

BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

MARCH 15, 1929.

I.—GENERAL; PLANT; MACHINERY.

Approximate determination of the absolute size of pores. M. A. RABINOVICH and N. S. FORTUNATOV (J. Chem. Ind. Moscow, 1928, 5, 689—694).—Vapour pressure determinations lead to determinations of the absolute dimensions of pores. Minkovski's equation is modified: $r = k(\log P_0 - \log P_1)$, where k is a constant, P_0 the vapour pressure over the flat surface, and P_1 the vapour pressure over the meniscus in the capillary pore. For charcoal the order of decreasing relative volume of the pores is: birch, pine, activated; porosity determinations give the order: activated, birch, pine. Experiments were also performed with graphites, kaolin, and porcelain. Ignition at a high temperature leads to the same changes in the structure of kaolin as are observed in the ageing of gels.

CHEMICAL ABSTRACTS.

Apparatus for indicating the saturation of an absorption system. A. MACKERT (Chem. Fabr., 1929, 39—40).—The apparatus automatically gives an alarm when, e.g., an activated carbon or silica gel scrubber is saturated and is allowing benzol vapour to pass. A number of beads of activated carbon are hung on a light metal ring from a leaf spring within a vessel through which a portion of the exit gas passes. One end of the leaf spring is clamped and the other end bent at right angles above a mercury contact. Any adsorption by the beads leads to an increase in weight, which depresses the spring and closes an electric circuit. The apparatus is readily adjusted as regards sensitiveness, and will record a few g./m.³ if required. C. IRWIN.

See also A., Feb., 161, **Gas analysis apparatus (BAHR). Hydrogen-ion colorimeter (GRADWOHL). 167, Determination of Engler viscosities (ERK). Turbidimeter (EWALD).**

Slag wool. GUTTMANN.—See X.

PATENTS.

Regenerative furnace. W. MILLWARD (U.S.P. 1,695,199, 11.12.28. Appl., 5.7.23).—The furnace is provided with a gas uptake and an unobstructed air uptake. The former has a gooseneck terminal which stops short of the air uptake and can be supplied with air under pressure, so forming a primary mixing chamber. A secondary mixing chamber centred relatively to the first is provided, the whole arrangement forming a means for effecting sharp combustion in furnaces of the regenerative type. A. B. MANNING.

Desiccation of substances. F. H. DOUTHITT (B.P. 301,952, 8.9.27).—In the apparatus described in B.P. 260,453 (cf. B., 1927, 26) the drying air is admitted through a number of slit-like tangential nozzles which

are individually or collectively adjustable by hinged vanes. Another form of scraper is described.

B. M. VENABLES.

Apparatus for producing an intimate mixture of several media by means of centrifugal force. P. JANES (B.P. 283,975, 21.1.28).—An intimate mixture of a gas and liquid or powder is created by a centrifugal rotor which draws in the gas through an upper axial opening and the other medium through a lower axial opening, the two being kept apart for about two thirds the radial distance they have to flow and being mixed in the outer third. The mixing is aided by corrugations formed on the interior of the outer third of the rotor, and the outermost rim deflects the mixture downwards, so that coarser particles are caught in a basin below and re-fed to the lower axial inlet; only the finer gas-borne particles leave the apparatus.

B. M. VENABLES.

Separation of substances of different sp. gr. W. R. CHAPMAN (B.P. 301,336, 24.6.27).—The coal or other material is passed down an inclined covered trough, a current of gas in the same direction being provided to promote stratification. The heavier materials are drawn off through unobstructed apertures the full width of the bottom of the trough, up which there may be auxiliary currents of gas to prevent the fall of lighter materials. The trough may be reciprocated in a plane inclined to it, and riffles may be provided.

B. M. VENABLES.

Apparatus for classifying or separating granular materials. A. FRANCE (B.P. 301,812, 1.9.27).—In a wet classifier of the type where a stream of pulp flows down an inclined trough with a transverse pocket for intercepting heavy material, the depth of the pulp stream, acting on a flap, is caused to vary the conditions of classification in a number of ways, through an elaborate mechanical gear. B. M. VENABLES.

Separating constituents of loose mixtures particularly of liquids, vapours, and gases. F. BARTLING and F. LAWACZECK (B.P. 282,840, 2.1.28. Ger., 31.12.26).—When two surfaces are moving at different speeds and a current of gas is passed between them the coarser particles will move to the layers of lowest speed. The apparatus, based on the above principle, comprises a hollow cylindrical or conical member rotating between stationary walls, the heavier particles collecting on the stationary walls and the cleaned gas passing off through the interior of the rotating members. B. M. VENABLES.

