. See second part of this Dictionary, devoted to Measuring Instruments and Laboratory Supply.

STIRRERS. In melting copper, brass, aluminium, tin, zinc, etc., rods and bars containing graphite have always been used as stirrers. Acheson graphite rods and bars can readily be machined to fit any holder, contain no clay or other bond to contaminate the metal,

and, being a pure form of carbon throughout (99%) reduce oxides present in the bath with evident beneficial results.
—International Acheson Graphite Co., Niagara Falls, N. Y.

STIRRING APPARATUS OF STONE-WARE. Supplied in any shape or size; according to the consistency of the material to be handled, the stirrers are either made paddle or screw shaped; can also be furnished of enameled cast iron.
—J. W. Sittig, New York.
(Other stoneware makers see Stoneware.)

STIRRING LIQUIDS. See Agitation.

STONEWARE, CHEMICAL. See the different apparatus made from stoneware for the chemical industries.
—Didier-March Co., New York.
—Charles Graham Chemical Pottery Works, Brooklyn, N. Y.
—J. W. Sittig, New York.
—U. S. Stoneware Co., Akron, Ohio.
—A. J. Weeks, Akron, Ohio.
(See also Earthenware, Porcelain.)

STORAGE AND BOILING VESSELS. With iron mantle, holding up to about 5000 gallons made of stone-ware segments, tightly ground together and enclosed in an iron jacket, the space between the stone-ware being cast out with cement; practically indestructible.
—J. W. Sittig, New York.

Storage Vessels. Of stone-ware, in conical or cylindrical form, holding up to 800 gallons.
—J. W. Sittig, New York.

STORAGE POTS. For laboratories, made of acid-proof stoneware, with lids and inscription as may be desired for laboratories and drug stores.
—Didier-March Co., New York.

STORAGE TANKS. Graham chemical stoneware tanks, cylindrical or square, provide best means for holding acids, alkalies, chlorinated liquids etc. in any strength. All sizes made up to order, with inlets, outlets etc. according to customers' requirements. Guaranteed to be chemical proof.
—Charles Graham Chemical Pottery Works, Brooklyn, N. Y.

Storage Tanks. Of chemical stoneware made either straight or of conical or oval shape. To be perfect for the use of storing acids they should be made of a proper combination of clay and glazed with the best acid-proof glazing. A heavy projecting rim is required to insure strength to the top of the pot.
—U. S. Stoneware Co., Akron, Ohio.
(Other stoneware makers see Stoneware.)

STROUD MILL. See Crushing and Grinding, Stroud Mill.

SUBLIMING DISHES. For iodine etc., made of acid-proof stoneware, in various shapes and sizes, covers ground on to a tight fit.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

SUCTION FILTERS, STONEWARE. In all sizes with perforated diaphragm, for quick filtration. Of best chemical stoneware, guaranteed proof against muriatic, nitric and sulphuric acids, chlorine, etc., etc.
—Charles Graham Chemical Pottery Works, Brooklyn, N. Y.
(Other stoneware makers see Stoneware.)

SUGAR MACHINERY.
—Allis-Chalmers Co., Milwaukee, Wis.

SULPHIDE OF IRON.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

SULPHUR. Used in the chemical industries, in the manufacture of sulphuric acid; it also enters into a multitudinous number of acids of which sulphuric is a component part. Used in the manufacture of sulphurous acid for use in the pulp mills; the manufacture of gun powder and other explosives; is employed as a fumigant; as a fungicide and germicide to plant life; for fertilizer material; as a component part of the material used for ignition purposes in fuses and matches; for bleaching various materials—cotton goods, grain, etc. Sulphur is also one of the chief ingredients in sheep-dip. The refined grades enter largely into the manufacture of different drugs; crude also used in the preparation of colors and the refining of oil. Malt companies also use sulphur in their process, and it is also employed in evaporating apples. As a preservative it is also used by beef packers and others. Glue companies and photographic film concerns also use sulphur in the preparation of their commodities. In metallurgy, sulphur is employed in certain processes of smelting and precipitating metal; in connection with the production of steel rails of certain specific hardness; also for putting a clean face on steel, and for the bedding of heavy machinery. In the electric industry, sulphur is employed in the manufacture of storage batteries and the preparation of rubber for installation purposes.
—Union Sulphur Company, New York.

SULPHUR FURNACE. For sectional view see manufacturers' catalog 7-S. Advantages: Simple manipulation to escape of sulphurous acid fumes, continuous working, to which work burning sulphur is visible from outside. Easy Cleaning. Greatest efficiency of at least 95% of burned sulphur arranged for suction as well as compressed air. Sulphur is fed to the pans by means of hoppers, holding sufficient quantity for a number of hours' run. Holes are

provided on outside to light sulphur by means of a red hot iron rod. Combustion air is carried to the sulphur heated and in the right proportion.
—Schutte & Koerting Co., Philadelphia, Pa.

SULPHUR FURNACES.
—H. G. Trout Co., Buffalo, N. Y.

SULPHUROUS ACID. See Sulphur; Cooler, Lead.

SWITCHBOARDS. The General Electric Co. has designed a complete line of standard switchboards for every class of service and is also prepared to fill promptly and satisfactorily specifications of a special nature. The instruments, meters and appliances furnished with these switchboards represent the latest and best engineering practice. Standard lines of lever switches, toggle brush switches, oil switches, circuit-breakers, etc., have been perfected for all voltages and ampere capacities, ranging from 1 to 10,000 amps. and 1 to 110,000 volts.
—General Electric Co., Schenectady, N. Y.

SYPHONS. Of acid-proof stoneware, in various styles and shapes, for large and small vessels.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

SYPHON. See Acid-syphon,

TANKS, ACID-PROOFED CEMENT. Concrete or cement tanks of any size or shape are acid-proofed by saturating them with sulphur. Write for licenses.
—Anson G. Betts, Troy, N. Y.

TANKS. Of steel. Of all kinds used in cyanide work, including lead-lined tanks for acid treatment. Special fittings and attachments for cyanide process.
—Colorado Iron Works Co., Denver, Colo.

TANKS, SEAMLESS STEEL. COLD DRAWN. Specially adapted to retain air, gas, steam, water, oils, fluids, etc., under pressure for lighting systems, fire extinguishers and air brake reservoirs oxygen gas, hydrogen gas, calcium light, gasoline, acetylene gas and chemical tanks, automobile tanks, fuel oil burner tanks, heater tanks, expansion and anti-expansion tanks, filter tanks, gas and gasoline engine tanks, nebulizer, vaporizer and atomizer tanks, and for any purpose, where a light, strong, durable, and well made tank is wanted. Spuds are tapped to suit requirements and can be placed at any point on the tank. Tanks and cylinders are made for any hydraulic pressure test from 150 to 1200 pounds per square inch, the thickness of material in the finished product varying according to the test required. All pieces are thoroughly coated inside and out (tinned

or galvanized) to suit requirements. The general requirements call for 300 pounds hydraulic test. In all diameters 6″-7″-8″-9″-10″-12″-14″-16″-18″-20″. and in any length up to ten feet.
—Janney, Steinmetz & Co., Philadelphia.

TANKS. Open or closed tanks, receptacles and boilers, etc., made of sheet metal of all kinds best suited for desired service. If desired seams can be welded, thus avoiding rivet heads and hard or soft solder which for some purposes is not desirable. Tanks can be furnished with block-tin or lead lining.
—Baeuerle & Morris, Philadelphia, Pa.

TANKS. For solutions. All kinds, wood, cast iron, steel and earthenware. Especially for electroplaters.
—Hanson & Van Winkle Company, Newark, N. J.

TANKS. Of hard rubber.
—American Hard Rubber Co., New York.

TANKS. For all chemical and metallurgical purposes.
—F. J. Stokes Machinery Co., Philadelphia, Pa.

TANKS and special chemical stoneware apparatus of every description made from selected vitreous clays according to sketches or blue-prints. More than 25 years' experience in manufacturing clay prodcuts.
—A. J. Weeks, Akron, Ohio.

TANKS, SQUARE. Of best alkali, acid temperature-resisting material, used for refining and plating purposes, made up in any sizes as far as their construction in stone-ware is practicable; very favorably known throughout the country. Are also made of cast-iron coated with acid-proof enamel.
—J. W. Sittig, New York.

TANKS. Of acid-proof stoneware, of all sizes and capacities, with and without outlets.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

TANKS, OIL STORAGE. Cylindrical style ready for transportation in capacities of 500 to 15,000 gallons. Manhole and all flanges for pipe connections. Blueprint of setting and Catalog 3.
—W. S. Rockwell Company, New York.

TANKS. See also Kettles.

TEMPERING FURNACE. Stationary types. For all classes of work, either by direct heat or by lead, sand or oil bath. All sizes.
—W. S. Rockwell Company, New York.

TEMPERING FURNACES. Rotary types. See Hardening Furnaces.
—W. S. ROCKWELL COMPANY, NEW YORK.

TEMPERING FURNACE ELECTRIC. See Furnace, Electric, Hardening and Annealing Steel.

TESTING OF ORES. We have probably the largest and most complete ore testing plant in existence, and are prepared to conduct milling tests on ores by all modern processes.
—COLORADO IRON WORKS CO., DENVER, COLO.

TESTING OF REFRACTORIES. We maintain a complete physical and chemical laboratory and testing department and are prepared to make complete tests and analyses of all refractories employed in the constructions of metallurgical, electrical and chemical works furnaces. Submit us samples of your slags with full information and particulars governing your furnace conditions and we will make analysis and go into detail from the engineering as well as chemical standpoint.
—LACLEDE-CHRISTY CLAY PRODUCTS CO., ST. LOUIS, MO.

THERMIT. The trade name given to the mixture of iron oxide and finely divided aluminum used in the applications of aluminothermics, which see. When ignited by means of ignition powder in one spot, the reaction between the two ingredients spreads throughout the mass without supply of heat or power from outside. The aluminium combines with the oxygen of the iron oxide to aluminium oxide Al_2O_3—a slag, which floats on the top and occupies three-fourths of the volume of the superheated liquid mass. During the formation of this aluminium-oxide the iron is set free, and, being the heavier, sinks to the bottom of the containing vessel. Its weight equals that of the slag and is half the weight of the quantity of thermit ignited. Its volume, however, is only one-third of that of the slag. The reaction must take place in suitable vessels, namely, magnesia-lined crucibles. (See " Welding Outfit—Thermit.")
—GOLDSCHMIDT THERMIT CO., NEW YORK.

THERMIT STEEL RESULTING FROM THE THERMIT REACTION. Is a pure mild steel of about the following average analysis:

Carbon	0.05 to 0.10
Manganese	0.08 " 0.10
Silicon	0.09 " 0.20
Sulphur	0.03 " 0.04
Phosphorus	0.04 " 0.05
Aluminum	0.07 " 0.18

Its weight is half of that of the quantity of thermit ignited in order to produce it. (See " Thermit.")
—GOLDSCHMIDT THERMIT CO., NEW YORK.

TIMBER PRESERVING MACHINERY.
—Allis-Chalmers Co., Milwaukee, Wis.

TIN-LINED iron pipe. See Pipe.

TINNING FURNACES. For wire, tubing or sheets. All styles and sizes.
—W. S. Rockwell Company, New York.

TITANIUM.
—Roessler & Hasslacher Chemical Co., New York.

TORCH, OXY-ACETYLENE. See Welding, Oxy-acetylene and Cutting, Oxy-acetylene.

TOURILLS. Receivers, made of acid-proof stoneware with 2 or 3 sockets in various sizes and shapes.
—Didier-March Company, New York.

Tourills, System Cellarius. Made of acid-proof stoneware, for cooling and absorption apparatus. These tourills are very efficient owing to the large cooling surface. The absorbing liquid travels twice the length of the tourill. Especially well suited for hydrochloric acid plants. By efficient cooling an acid of 24% Be. can be obtained and the capacity increased.
—Didier-March Company, New York.

Tourills, Vacuum. Made of acid-proof stoneware in various capacities. These tourills are tested to stand a vacuum of 26 inches.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

TOWER FILLINGS. Every description of tower packings, made from best chemical proof stoneware. Rings, tubes, pans, Guttmann balls, etc.
—Charles Graham Chemical Pottery Works, Brooklyn, N. Y.

Tower Filling. Consisting of partition pipes, plates, cups, balls, etc., all made of acid-proof stoneware, offering large surface for cooling and absorption.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

Tower Filling. Vitrified chemical rings for packing acid worms.
—Laclede-Christy Clay Products Co., St. Louis, Mo.

TOWNSEND CELL. See Cells, Electrolytic.

TRANSFORMERS. General Electric transformers in all sizes, ranging from the small 6-kw. lighting transformers up to 10,000-kw. units for use on high-tension transmission lines. Voltages range from standard lighting potentials up to high potentials of 500,000

volts for testing purposes. Transformers are either oil-cooled, air blast, or water-cooled. In units of small capacity, or of moderate capacity where minimum attendance is essential, the first type is preferable. Transformers of this type are of 500-kw. capacity or less. For large units either air-blast or water-cooled types are used, selection depending upon line voltage and local conditions. Transformers with low-voltage high-current secondaries are specially wound for electric furnace work.
—General Electric Co., Schenectady, N. Y.

TRANSFORMERS. Alternating-current Electric.
—Allis-Chalmers Co., Milwaukee, Wis.
—General Electric Co., Schenectady, N. Y.

TRANSPORT VESSELS OF STONE-WARE. Also adaptable for storing large quantities of acids, made up to hold about 800 gallons of liquids.
—J. W. Sittig, New York.

TUBE MILL. See Crushing and Grinding.

TUBING, RUBBER. We make a specialty of rubber tubing either pure or with cloth insertion, for conducting acids, chemicals, etc. under different pressures. When the use is stated we can supply tubing that will fully answer all requirements.
—Boston Belting Company, Boston.

TUBING, RUBBER. Brands Granite Shawmut Harlem. Cloth insertion tubing. For acids, etc.
—Revere Rubber Co., Boston, Mass.

TUNGSTATE OF SODA.
—Primos Chemical Co., Primos, Pa.

TUNGSTEN. Metallic. Low carbon.
—Primos Chemical Co., Primos, Del. Co., Pa.
—York Metal & Alloy Co., York, Pa.

TUNGSTEN. In powder metal. 99%, free from carbon. "Ruthlock" brand.
—Marcus Ruthenburg, London.

TUNGSTEN. Running uniformly 96–98% in pure tungsten, with carbon of a low percentage (0.2% and lower). This metal is absolutely free from any injurious elements effecting high-grade steel. Also tungstic acid, tungstate of soda, calcium tungstate of highest quality.
—Minerals Products Manufacturing Co., Wilmington, Del.

TUNGSTEN. Powder 98% pure. (Very low in carbon.)
—Roessler & Hasslacher Chemical Co., New York.

TUNGSTEN. Metallic, 96 to 99% pure.
—Geo. G. Blackwell, Sons & Co., Ltd., Liverpool, England.

TUNGSTEN. See also Ferro-tungsten and Scheelite.

TUNGSTIC ACID.
—Primos Chemical Co., Primos, Del. Co., Pa.
—York Metal & Alloy Co., York, Pa.

TURBINES, HYDRAULIC. Built to special design to meet any and all conditions. Sole American builders of the Escher Wyss & Co's. turbine.
—Allis-Chalmers Co. Milwaukee, Wis.

TURBINES, STEAM. Allis-Chalmers.
—Allis-Chalmers Co., Milwaukee, Wis.

TURBINES, STEAM. The General Electric Curtis steam turbine is the most efficient and satisfactory prime mover on the market and especially adapted for power service. Its advantages are: high steam economy at all loads; small space per kilowatt capacity; uniform angular velocity; simplicity in operation and low expense for attendance; freedom from vibration; adapted to high steam pressures, high super-heat and high vacuum; condensed water is free from oil and may be returned to the boilers; self contained and automatic. Special turbines are built for operation with exhaust steam from reciprocating non-condensing engines; built in sizes from 15 to 14,000 kws.
—General Electric Co., Schenectady, N. Y.

UNIVERSAL KNEADING AND MIXING MACHINE. See Kneading.

UNIVERSAL PAPER PULPING MACHINE. See Paper Pulping.

VACUUM VESSELS OF STONE-WARE. Capable of withstanding as much as 730-740 mm. of mercury.
—J. W. Sittig, New York.

VACUUM APPARATUS. For boiling and distilling, made of acid-proof stoneware, either in one piece or two pieces, in various capacities and shapes.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

VACUUM. See Exhausters, and Compressors.

VACUUM DRYERS. See Dryers.

VACUUM EVAPORATORS. See Evaporators and Pans.

VACUUM PANS. See Pans and Evaporators.

VALVE. Lead-lined iron valve, in form of a Y. The washer can be hard lead, asbestos or rubber. The valve can be made either flanged or screwed. All the interior parts are thoroughly protected with lead. The washer can be removed at any time, and a new one substituted at a very slight expense. They are all made outside screw and yoke, and the lead lining extends up into the stuffing box. There is no possible chance for acids or corrosive liquors to get at the iron.
—Lead-Lined Iron Pipe Co., Wakefield, Mass.