Steam purifiers and like apparatus for separating impurities from fluids. M. R. PATTISON (B.P. 302,018, 1.11.27).—A number of open-bottom tubes are placed side by side so that the fluid passes downwards

between the tubes and then through them. The tubes are of aerofoil shape in section, so that the spaces between are of Venturi section. A sludge tank is provided to collect solid impurities. B. M. VENABLES.

Centrifugal separator. J. I. FRITZ (U.S.P. 1,694,972, 11.12.28. Appl., 30.6.26).—The apparatus is provided with a central supply feed below a perforated diaphragm almost closing the lower portion of the bowl, and with a superposed axial deflecting member. L. A. COLES.

Apparatus for the treatment of solid-bearing solutions. W. L. REMICK (U.S.P. 1,696,014, 18.12.28. Appl., 17.9.25).—A tank discharging into a filter is provided with a receptacle for the separated solids and with means to convey the solids from the receptacle to the tank or to return the filtered liquid to the tank. A. R. POWELL.

Plant for washing, drying, and chemical treatment of granular and crystalline materials. T. O. and N. WILTON, and CHEM. ENGINEERING & WILTON'S PATENT FURNACE Co., LTD. (B.P. 297,630, 28.1.28).—The material is spread on a conveyor of woven wire and there treated with sprays of reagents or washing fluids; thus, between the runs of the conveyor the material catches the effluent liquids, and on the return run of the conveyor is washed, after discharge of the solid material, by dipping into a trough. B. M. VENABLES.

Extraction from gases or liquids of substances suspended or contained therein. A. H. PEHRSON (B.P. 278,722, 6.10.27. Swed., 7.10.26).—The fluid to be cleaned is passed through a mass of granular material which is tumbled about in a rotary, perforated container. The granular material may be damped with water, tar, lye, etc. according to the constituent it is desired to remove. Superfluous liquid formed during treatment may be evaporated by passing heated gases. [Stat. ref.] B. M. VENABLES.

Filter. A. BOULADE, Assr. to SOC. DU CARBURATEUR ZÉNITH (U.S.P. 1,688,326, 23.10.28. Appl., 16.9.25).—A filter for separating solids from oils comprises a series of flat filtering discs corrugated on the top and bottom so as to form a number of thin annular apertures through which the liquid passes to a central annular space surrounding a central supporting stem. A. R. POWELL.

Air filter. H. E. BIRKHOLZ, Assr. to NAT. AIR FILTER Co. (U.S.P. 1,690,813, 6.11.28. Appl., 24.9.26).—An apparatus for removing dust from air comprises a rotating drum containing a metal wire screen coated with oil, which acts as a collector for the dust, and means for directing a small stream of oil in a helical path over the screen, so that only a relatively small area of the screen is in a newly washed condition at any time. A. R. POWELL.

Recovering [crystallisable] values by evaporation. H. W. CARR (U.S.P. 1,694,841, 11.12.28. Appl., 30.4.27).—Solutions containing crystallisable constituents are dropped on to residues obtained by the previous evaporation of similar solutions, maintained at a temperature sufficiently high to cause evaporation of the liquid. L. A. COLES.

Pasteurisation of liquids. A. JENSEN (U.S.P. 1,693,034, 27.11.28. Appl., 2.2.26).—The liquid, in a closed chamber, is caused to rise up on the side walls thereof by centrifugal action and brought to the required temperature by means of a heating fluid under pressure in contact with the walls. Deleterious gases are withdrawn centrally from the chamber by suction. W. J. BOYD.

Stirring apparatus for vacuum distillation vessels. G. SCHAUS (G.P. 450,978, 7.8.25).—The shaft of the stirring device is provided with an inverted conical protuberance which works in a suitably shaped oil-lubricated bearing. Below this is a small chamber which serves to collect the oil that percolates through; this chamber may be provided with a water-cooling arrangement to prevent the heat of the distillation vessel affecting the viscosity of the lubricating oil in the vacuum-tight bearing. A. R. POWELL.

Condensate removing systems. [Steam trap.] R. BELL-IRVING and P. SANDWELL (B.P. 301,213, 9.12.27).—The discharge for condensate from apparatus such as drum dryers comprises a main pipe extending nearly to the bottom and a shorter auxiliary pipe. The main pipe is normally closed by a valve which is opened by the steam pressure on a diaphragm. Whether or not the diaphragm receives pressure is determined by a float-operated valve, the float being raised and valve closed when the auxiliary pipe is discharging mainly steam and air, and sunk when the latter pipe is discharging water. B. M. VENABLES.