VALVE, LEAD-LINED CHECK VALVE. The Schutte Lead Lined Check Valve, as its name implies, is a check to be used in lead pipe lines for handling acids. Every inside part is completely lined with hard leads. The disc is an earthenware ball which closes against a reinforced seat turned in the hard lead. This ball is guided by ribs in body. The valve is flanged body; the inlet being offset and above the outlet. The lead projects over face of flanges and turned for smooth joint.
—Schutte & Koerting Co., Philadelphia, Pa.

VALVE, LEAD LINED STOP VALVE. Made for handling acids, etc.; has a brass casing lined with hard lead on every inside part which comes in contact with the liquid. It is made in the angle form for convenience of moulding. The lead seat is cone faced and reinforced at this point in body, while the lead disc is strengthened by a flattened knob on bottom of hard bronze stem. The lead surrounds this stem entirely to outside of lead lined stuffing box. The spindle is prevented from turning by a crosshead guided in yoke, while the nut and hand wheel only revolves. The valve is flanged, the lead projecting over faces and turned for smooth joint. This valve makes a positive shut-off and has wearing and lasting qualities.
—Schutte & Koerting Co., Philadelphia, Pa.

VALVES, RUBBER. We supply all shapes and sizes of rubber valves for all temperatures and pressures, and for use in connection with air, acids, alkalies, water, chemicals, oil, etc.
—Boston Belting Company, Boston.

VALVES, RUBBER. For mining and blower engines, acid, ammonia, boiler feed and other pumps. Valves to meet the requirements of each case. Among our specialties are valves for the belt sugar industry, mine pumps (for all conditions of water), marine pumps, Bessemer blowing engines, boiler feed pumps (high temperatures), pumps of water works, etc.
—Revere Rubber Co., Boston, Mass.

VALVES, SAFETY. Of acid-proof stoneware, for Montejus or Autoclaves.
—Didier-March Company, New York.
(Other stoneware makers see Stoneware.)

VANADATE OF IRON. Containing 60% vanadic acid.
—Vanadium Alloys Co., New York.

VANADIUM-COPPER. For brass foundries.
—C. W. Leavitt & Co., New York.

VAPOR CONDENSERS. The Koerting "obnoxious vapor condenser" absorbs fumes and bad-smelling vapors in water. The vapor condenser proper, operated by water pressure, sucks in the vapors and gases from dryer, etc., and partly absorbs them, and then discharges into tank where they receive a further treatment of water by means of Koerting centrifugal spray nozzles, arranged in this tank. The draft created by the vapor condenser proper forces the unabsorbed vapors and gases up a stack, where they are finally absorbed by several sprays of water from Koerting spray nozzles, and the water drains back to tank and discharges at bottom to sewer. In cases where the vapor contains gases which are objectionable and cannot be absorbed by water, we install an arrangement in connection with our Koerting vapor condenser whereby certain chemicals are sprayed through a spray nozzle installed in up-take or stack.
—Schutte & Koerting Co., Philadelphia, Pa.

VAPOR CONDENSER. See also "Dust Collector," "Gas Washer," "Smoke Consumer."

VAUGHN QUARTZ MILL. See Crushing and Grinding.

VENTILATORS. Fans. For all purposes.
—Allis-Chalmers Co., Milwaukee, Wis.

VENTILATOR. See Blast nozzle; Blowers.

WASHERS. Washers, bushings, discs, and other small carbon articles formerly made in moulds, can frequently be far more economically produced by machining from solid Acheson graphite rods. High electrical conductivity, purity (99%), smoothness, lubricating properties, resistance to oxidation and disintegration, and non-arcing properties are important considerations in this connection.
—International Acheson Graphite Co., Niagara Falls, N. Y.

WATER. See Stills.

WELDING. *To weld is to unite without the use of solder.*

Welding—Thermit. (1) The fracture is opened out by drilling a line of holes through the section of the metal to be repaired. A matrix of wax is then formed over the break, of the exact shape that the thermit steel collar which is fused into the casting is to take later. Over this wax matrix is made a mold of refractory material, in a sheet iron box, a preheating gate, pouring gate, and large riser being provided. When the mold is made, a gasoline torch, under

compressed air pressure of some 30 lbs., is directed through the preheating hole. It melts out the wax, dries out the mold and brings the metal at the break to a bright red heat. While the preheating is going on, a crucible containing the necessary charge of thermit with the admixture of punchings and manganese, is suspended over the gate. When the necessary temperature is reached, the gasoline torch is withdrawn, the preheating hole plugged with a sand core held in readiness and the charge in the crucible ignited without loss of time. The ignition of the thermit starts the reaction between the aluminium particles and the iron oxide and the superheated liquid steel produced thereby is run into the mold by tapping the crucible from the bottom. The superheated liquid steel running into the mold melts the ends of the casting and fuses with them, and in cooling forms one homogeneous mass. The metal not only fuses together the two ends of the fracture, but forms a steel collar, which is absolutely amalgamated with the casting and strongly reinforces it. (2) Another method applicable to the welding of pipes and rods is the following: The pieces to be welded are accurately butted together and held in specially constructed clamps. They are not preheated. A cast iron mold is placed around the joint to be welded. The thermit is ignited in a flat-bottom crucible, in which, after completed reaction, the slag floats on top and the superheated liquid steel at the bottom. This superheated mass is poured rapidly over the lip of the crucible, so that the slag will flow first into the mold and form a thin, but highly refractory layer on the walls of the cast iron mold and on the surface of the pieces to be joined. The thermit steel which follows simply lies between two layers of slag. This mass, held in the mold, brings the ends of the pipes or rods to welding temperature. The clamps are then further tightened and the weld is complete.
—Goldschmidt Thermit Co., New York.

Welding Outfit—Thermit. (A) This consists of a crucible supplied in ten different sizes, with a capacity of from 4 to 400 lbs. and a shipping weight of from 40 to 720 lbs., made of sheet iron and lined with magnesia tar. The crucible is supported in a wrought-iron ring, to which are attached three wrought-iron legs. Larger sized crucibles are usually slung in chains. To close the orifice at the bottom, so-called " plugging material " is provided, including a pin, which, when driven up from below, releases the charge in the crucible. To preheat the casting and dry out the mold, a gasoline preheater, operated with compressed air, is necessary. With about 20 to 30 lbs. of pressure, this gasoline preheater is capable of bringing the heaviest sections, like 8 x 10, to a bright red heat in three or four hours. For tapping-spade, a piece of gas pipe, flattened out at the end, can be used. These appliances form the entire equipment. The superheated liquid steel, which, by fusion, makes the weld, is produced through the ignition of the Thermit Powder, which is shipped in 50 or 100 lb. drums. In order to start the reaction, Ignition Powder is required, the usual proportion being about 1 lb. of Ignition Powder to about 50 reactions. Admixtures which

are advisable in operating the process are metallic Manganese and steel punchings.

(B) The pipe welding outfit consists of a cast-iron mold, flat-bottom crucibles of four different sizes, tongs to hold the crucibles, clamps to draw the pipe ends together (which may be loaned by the Goldschmidt Thermit Co., if desired) and the necessary welding portions, accurately measured off for any size and weight of pipe up to 4".
—GOLDSCHMIDT THERMIT CO., NEW YORK.

Welding Solid Iron & Steel Sections by the Thermit Process. The Thermit Process is the only one which under all circumstances can take its equipment to the job. It can weld sternposts of vessels in drydock, rails in paved streets, locomotives on the engine, without dismantling; crank shafts of any diameter; broken bosses of rolls; arms of the largest dredge buckets, in the field; gear wheels. We also undertake work by contract, under guarantee. For description of operation see " Welding—Thermit."
—GOLDSCHMIDT THERMIT CO., NEW YORK.

Welding—Oxy-Acetylene. Oxy-acetylene welding apparatus, designed by experts having extensive foreign experience, to meet every welding requirement. A feature of this apparatus is its portability. As acetylene cylinders are used, no difficulty from an insurance standpoint is experienced, and there is no necessity of building expensive generator houses. The blow pipes are economical and will not flash back or overheat. The reducing valves are of types that have been used for a long time in other lines, but have been modified to meet the special requirements of oxy-acetylene welding. The company is also prepared to supply oxygen and acetylene generators but make a special feature of their portable plants.
—AMERICAN FERROFIX BRAZING CO., PHILADELPHIA, PA.

Welding Oxy-Acetylene. Cast iron, steel, aluminium, brass, copper and other metals, also welding cast iron to steel, brass and copper to either and to each other. Davis-Bournonville process. A temperature of 6300° F. is attained, under absolute control of the operator. With the Davis-Bournonville torch the acetylene and oxygen gases are most thoroughly mixed, which results in uniform welds, the metals operated upon being neither oxidized nor carbonized. In the tip the oxygen enters directly in line, the acetylene enters laterally through four holes, both uniting and discharging through one hole. The openings are accurately sized to secure proper mixture at a definite relation between the pressures of the two gases. Both gases are furnished to the flame under pressure, which means uniformity in flow. The Davis pressure generator maintains a maximum pressure of 15 lbs. per sq. inch of acetylene gas. The process permits strengthening of worn parts of metal (see Putting-on Tool.) With this process it is possible to build up teeth in broken gear wheels, fill blow holes in castings, weld broken frames, repair steam and water pipes in place, weld

aluminium automobile gear cases, automobile crank shafts, etc.
—Davis-Bournonville Co., New York.

Welding, Oxy-Acetylene. Oxygenite process (see Oxy-genite). "The Weld that held." Easy, effective, economical.
—Industrial Oxygen Co., New York.

Welding, Oxy-Acetylene. Also air-acetylene, and air-oxy-acetylene apparatus for manufacturing and laboratory purposes. Special burners made for any desired purpose. Acetylene generators of most approved type. About 3 lbs. constant air pressure required for any of the burners.
—Harris Calorific Co., Cleveland, Ohio.

Welding, Oxy-Acetylene. Low-pressure system with the Fouche injector blow-pipe. In the low-pressure system only the oxygen is required under pressure. The acetylene generator is entirely automatic, without any positive feed mechanism. No motive power of any kind is required to operate the plant.
—Linde Air Products Co., Buffalo, N. Y.

Welding, Oxy-Hydrogen. No. 28 oxy-hydrogen burner for lead burning is made of brass throughout. Provided with safety gauges to prevent striking back of flame. Has six jet tops with varying sized orifices and a wind shield to prevent blowing out of flame when in use out of doors.
—Buffalo Dental Mfg., Buffalo, N. Y.

WHEELS, WALRUS, BULL NECK AND SHEEPSKIN.
—Levett Mfg. Co., Matawan, N. J.

WIRES AND CABLES. All classes of magnet wires, insulated cables and National Electrical Code wires.
—General Electric Co., Schenectady, N. Y.

WIRES, OKONITE. "The standard for rubber insulation."
—Okonite Co., New York.

WOOD-PIPE. See Pipe.

ZINC AND ZINC DUST.
—Fuerst Bros. & Co., New York.

ZINC CHLORIDE.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

ZINC PLATING ON IRON. See Electrogalvanizing.

ZIRCONIUM.
—Roessler & Hasslacher Chemical Co., New York.

PART II.

Measuring Instruments and Laboratory Supplies.

ACIDS. "Baker's Analyzed Chemicals." Every label shows an analysis and our guarantee provides that the contents of each bottle will conform with that analysis.
—J. T. Baker Chemical Co., Phillipsburg, N. J.

ACIDS. Chemically pure. Hydrochloric, nitric, sulphuric acids. Full particulars and prices on request.
—Baker & Adamson Chemical Co., Easton, Pa.

AMMETERS, WESTON STANDARD. See Instruments, Weston Standard.
—Weston Electrical Instrument Co., Waverly Park, Newark, N. J.

ANALYTICAL APPARATUS AND CHEMICALS.
—Wm. Ainsworth & Sons, Denver, Colo.
—Baker & Adamson Chemical Co., Easton, Pa.
—J. T. Baker Chemical Co., Phillipsburg, N. J.
—Bausch & Lomb Optical Co., Rochester, N. Y.
—Buffalo Dental Mfg. Co., Buffalo, N. Y.
—Eimer & Amend, New York City.
—Geo. D. Feidt & Co., Philadelphia, Pa.
—Wm. Gaertner & Co., Chicago, Ill.
—Henry Heil Chemical Co., St. Louis, Mo.
—Hoskins Manufacturing Co., Detroit, Mich.
—International Instrument Co., Cambridge, Mass.
—Herman Kohlbusch, Sr., New York City.
—Merck & Co., New York City.
—Queen & Co., Philadelphia, Pa.
—Roessler & Hasslacher Chemical Co., New York City.
—E. H. Sargent & Co., Chicago, Ill.
—Scientific Materials Co., Pittsburgh, Pa.
—Arthur H. Thomas Co., Philadelphia, Pa.
—Voland & Sons, New Rochelle, N. Y.
—Wilson-Maeulen Co., New York City.

ANEMOMETERS. For measuring the velocity of air or gases, all kinds.
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ASSAY FURNACES. Our combined crucible and muffle furnace, which can be used for crucible fusions or muffle work at the will of the operator, is unexcelled for assaying and can be used with any kind or quality of gas. Temperatures of 2800° F. are readily obtainable.
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Assay Furnaces. A great many different types, for coal, gas (blast or draft), gasoline (blast), kerosene (blast).
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Assay Furnaces. Brown's and other types.
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Assay Furnaces. All kinds of furnaces for assaying and general laboratory work.
—Scientific Materials Co., Pittsburgh, Pa.

Assay Furnaces. Other dealers see under Laboratory Supplies.

ASSAY SUPPLIES. See Laboratory Supplies.

BACTERIOLOGICAL APPARATUS. See our full illustrated catalogs.
—Bausch & Lomb Optical Co., Rochester, N. Y.
—Eimer & Amend, New York City.
—E. H. Sargent & Co., Chicago, Ill.
—Scientific Materials Co., Pittsburgh, Pa.

BALANCES AND WEIGHTS. Ainsworth balances are beyond the experimental stage. For 25 years we have been perfecting them and the machinery for their manufacture. We now have an absolutely modern and up-to-date factory for the manufacture of fine balances. Annual output 1000 fine balances. Gold medal for fine balances and weights at St. Louis Exposition. Catalog A-4.
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BALANCES. Bausch & Lomb chemical balance, of high order of construction and accuracy and moderate price.
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BALANCES and weights. The analytical and assay balances of our own make have been entirely satisfactory to hundreds of buyers for some ten years past; while fully satisfactory, they are comparatively inexpensive. We also furnish balances of other makes, like Becker's, Troemner's, Satorius', G. Kern and Sohn, and others. Precision and ordinary balances for general laboratory work. 25

full pages in our Chemical Apparatus Catalog descriptive of our balances and weights, 85 different balances being listed there. The Williams improved Westphal balance for the rapid and accurate determination of the specific gravity of liquids and solids both soluble and insoluble in water, specially suitable for cement laboratories and for the mineralogist and prospector.
—EIMER & AMEND, NEW YORK.

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—WM. GAERTNER & CO., CHICAGO, ILL.

BALANCES and weights. We are the American agents for the balances made by Becker Fils & Co., Brussels. They are of superior workmanship, elegant finish, and greatest sensitiveness and accuracy. Our gold-plated analytical balance with aluminium short beam No. 300 has a capacity of 200 grams and is sensitive to 1/20 milligram. Gold-plated weights.
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BALANCES and weights. We manufacture fine balances and weights for every purpose where accuracy is required. Established 1859. Illustrated catalog.
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BALANCES and weights. We are the sole U. S. agents for Becker's Sons (Rotterdam) high-grade balances and weights. We are also prepared to furnish balances and weights of any make, such as Troemner's, Ainsworth's, Thompson's, Christian Becker's, Sartorius', Kern's, etc. All kinds for all purposes. Illustrated catalogs.
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BALANCES, analytical and weights. Sole U. S. Agents for the Staudinger analytical and assay balances, also Troemner, Becker, and other American makes at factory prices.
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BALANCES and weights. Standard precision balances and weights. Established 1888. Our new factory is equipped in the most modern way for the manufacture of the finest, most sensitive and quick-weighing balances. We are able to fill almost any telegraphic order in the quickest possible time. Assay balances, analytical balances, bullion balances, balances for scientific use, diamond balances, jewelers' balances, prescription balances, pulp balances.

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Blowers. Positive pressure blowers of various types. Also hand blowers, etc.
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Blowers. Various hand, foot, and water-blast blowers.
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(Other dealers see under Laboratory Supplies.)

BLOW PIPES. Ranging in size from the smallest automaton to the largest brazing and welding blowpipes made, for use with coal gas, natural gas, or gasoline gas. Oxy-hydrogen blow pipes for lead burning, with straight and curved shaft, and six jets with varying sized orifices and wind shield.
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Blowpipes. All kinds and types. Plattner's blow-pipe cabinet of Lingke's (Freiberg) make. Blow-piping set, prospector's outfit.
—Eimer & Amend, New York City.

Blowpipes. Of all kinds. Fletcher's special chemical blowpipe. Fletcher's blowpipe-furnace.
—Geo. D. Feidt & Co., Philadelphia, Pa.

Blow Pipes, Gasoline. The Hoskins blow pipes are made in different sizes entirely of brass and are safe and convenient for chemical or assay work, heating soldering irons, brazing, etc. A blast lamp, adaptable to a variety of laboratory uses and affording a control of heat from that of a blast burner to that of a small Bunsen flame, is also made.
—Hoskins Manufacturing Co., Detroit, Mich.

Blow Pipes. All kinds for laboratory work.
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BLOWPIPE FURNACES. Miniature furnaces of fire clay for small tests, supported over a high-power blast bunsen burner by means of an adjustable support. Catalog B.
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BRIDGE. Hoopes conductivity, consists of a modified form of Kelvin Bridge, the modification consisting in an arrangement of scales, by which the percentage conductivity of the specimen being tested is directly read from the scale. It is particularly adapted for use where it is desired to know the conductivity of large numbers of samples of metals as they are being produced, or of wires as they are being drawn. It may be arranged for wires of a large number of sizes and for wires of different metals. The instrument is capable of being used to an accuracy of 1/20 of a per cent.
—LEEDS & NORTHRUP CO., PHILADELPHIA, PA.

BRIDGE. Kelvin double bridge. Intended for the measurement of resistances of less than 1 ohm, and with it measurements may be made down to .00001 ohm with the same accuracy that higher resistances are measured on the Wheatstone Bridge. In this instrument a few fixed ratio coils are employed with an accurate variable low-resistance standard. The resistance ratio coils are built of manganin which has a very low temperature coefficient, and a negligible thermo-electromotive force against copper. It will measure resistances from 1 to .00001 of an ohm with an accuracy of better than 1/50 of a per cent.
—LEEDS & NORTHRUP CO., PHILADELPHIA, PA.

BRIDGE. Slide wire, Leeds & Northrup. Largely used in the measurement of the conductivity of electrolytes. They are built one meter long in two types, reversible and non-reversible. The reversible type is used for work of the highest precision, and is so arranged that the terminals of the bridge may be reversed. In both types, the strap connections are of heavy copper, all joints soldered and provision made for the insertion of extension coils. The reversing type is provided with coarse and fine adjustments, and vernier enables an adjustment to be made to 0.1 millimeter.
—LEEDS & NORTHRUP CO., PHILADELPHIA, PA.

BRIDGE. Slide wire, Kohlrausch. A special type of slide-wire bridge. In it the slide wire is coiled on a marble cylinder 15 cm. in diameter with total length of wire of 470 cm. There are no sliding contacts in circuit with bridge wire, and the point of contact is so connected that it affects nothing other than the sensitiveness of the combination. The sliding contact is made so that it will positively not wear the wire.
—LEEDS & NORTHRUP CO., PHILADELPHIA, PA.

BRIDGE, Wheatstone, and Resistance Boxes, Leeds & Northrup. The resistance material used in these instruments is manganin wire, it being wound on wooden or metal spools. These spools are mounted in each case on the polished hard-rubber tops of the protecting box. Manganin has an exceedingly low temperature coefficient, and a negligible thermo-electromotive force against copper. The winding is strictly bifilar, and practically free from inductance and capacity. The coils of a given type are completely inter-

changeable, and are provided with copper terminals so that should an accident occur and a given coil be burned out a new coil could be mounted in the case by the user without affecting the accuracy of adjustment. The coils are carried in stock until thoroughly seasoned. The bridges are listed as the following: Dial Decade Box, Plug Decade Box, Post-Office Box, and Anthony Box. The Dial Decade is the most convenient for ordinary commercial purposes. The accuracy of adjustment ranges from 0.01 per cent in high grade standard sets, to 0.2 per cent in the commercial sets.
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BURNERS. Heating burners of all kinds and styles. Evaporating burners of copper and cast iron, adapted for any kind or quality of gas by adapting our wheel valve or cap nut regulator. Bunsen burners, with fixed length of flame, and also adjustable bunsens.
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Burners. For alcohol, gasolene, kerosene, coal gas, gasolene gas and natural gas. A very large variety. Also blast lamps.
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Burners. For laboratories. All kinds for use with alcohol, benzine, gasoline, natural gas, or artificial gas.
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(Other dealers see Laboratory Supplies. See also Welding, Oxy-acetylene, and Oxy-hydrogen, in Part I of this Dictionary.)

CALORIMETERS. Atwater's bomb. Emerson fuel calorimeter (a bomb calorimeter of the Berthelot type embracing the latest improvements in calorimeters). Graefe gas calorimeter (a handy and inexpensive substitute for the Junker calorimeter for use where extreme accuracy is not essential). Hempel's calorimeter (as described in his work on Methods of Gas Analysis). Junker's gas calorimeter (for measuring the calories produced per unit volume of gas; very little time is required for taking a measurement and the instrument may be attended to by an inexperienced person). Mahler's bomb. Parr standard calorimeter (for determining the heat units in bituminous and anthracite coals, lignites, coke, petroleum, etc.)
—EIMER & AMEND, NEW YORK CITY.

Calorimeter. Sargent's for the rapid estimation of the calorific value of combustible gases. Accuracy and uniformity of results gained by weighing the water. Also Junker's gas, Mahler bomb, and Parr's calorimeter.
—E. H. SARGENT & CO., CHICAGO, ILL.

Calorimeters. Mahler Bomb, Parr standard, or Junker.
—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

Calorimeter. Rosenhain fuel. For determining the calorific value of solid or liquid fuel. The sample is of compressed, powdered solid fuel or is an absorption pellet soaked with liquid fuel. It is burnt in a current of oxygen inside a glass vessel completely immersed in water so that the water takes up practically the whole of the heat given out. The rise of temperature in the water is read by an accurate thermometer.
—Taylor Instrument Companies, Rochester, N. Y.

Calorimeters. Parr standard, Atwater bomb, Junker gas, Emerson fuel, Mahler bomb for immediate delivery at factory prices.
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(Other dealers see Laboratory Supplies.)

CAUSTIC SODA.
—Arnold, Hoffman & Co., Providence, R. I.
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(Also all dealers of chemicals. See Chemicals, and Laboratory Supplies.)

CEMENT. De Khotinsky laboratory cement. Originally prepared for making air-tight joints in incandescent lamps and vacuum tubes, but generally useful for cementing glass and metals, and also as an insulating material and a protective covering. Its specific resistance and specific inductive capacity are higher than those of mica. It is not attacked by nitric, sulphuric, and hydrochloric acids, bisulphide of carbon, benzine, gasoline, and turpentine, and very little affected by ether, chloroform, caustic alkalies, etc. Three grades: Hard cement for cementing glass, metals, porcelain, etc. Medium, for cementing and insulating purposes. Soft, for insulating and covering electric wires, for condensers and static machines, and for protection against corrosion. An especially hard material is prepared for molding insulators for high-potential purposes.
—Wm. Gaertner & Co., Chicago, Ill.

CEMENT TESTING APPARATUS. Complete equipment of apparatus necessary for the chemical analysis or physical tests of cement. In our automatic cement testing machine, the weight is applied by a stream of shot which runs from a reservoir into a pail

suspended at the end of a steel yard-arm and which is cut off automatically when the briquet breaks. In its improved form, it is equipped with sub-base containing a new tension attachment, to apply steady tension to briquets until broken. Capacity 1000 or 2000 lbs.
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(Other dealers see Laboratory Supplies.)

CENTRIFUGAL MACHINE. Bausch & Lomb precision centrifuge, electrically driven, with sufficient power and capacity to accomodate varied sizes of bottles in all kinds of analyses.
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Centrifugal Machines. E. & A. laboratory universal centrifugal machine, for hand and power. Purdy's electric centrifuge. Babcock's centrifuge. Centrifuges with water motor etc.
—Eimer & Amend, New York City.

Centrifugal Machines. Purdy's electric centrifuge. Centrifuges with Stewart hood. Babcock's centrifuge. Leffmann and Beam's centrifuge for estimating butter fat in milk.
—Geo. D. Feidt & Co., Philadelphia, Pa.

Centrifugal Machines. A rotating receptacle or receptacles for applying centrifugal force, usually to liquid or solid material, for the purpose of separating the integral parts of the mixture, *e.g.*, to throw off mother-liquor from salts or to hasten precipitates of solid particles in a liquid. Made in two general types, the bucket type and the cylindrical or basket type; in the former type one or more pairs of cups or tubes for containing liquid are horizontally rotated about a vertical axis, in the latter type a cylinder, either solid or perforated, is rotated about its own vertical axis. The precipitating force varies directly as the distance of the particles from the axis of rotation, and directly as the square of the speed of rotation. The electric centrifuges of the International Instrument Co. are made in 4 regular sizes, the motors ranging from about ¼ h.p. to about 1½ h.p. and are made in special sizes for motors up to 7 h.p. All but the smallest size are entirely enclosed with steel armor. Tube receptacles vary in capacity from 2 cc. to 500 cc. Cylindrical or basket receptacles from 200 cc. to 4000 cc. Maximum speeds are different models and vary from 1200 r.p.m. to 4000 r.p.m. For chemists centrifuges are especially useful for two purposes, for efficient removal of mother-liquor in purification of salts (see Article by Richards, Vol. 27, 1905, p. 104, *Jour. Am. Chem. Soc.*) and for quick and complete settling of precipitates, as barium sulfate, for example, in gas analsyis.
—International Instrument Co., Cambridge, Mass.

Centrifugal Machine. For the rapid approximate determination of phosphorus in steel by the Goetz method.
—E. H. Sargent & Co., Chicago, Ill.

Centrifugal Machines. All kinds for all purposes.
—Scientific Materials Co., Pittsburgh, Pa.
(Other dealers see Laboratory Supplies.)

CHEMICALS. Chemically pure ammonium hydrate, chemical salts, and reagents. Full particulars and prices on request.
—Baker & Adamson Chemical Co., Easton, Pa.

CHEMICALS. "Baker's Analyzed Chemicals." Every label shows an analysis, and our guarantee provides that the contents of each bottle will conform with that analysis. Price lists on request.
—J. T. Baker Chemical Co,. Phillipsburg, N. J.

CHEMICALS. Heavy and fine chemicals, drugs, oils, wax, minerals, etc. Nickel, antimony, and other metals. Stearine pitch, nickel salts. A full line of varnish dryers.
—Fuerst Bros. & Co., New York City.

CHEMICALS. "Let Merck make the 'Blank Test' for you. To that end, buy Merck's Blue Label Reagents."
—Merck & Co., New York, St. Louis, Rahway, N. J.

CHEMICALS. For laboratory use.
—Roessler & Hasslacher Chemical Co., New York City.
(Other dealers in chemicals see Laboratory Supplies.)

CHLORINE and chlorine products, like bleaching powder.
—Arnold, Hoffman & Co., Providence, R. I.
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—Development & Funding Co., New York.
—Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
(Also general dealers in chemicals. See Chemicals.)

CIRCUIT TESTERS, WESTON. See instruments, Weston Standard.
—Weston Electrical Instrument Co., Waverly Park, Newark, N. J.

COLORIMETER. Leed's Stammer's, Dubosc-Soleil's, Lavibond's tintometer for the analysis, accurate measuring, and recording of all colors, for chemists, dyers, brewers, tanners, sugar refineries, flouring mills, oil refineries, soap and paper manufacturers, etc.
—Eimer & Amend, New York City.

COLORIMETER. Kennicott-Sargent. An improved form of the Kennicott apparatus. Permits great rapidity of operation, while maintaining highest efficiency.
—E. H. Sargent & Co., Chicago, Ill.
(Other dealers see Laboratory Supplies.)

COMBUSTION APPARATUS. For the determination of carbon in steel, ferro-alloys and graphite, by the use of the new combustion train of C.M. Johnson, together with our No. 17 tube furnace, operated by gas. Write for illustrated and descriptive brochure.
—Buffalo Dental Mfg. Co., Buffalo, N. Y.

Combustion Apparatus. E. & A. carbon combustion crucible, so arranged that the entering air or oxygen is superheated and does not blow directly upon the substance to be treated. The gases CO and CO_2 escaping slowly through a chamber in the top of the apparatus which is provided with granulated copper oxide to effect perfect oxidation, doing away with the cumbersome water-cooling and special CuO-tube. In this crucible combustions are made in about half the usual time without any loss of material and without use of rubber joints. It may be provided with stirring arrangement, and can be had of straight or conical form to admit a Gooch crucible, saving transferring.
—Eimer & Amend, New York City.

Combustion Apparatus. Shimer-Sargent. For the determination of carbon in steel by the direct or precipitation combustion methods with the assistance of air or oxygen.
—E. H. Sargent & Co., Chicago, Ill.

Combustion Apparatus. C. M. Johnson's. For the determination of carbon in iron, steel, ferro-alloys, etc. A complete combustion in steel can be made in 25 minutes, including all operations. Very compact and with the exception of the connections to the combustion tube there are no rubber stoppers in the entire train, glass goosenecks being used to avoid stoppers. The electric furnace is very economical and radiates very little heat. Operates equally well on either alternating or direct current at either 110 or 220 volts; also made to order for other voltages up to 220. By making a " Y " connection two furnaces can be operated together, thus saving considerable time. (See Scientific Materials Co's. advertisement in Electrochemical and Metallurgical Industry, May, 1909).
—Scientific Materials Co., Pittsburgh, Pa.

COMBUSTION CRUCIBLE. Aupperle for carbon determination gives rapid and accurate results. Capacity 60 cc. weight 105 grams.
—J. Bishop & Co., Malvern, Pa.
(Other dealers see Laboratory Supplies.)

COMBUSTION FURNACES. Operated by air blast or direct draft, for use with coal gas, natural gas or gasoline gas. Will accomodate combustion tubes up to 1 inch diameter. Burner has a series of shut-offs by means of which the flame can be adjusted to any section of the tube desired.
—Buffalo Dental Mfg. Co., Buffalo, N. Y.

Combustion Furnaces. Bunsen's, Fuchs', Glaser's, Liebig's and others. Sectional electric combustion furnace for progressive

heating from rear to front end. Kryptol combustion furnaces (see Kryptol).
—Eimer & Amend, New York City.

Combustion Furnace. Bunsen's, Fletcher's, Hoskins' and many others. Furnaces for gas, oil, etc. Assay furnaces.
—Geo. D. Feidt & Co., Philadelphia, Pa.

Combustion Furnace. In our electric combustion furnace a combustion is complete in 25 minutes. Not affected by laboratory fumes. See Electric furnace.
—Hoskins Co., Chicago, Ill.

Combustion Furnaces. Bunsen's, Glaser's and other types.
—E. H. Sargent & Co., Chicago, Ill.
(Other dealers see Laboratory Supplies.)

CONDUCTIVITY Measurements of electrolytes. See Bridge, Slide Wire, and Bridge, Wheatstone. For conductivity measurements of metals and wires see Bridge, Hoopes conductivity.

CRUCIBLE FURNACES. Operated by air blast or direct draft, for use with coal gas, natural gas, gasoline gas or kerosene oil. Catalog B.
—Buffalo Dental Mfg. Co., Buffalo, N. Y.
(Other dealers see Laboratory Supplies.)

CRUCIBLES. Plumbago crucibles. "Buffalo clay" crucibles. made of the most refractory clay known, readily resisting temperatures to nearly 1800° C. Clay covers. Catalog B.
—Buffalo Dental Mfg. Co., Buffalo, N. Y.

Crucibles of carbon and graphite.
—International Acheson Graphite Co., Niagara Falls, N. Y.
—National Carbon Co., Cleveland, Ohio.

Crucibles. Made of porcelain, nickel, copper, iron, clay, plumbago, silver, or platinum.
—Scientific Materials Co., Pittsburgh, Pa.

Crucibles of platinum. See Platinum. Other dealers in crucibles see Laboratory Supplies.

CRUSHERS and grinding mills for laboratory and assay work.
—Geo. D. Feidt & Co., Philadelphia, Pa.
(See also Crushing and grinding in the first part of this Dictionary.)

DISTILLING Apparatus. See Still.

DRAFT GAUGE. Our draft gauge is designed for indicating very light draft pressure, and is graduated to read in millimeters or in

inches of water pressure. Extensively used on kilns, flues, furnaces, etc., where it is desirable to know the draft changes.
—Edward Brown & Son, Philadelphia, Pa.

DRAFT GAUGES. Recording. Pressure and vacuum gauges for all commercial ranges of pressure and vacuum. Bulletin 104.
—Bristol Co., Waterbury, Conn.
(See also Micro-Manometer.)

ELECTRIC FURNACE. Quartz-lined, which permits to heat it up quickly without danger of cracking its interior. For hardening small tools, determining the recalescent points of steel, and general laboratory work. Used in connection with the Bristol recording pyrometer.
—Bristol Co., Waterbury, Conn.