Diffusion reaction. H. WALTER, Assr. to VER. F. CHEM. IND. A.-G. (U.S.P. 1,685,759, 25.9.28. Appl., 1.5.26. Ger., 22.5.24).—Gases which react slowly in simple mixtures are passed in countercurrent on opposite sides of a porous partition under substantially the same pressure. Reaction takes place in the capillaries of the partition, and the reaction products diffuse out on both sides and are removed by the countercurrents and condensed. The partition may be impregnated with a specific catalyst for the reaction, e.g., for the production of methyl alcohol from carbon dioxide and hydrogen at 380° and 50 atm., with a solution of 80 g. of zinc nitrate, 10 g. of copper nitrate, and 20 g. of borax in 500 c.c. of water. R. BRIGHTMAN.

Treatment of liquids. C. BENEDICKS (U.S.P. 1,691,458, 13.11.28. Appl., 29.1.25. Swed., 2.7.24).—Molten glass or other liquid is freed from dissolved or occluded gas by agitating it in the presence of a device kept at a temperature higher than that of the liquid. F. G. CLARKE.

Digesters. J. W. PENMAN (B.P. 302,077, 31.1.28).—A false bottom of a digester is connected to the end plate of the digester in such a manner that it is slightly flexible between the rivets of the joint, e.g., by making fine saw cuts radially inwards. B. M. VENABLES.

Autoclaves. T. W. BARBER (B.P. 301,994, 30.9.27).—A continuously operating autoclave for such purposes as separation of oil from a magma by heating in an aqueous liquor is provided with outlet valves in the upper and lower parts which are controlled by floats; circulation of the charge is effected by convection

currents and by the injector effect of the incoming liquid.

B. M. VENABLES.

Photometer. R. H. DAVIS (B.P. 301,665, 10.1.28).—A shadow photometer is provided with a holder for a standard candle which can be placed in any one of several fixed positions to suit different ranges of candle-power to be measured, and can be raised or lowered so as to be level with the illuminant to be measured. The latter, *e.g.*, a miner's lamp, is supported on a base slidable against a square-root scale and preferably formed in stepped circles to suit various diameters of lamp. The base may also be provided with a scale of degrees so as to determine the candle-power at various angles of lamps with reflectors.

B. M. VENABLES.

[Flat] glass bulbs for hydrometers and like instruments. F. F. W. FLAIG (B.P. 302,034, 16.11.27).—A flat glass bulb is provided with a stay between the flat surfaces comprising a tube or bridge, the space within the bulb becoming annular.

B. M. VENABLES.

Hydrometer device. S. P. WILBUR, Assr. to U.S.L. BATTERY CORP. (U.S.P. 1,696,618, 25.12.28. Appl., 26.5.20. Renewed, 16.1.28).—A float is adapted to co-operate with the vertically projecting stem of a sp. gr. device having a distinctive zone and presents a contrast to that zone.

J. S. G. THOMAS.

[Laboratory] crucible holder and stand. G. S. HARTLEY (B.P. 301,685, 13.3.28).—A laboratory crucible which has been ignited while on the usual pipeclay or silica triangle is removed therefrom and supported while cooling by a triangular stool of refractory material which, together with a wire handle, is small enough to pass through the pipeclay triangle. After cooling, the crucible is transferred (for weighing) to a light stand made of bent sheet metal which is large enough to slip over the refractory stool and small enough to retain the crucible. Direct contact with the hand or tongs is avoided in all the above operations.

B. M. VENABLES.

Apparatus for pulverising. W. R. WOOD, Assr. to INTERNAT. COMBUSTION ENGINEERING CORP. (U.S.P. 1,697,704, 1.1.29. Appl., 24.2.27. U.K., 1.4.26).—See B.P. 269,319; B., 1927, 575.

[Combustion apparatus for] furnaces. C. H. GLOVER (B.P. 302,757, 17.10.27).

[Door suspension and control system for] annealing and other furnaces, muffles, etc. BIRMINGHAM ELECTRIC FURNACES, LTD., and A. G. LOBLEY (B.P. 304,458, 11.1.28).

Refrigerating machines. BRIT. THOMSON-HOUSTON Co., LTD., Assees. of C. STEENSTRUP (B.P. 284,730, 4.2.28. U.S., 5.2.27).

Refrigerating apparatus. N. V. "KODOWA" REFRIGERATOR Co. (B.P. 294,999, 20.10.27. Holl., 4.8.27).

Economical carrying-out of refrigeration on a large scale. BROWN, BOVERI & Cie. A.-G. (B.P. 285,003, 15.11.27. Ger., 8.2.27).

Rectification by cooling of gases, gas mixtures, or vapours in absorption refrigerating apparatus. ELECTROLUX, LTD., Assees. of PLATEN-MUNTERS RE-

FRIGERATING SYSTEM AKTIEBOLAG (B.P. 274,840, 30.6.27. Ger., 26.7.26).