ELECTRIC FURNACES. For chemical work in the laboratory. A complete line of all types. E. & A. sectional crucible, muffle and combustion furnace. Borchers universal resistance and arc furnace. Various sizes of electric furnaces of the Moissan type. Roessler's electric melting furnace for continuous work. Hertzfeld's electric muffle furnace. Sauveur's electric muffle furnace. Electric drying ovens of various sizes and constructions. Kryptol furnaces (see Kryptol).
—Eimer & Amend, New York City.

ELECTRIC FURNACE. Heraeus. Indispensable for exact heat determinations in laboratories. Write for pamphlet.
—Charles Engelhard, New York.

ELECTRIC FURNACES. For use in the laboratory.
—Geo. D Feidt & Co., Philadelphia, Pa.
—Scientific Materials Co., Pittsburgh, Pa.

ELECTRIC FURNACES. Hoskins Electric Furnaces are made in three types, FA, FB, FC—all of these being manufactured in crucible, muffle or tube chambers of various sizes. They are adaptable to a wide range of commercial and experimental uses. Type FA furnaces are wire-wound for standard voltages, either alternating-current or direct-current circuits and produce temperatures as high as 1000° C. or 1832° F. Type FB furnaces are made of heavy wire for low-voltage, alternating-current circuits only and produce temperatures as high as 1200° C. or 2192° F.

Type FC furnaces are of the carbon resistor type for alternating-current circuits only, capable of developing temperature up to 2000°C or 3600° F.
—Hoskins Manufacturing Co., Detroit, Mich.

ELECTRIC FURNACES. Small electric furnaces for high-temperature reactions are most satisfactorily made using pure graphite for electrodes, containers and resistor. Ease of machining and

joining affords economy in producing any desired shape, or style of connection. Tubes, crucibles, rods, blocks and plates 99% graphite can be had, assuring no contamination of the charge. Granular graphite resistor affords reasonably uniform resistance and heating, with freedom from volatile matter.
—International Acheson Graphite Co., Niagara Falls, N. Y.

ELECTRIC FURNACE. For moderate temperatures as 50° to 300° C. The International Instrument Company's oven's regular size is 12″ x 12″ x 12″ with one middle shelf. Iron-lined or copper-lined for temperatures up to 130 degrees C. Wood cabinets with heavy interior insulation, ventilating air space, metal lining, tubules for thermometers, mercury thermo-regulator and ventilation, outside regulating resistance and relay control, operating on 110-volt a.c. or d.c.
—International Instrument Co., Cambridge, Mass.

ELECTRIC FURNACES. Hoskins combination crucible and muffle type. Also a full line of electric ovens of stamped steel on cast iron frames, ranging in sizes from 12 in. square to 13 x 15 x 18 in. operated with either alternating or direct current.
—E. H. Sargent & Co., Chicago, Ill.

ELECTRIC FURNACES. For laboratories. Dealers in most approved types of electric laboratory furnaces, both of domestic and foreign manufacture, at manufacturers' prices.
—Arthur H. Thomas Co., Philadelphia, Pa.
(For large electrical furnaces see Part I of this Dictionary.)

ELECTRO-ANALYSIS. Electrolytic decomposition and deposition apparatus. Electrolytic supports.
—Eimer & Amend, New York City.

Electro-Analysis. Rotating Electrode apparatus. Simple and very convenient stand. See description in Electrochemical & Metallurgical Industry, Vol. VII, p. 331.
—C. J. Reed, Philadelphia, Pa.

Electro-Analysis. Rotating Electrode apparatus, B. F. Weston's. For rapid determination of metals. Arranged to use any style of electrodes, such as platinum dishes, crucibles, spirals, gauze, or the newer mercury cathode cell. By using a platinum crucible or dish, and a piece of platinum foil or gauze, to be found in most laboratories, the extra expense of special electrodes is avoided. Complete apparatus for electro-analysis, in practical use for the determination of antimony, cadmium, copper, iron, lead, mercury, nickel, silver, tin, and zinc.
—Scientific Materials Co., Pittsburgh, Pa.

ELECTROQUARTZ. See Quartz, Fused, Opaque.

EXTENSOMETER. Cambridge Patent. The elastic extension of the test piece is measured to within 1/25000 inch without the use of mirrors or microscopes. Particularly suitable for use in a works laboratory. Quickly adjusted and read. Apparatus for marking off the test piece is also supplied.
—Taylor Instrument Companies, Rochester, N. Y.

EXTENSOMETER, Ewing. An instrument for the measurement of small variations in length in a sample subjected to tensile or compressive stresses. The elastic extension of the test piece is measured and read by means of a micrometer scale in the eye piece of a microscope. By estimation of tenths of a division on the micrometer scale readings may be made down to 1/50000 inch. In addition to the usual form for the measurement of elastic elongation under tension, a pattern is made for measuring elastic compression of short blocks. Suitable marking off apparatus is supplied for use with the above instrument.
—Taylor Instrument Companies, Rochester, N. Y.

FILTER PAPER. Baker's " ashless filters," made of the finest Swedish hand-made filter paper extracted with HCl and HF. Also " washed filters," washed in hydrochloric acid only.
—J. T. Baker Chemical Co., Phillipsburgh, N. J.

FILTER PAPERS. Ashless. Of superior quality.
—Baker & Adamson Chemical Co., Easton, Pa.

FILTER PAPERS. We are sole U. S. agents for the filter papers of Schleicher & Schnell, Dueren, Germany, but also make a cheap, yet efficient E. & A. brand of filter paper for general use.
—Eimer & Amend, New York City.

FILTER PAPER. B. & C., black label filters (white); black label, gray (a superior gray paper); red label (a superior white paper, retains fine precipitates); blue label ashless (made from finest quality of Swedish paper).
—Geo. D. Feidt & Co., Philadelphia, Pa.

FILTER PAPER. We are the sole agents for the filtering paper manufactured by Max Dreverhoff, Dresden-N. It is made throughout from finest, carefully selected stock, is strong, pure, and uniform, insuring the retention of the finest precipitates and uniform results in filtration. It is made in so many grades, that suitable paper for any purpose can be found among them.
—Henry Heil Chemical Co., St. Louis, Mo.

FILTER PAPER. We are the sole agents for J. H. Munktell's Swedish filter papers of highest quality.
—E. H. Sargent & Co., Chicago, Ill.

FILTER PAPER. All kinds.
—Scientific Materials Co., Pittsburgh, Pa.

FILTER PRESSES. See Part I of Dictionary.

FIRE-CLAY GOODS. We are the agents for the fire-clay goods, made by The Morgan Crucible Co. Ltd. (Battersea Works), London, such as crucibles, scorifiers, muffles, roasting dishes and annealing cups. They are made of most refractory fire-clay and answer all purposes for which the expensive French crucibles are used. They are strong and rarely break in transportation. The Battersea crucibles can be employed for all operations for which Hessian crucibles are used and are incomparably superior to them in absorbing only one-twelfth the weight of metal, in resisting the action of corrosive fluxes, in shape, in being sold in single sizes instead of nests, and in being lighter.
—Henry Heil Chemical Co., St. Louis, Mo.

FLASKS. All shapes and sizes for laboratory work, of best Bohemian or Jena glass.
—Scientific Materials Co., Pittsburgh, Pa.
(Other dealers see Glassware, also Laboratory Supplies.)

FURNACES. Of all kinds for chemical laboratory and assay work. Crucibles, muffles, etc.
—Henry Heil Chemical Co., St. Louis, Mo.

FURNACES. See also Assay furnaces, Blowpipe furnaces, Combustion furnaces, Crucible furnaces, Electric furnaces, Gasoline furnaces, Muffle furnaces.

GALVANOMETERS. Dead-beat and ballistic D'Arsonval galvanometers. Any desired resistance. Sensitiveness 0.1 microcoulomb gives a deflection of 35 mm. at a meter distance. Period about 12 seconds.
—Wm. Gaertner & Co., Chicago, Ill.

GALVANOMETERS, D'ARSONVAL. This type of galvanometer consists of a coil of wire freely suspended between the poles of a permanent magnet. This type is most generally used in present day practice because of its freedom from interference by exterior magnetic fields. The sensibility of the galvanometer is defined in one of three ways:—(1) In megohms, the sensibility being the number of megohms through which one volt will produce a deflection of 1 mm. with the scale at 1 meter difference. (2) In microvolts, the sensibility being the number of micro-volts which applied directly to the terminals of the galvanometer will produce a deflection of 1 mm. on a scale 1 meter from the mirror. (3) In current, the sensibility being the fraction of an ampere that will give 1 mm. deflection at 1 meter.
—Leeds & Northrup Co., Philadelphia.

Galvanometer. Portable D'Arsonval. Made in two types. (1) The pointer type resembles a small portable voltmeter. Its sensi-

bility is such that the current from one volt through a resistance of 500 ohms will cause the pointer to move one mm. over the scale. Its over-all dimensions are $5\frac{1}{4}'' \times 2\frac{5}{8}'' \times 4\frac{1}{2}''$. It is amply sensitive for checking ammeters and voltmeters to an accuracy of 1/5% by the potentiometer method, and for almost all Wheatstone Bridge measurements to commercial accuracies. It requires no levelling whatever. It has a suspended system so protected that breakage due to dropping, etc., is almost impossible. (2) The portable telescope galvanometer requires no levelling, is completely portable, and will stand as much rough usage as an ordinary voltmeter. It has a scale of 400 divisions which when viewed through a reading telescope appears as though it were 400 mm. long. Complete with the reading telescope, it occupies but slightly more space than does an ordinary voltmeter. The current from one volt through seven megohms will cause a deflection of one scale division. It requires no light other than ordinary daylight.
—LEEDS & NORTHRUP CO., PHILADELPHIA, PA.

Galvanometers, Reflecting, Leeds & Northrup. Intended for use with telescope and scale, or with lamp and scale. The moving systems are at all times visible, and all parts are interchangeable. The deflections are approximately proportional to the current, or for ballistic measurements to the quantities of electricity discharged. The systems do not oscillate but deflect quickly and come promptly to rest either deflected or at zero. New suspensions can be easily replaced by the user. No delicate adjustments are required to get the coil to swing free. They are supplied with the following typical sensibilities:—

Type HS. Resistance 1600 ohms, sensibility 1200 megohms.

Resistance 30 ohms, sensibility .15 micro-volts.

Type H. Resistance 460 ohms, sensibility 300 megohms or $3\frac{1}{3} \times 10^{-9}$ amp.

Resistance 2000 ohms, sensibility 1000 megohms or 10^{-9} ampere.

Resistance 30 ohms, sensibility .2 micro-volt, or 7×10^{-9} ampere.

Type P. Resistance 100 ohms, sensibility 80 megohms.

Ballistic Type. Resistance 2000 ohms, sensibility .0045 microcoulomb. Steady current sensibility 600 megohms. Time of ballistic throw from zero to end of deflection 5 seconds.
—LEEDS & NORTHRUP CO., PHILADELPHIA, PA.

Galvanometers, Weston. See Instruments, Weston Standard.
—WESTON ELECTRICAL INSTRUMENT CO., WAVERLY PARK, NEWARK, N. J.

GAS ANALYSIS. Barnhart's apparatus for the analysis of blast furnace, producer, flue, illuminating and fuel gases. The time required for a complete analysis of coal or producer gas with this apparatus is about 20 minutes. Also Hempel's apparatus for gas analysis, as described in his work "Methods of Gas Analysis." Drehschmidt's apparatus for determining sulphur in coal gas. Ruedorff's CO_2 apparatus. Reich's apparatus for determining SO_2

in lead chambers. Petterson & Palmquist's CO_2 apparatus. Apparatus according to Bunsen's gasometric methods. Apparatus of Orsatt, Elliott, etc.
—Eimer & Amend, New York City.

GAS ANALYSIS Apparatus. A complete stock of all the improved apparatus for the analysis of all kinds of gases.
—Scientific Materials Co., Pittsburgh, Pa.
(Other dealers see Laboratory Apparatus.)

GAS BURETTE. We are the makers of Morehead's gas burette. While sacrificing none of the accuracy of the Hempel, Orsat, or McIntosh-Elliott burettes, it greatly decreases the time necessary for an analysis. We also handle other gas analytic apparatus.
—E. H. Sargent & Co., Chicago, Ill.

GAS FILTER and dust determinator, with electric heater. Designed by Mr. William Brady of Illinois Steel Co., for the analysis of blast furnace gases to be used in gas engines.
—E. H. Sargent & Co., Chicago, Ill.

GAS GENERATORS for Laboratories. All kinds.
—Eimer & Amend, New York City.
—Geo. D. Feidt & Co., Philadelphia, Pa.
—Henry Heil Chemical Co., St. Louis, Mo.
—Roessler & Hasslacher Chemical Co.. New York City.
—E. H. Sargent & Co., Chicago, Ill.
—Scientific Materials Co., Pittsburgh, Pa.
—Arthur H. Thomas Co., Philadelphia, Pa.

GASOLINE FURNACES. Hoskins gasoline furnaces are made in crucible, muffle, and combination crucible and muffle types of various sizes, applicable to a variety of chemical and assay work. Among other types, a compact portable outfit is made. Several sizes of gasoline blow-pipes are manufactured to operate in connection with these.
—Hoskins Manufacturing Co., Detroit, Mich.
(Other dealers see Laboratory Supplies.)

GLASSWARE. Graduated, Bausch & Lomb. In addition to our regular graduated glassware, we supply a full line of graduated pieces, each accompanied by a certificate of accuracy showing errors, if any, existing. Our glassware is made at our own factory in Germany, which is equipped with the most modern apparatus for the production of high-grade graduated glassware with clear, uniformly accurate graduations. Our precision glassware is made to conform to the requirements of the U. S. Bureau of Standards. This glassware is supplied with or without certificate of the Bureau of Standards as may be desired. Glassware bearing the stamp of the German Imperial Commission imported to order.
—Bausch & Lomb Optical Co., Rochester, N. Y.

Glassware, Bohemian, Henry Heil Chemical Co's. The glassware marketed under this name bears a distinctive label and is made of a special composition of Bohemian glass, which has a higher resistance to changes in temperature and the corrosive action of chemical compounds than any other known glass. It is perfect in shape, uniform in thickness, and annealed with the greatest care. Also Jena normal glassware and genuine porcelain ware.
—Henry Heil Chemical Co., St. Louis, Mo.

Glassware. Our Jena normal glassware and Josef Kavalier's Bohemian glassware meet the requirements of the Bureau of Standards. We also stock a cheaper grade of Bohemian glassware. Also German glass of Greiner & Friedrichs. We have an up-to-date and fully equipped glass blowing establishment on the premises and are prepared to furnish any special apparatus, no matter how complicated, on short notice.
—Eimer & Amend, New York City.
(Other dealers see Laboratory Supplies. See also Quartz, Fused.)

GROUND DETECTORS, WESTON. See Instruments, Weston Standard.
—Weston Electrical Instrument Co., Waverly Park, Newark, N. J.

HEATER, WATER. By a specially constructed tap, the gas and water are turned on simultaneously and hot water produced instantly. The speed at which the water runs rules its temperature. Capacities one pint to one quart per minute. Catalog B.
—Buffalo Dental Mfg. Co., Buffalo, N. Y.

HEATING APPARATUS, ELECTRIC. For distilling inflammables without danger. Electric coil heaters for immersion in water, paraffin, toluol, etc., for one or three heats.
—Eimer & Amend, New York City.
(Other dealers in heating apparatus see Laboratory Supplies.)

HOT PLATES. For two, three, and five burners; equipped with wheel valves which adapt them to burn any kind or quality of gas. Catalog B.
—Buffalo Dental Mfg. Co., Buffalo, N. Y.

HOT PLATES, electric. Circular and square, of various sizes.
—Eimer & Amend, New York City.

HOT PLATE. The Hoskins laboratory hot plate is made in a number of sizes, adaptable to either alternating-current or direct-current circuits; the heating unit is centrally located covering a circular space five inches in diameter. Water may be boiled directly over this and contents of beakers evaporated to dryness around the edges. These hot plates can be made to give any desired temperature up to 400° C.
—Hoskins Mfg. Co., Detroit, Mich.

HOT PLATES. Electric. Rectangular with one or three heating units. Circular hot plates for heating flasks, provided with ring top of copper and controlling switch, giving three heat ranges. Also a one-heat type. For alternating or direct current.
—E. H. SARGENT & CO., CHICAGO, ILL.
(Other dealers see Laboratory Supplies.)

HYDRODEIK. Thwing's Direct-Reading. A strong and sensitive mechanical differential thermometer sets the scale reading corresponding to a given difference between the wet and dry bulb temperatures to position opposite the pointer of a thermometer which indicates directly on the scale the relative humidity or the absolute humidity in grains per cubic foot or grams per cubic meter. Accurate within the range of barometric variation. No setting or other adjustment required.
—C. B. THWING, PHILADELPHIA, PA.

HYDRODEIK. Thwing's Recording. All measurements and corrections made electrically and recorded on the recorder described under " Pyrometer, Thermo-electric, Thwing's Recording." Several simultaneous records on one instruments if desired.
—C. B. THWING, PHILADELPHIA, PA.

HYDROGEN. Producing of. See Part I of Dictionary.

HYDROMETERS. All scales and ranges for different liquids.
—EIMER & AMEND, NEW YORK CITY.
—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.
(Other dealers see Laboratory Supplies.)

INSTRUMENTS. A complete line of recording instruments: ammeters, voltmeters, wattmeters, thermometers, pyrometers, pressure gauges, etc.
—BRISTOL CO., WATERBURY, CONN.

Instruments, Electric. Ammeters, voltmeters.
—EAGER ELECTRIC CO., WATERTOWN, N. Y.

Instruments. All kinds of instruments for use in laboratories. Electrical laboratory instruments of Hartmann & Baum.
—EIMER & AMEND, NEW YORK CITY.

Instruments. Electric. A complete line of electrical measuring and testing instruments and apparatus both for direct and alternating current.
—GENERAL ELECTRIC CO., SCHENECTADY, N. Y.

Instruments of precision. Measuring instruments. Optical instruments. Measuring microscopes. Micrometers. Level testers. Reckoning machines, Cathetometers. Comparators for measuring Spectra photographs, scabs, etc. Dividing machines. Physical

demonstration apparatus. Spectrometers. Chronographs. Catalog M-L.
—Wm. Gaertner & Co., Chicago, Ill.

Instruments. Physical and electrical instruments and apparatus, X-ray apparatus and accessories. A specialty is made of fine electrical measuring and testing instruments used in high schools, colleges, and laboratories, as well as high-grade commercial instruments. Laboratory meters, galvanometers, portable testing sets. We began the manufacture of electric testing instruments in 1888.
—Queen & Co., Philadelphia, Pa.

Instruments, Weston Standard Electrical. Direct-reading voltmeters, millivoltmeters, voltammeters, ammeters, milammeters, ground detectors, galvanometers, ohmmeters, and circuit testers, for portable, station, and laboratory use. The moving element in the instruments is a light coil of wire on which is mounted an index or pointer, and through which a certain proportion of the current passes, causing deflection of the coil in the magnetic field by which it is encompassed. For the direct-current instruments, a permanent steel magnet produces the magnetic field, being so designed as to make the field uniform. In the alternating-current instruments the field is produced by a second coil, which acts in conjunction with the moving element, the operation being based on the dynamometer principle. Notable characteristics of Weston instruments are their accuracy and economy of current consumption, combined with excellent mechanical and electrical workmanship and design.
—Weston Electrical Instrument Co., Waverly Park, Newark, N. J.

Instruments. Various instruments for laboratory and commercial uses. (See also the different instruments.)
—Edw. Brown & Son, Philadelphia, Pa.
—Eimer & Amend, New York City.
—Charles Engelhard, New York City.
—Geo. D. Feidt & Co., Philadelphia, Pa.
—Henry Heil Chemical Co., St. Louis, Mo.
—International Instrument Co., Cambridge, Mass.
—Leeds & Northrup Co., Philadelphia, Pa.
—E. H. Sargent & Co., Chicago, Ill.
—Scientific Materials Co., Pittsburgh, Pa.
—Siemens & Halske Co., New York City.
—Taylor Instrument Companies, Rochester, N. Y.
—Arthur H. Thomas Co., Philadelphia, Pa.
—C. B. Thwing, Philadelphia, Pa.
—Wilson-Maeulen Co., New York City.

INTERFEROMETERS and accessories. Catalog 1.
—Wm. Gaertner & Co., Chicago, Ill.

JAR MILL, Laboratory. "The Little Trojan" a porcelain jar mill for handling from a few ounces up to 5 pounds at a charge.

Also built with 2, 4, 6 and 12 jars of the same size to handle a number of different products at once.
—Abbe Engineering Co., New York.
(See also Crushing and Grinding in Part 1 of this Dictionary.)

KELVIN BRIDGE. See Bridge.

KRYPTOL. A granulated resistor material which is filled into the heating apparatus or spread out on clay or enamel plates and is heated by the passage of the electric current. Temperatures up to 2500° C. or more can be produced, the temperature depending on the thickness of the layer of kryptol and the current. Kryptol baths for evaporating dishes. Kryptol hot plates. Kryptol heaters for flasks and test tubes. Kryptol drying ovens. Kryptol crucible muffle, and tube furnaces. Kryptol combustion furnace for analysis.
—Eimer & Amend, New York City.

LABORATORY SUPPLIES. Chemicals and chemical apparatus. Standard c.p. chemicals, imported direct. Complete laboratory equipments and supplies.
—Bausch & Lomb Optical Co., Rochester, N. Y.

LABORATORY SUPPLIES. High-grade chemical and assay apparatus, chemicals, etc., etc. Manufacturers and direct importers. An enormous and most complete stock of anything that is needed in the laboratory. Any article listed in our 440 pages catalog on Chemical Apparatus is kept in stock. Established 1851.
—Eimer & Amend, New York City.

LABORATORY SUPPLIES. Chemicals and apparatus. Manufacturers and direct importers of high-quality chemicals and apparatus. Gas analytic apparatus, gas generators, nitrogen determination apparatus, reagents, hydrometers, etc.
—Geo. D. Feidt & Co., Philadelphia, Pa.

LABORATORY SUPPLIES. Apparatus, Instruments, and Appliances. We manufacture a complete line of universal laboratory supports and appliances; the parts of the system of our supports are interchangeable, and are capable of being used in many different ways, the various combinations often serving the purpose of expensive pieces of apparatus; see our illustrated catalog S-T. We specialize on high-grade physical apparatus covering almost every requirement and have special facilities and a large well-equipped shop for the construction of apparatus for research work. Catalog A on astronomical instruments. Catalog D on physical demonstration apparatus. Catalog E on electrical apparatus. Catalog H on high-school laboratory apparatus. Catalog I on interferometers and accessories. Catalog M-L on instruments of precision, laboratory apparatus.
—Wm. Gaertner & Co., Chicago, Ill.

LABORATORY SUPPLIES. Laboratory and assay apparatus, chemicals and reagents. Mill chemicals. Merck's chemicals, Schuchardt's chemicals, J. T. Baker Chemical Co's. analyzed chemicals. Write for our catalogs, covering over 600 pages.
—Henry Heil Chemical Co., St. Louis, Mo.

LABORATORY SUPPLIES. Chemicals and chemical apparatus. All kinds of apparatus, made for use in chemical laboratories, glass, wood, hardware, etc.
—Queen & Co., Philadelphia, Pa.

LABORATORY SUPPLIES. Chemicals and laboratory and assayers' supplies. Importers and dealers in chemical glass and porcelain ware and chemicals, manufacturers of chemists' hardware (clamps, supports, burners, etc), and dealers in all kinds of chemicals and apparatus for analytical chemists. Established 1852.
—E. H. Sargent & Co., Chicago, Ill.

LABORATORY SUPPLIES. This we make our sole business and carry in stock all the apparatus and chemicals necessary for the entire equipment of any chemical or bacteriological laboratory. The largest and most complete catalog ever published (over 540 pages and describing over 3,000 different apparatus) will be furnished on request. A complete stock of high-purity chemicals.
—Scientific Materials Co., Pittsburgh, Pa.

LABORATORY SUPPLIES. Chemicals. A full assortment of chemicals for analytic work from most reliable makers in Europe and America. All of Baker's analyzed chemicals, factory packing in special packages for our trade. A complete stock of apparatus equipment for both chemical and biological laboratories. 440-page illustrated catalog on request.
—Arthur H. Thomas Co., Philadelphia, Pa.

LABORATORY SUPPLIES.
—Buffalo Dental Mfg. Co., Buffalo, N. Y.
—Hoskins Mfg. Co., Detroit, Mich.
—International Instrument Co., Cambridge, Mass.
—Leeds & Northrup Co., Philadelphia, Pa.
—Schutte & Koerting Co., Philadelphia, Pa.
—J. W. Sittig, New York.
—F. J. Stokes Machine Co., Philadelphia, Pa.
—Wilson-Maeulen Co., New York City.

LAMP AND SCALE. For use with reflecting galvanometers. The image of a brilliantly illuminated lens is reflected by the mirror of the galvanometer on to an accurately divided scale. In the Taylor-Cambridge lamp and scale, the scale is transparent and can therefore be read from either side; the lamp contains a Nernst filament and therefore gives an image bright enough for reading in

ordinary day-light. Both lamp and scale are adjustable and are mounted upon a stand which may be portable or fixed.
—Taylor Instrument Companies, Rochester, N. Y.

LAMPS, QUARTZ. Heraeus patented fused-quartz-glass lamps, with mercury, cadmium or zinc, for commercial, scientific, and medicinal purposes. Write for pamphlet.
—Charles Englehard, New York.

LEAD BURNERS. See Blowpipes; also Part I of Dictionary.

METERS, QUEEN. These instruments are of the D'Arsonval permanent-magnet type moving-coil system, the action being perfectly dead-beat and the scale divisions accurately placed. Suitable only for use on direct-current circuits, and made in all ranges from a total of 100 millivolts up to the highest possible current and voltage readings that ever might be desired on this type of indicator. Several features render the meter especially valuable in regard to appearance, durability and permanency. Accuracy in the portable type 1/5 of 1%; switch type ½ of 1%. We also make portable and switchboard-type instruments for alternating-current circuits, dynamometers, galvanometers and other current-measuring instruments.
—Queen & Co., Philadelphia, Pa.

MICRO-MANOMETER. An instrument for measuring extremely small differences of fluid pressure; used in the estimation of flow of gases in pipes. The Taylor-Cambridge micromanometer is made according to an original design by R. Threlfall. Measures small differences of fluid pressure up to a maximum of 100 millimeters water pressure. Particularly useful with Pitot tube and side gauge for estimating the velocity of flow of gases in pipes. The measurement is made by a micrometer screw with an accurately divided head. The position of contact between the point of the micrometer screw and the liquid in the gauge is seen by the springing up of the liquid round the point due to surface tension. The readings can be made down to 100th millimeter.
—Taylor Instrument Companies, Rochester, N. Y.

MICROSCOPES. For many years we have bent our efforts to designing and making new types of microscopes of increasing efficiency, in a wide variety and at reasonable prices. Two factors of great significance have recently contributed to the still greater perfection of our instruments. Firstly, we have developed the scientific computation and construction of microscope objectives to a high state of efficiency; our present optical systems for the microscope were designed and executed under the direction of Dr. Hermann Kellner and embody novel features hitherto unattained. Secondly, we refer to our recent alliance with the Carl Zeiss Optical Works of Jena. All our microscopes are made from raw materials within our own manufactory and we control every operation from

the making of castings to the shipping of our products. Our microtomes and projection apparatus have recently been remodeled and improved. For descriptions of our microscopes see our catalog on Microscopes and Accessories. We also make the Bausch & Lomb Chalmot chemical microscope, designed for chemical investigations of all kinds after specifications of Professor Chalmot.
—Bausch & Lomb Optical Co., Rochester, N. Y.

Microscopes of the best makers, including those of Carl Zeiss and the Spencer Lens Co.
—Eimer & Amend, New York City.

Microscopes. Magnifiers or pocket microscopes. Dissecting microscopes. Microtomes.
—Geo. D. Feidt & Co., Philadelphia, Pa.

Microscopes. The eight grades of Queen compound microscopes cover the entire field of microscopy.
—Queen & Co., Philadelphia, Pa.

Microscopes. The Sauveur metallurgical microscope. Complete microscopic outfits, including all needed accessories, specially constructed for the examination of metals and alloys.
—Albert Sauveur, Cambridge, Mass.

Microscopes. Complete line of Bausch & Lomb microscopes carried in stock for immediate delivery at factory prices. Also microscopes and optical measuring instruments of Carl Zeiss.
—Arthur H. Thomas Co., Philadelphia, Pa.

Microscopes. A full line of various makes.
—E. H. Sargent & Co., Chicago, Ill
—Scientific Materials Co., Pittsburgh, Pa.
—Wilson-Maeulen Co., New York.

MILAMMETERS, WESTON STANDARD. See Instruments, Weston Standard.
—Weston Electrical Instrument Co., Waverly Park, Newark, N. J.

MILLIVOLTMETERS, WESTON STANDARD. See Instruments, Weston Standard.
—Weston Electrical Instrument Co., Waverly Park, Newark N. J.

MUFFLE FURNACES. See Laboratory Supplies; also Part I of this Dictionary under Muffle Furnaces.

OHMMETERS, WESTON. See Instruments, Weston Standard.
—Weston Electrical Instrument Co., Waverly Park, Newark, N. J.

OIL TESTING. Apparatus. All the necessary apparatus for the determination of gravity, viscosity, flash point and chemical composition of oils.
—Scientific Materials Co., Pittsburgh, Pa.
—Eimer & Amend, New York City.
—E. H. Sargent & Co., Chicago, Ill.
—Arthur H. Thomas Co., Philadelphia, Pa.
(Other dealers see Laboratory Supplies.)

OVENS, ELECTRIC. The term applies to hot air chambers for drying or for baking (or for constant-temperature chemical reactions) at moderate temperatures say 50° C. to 300° C. See Electric Furnaces.

OXYGEN. Production of. See Part I of Dictionary.

PHOTOMICROGRAPHIC APPARATUS. For makers see Microscopes.

PLATINUM ware of all kinds. Sheet and wire for all purposes. Scrap purchased.
—American Platinum Works, Newark, N. J.

PLATINUM for all purposes. Hammered to shape, tested and strictly guaranteed. An American product, manufactured by skilled workmen. Special apparatus of any size or shape made from drawings. Scrap purchased.
—Baker & Co., Newark, N. J.

PLATINUM ware. Made of pure platinum, hammered into the various forms. Sold according to weight.
—Bausch & Lomb Optical Co., Rochester, N. Y.

PLATINUM. Crucibles, dishes, electrodes either stationary or rotating, either in stock forms, as illustrated in our catalogue, or made in accordance with drawings or models that may be submitted. C. P. platinum and platinum-rhodium for thermo-couples; also platinum-iridium alloy in any desired form for the analyst, electrochemist, or metallurgist.
—J. Bishop & Co., Malvern, Pa.

PLATINUM ware for chemists, electrochemists, metallurgists. Imported, hammered, and finished in the best possible manner. Platinum wire, sheet, foil, gauze.
—Croselmire & Acker Co., Newark, N. J.

PLATINUM ware. Chemically pure, containing no iridium or other metals. Hammered ware. Imported ware of Demontis & Co's. make. Largest stock of ready-made ware; vessels of special size or shape made to order at short notice. Sold according to weight. Wire, foil, or vessels of platinum-iridium alloy to order.
—Eimer & Amend, New York.

PLATINUM apparatus, hammered.
—Chas. Engelhard, New York.

PLATINUM ware and apparatus of all kinds for laboratories.
—Geo. D. Feidt & Co.

PLATINUM. Hammered platinum ware and apparatus of all kinds for laboratory use.
—Henry Heil Chemical Co., St. Louis, Mo.

PLATINUM. Pure or alloyed, in sheet or wire, any size, shape or degree of hardness, for all purposes. Platinum-ware dishes, crucibles, etc., for any and all purposes required by chemists, druggists, chemical supply houses, colleges, physicists, students, experimenters and manufacturers. All of our platinum-ware is guaranteed imported hammered and free from all flaws and blisters. Anything containing gold, silver or platinum, either refined or purchased.
—Roessler & Hasslacher Chemical Co., New York.

PLATINUM apparatus and appliances of all kinds for laboratories.
—E. H. Sargent & Co., Chicago, Ill.

PLATINUM ware, crucibles, dishes, sheets, wire, foil, and laboratory apparatus of finest pure hammered platinum.
—Scientific Materials Company, Pittsburgh, Pa.

PLATINUM apparatus, hammered, for use in laboratories, at current prices.
—Arthur H. Thomas Co., Philadelphia.

POLARISCOPES. We are sole U. S. agents for the German polariscopes of Schmidt & Haensch, but handle also Laurent's polariscopes.
—Eimer & Amend, New York City.

POLARISCOPES.
—Henry Heil Chemical Co., St. Louis, Mo.
—Geo. D. Feidt & Co., Philadelphia, Pa.
—Scientific Materials Co. Pittsburgh, Pa.

POLARISCOPES. We are the sole agents for Josef & Jan Fric.
—E. H. Sargent & Co., Chicago, Ill.

POTENTIOMETER. Direct reading, and used for the precision measurement of D.C. electromotive forces from .00001 to 1.6 volts. This range is covered by a double scale, the second scale being 1/10 the value of the first scale. With accessories, it may be used up to 1500 volts, and currents up to 2000 amperes. It has a low internal resistance. The last portion of the measurement is made on an extended wire which enables fluctuating voltages to be followed with accuracy. The accuracy may be checked up at any time with

facilities available in an ordinary laboratory. The resistances used in this instrument are of manganin which has a very low temperature coefficient and a negligible thermo electromotive force against copper. The coils are adjusted to equality to 1/100 per cent. The current in the potentiometer circuit is adjusted without disturbing the setting of the potentiometer.
—Leeds & Northrup Co., Philadelphia, Pa.