Combustion of fuels [for steam generators etc.] (B.P. 302,255). **Distillation of liquids** (B.P. 303,038).—See II. **Plant for cooling liquids** (B.P. 302,004).—See V. **Separation of gases etc. from discharge gases of furnaces** (B.P. 302,386). **Hardness testing** (B.P. 301,762).—See X. **Pyrometer** (U.S.P. 1,697,148).—See XI.

II.—FUEL; GAS; TAR; MINERAL OILS.

Flotation of coal. K. YAMAGUCHI (J. Fuel Soc. Japan, 1928, 7, 126—128).—The separation of pyrites from coal by froth-flotation has been studied. A mixture of pyrites with a coal containing 3% of ash was successfully separated by taking advantage of the different rates of flotation of the two constituents. Less success was attained with a mixture of pyrites and a very high-ash coal.

A. B. MANNING.

Determination of the ignition point of liquid fuels. F. HOFFMANN (Arch. Warmewirts., 1928, 9, 213—219; Chem. Zentr., 1928, ii, 726—727).—A comparative study of methods.

A. A. ELDRIDGE.

Firedamp explosions within closed vessels: "pressure piling." C. S. W. GRICE and R. V. WHEELER (Safety in Mines Res. Board Paper No. 49, 1929, 26 pp.).—When two vessels of different size, and communicating with one another through a short, narrow passage, are filled with an explosive mixture, and the latter is ignited in the larger vessel, a sudden and rapid production of pressure occurs in the smaller vessel. Photographs of the flame movement within glass vessels have shown that this is due to the turbulence in the smaller vessel produced by the explosion in the larger, and to the large flame which is projected through the communicating passage. If the mixture is ignited in the smaller vessel, the turbulence produced in the larger is inconsiderable, and the flame projected thereinto is smaller. If the ratio of the volumes of the vessels is greater than 10:1 and the communicating passage is narrow, then an explosion of methane and air initiated in the former can give rise to pressures in the latter considerably higher than those normally developed by methane-air mixtures initially at atmospheric pressure. This phenomenon, known as "pressure piling," is due partly to the causes already mentioned, but principally to the compression of the mixture before ignition.

A. B. MANNING.

Thermal decomposition of methane. T. KUSAMA and Y. UNO (Bull. Inst. Phys. Chem. Res., Tokyo, 1929, 8, 1—11).—Catalytic reduction of natural gas was tried, using as catalyst pure nickel, a mixture of nickel and kieselguhr, which was equally suitable after being deactivated by the reduction of naphthalene, and finely-divided iron. Carbon obtained as a decomposition product of methane was of graphitic form and contained nickel, which was recovered by digesting the deposit with hydrochloric acid with subsequent reduction of nickel chloride to active nickel. Dissociated hydrogen was always contaminated with considerable quantities of methane, and the mixture was used for the catalytic reduction of naphthalene.

C. A. KING.

Products and mechanism of the thermal decomposition of benzene. Y. KOSAKA (J. Fuel Soc. Japan, 1928, 7, 121—123).—The decomposition products obtained when benzene is dropped down through a tube packed with silica or coke granules and heated at 700°, 800°, or 900° are diphenyl, diphenylbenzenes, ethylene, methane, carbon, and hydrogen. The yields at each temperature have been determined and tabulated. No condensed-ring compounds are formed.

A. B. MANNING.

Products and mechanism of the thermal decomposition of phenol. Y. KOSAKA (J. Fuel Soc. Japan, 1928, 7, 123—125; cf. preceding abstract).—The products obtained when phenol is decomposed by being dropped down through a hot tube packed with coke or silica granules include benzene, naphthalene, diphenyl, anthracene, phenanthrene, ethylene, methane, carbon, and hydrogen. The yields of each product obtained at 700°, 800°, and 850°, respectively, are tabulated.

A. B. MANNING.

Rational production of mixed gas, including the use of composite producer gas ("Doppelgas"). E. LANGTHALER (Gas- u. Wasserfach, 1929, 72, 31—33).—Mixed gas, having a gross calorific value of 4200 kg.-cal./m.³, may be produced by mixing ordinary coal gas (gross cal. value 5000 kg.-cal./cub. m.) with suitable proportions of flue gases, ordinary producer gas, water-gas, or composite producer gas ("Doppelgas") obtained by carbonising coal and completely gasifying the coke in the same retort, the gross calorific values of these latter being, respectively, 0, 1150, 2750, and 3300—3600 (carburetted) kg.-cal./m.³. Considering these five gaseous admixtures in the above order, the percentage of each in a mixed gas containing coal gas as the only other constituent and having a gross calorific value of 4200 kg.-cal./cub. m. is 16, 20, 35, 47, and 58%, respectively. The coal required per 1000 cub. m. of mixed gas is 2580, 2340, 1980, 1980, and 1760 kg., respectively, and the available coke remaining is 1390, 1220, 785, 874, and 715 kg., respectively. The mixed gas obtained by diluting coal gas with flue gases or producer gas contains an excessive proportion of inerts (26—28%), but the possibilities of composite producer gas are noteworthy.

W. T. K. BRAUNHOLTZ.

Removal of sulphur from illuminating gas by activated carbon. E. W. TODD (Proc. Nova Scotian Inst. Sci., 1928, 17, 120—121).—The activated carbon "Rotite" (125 g.) reduced the sulphur content of 100 cub. ft. of gas passed through it to one eighth of its original value. The carbon, saturated with sulphur from 300—400 cub. ft. of gas, was considerably revived by heating with stirring in an open vessel. "Norit" carbon gave similar results.

B. W. ANDERSON.

Colorimetric determination of carbon disulphide in gas. G. G. DÉSY (Proc. Amer. Gas Co., 1927, 1440—1441).—The gas (100—1000 c.c.) is passed through 10% potassium hydroxide solution, and then through concentrated sulphuric acid, and its volume is measured; it is then passed from a capillary orifice through alcoholic potassium hydroxide, which is diluted in a Nessler tube with distilled water to 48 c.c., and made slightly acid (to phenolphthalein) with acetic

acid. Four drops of 0.05N-copper acetate solution are added, and the colour is compared with controls similarly prepared from ethyl xanthate. The method is accurate to about 10%. CHEMICAL ABSTRACTS.

Action of silent electrical discharge on mineral and vegetable oils. T. RABEK (Przemysl Chem., 1928, 12, 240—249; Chem. Zentr., 1928, ii, 512).—An improved polymerisation process is described.

A. A. ELDRIDGE.

See also A., Feb., 147, **Effect of anti-knock materials on flame of hydrocarbon-air mixtures** (NAGAI). 161, **Gas analysis apparatus** (BAHR). 168, **Base exchange and genesis of petroleum** (TAYLOR). 169, **Fushun coal** (IWASAKI). 184, **Naphthenic acids in Japanese petroleum** (KUWATA).

Indicator for absorption systems. MACKERT.—See I. **Conductivity of kerosene and gasoline.** MOREHOUSE.—See XI.

PATENTS.

Retort structures. E. G. BLACKWELL (B.P. 297,445, 18.1.28. U.S., 22.9.27).—A retort chamber of elongated cross-section is disposed between, and with its ends against, abutments; the side walls are constructed of bricks the adjacent abutment faces of which converge in the direction of the forces acting on the wall. By constructing the horizontal courses so that in some the brick abutment faces converge inwards and in others outwards, a structure capable of withstanding both external and internal pressures is obtained.

A. B. MANNING.

Vertical coking retort ovens. KOPPERS Co., Asses. of J. VAN ACKEREN (B.P. 283,191, 5.10.27. U.S., 8.1.27).—In order to facilitate the discharge of the coke by gravity the coking chambers of a vertical coke-oven setting are of progressively increasing width from top to bottom; to produce a corresponding gradient in the rate of heat supply the vertical heating flues are subdivided into superimposed sections to each of which the supply of fuel gas can be suitably adjusted. The flue sections increase progressively in size from the bottom to the top of the coking chamber, thereby attaining substantially uniform velocities of the products of combustion throughout the height of the heating walls. The upper ends of the vertical flues communicate with horizontal flues which are connected together in pairs by cross-over ducts. At the lower end of the vertical flues of each heating wall are two horizontal flues which can be connected directly to regenerators disposed outside and below the main oven structure. The bottom openings of the chambers are provided with doors the supporting frames of which form water-seals for the chambers.

A. B. MANNING.

Charging of coke ovens. L. MELLERSH-JACKSON. From KOPPERS Co. (B.P. 302,188—9, 11.6.27).—(A) A coke oven has an offtake near each end and charging openings in the roof between the offtakes. Means are provided for inducing a forced draft within the offtakes in order to remove the gas and smoke evolved during charging (cf. B.P. 278,012; B., 1929, 160). The oven may be charged first through openings near the ends and subsequently through an intermediate opening, the gas

and smoke being removed through the end offtakes. In another modification offtake pipes are provided which can be simultaneously connected to the mains and to additional offtake openings between the charging openings. Coal hoppers corresponding in number with the charging openings, the offtake pipes, and the mechanism for operating the connecting devices between these and the offtake openings and the mains respectively, and for operating similar connecting devices between the hoppers and the charging openings, are all mounted on a larry car, which traverses the top of a battery of ovens, charging each in succession. (B) The hoppers from which the oven is charged may be made of different holding capacity, one only being of such size that its contents when charged into the chamber will, until levelled, divide the chamber into two separate compartments. All the smoke and gases evolved during charging can then be withdrawn through one or other of two offtakes at either side of the oven and no further offtake openings are required.