POTENTIOMETER, THERMO-ELECTRIC. An instrument in which the electromotive force developed by a thermocouple is measured by "null" methods. Instead of measuring the current which flows in a circuit as the result of the electromotive force of a thermocouple, as is done in the "deflection" method, the measurement is made by balancing a known electromotive force against that of the thermocouple. The Taylor-Cambridge thermocouple potentiometer has a range up to 30 millivolts, and the scale is divided down to 10 microvolts, and is readable by estimation to 1 microvolt. Specially convenient for quick laboratory work having arrangements whereby the balance against the standard cell can be instantly verified after each reading. Suitable galvanometers, accumulators and standard cells are supplied.
—Taylor Instrument Companies, Rochester, N. Y.

PRESSURE GAUGES. Vacuum gauges. Recording. For all commercial ranges of pressure and vacuum. For all pressure of steam, hot blast, blast-furnace top gas, etc. New bulletin 104.
—Bristol Co., Waterbury, Conn.

PRESSURE GAUGE, Mercury. The open-column mercury gauge, is a very accurate form of gauge manufactured, and its accuracy may be relied upon after years of use (which is impossible with spring gauges.) This instrument is manufactured for pressures of five to thirty pounds, and is largely used at blast furnace plants for indicating the pressure of the blast.
—Edward Brown & Son, Philadelphia, Pa.

PRINCEPS ALLOYS. Of various melting points for approximate temperature determination in kilns, especially in ceramic works.
—Eimer & Amend, New York.

PROJECTION APPARATUS. See our full illustrated catalog.
—Bausch & Lomb Optical Co., Rochester. N. Y.

PUMP. Geryk's air pump for vacuum operates upon the hydraulic principle, by which friction is reduced to a minimum; all working joints are liquid sealed and self-adjusting; all valves are automatic, so that the air meets with no resistance whatever. There is no clearance space, and the suction and delivery of air is absolute, however slowly the pump is worked. The liquid used is an oil of lowest vapor tension, the vacuum obtained being equal to the vapor tension of the oil in the vacuum. No air will ever leak back through

the pump. The "Geryk" pump has the advantage of both mechanical and mercury pumps, and the faults of neither. It produces a vacuum comparable with that obtained by the large Sprengel or other mercury pumps and is infinitely more rapid in action. Being sealed and packed, it is not dependent upon tight-fitting mechanical pistons for the attainment of its results, and consequently the excellence of the vacuum is not diminished by wear. It is always ready for use, as the valves and pistons work in oil.
—Scientific Materials Co., Pittsburgh, Pa.
(Other dealers see Laboratory Supplies.)

PUMP, Vacuum, for laboratories. See page 106.
—Schutte & Koerting Co., Philadelphia, Pa.

PYROMETERS. ELECTRIC RESISTANCE. *The "bulb" or sensitive portion of the resistance thermometer contains an electric resistance which varies with its temperature. The temperature measurement is made by measuring the consequent change in resistance of the bulb. In pure metals, such as platinum, nickel, and copper, the change is approximately* 4-1000 *of the total resistance for each degree Centigrade. Resistance pyrometers may be used to measure any temperature from the lowest (liquid air) up to* 1200° *C. (about* 2200° *F.).*

Pyrometer. Electric Resistance. Leeds and Northrup. The bulb consists of a coil of platinum or nickel wire. Resistance change is measured with a differential galvanometer on a slide resistance. The amount of energy available for measuring purposes with these thermometers is at least 500 times that available in the best thermo couple practice, thus enabling the measuring instrument to be stouter in construction than the millivoltmeter of a thermo couple The indicator, which is the term given to the differential galvanometer with slide resistance, is made in the following types:— Single Dial, Partial Deflection, Deflection and Recording Types. The Single Dial Type is recommended for use of the highest precision, the Partial Deflection for commercial work, and the Deflection Type for work where temperature changing rapidly are to be followed. For the supervision of temperature, the recording type, which is identical with the Single Dial Indicators, except that it is self-balancing instead of being balanced by hand, is recommended. Supplied with an accuracy which is guaranteed better than ½% of the temperature range of the instrument for all temperatures lying below 2200° Fahr. and all ranges above 8° Fahr.
—Leeds & Northrup Co., Philadelphia, Pa.

Pyrometer. Electric Resistance. Operated by telephone. For reading temperatures from 212° F. to 2200° F., or about 100° C. to 1200° C. in commercial work. Perfectly portable, with no adjustment to be made when placed in position. To make a measurement, the stylus or pointer is slid along a scale wire, the telephone receiver being held to the ear, and the temperature is read off on the chart immediately below the point of the stylus on the

scale when the humming noise in the telephone ceases. A galvanometer may be used in place of the telephone receiver.
—EIMER & AMEND, NEW YORK.

Pyrometer. Electric Resistance. Taylor-Cambridge. In these instruments the sensitive bulb contains a coil of platinum wire suitably protected. It is made up in a variety of forms for different purposes. Suitable for use for all temperatures below 1500° F. The measuring instruments are of very high accuracy. The Whipple Patent Indicator is a portable instrument and the Callendar Patent Recorder fixed instrument, both working on the Wheatstone-Bridge principles, and therefore capable of reading accurately very small changes in temperature.
—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

Pyrometer. Electric Resistance. Wilson-Maeulen. Indicator type.
—WILSON-MAEULEN CO., NEW YORK.

Pyrometers, Electric Resistance, Heraeus Quartz Glass. Measure temperatures from —200° up to +900° C.; they are absolutely exact, durable, and easy to handle.
—CHARLES ENGELHARD, NEW YORK.

Pyrometers. Electric Resistance. Thwing's. Designed especially for low temperatures. The temperature is read directly in degrees without setting. It is readily applied to the recorder. Applicable in many situations where thermocouples can not be conveniently employed.
—C. B. THWING, PHILADELPHIA, PA.

PYROMETER. THERMO-ELECTRIC. *The bulb of the pyrometer contains one junction of a thermocouple, which when heated becomes the seat of a thermo-electromotive force; this indicates the temperature of the bulb. The thermo-electric pyrometer employing platinum can be used up to* 1600° *C. (about* 2900° *F.), that is up to higher temperatures than the resistance pyrometer, and is therefore of special importance in the temperature range from* 1200 *to* 1600° *C. (about* 2200 *and* 2900° *F.). Thermocouples made of other metals have other ranges of temperatures, as stated below.*

Pyrometer. Thermo-Electric. Heraeus-Le Chatelier. Measures temperatures between zero and 1600° C. or up to 2920° F. Recognized as standard instrument. Widest distribution. The Heraeus thermo-couples are interchangeable after years. Write for our red and blue books.
—CHARLES ENGELHARD, NEW YORK.

Pyrometer. Thermo-Electric. Le Chatelier. Wall pattern and portable indicators with patented single-pivot movement. Indicators do not have to be set level and are not affected by heavy vibrations. Each instrument provided with automatic clamp for

coil and pointer which are set free to swing when indicator is set upon either flat surfaces or wall bracket or when cover of portable instrument is opened. These indicators having high internal resistance may be calibrated for both platinum, platinum-rhodium thermocouples and "Advance" fire-rods. Platinum, platinum-rhodium couples are absolutely interchangeable and supplied in all lengths. Pyrometer tubes of refractory fire-clay, electroquartz or Royal Berlin porcelain.
—Wilson-Maeulen Co., New York.

Pyrometer. Thermo-Electric. For 200° to 2900° F., consisting of a platinum, platinum-rhodium couple, and a D'Arsonval galvanometer. The thermo-electric wire couples can be replaced at any time, as they are interchangeable. Sold as indicating as well as recording instrument.
—Eimer & Amend, New York.

Pyrometer, Thermo-Electric Le Chatelier. Consists in stationary form of a 60-inch platinum, platinum-rhodium, thermo-couple, Siemens and Halske pyrometer-galvanometer, pair of 50-inch best porcelain tubes. In portable form, the same as above except 30-inch couple and 18-inch tubes.
—Scientific Materials Co., Pittsburgh, Pa.

Pyrometer, Thermo-Electric, Siemens. The Siemens thermo-electric pyrometer can be used in connection with any suitable thermo-couple. For high temperatures between 200 and 1600° C. (about 400 and 2000° F.) the most suitable thermo-couple is platinum and platinum-rhodium. For lower temperatures up to 1000° C. (about up to 1800° F.), platinum-iridium may be used instead of platinum-rhodium. For still lower temperatures and also for temperatures down to minus 190° C. (—310° F) constantan-silver couples are advisable on account of the higher thermo-electric force. The Siemens pyrometers are upon request furnished with a certificate of the German Reichsanstalt. Of course, the Bureau of Standards in Washington will also test and certify the Siemens pyrometers. Widely used for blast furnaces, foundries, hardening furnaces, boilers, porcelain furnaces, and in chemical factories.

The Siemens instrument is of highest accuracy and sensitiveness. With the pivoted direct-reading galvanometer, the necessity of levelling the instrument is avoided. Made in several types; for laboratory work the suspension-strip pyrometer is recommended; for supervision and control of temperatures the recording suspension-strip pyrometer; for supervision and control of temperatures in industrial works the recording pivoted-coil pyrometer.

A special feature of all Siemens-pyrometers, the direct-reading as well as the recording pyrometers, is their high internal resistance that amounts to several hundred ohms; even in the pivoted type. This feature enables the Siemens pyrometers to be used in connection with a special commutator so that five thermo-couples can be connected to one recording pyrometer. The Siemens & Halske

Co. furnishes also a complete set of all auxiliary apparatus to be used in connection with pyrometers; especially may be mentioned a potentiometer for very exact thermo-electrical measurements according to Lindeck's method.
—Siemens & Halske Co., New York.
—Charles Engelhard, New York (Agent for the United States.)

Pyrometer, Thermo-Electric, Taylor-Cambridge Standard. For high temperatures and for accurate work the thermocouple is made of platinum and platinum-rhodium, protected in a highly refractory stem. Measurement of temperature is made on a specially calibrated indicating millivoltmeter either portable, wall type, or recording. In all cases these are of high resistance and the portable and wall-type instruments do not require accurate leveling in use, nor the clamping of the coil when carrying. The scale in these instruments is over 6″ long.
—Taylor Instrument Companies, Rochester. N. Y.

Pyrometer, Thermo-Electric, Queen. Based on the Le Chatalier principle. Consists of a platinum-rhodium couple and a sensitive d'Arsonval galvanometer with a scale, carefully calibrated either in Fahrenheit or Centigrade degrees, or millivolts if desired. The instrument has been greatly improved over former types of the company, so as to be most accurate and sensitive, besides being of rugged construction throughout and capable of withstanding rough usage.
—Queen & Co., Philadelphia, Pa.

Pyrometer, Thermo-Electric, Advance. Large-dial indicators of standard and special ranges. Double pivot wall or portable instruments. Fire-rods of which the two elements of the couple are a rod and a tube, the insulation being around the rod and wholly inside the tube so that no short-circuiting can occur and quickest response to temperature change is obtained. Fire-rods may be beat without injury. They are made in many lengths and all interchangeable. Regular fire-rods for use to 1800° F. or 1000° C. Special thermocouples for higher heats.
—Wilson-Maeulen Co., New York.

Pyrometer. Thermo-Electric. Advance Recording. Ranges to 1200° F., 1800° F., 2200° F. For use in connection with Advance fire-rods and on special alloy thermocouples. The record is made with ink on white paper, the paper travelling " straight ahead ". Records continuous for 24 hours or four weeks obtained according to form of record paper used.
—Wilson-Maeulen Co., New York.

Pyrometer, Thermo-Electric, Bristol. Indicating and recording. With low resistance. Inexpensive couples of special alloys used. A special feature of the Bristol pyrometer is the compensator, which automatically makes correction for any change of temperature of

the cold junction. For indicating pyrometers the commercial switchboard type of portable dead-bent indicating instrument may be employed. For recording pyrometers the record is made on a smoked chart by a method which absolutely eliminates friction between pen and chart. Widely used for measuring and recording the temperature of the blast and top gases of blast furnaces, etc., and in general for measurement of temperatures not to exceed 2000° F. —Bristol Co., Waterbury. Conn.

Pyrometer, Thermo-Electric, Bristol. For instantaneously taking the temperature of molten metals. A portable instrument. The feature is a special thermo-electric couple, the two elements of which are disconnected and left without insulation. When the tips of these elements are slightly immersed into the molten metal, an electric connection is made and the reading on the instrument will be the same as if the couple had been originally joined.
—Bristol Co., Waterbury, Conn.

Pyrometer, Thermo-Electric, Brown. Particularly designed for ordinary rough industrial use where an accurate instrument is desired. The thermo-couple consists of two nickel-alloy rods, ¼″ in diameter, suitably insulated and protected by steel protecting tubes. The indicator can be either of the stationary or portable type, the stationary instrument having an extra long scale, the instrument being what is known as a large type millivolt-meter. The instrument is furnished complete with leads or wiring ready for use.
—Edward Brown & Son, Philadelphia, Pa.

Pyrometer, Thermo-Electric, Brown Recording. Makes a dotted ink line record on an ordinary white 8″ recording chart, the dots being formed so close together that they form practically a continuous ink line. The pointer is actuated in this instrument the same as in an indicating instrument, and the 8″ chart is brought forward and makes a contact every minute with the ink pen. The whole clock mechanism is of powerful construction, and is designed for ordinary shop use.
—Edward Brown & Son, Philadelphia, Pa.

Pyrometer, Thermo-Electric, Hoskins. The Hoskins pyrometer, Type PA 101, consisting of thermo-couple, twin wire leads and a meter is sensitive, accurate and durable. The instrument is adaptable to either practical shop or laboratory work or to experimental usage, the range of temperature through which it is capable of use being 150 to 1400 degrees C. (300° to 2550° F.). The couple is made of nickel and a patented nickel-chromium alloy. This has a high melting point and straight line temperatures-e.m.f. curve, is robust and does not require the use of a protecting tube, thus giving its temperature indications without lag. The meter is portable and direct reading—either Fahrenheit or Centigrade scales being furnished, as specified. An illuminated dial switch board type meter is made, which in connection with a switch enables the tem-

perature indication on this instrument from a number of different sources.
—Hoskins Mfg. Co., Detroit, Mich.

Pyrometer, Thermo-Electric, Le Chatelier, Hoskins, Bristol types.
—Geo. D. Feidt & Co., Philadelphia, Pa.

Pyrometer, Thermo-Electric, Taylor-Cambridge, Base-Metal. For use where robustness and cheapness is preferred to extreme accuracy. Standard ranges 200 to 1000° F., and 300 to 1800° F. The thermocouple is made of thick wires of heat resisting alloys insulated by refractory compound and protected by a steel stem. It is provided with a plug head for quick attachment of cable. The temperature measurement is made by a specially calibrated indicating millivoltmeter which may be portable, wall type or recording. The portable and wall types are independent of levelling and may be used in any position.
—Taylor Instrument Companies, Rochester, N. Y.

Pyrometer, Thermo-Electric, Thwing. The couple consists of nickel alloys, one being in the form of a heavy tube enclosing the other, the junction being welded. This construction affords protection from injury without sacrificing quickness of response to temperature changes. The galvanometer is compensated for changes of air temperature and for error of cold ends. Furnished with *Pt/Pt-Rh* couples for temperatures above 1100° C. Furnished in portable or wall form or as recorder.
—C. B. Thwing, Philadelphia, Pa.

Pyrometer, Thermo-Electric, Thwing Recording. The record is distinctly printed in ink and visible in its etirety. It is surmounted by a distinct indicating scale from which the temperature may be read directly at any time. It may be made to record simultaneously as high as four temperatures at one time, the records being distinguishable by varying frequency of the dots composing the record. This makes the comparison of two or more related temperatures very convenient. The cost of making the additional records is small.
—C. B. Thwing, Philadelphia, Pa.

Pyrometer, Thermo-Electric. Special Thermocouples. We make a specialty of thermocouples for special temperature ranges and special conditions. Thermocouples (for moderate heats) of wire as fine as #28 B. & S. Couples in stock for temperatures as low as 250° below 0° F. Interchangeable couples of platinum-iridium.
—Wilson-Maeulen Co., New York.

Pyrometer Tube. Protecting sheaths or tubes for the thermocouples used in pyrometry. In addition to fire clay, glazed porcelain, fused quartz, etc., pure Acheson graphite has proved of value in brass, aluminium, zinc and other metallurgical work. These are

readily made by boring solid Acheson graphite rods. The purity, inertness, high heat conductivity and low price are favorable factors.
—International Acheson Graphite Co., Niagara Falls, N. Y.