A. B. MANNING.

Carbonisation of coal, wood, peat, and other ligneous material. GAS LIGHT & COKE CO., H. HOLLINGS, and J. NEATH (B.P. 302,437, 6.10.27).—In order to avoid losses of gas by leakage resulting from fluctuations of pressure within retorts in which coal, wood, etc. is being carbonised, the pressure is controlled in such a way as to suit the requirements of the material undergoing treatment and the other conditions of carbonisation. The pressure may be regulated (a) by varying the position of an adjustable dip-pipe in the hydraulic main, (b) by varying the level in the main by the use of an adjustable overflow pipe, or (c) by means of a gas governor. The adjustable dip-pipe, overflow pipe, or gas governor is controlled mechanically by a cam of suitable design rotated at the desired speed. The design of the apparatus for effecting the control is described in detail.

A. B. MANNING.

Carbonisation of low-grade fuel substances and apparatus therefor. M. MIGEON (B.P. 288,335, 5.4.28. Ger., 8.4.27).—The material after being dried by the waste heat of the plant passes down a vertical retort in which it undergoes a primary distillation. This retort is constructed of superimposed elements, each of which consists of a number of radial chambers stepped laterally in relation to each other; the material thus follows a helicoidal path, the heating surface being thereby increased and the production of dust reduced. The products of distillation from each element are condensed rapidly and are then redistilled by contact with a bath of molten metal. The lower end of the vertical retort communicates by means of inclined retorts with a number of other vertical retorts heated by burners and capable of acting as producers. The hot gases from the burners pass up and heat in succession the inclined retorts, the main vertical retort, and finally the dryer. During the primary distillation the material may be internally heated by the passage of hot distillation gases which have passed through a reheater in the lower part of the kiln and thence up a central duct provided with inlet openings into the vertical retort.

A. B. MANNING.

Combustion of fuels and the application and use of the heat produced thereby. A. MUSKER (B.P. 302,255, 11.8.27, 19.11.27, and 9.6.28).—Pulverised or gaseous fuel admixed with air is introduced into the upper end of a separate vertical combustion chamber, the flame of the burning fuel being then directed through horizontally-projecting ducts at a lower level to the furnace or flues of the apparatus (e.g., a Lancashire boiler or other type of steam generator) to be heated. The chamber is lined with brickwork and is surrounded by an annular jacket in which the air for combustion is preheated. Some of this air is injected into the chamber at different levels through nozzles arranged to impart a whirling motion to the fuel-air mixture; some also is passed up through the ash-pit at the bottom of the chamber. If desired, other air nozzles may be provided at the end of the horizontal ducts. Below the open end of the burner delivering the fuel-air mixture into the chamber is an adjustable conical distributing device, preferably provided with spiral vanes.

A. B. MANNING.

Recovery of soluble products from coal and the like. J. Y. JOHNSON. FROM I. G. FARBENIND. A.-G. (B.P. 301,946, 1.9.27).—Coal is heated under pressure in a closed vessel and is then extracted with a solvent also under pressure and at elevated temperatures. A much greater yield of soluble products is obtained than by direct extraction under pressure. The products may be subjected to further treatment, such as cracking, hydrogenation, or separation by means of suitable solvents into resins, waxes, etc.

A. B. MANNING.

Apparatus for the distillation of fuels at low temperature. A. ABRASSART (B.P. 302,875, 5.7.28. Belg., 12.1.28).—The apparatus comprises a setting of three retorts of which the upper two serve for the dehydration and the partial distillation of the fuel. These retorts consist conveniently of horizontal tubes fitted with worm-conveyors. The partially distilled product is briquetted with a suitable binding agent, and the briquettes are then carbonised at 450–580° in the third retort, through which they are carried on a flexible movable conveyor. The conveyor is constructed of a metallic lattice and is so arranged that the idle strand and the members actuating the conveyor are located outside the retort. The conveyor enters and issues from the retort through a seal.

A. B. MANNING.

Production and activation of carbon. J. S. DANIELS, Assee. of E. H. MEEZE (B.P. 277,987, 22.9.27. U.S., 22.9.26).—Carbonaceous material is subjected to destructive distillation at 500–800°, preferably under reduced pressure and in the presence of steam or inert gases, and after being cooled and crushed under conditions encouraging the occlusion of atmospheric oxygen is further carbonised at 850–1000°. Compounds of zinc, magnesium, ammonium, etc. (up to 0.5% of the raw material) may be added to the material before it is subjected to the second heat-treatment.

A. B. MANNING.

Manufacture of activated carbon. R. DEFRES and R. WÄLDER (B.P. 303,669, 7.2.28).—Carbonaceous material, mixed with a binding agent and with 0.5–20% of suitable fibrous material, is briquetted, carbonised,

and activated. The fibrous material, *e.g.*, animal hair, is of such a nature as to produce a network of macrocapillary pores throughout the briquette, so permitting easy access of the activating gases to all portions of the material.

A. B. MANNING.

Production of active carbon. METALLBANK U. METALLURGISCHE GES. A.-G. (B.P. 302,774, 1.11.27. Addn. to B.P. 238,889; B., 1925, 977).—Fine-pore, non-carbonised, vegetable substances of a preponderantly sclerenchymatic structure, *e.g.*, plum stones, coconut shell, etc., are treated with a concentrated solution of zinc chloride containing a weight of the salt less than that of the dry material. The mixture is dried and carbonised, and the product extracted with hydrochloric acid and water.

A. B. MANNING.

Production of lamp-black. J. L. MAJOR (B.P. 303,632, 6.12.27).—Lamp-black is produced by the incomplete combustion of a carbonaceous liquid which is fed on to trays mounted one above the other within a combustion chamber in such a way that the liquid cascades from tray to tray. Each tray projects further forward than the one immediately above, and has its front edge and sides notched to form a weir. Air is admitted through orifices over the trays and passes transversely across the cascading liquid.

A. B. MANNING.

Treatment of hydrocarbons to obtain ink or soot. AULT & WIBORG CO., Assees. of A. L. MILLER (B.P. 286,207, 3.8.27. U.S., 28.2.27).—A hydrocarbon oil is decomposed by incomplete combustion, 5–9 pts. of air (by wt.) being present to 1 pt. of oil, into free carbon and gases at 1093–1426°. These are removed rapidly from the zone of combustion at a minimum constant velocity of 500 ft./min., cooled to 121–593° while at the same speed, and the carbon particles separated from the products of combustion by causing the gases to impinge against an interposed film or sheet of an oily ink vehicle extending at an angle to their direction of flow. The oil vehicle is continuously withdrawn from contact with the gases, mixed with a larger quantity of the same vehicle, cooled, and returned into contact with the carbon-laden gases. Any unabsorbed oil-laden soot particles are removed by electrical precipitation after reducing the velocity of flow of the gases.

H. S. GARLICK.

Hydrogenation of coal and like carbonaceous material. C. H. LANDER, F. S. SINNAT, and J. G. KING (B.P. 302,629, 17.9.27).—Sulphur compounds in the gases or vapours formed during the hydrogenation of carbonaceous material under pressure are removed by withdrawing the gases through a by-pass on the reaction vessel, to which they are returned after passage through a treatment chamber. If desired, other constituents, *e.g.*, carbon dioxide or volatile hydrocarbons, may be removed from the gaseous phase in the same manner.

A. B. MANNING.

Production of liquid products from coal and other solid carbonaceous material. MELAMID (B.P. 285,879, 24.2.28. Ger., 24.2.27).—The finely-divided material is subjected to the action of hydrogen at a high pressure and a relatively high temperature in the presence of a catalyst, the material and catalyst, which

is also in a finely-divided form, being injected simultaneously into the reaction chamber by means of the hydrogen used for effecting hydrogenation.

A. B. MANNING.

Hydrogenation of organic substances, especially of the products of the distillation of coals and petroleum oils. G. HUGEL, M. PAUL, and M. BOISTEL (B.P. 286,206, 18.7.27. Fr., 28.2.27).—Tar, pitch, heavy petroleum fractions, etc. are hydrogenated under pressure in the presence of catalysts consisting of the hydrides of the alkalis or alkaline-earths. The catalysts are prepared by heating the metal with hydrogen under pressure and are then stabilised by the addition of an oil such as tetrahydronaphthalene or of a substance more easily oxidisable than the catalyst itself, *e.g.*, sodium amide.

A. B. MANNING.

Distillation of oils, coal tar, and other liquids. GAS LIGHT & COKE CO., W. G. ADAM, and F. M. POTTER (B.P. 303,038, 27.8.27).—The material to be fractionated is passed through one or more heating coils while being maintained under pressure, and is then allowed to expand suddenly, the liquid and vapour being withdrawn separately and passed in heat-exchanging relation with the material passing to the heating coils. The vapour is condensed directly, or is further fractionated in a suitable column, supplemented, if desired, by a reheating still. The soft pitch passing from the heating coils is treated with superheated steam in a column down which it passes countercurrent to the steam, producing a pitch residue of any desired m.p.