PYROMETER, OPTICAL. *An instrument in which the temperature measurement is made by the comparison of the relative luminous intensity of the hot body and a standard. The adjustment is made by the operator until equality is established between the two intensities. This adjustment provides a reading which is convertible into temperature. Optical and radiation pyrometers are the only instruments permitting the measurement of temperatures above* 1600° *C. or about* 2900° *F. (the upper limit of electric pyrometers). They measure the temperature from a distance, so that the instrument is not subjected to any excessive temperature.*

Pyrometer, Optical, Le Chatelier. For temperatures above 1000° C. The standard of luminosity is a gasoline lamp. The regulation of the intensity of the light from the standard lamp is controlled by a cat's eye diaphragm (no prisms being used).
—Wilson-Maeulen Co., New York.

Pyrometer, Optical, Fery Absorption. For temperatures above 1200° C. An improved form of the original optical pyrometer of Le Chatelier. The standard of luminosity is an amyl-acetate lamp. The image of this flame when seen through the eye piece is superposed on the image of the hot body, and variation of luminous intensity in the latter is made by traversing a pair of absorbing quartz wedges between the focused image and the hot body. When equality is established the reading is made upon a scale attached to the quartz wedges. Can be used on extremely small hot bodies of irregular shape.
—Taylor Instrument Companies, Rochester, N. Y.

Pyrometer, Optical, Wanner. Wanner, making use of the polarizing principle discarded by Le Chatelier, has deviced a photometer-pyrometer, which is a modification, suited to temperature-measurements, of König's spectrophotometer. Has been in wide use for a series of years in industrial plants, and has been improved in its latest design so as to avoid errors due to loss of light in its passage through the apparatus. Measures temperatures above 900° C. (about 1650° F.). Supplied with Reichsanstalt certificates in three ranges, one going up to 2000° C. (about 3600° F.), the second to 4000° C. the third to 7000° C. Determinations of temperature exact and rapid, no previous knowledge being required. The " new Wanner pyrometer " is made in two styles, with temperature ranges of 600 to 1000° C. (particularly for the annealing and tempering of steel), and 900 to 7000° C.; this instrument is portable, accurate and convenient.
—Eimer & Amend, New York.
—Scientific Materials Co., Pittsburgh, Pa.

PYROMETER, RADIATION. *A device sensitive to temperature is subjected to the radiant heat given out by the body whose temperature is to be measured, in such a way that the measurement made is one of intensity of radiation and is within limits independent of the size of the hot body, or the distance separating it from the pyrometer. Radiation pyrometers and optical pyrometers are both based on the laws of radiation; but in the former the total heat of radiation is used as measure of temperature, in the latter only the radiation corresponding to a certain wave length.*

Pyrometer, Radiation, Fery. Works a distance from the hot body. For all temperatures above 1200° F. Standard range 1000 to 3600° F. Radiant heat from hot body focused by gilded concave mirror on to one junction of a minute Thermocouple. The focusing arrangements make the measurement independent of distance. Can be used on a hot body as small as ½" diameter. Temperature is read direct on a specially calibrated millivoltmeter, portable, wall type or recording. Millivoltmeter is of high resistance, and in the portable and wall types the movement is double pivoted, avoiding the necessity for accurate levelling in use.
—Eimer & Amend, New York City.
—Taylor Instrument Companies, Rochester, N. Y.
—Wilson-Maeulen Co. New York.

Pyrometer, Radiation, Fery modified. In the latest form of the Fery radiation pyrometer the thermo couple is replaced by a spring of two metal strips with different coefficients of expansion. When heated by the radiation being concentrated upon it, the spring unrolls and acts on a pointer.
—Taylor Instrument Companies, Rochester, N. Y.

Pyrometer, Radiation, Thwing. A simple hand tube receives the radiations from the hot body the temperature being read directly in degrees, in three seconds after pointing at the source of heat, upon the scale of a portable galvanometer. The tube requires no focussing and the galvanometer no levelling. The entire outfit weighs but four pounds. Highly accurate where conditions are suitable. In use for temperatures as low as 200° C. but especially suitable for very high temperatures.
—C. B. Thwing, Philadelphia, Pa.

PYROMETERS. OTHERS THAN ELECTRIC, OPTICAL, AND RADIATION.

Pyrometer, Bristol Recording. For temperatures from 40 to 800° F., for kilns, ovens, flue gases, superheated steam, core-ovens, drying apparatus, etc. The operation depends on the pressure due to the expansion of a gas contained in a bulb which is connected with a Bristol recording pressure gauge by a small flexible copper tube 25 feet or more in length.
—Bristol Co., Waterbury, Conn.

Pyrometer. Brown Standard Portable. Used largely at blast furnace plants for testing the temperature at the tuyeres. It is held to the plughole and the temperature of the hot blast, in passing through, is indicated on the dial. A desirable feature about the improved portable pyrometer is its quickness in indicating, about 25 seconds being necessary to make a test. This is important where the pressures are high.
—Edward Brown & Son, Philadelphia, Pa.

Pyrometer. Brown Hot-Blast. Based on the difference in expansion of a special steel stem and non-expansion of graphite rods. The temperature is readily observed on a large 6½" dial, the pointer passing around this dial and having wide divisions reading to 10 degrees. This instrument has a porcelain dial which does not become tarnished; is practically unbreakable, the stem being all of steel and the instrument is accurate and durable when used for temperatures up to 1500 degrees Fahrenheit.
—Edward Brown & Son, Philadelphia, Pa.

Pyrometer, Brown Recording. Based on the expansion of a special alloy steel stem and the non-expansion of graphite rods. Instead of a dial with pointer as in the Brown hot-blast pyrometer the instrument is supplied with a recording mechanism with a pen resting directly on the chart and tracing a red line on the white chart. This instrument is adaptable for recording temperatures to 1500 degrees Fahrenheit.
—Edward Brown & Son, Philadelphia, Pa.

Pyrometer. Brown Quick-Acting Platinum. A portable pyrometer designed for practical use in measuring high temperatures. This instrument has no parts which can be readily broken and is suitable for placing in the hands of any ordinary workman. It is particularly used in the annealing ovens of malleable iron works, glass melting tanks, chemical works, etc. The instrument is inserted in the furnace or kiln and the pointer immediately passes around the dial, stops, the temperature is noted, and the instrument withdrawn, taking altogether about 15 seconds.
—Edward Brown & Son, Philadelphia, Pa.

Pyrometers. Gauntelett. Based on the different expansion coefficient of an iron and a copper tube. Specially adapted for higher temperatures, 1500° F. being, however, about the limit. Pyrometers in stock with dials of 1000, 1200 and 1500° F. maximum.
—Eimer & Amend, New York.

Pyrometer. Hobson Hot-Blast. This is an English instrument which is used at blast furnace plants in certain sections of the United States. The nozzle of the instrument is held to the tuyere at the blast furnace, and the hot blast is drawn in and cooled by three parts of cold air, the actual temperature of the hot blast being read on the brass scales alongside of the thermometer designed for

this purpose. It is a very handy form of instrument, and is preferred by many iron plants on account of its simplicity.
—Edward Brown & Son, Philadelphia, Pa.

Pyrometers. Princeps Alloys. Strips of metals and alloys of various melting points (315 to 1775° C.) for approximate temperature determinations in ceramic works.
—Eimer & Amend, New York.

Pyrometers. Seger cones. Set of 36 numbered cones, ranging from 1150 to 1850° C., for use in the ceramic industry.
—Eimer & Amend, New York.

Pyrometer. Siemens Water. Consists of a cylindrical copper vessel containing water in which a mercury thermometer with an adjustable brass scale is inserted, and with the thermometers are furnished copper cylinders. Exactly 20 ounces of water are placed in the pyrometer, the copper ball is heated in the furnace and dropped into the water, the temperature of which rises and can be read off on the graduated scale placed alongside of the pyrometer. in the actual degrees of temperature of the furnace. For measuring the temperature of annealing furnaces, etc., up to 1800° F.
—Edward Brown & Son, Philadelphia, Pa.
—Eimer & Amend, New York.

Pyrometers. In most approved types, both of domestic and foreign manufacture, at manufacturers' prices.
—Arthur H. Thomas Co., Philadelphia, Pa.

QUARTZ, FUSED TRANSPARENT. Laboratory utensils, like beakers, crucibles, dishes, flask, tubes, test tubes. Have a softening point about 800° C. higher than ordinary glass and stand the most sudden and violent changes of temperature without breaking. Quartz-glass resists the actions of many chemicals and the surface is not hygroscopic. Nearly any piece of laboratory glass-blown ware can be duplicated in quartz.
—Eimer & Amend, New York City.

QUARTZ, FUSED, TRANSPARENT, Hereaus. Fused quartz glass articles, of transparent fused quartz, can be raised to white heat and plunged into cold water without damage; not affected by any temperature changes. Anything that the glass blower can make, can be made of Hereaus fused quartz glass. Write for pamphlet.
—Charles Engelhard, New York.

QUARTZ, FUSED, TRANSPARENT. Laboratory Ware.
—Scientific Materials Co., Pittsburgh, Pa.

QUARTZ, FUSED, TRANSPARENT. This apparatus is manufactured by a process which has the merit of producing articles of a

symmetry hitherto unattained in silica ware. The apparatus being transparent and consisting of pure silica in a thoroughly fused and homogeneous condition, fulfills purposes for which the ordinary opaque material is unsuitable. Fused quartz articles do not crack when subjected to the most violent and sudden changes of temperature; they are unattacked by the volatile acids, with the exception of hydrofluoric acid; they have a melting point approximately equal to that of platinum; they are harder than ordinary glass. Above 1000° C. permeable to hydrogen and certain other gases. Coefficient of expansion 0.00000059 per degree Centigrade (about 1/17 that of platinum). Its expansion up to 1000° C. is regular; above 1200° C. it contracts. As far as known at present, it shows no tendency to devitrification. Density 2.2
—Arthur H. Thomas Co., Philadelphia, Pa.

QUARTZ, FUSED, TRANSPARENT. The articles are hand worked and made in intricate shapes. The transparent fused quartz differs from the opaque electroquartz (see below) only in being free from air inclusions and so is transparent and tougher.
—Wilson-Maeulen Co., New York City.

QUARTZ, FUSED, OPAQUE or electroquartz. In the opaque state, quartz articles are made in cast, pressed, and drawn pieces with perfect glaze on both outer and inner surfaces of laboratory articles. Large basins, glazed inside. Pipes and large tubes, smooth but not glazed. Serviceable for pyrometer tubes in most cases, combustion tubes, pipes and containers for hot acids. Because of negligibly small coefficient of expansion electroquartz withstands sudden and violent temperature changes. It differs from the transparent fused quartz only in having air inclusions and so being opaque and less tough. Like the transparent fused quartz it is pure SiO_2 and so should be limited to acid or neutral contents.
—Wilson-Maeulen Co., New York City.

QUARTZ GLASS. A term sometimes used for fused quartz. It is not glass, but pure silica. See Quartz, Fused.

RADIUM.
—Eimer & Amend, New York City.
—Fuerst Bros., New York.

REAGENTS. See Chemicals.

REFRACTOMETERS. All kinds.
—Scientific Materials Co., Pittsburgh, Pa.
—Geo. D. Feidt & Co., Philadelphia, Pa.

RETORTS for Laboratories, made of copper, porcelain, glass or iron.
—Scientific Materials Co., Pittsburgh, Pa.

REVOLUTION INDICATOR. Extensively used for continually indicating the speed of engines, rotating shafts, water wheels, etc. The instrument shows at a glance by the height of a column of mercury the number of revolutions per minute made by an engine or dynamo without the necessity of counting or using a watch. This revolution indicator is particularly adaptable for slow speed engines, such as blast furnace blowing engines, and it is very extensively used for this purpose.
—Edward Brown & Son, Philadelphia, Pa.

REVOLUTION RECORDER, Brown. Continually records on an 8" circular chart the revolutions per minute made by an engine, motor, etc., the instrument being very sensitive and recording the slightest change in speed. A clear ink line record is made on the recording chart, and the instrument can be used for either high or slow speed engines or rotating shafts. The instrument is particularly used at blast furnace plants.
—Edward Brown & Son, Philadelphia, Pa.

RUBBER GOODS for Laboratories. Rubber bulbs, gloves, fingers, sheet, stoppers and tubing.
—Scientific Materials Co., Pittsburgh, Pa.
—Geo. D. Feidt & Co., Philadelphia, Pa.
(Other dealers see Laboratory Supplies.)

SEGER CONES. For measurements of temperatures, set of 36 numbered cones, ranging from 1150 to 1850° C.
—Eimer & Amend, New York.

SHAKING MACHINE. J. M. Camp's. A great time and labor saver, where agitation is desired in a flask for either dissolving or precipitating, and particularly adapted for precipitating phosphorus by the molybdic acid method, or dissolving steel or pig iron for carbon combustion. Holds six of any sized flasks, Florence or Erlenmeyer, from six to twenty-four ounces capacity, any one of which can be placed or removed in a fraction of a second. Requires about 1/25 horse power and can be operated by a small electric motor. (See illustrated description in Electrochemical and Metallurgical Industry, vol. v. p. 270.)
—Scientific Materials Co., Pittsburgh, Pa.

SILICA, FUSED. See Quartz, Fused.

SLIDE RULE, CHEMISTS'. Contains seventy-five factors constantly used in calculating analytical results. Reduces the time required for calculation of chemical analysis to a few seconds and also increases the accuracy of the results. The rule permits the reading of results to four places of figures. In addition to the calculations of percentage of given elements in a substance, the rule also serves for the performance of simple multiplication, division, determination of powers of a number, the extraction of roots, and

can also be used in volumetric determinations. The factors for elements, in the different forms of combination in which they are ordinarily calculated, are indicated on the face of the rule; on the back is a table of the atomic weights, and on the edge is a scale divided into millimeters. Write for pamphlet for description.
—Scientific Materials Co., Pittsburgh, Pa.

SPECTROSCOPES.
—Eimer & Amend, New York.
—Henry Heil Chemical Co., St. Louis, Mo.
—Geo. D. Feidt & Co., Philadelphia, Pa.
—E. H. Sargent & Co., Chicago, Ill.
—Scientific Materials Co., Pittsburgh, Pa.
—Arthur H. Thomas Co., Philadelphia, Pa.

STILLS. See also Part I of this Dictionary.

STILLS. For laboratories and domestic uses.
—Henry Heil Chemical Co., St. Louis, Mo.
—Geo. D. Feidt & Co., Philadelphia, Pa.

Still. Mercury distilling apparatus.
—Wm. Gaertner & Co., Chicago, Ill.

Still. Sargent's automatic water still for the continuous production of distilled water for laboratory and domestic use. Made in two sizes to produce ½ and 1 gallon per hour. Equipped with burners for gas or gasoline or with steam coil. We also supply automatic stills heated by steam only with a capacity of 5 gallons per hour up to any capacity desired. Electric distilling apparatus, may be operated on 110-volt alternating or direct current. Also supplied for use on 220-volt circuits. Capacity of standard apparatus is one gallon per hour. Also Scott's oil still.
—E. H. Sargent & Co., Chicago, Ill.

Still, Automatic. Steam heated still for large laboratories. Boiling chamber made of heavy copper, fitted with water gauge. Condensing chamber made of heavy copper with ¾ inch heavy block tin condensing coil. The boiling chamber, condenser and steam oil are heavily coated on the inside with block tin. Approximate capacity, 4 gallons per hour. Also made for any other size desired.
—Scientific Materials Co., Pittsburgh, Pa.

STONEWARE, CHEMICAL. See Part 1 of Dictionary under Stoneware and Earthenware, also different apparatus made from stoneware.

SUPPORTS. Universal laboratory supports. A complete system of supports covering practically every requirement in chemical and physical laboratories. The parts of the system are inter-

changeable and are capable of being used in many different ways, the various combinations often serving the purpose of expensive pieces of apparatus. Many improvements have been made and many new and useful pieces have been added to make the system a most complete one.
—Wm. Gaertner & Co., Chicago, Ill.

TELESCOPE AND SCALE. For the measurement of small movements at a distance a telescope is provided on an adjustable stand. Where the movement is that of the mirror in a reflecting galvanometer, a scale is also mounted and the movement of the image of this scale is measured in the eye piece of the telescope. In the Taylor-Cambridge telescope and scale, the scale is 40 cm. long divided in millimeters and figured. It can be placed horizontally or vertically. The telescope and scale are both mounted upon an adjustable stand.
—Taylor Instrument Companies, Rochester, N. Y.

TESTING SETS, Portable, Leeds & Northrup. Conveniently portable and thoroughly reliable instruments for measuring resistances ranging from a fraction of an ohm to a few megohms, to a better degree of accuracy than that required by ordinary commercial practice and for making the Murray and Varley loop tests. They consist of a Wheatstone Bridge, a battery, and a portable galvanometer, mounted in a portable case. Besides these, they are provided with various switches and coils to admit of the location of faults, crosses and grounds on circuits whose resistance is over 10 ohms. A special type provides for the location of faults in low resistance type circuits.
—Leeds & Northrup Co., Philadelphia, Pa.

TESTING, ELECTRIC. See Instruments; also Part III, Electrical Testing Laboratories.

THERMOMETERS. See also Pyrometers.

THERMOMETERS, Chemical. Of best European make, of resistance glass. We supply, on special orders, thermometers tested by the U. S. Bureau of Standards. Also thermometers with certificate of German Reichsanstalt. Maximum and minimum thermometers. Thermometers for special purposes. M. Sendter's recording thermometers, etc.
—Eimer & Amend, New York City.

Thermometers, Queen, are the result of long experience in this line of work. Queen & Co. have in many respects been the pioneer in the development of scientific thermometer making in America, for instance, 1000° chemical thermometer and the first meteorological pyrometer to 1000° made in this country were made by us. The first scientific catalogue of thermometers and meteorological instruments ever published in this country was written and issued by

Queen & Co., many years ago. Queen thermometers are made for all purposes, technical, scientific, meteorological, household, etc. Data, prices and full information furnished upon request.
—Queen & Co., Philadelphia, Pa.

Thermometers. All glass etched scale thermometers for laboratory use. All glass thermometers encased in substantial metallic case and arranged so that the temperature can be read on the outside of the apparatus, for use on air ducts etc. This corporation is the outgrowth of the thermometer business established in 1851 by George Taylor; since 1890 the company has absorbed the Hohmann & Maurer Mfg. Co. (high-grade thermometers and gauges), the Watertown Thermometer Co. (general thermometers), the R. Hoehn Co. (commercial thermometers and hydrometers), Short & Mason, Ltd., the H. & M. Automatic Regulator Co., and the American branch of the Cambridge Scientific Instrument Co. of Cambridge, England (pyrometers and measuring instruments).
—Taylor Instrument Companies, Rochester, N. Y.

THERMOMETERS, Chemical.
—Wm. Gaertner & Co., Chicago, Ill.
—Geo. D. Feidt & Co., Philadelphia, Pa.
—Scientific Materials Co., Pittsburgh, Pa.
—Arthur H. Thomas Co., Philadelphia, Pa.
(For other dealers see Laboratory Supplies.)

TIME RECORDER, Bristol. Records automatically the occurrence and duration of various operations, such as the starting and stopping of machines, opening and closing of valves, etc. Used in connection with gas producers, Bessemer converters, to record charging and discharging of coke ovens etc. Several different operations may be recorded on the same chart.
—Bristol Co., Waterbury, Conn.

VACUUM PUMPS. See Blowers ; also Pumps.

VISCOSIMETER. Stormer's. Simple in construction, quickly and easily cleaned, permits a large number of tests to be accurately made within a short time. Its operation depends on a paddle wheel driven by constant force. Number of revolutions measured with the aid of a stop-watch. Only 50 cc. sample required for determination of viscosity.
—Bausch and Lomb Optical Co., Rochester, N.Y.

Viscosimeter. Doolittle's improved torsion viscosimeter. No hole to clog and spoil results, simply a wire to twist. Instant repetition of tests can be made without cleaning the instrument. Viscosity can be measured at any temperature with ease. The viscosity of an oil can, therefore, be taken at the temperature at which it is to be used. Specific gravity does not influence the result.
—Eimer & Amend, New York City.

Viscosimeter, Engler's, Reilly's, Scott's, Boverton Redwood's, Tagliablue's. Lepenan's leptometer for the direct comparison of the viscosity of two oils under similar conditions simultaneously.
—Eimer & Amend, New York City.

Viscosimeter. Scott's. So constructed that the reservoir may be readily removed and cleaned. The temperature of the liquid to be tested is accurately regulated by water or liquids of higher boiling points which surround the reservoir. We also handle Tagliabue's and Engler's viscosimeters.
—E. H. Sargent & Co., Chicago, Ill.

VOLTAMMETERS, WESTON STANDARD. See Instruments, Weston Standard.
—Weston Electrical Instrument Co., Newark, N. J.

VOLTMETERS. WESTON STANDARD. See Instruments, Weston Standard.
—Weston Electrical Instrument Co., Waverly Park, Newark, N. J.

VOLUMETER, Scott's. For paint chemists for measuring the volume of one cubic inch of powdered material.
—E. H. Sargent & Co., Chicago, Ill.

WATER ANALYSIS Apparatus.
—Scientific Materials Co., Pittsburgh, Pa.

WEIGHTS for balances. Most up-to-date factory of fine balances and weights. Gold medal at St. Louis Exposition. Catalog A-4.
—Wm. Ainsworth & Sons, Denver, Colo.

WEIGHTS. We manufacture fine balances and weights for every purpose where accuracy is required. Established 1859. Illustrated catalog.
—Herman Kohlbusch, Sr., New York City.

WEIGHTS and riders for balances of precision. Established 1888. Illustrated catalog E.
—Voland & Sons, New Rochelle, N. Y.

WEIGHTS for balances. See also Balances.
—Eimer & Amend, New York City.
—Geo. D. Feidt & Co., Philadelphia, Pa.
—Henry Heil Chemical Co., St. Louis, Mo.
—Queen & Co., Philadelphia, Pa.
—E. H. Sargent & Co., Chicago, Ill.
—Scientific Materials Co., Pittsburgh, Pa.
—Arthur H. Thomas Co., Philadelphia, Pa.

WHEATSTONE BRIDGE. See Bridge.

PART III.

Professional Directory.

BOOTH, GARRETT & BLAIR, Philadelphia, Pa.

Metallurgical, analytical, and engineering chemists. Firm established 1836. Analysis of special steels, ores, and minerals. Water analyses, bacteriological and sanitary. Mechanical tests of metals, stones, woods. Cement testing. While the work of the firm consists mainly in metallurgical analysis and investigation, a great variety of other work is also done. Particular attention is paid to alloy steels and also to the micrographic investigation of metals. The firm makes a specialty of general industrial investigation working out methods for obtaining the greatest efficiency of operation, and maintaining the quality of shipment by means of routine tests.

BYRNES, TOWNSEND & BRICKENSTEIN, Washington, D. C.

Patent lawyers and experts in electricity, metallurgy, chemistry, and electrochemistry. This firm, while practicing patent law before the Patent Office and Courts, is qualified and largely devotes its attention to chemical, electrochemical, and metallurgical subjects. Mr. Clinton P. Townsend was for seven years assistant examiner of the class of electrochemistry in the Patent Office; he is the inventor of the Townsend electrolytic cell. Mr. John H. Brickenstein entered the Patent Office as Assistant examiner of Metallurgy; he was thereafter in an electrical division, principal examiner of a chemical division, and for a number of years senior member of the board of examiners-in-chief. Dr. Eugene A. Byrnes was for seventeen years in the Examining Corps of the Patent Office, being for ten years principal examiner of the Division of Electrochemistry and Metallurgy, also having charge of the Laboratory. Mr. Brickenstein and Dr. Byrnes are members of the Bar of the Supreme Court.

GEORGE C. DAVIS, Philadelphia, Pa.

Metallurgical chemist. Analysis of alloys, iron, coal, sand, clay, and cement. Calorific value of coal.

DELTON, MAILLOUX & CO., New York and Paris.

A bureau of electrochemistry and electrometallurgy which has at its disposal the experience and data of dozens of electrochemical

plants and processes of all kinds. Not only the specifications, general and detailed plans, construction, data, etc., are available, but also records of tests and of practical operation, and data regarding the cost of production and the profits. The following list gives the principal electrochemical processes on which the firm has data: Production of pure alumina, artificial cryolite, and aluminium; calcium carbide (electric furnaces up to 5000 kw); production of ferro-alloys, including ferro-silicon, chromium, manganese, molybdenum, tungsten, vanadium, titanium; production of steel by the electric furnace; production of phosphorus by the electric furnace; electrolysis of sodium chloride by all processes, including diaphragm cells, mercury cathode cells, and gravity (" bell ") cells; production of chlorine compounds, chloride of lime, hypochlorite of lime, chloride of sulphur; production of potassium chlorate, or sodium chlorate by direct electrolysis; extraction of sodium chloride, by multiple evaporation system; steam and hydraulic power plants for power transmission and distribution, and for electrochemical works. The firm consists of Mr. C. O. Mailloux, New York, and Mr. Henri Delton, Paris.

ELECTRICAL TESTING LABORATORIES, New York.

A large and very fully equipped laboratory for carrying out all kinds of electrical tests, also other tests. The laboratories were founded with the support of the largest Edison companies in this country, who recognized the necessity of such an institution not only for their own purposes, for testing lamps, but for the electrical industries in general. A large part of the work of the laboratories is still the testing of lamps. But the equipment of the laboratories is so complete that almost any electrical tests desired may be easily performed there. Direct and alternating current equipment are available. Besides arc and incandescent lamp tests, the work of the laboratories includes electrical and photometrical standardization, resistance, conductivity, and insulation tests, calibration of measuring instruments, etc., also various special investigations. Also fuel tests and in general tests of materials used in chemical and metallurgical industries. The equipment is in every respect up-to-date. Isolated space is available for secret work.

R. LIVINGSTON FERNBACH, New York City.

Engineering and chemical laboratories; main office in New York City, laboratories in Boston, Mass., New York City, and Montreal, P. Q. The chief specialty of these laboratories is process installation and alteration. Machine design for special processes. Mill design and construction. Laboratories for all commercial tests and researches. Patent research.

FITZGERALD AND BENNIE LABORATORIES, Niagara Falls, N. Y.

The distinctive feature of these laboratories is the design, construction, and operation of electric furnaces for all purposes, and study of all problems associated therewith.

Special attention has been paid to the study of electric steel fur-

naces for all grades of steel. The induction furnace plant of the American Electric Furnace Co. was designed and installed under the supervision of the FitzGerald and Bennie Laboratories. The plant includes one induction furnace of 300 k.v.a. and two smaller experimental furnaces with motor-generator set. The experiments with the Lash steel process in the electric furnace, using a Heroult furnace of 1000 h.p. were in charge of these Laboratories.

FitzGerald and Bennie Laboratories do not, however, represent any interests controlling special types of furnaces, hence are in position to advise and suggest as to furnaces best adapted to any particular purpose. Intimate knowledge of all types of electric steel furnaces gives this feature special value to those interested in the application of the electric furnace to steel treatment or manufacture. Special attention is devoted to the study of resistor furnaces, involving problems requiring control and accurate adjustment of temperature or atmosphere. Research work in refractories is an important branch of work carried on. General analytical work is not undertaken; but special analytical problems connected with electric furnace work have been the subject of considerable study. The furnace laboratory equipment permits the study of problems requiring 50 to 100 kilowatts; for work on the commercial scale, up to 1000 kilowatts, special arrangements can easily be made for both power and apparatus.

HAMLIN & MORRISON, Philadelphia, Pa.

Analytical chemists. Firm established 1892.

CARL HERING, Philadelphia, Pa.

Consulting electrical engineer. Research work, reports on processes, testimony in patent litigation cases, etc. Design of electric furnaces, with a view of reducing the losses, notably the electrode losses, a specialty.

WOOLSEY MCA. JOHNSON, Hartford, Conn.

Metallurgical Engineer. Formerly electrometallurgist Orford Copper Co. and metallurgist Lanyon Zinc Co., etc. Member American Institute of Mining Engineers and American Electrochemical Society. Specialist on the application of physical chemistry to metallurgical and electrometallurgical processes. Research and electric furnace laboratory.

R. C. KLINE, B. S. La Jolla, San Diego Co., Cal.

Metallurgical engineer. Modern cyanide practice and mill design. Specially: the treatment of silver ores. (Temporary address: care of The Guanacevi Co., Ltd., Guanacevi, Durango, Mexico.)

LINDE AIR PRODUCTS CO., Buffalo, N. Y.

Consulting engineers and manufacturers of machines for the production of oxygen and nitrogen from the air, for the liquefaction of gases and the operation of gaseous mixtures.

ARTHUR D. LITTLE, INC., Boston, Mass.

A laboratory of engineering chemistry, established in 1886. The work of the Arthur D. Little Laboratory is primarily directed toward increasing the efficiency of industrial effort by aiding manufacturers, public service corporations, and individual clients in the economic selection of raw materials, the chemical control of processes and products, the rigid control of quality and money value of supplies, the preparation of specifications, chemical and physical tests on material delivered, and the study of special problems. The laboratory staff includes specialists in the several departments of chemistry and in chemical engineering, electrochemistry, fuel engineering, and lubrication, who have been selected equally with reference to their initial scientific and practical experience. The service of the Laboratory covers broadly all questions arising in the purchase and use of coal and lubricants, preservation of timber, problems of electrolysis, and the testing of miscellaneous supplies.

Through the reorganization of their coal department, just effected, the Arthur D. Little Laboratories are now prepared to extend their work to cover every phase of fuel engineering, including mine inspection; methods of preparation inspection, sampling, and testing of coal; power house practice; smoke abatement; the design of power plants; gas producer practice, and the manufacture of illuminating gas. Further, all problems pertaining to coal and its combustion such as the kind of coal best suited for a particular plant, the most advantageous time to purchase, the most economical methods of handling and storing, the prevention of smoke, and the most approved methods of firing. In short, this department of the Laboratory is designed to show every consumer of coal how to make his fuel account yield full value for every dollar expended.

FRED'K J. MAYWALD, New York.

Consulting chemist and chemical manager for manufacturers. Many manufacturers do not get the best results from their factories, because they do not make use of the chemist. They have not enough work to keep a chemist constantly employed, and so do not employ one at all. Mr. Maywald serves as chemical manager in such cases. For a fixed monthly sum he takes entire charge of the chemical work of a manufacture. This includes testing and analysis of supplies and raw materials, improvement of processes and products, with consequent reduction of manufacturing costs; recovery of wastes; investigation of complaints from customers; overcoming of difficulties in manufacture; working out new products, perfecting inventions, etc. This gives the manufacturer the benefit of Mr. Maywald's supervision and experience, the services of a trained and competent corps of chemists, and the advantage of a well equipped laboratory.

DR. CHAS. F. MCKENNA, New York.

The Laboratories of Dr. Chas. F. McKenna in New York, with their organization, equipment and records, are now a recognized centre for information on materials. His 25 years' experience in

studying raw materials and the production and properties of the finished materials of technology has brought them to this high standard.

The Chemical Department is engaged in analytical work as well as synthetic work and research. It is much consulted by patentees. The technical research outfit is particularly adapted to the investigation of new processes on a small practical scale with tanks, coils, centrifugals, grinders, furnaces, etc. Low temperatures are also provided. The Physical Department is supplied with most of the delicate physical apparatus used in the different branches of technology. The Mechanical Test Department is outfitted with heavy testing machines and the smaller machines for tests of cement, paper, textile fabrics, etc. The Bureau of Inspection is organized for the control of structural materials supplied to great works of engineering and architecture. Mill, shop, field and laboratory tests are all covered by this department. His clients are found amongst the most prominent engineers, architects, lawyers, inventors, financiers, and purchasing agents throughout the world.

C. L. PARKER, Washington, D. C. and New York.

Solicitor of chemical, electrochemical, and metallurgical patents. Successor to the Washington practice of Shepherd & Parker.

FRANCIS J. PECK & CO., Cleveland, Ohio.

Mining, metallurgical, and consulting engineers, chemists and assayers. Chemical and physical testing laboratories, Bureau of Inspecting Railroad supplies, foundry supplies and products. Cement sampled, tested and analysed.

CHARLES J. REED, Philadelphia, Pa.

Manufacturing and designing engineer. Grinding, mixing, and separating machinery. Magnetic separators for metals, ores, paper stock, grain and all purposes a specialty. Special apparatus designed and built on contract for new or old electrochemical processes. Automatic feeders for special machinery of all kinds.

SAM. P. SADTLER & SON, Philadelphia, Pa.

Consulting and analytical chemists. Organized and equipped for experimental studies of industrial processes and products, more particularly in the line of organic material. Will advise and aid inventors in bringing chemical inventions in form for presentation to the U. S. Patent Office as well as in submitting supposed anticipations to critical examination and comparison. The firm consists of Dr. Sam. P. Sadtler, president of the American Institute of Chemical Engineers, and Sam. S. Sadtler, former Secretary of the American Electrochemical Society.

E. P. SPALDING, Wallace, Idaho.

Mining Engineer.

JOHN E. TEEPLE, PH. D., New York.

Consulting chemist and chemical engineer. The consulting work of Dr. Teeple relates mainly to the design, installation, improvement, and operation of chemical plants, and the investigation of chemical plants, processes and propositions.

WILKINSON, FISHER & WITHERSPOON, Washington, D. C., and New York.

Attorneys and counsellors at law, making a specialty of chemical, electrochemical, and metallurgical patent practice. The firm consists of Ernest Wilkinson, Counsellor at law, Samuel T. Fisher, formerly Asst. Commissioner of Patents, and principal examiner of one of the chemical divisions, U. S. Patent Office, and Thomas A. Witherspoon, M. S., Late principal examiner, Division of Electrochemistry and Metallurgy, U. S. Patent Office.

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