A. B. MANNING.

Gas-producing plant. O. Y. IMRAY. From P. B. MORGAN (B.P. 303,554, 5.10.27).—A gas producer of the type having a device for levelling the surface of the fuel bed is provided with a number of such devices operating at different levels of the fuel layer. These have counterweights of different sizes, or are otherwise adjustable as to their position.

A. B. MANNING.

Process for producing gas. L. P. BURROWS (U.S.P. 1,695,914, 18.12.28. Appl., 13.11.22. Renewed, 13.1.28).—Coal is heated in a retort enclosed within a furnace. A current of steam is passed through iron pipes embedded within the furnace walls, whereby part of it reacts with the metal of the pipes producing hydrogen. The mixture of superheated steam and hydrogen is then passed through the retort, which can be rotated or is provided with other means for agitating the fuel contained therein.

A. B. MANNING.

Generating gases for power development. TRENT PROCESS CORP., Assees. of W. E. TRENT (B.P. 299,792, 12.9.27. U.S., 25.10.26).—The hot, waste gases from a boiler plant are passed to a coal-distilling apparatus of the type described in B.P. 277,660 and 291,062 (B., 1929, 160, 4), wherein finely-pulverised coal is carbonised without any agglomeration of the particles taking place. The carbonised particles are then passed directly to a gas generator to which air and, if desired, steam also is admitted, and in which the fuel is converted completely into gas and ash. The ash is discharged and the gas is returned to the boiler plant to be consumed therein.

A. B. MANNING.

Process of combined absorption and fractionation for recovering gasoline from gas. E. R. Cox

and D. A. CUSHMAN (U.S.P. 1,695,139, 11.12.28. Appl., 31.8.26).—The oil used for the absorption of the gasoline is first cooled to air temperature and part is then further cooled to a considerably lower temperature. The refrigerated oil is fed in at the top of the absorption tower up which the compressed gas is passed, whilst the remainder of the oil is fed in at a lower level.

A. B. MANNING.

Determining the content of combustible gas in gas mixtures. SIEMENS & HALSKE A.-G. (B.P. 282,080, 8.12.27. Ger., 10.12.26).—Combustible gas is determined by the variation in resistance of an electrically-heated wire which brings about the catalytic combustion of the gas as the gas mixture passes over it. A uniform and constant position of the wire is attained by mounting it in such a way that it is stretched in the direction of the longitudinal axis of the chamber, and that all the insulated parts required for this mounting are arranged before the point in the current of gas at which the catalysis takes place. Thus two metal pins may be arranged close to the inlet opening for the gas current, and the wire may be stretched between one of these and a bracket supported by the other.

A. B. MANNING.

Joint manufacture of valuable liquid and other hydrocarbons and derivatives thereof and ammonia. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 302,620, 17.9.27).—The methane and other hydrocarbons in the waste gases from the hydrogenation of carbonaceous materials are converted into hydrogen, *e.g.*, by passage of the gas, admixed with air and steam, over a nickel catalyst at 600°, and the resultant mixture of hydrogen and nitrogen obtained after the further catalytic conversion of the carbon monoxide and elimination of the carbon dioxide is used for the synthesis of ammonia. A. B. MANNING.

Preparation of hydrocarbon products. N. E. LOOMIS, Assr. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,694,272, 4.12.28. Appl., 13.7.23).—A light condensate containing some normally gaseous hydrocarbons is introduced into the intermediate region of an absorber tower up which vaporising constituents pass through progressively cooler zones countercurrent to a flow of heavy naphtha under a pressure of 100–300 lb./in.², and a balanced gasoline is withdrawn from the bottom of the tower.

H. S. GARLICK.

Production of homogeneous mixtures of aliphatic mineral oils or distillates and aliphatic alcohols. J. KIRSCHNER (B.P. 277,357, 9.9.27. Ger., 9.9.26).—Mechanically prepared mixtures of the components at raised temperatures are subjected to the action of nascent hydrogen prepared by passing the mixtures with the addition either of organic acids or salts, *e.g.*, oxalic acid or oxalates, into contact with heated metals or alloys, m.p. above 100° (*e.g.*, lead and nickel mixture), or with hydrochloric acid they are passed in vapour form over a granulated metal such as zinc. On condensation a homogeneous mixture is obtained, the use of which is governed by the b.p. of the original fraction of mineral oil selected.

H. S. GARLICK.

Apparatus for treating emulsified oil. G. EGLOFF and H. P. BENNER, Assrs. to UNIVERSAL OIL PRODUCTS Co. (U.S.P. 1,694,643, 11.12.28. Appl., 21.8.20. Renewed 28.5.28).—A horizontal cylindrical still is heated by a pair of burners of about the same length as the still and arranged to heat its walls in a plane above the highest liquid level in the still so that oil is distilled only from the surface. A rotating shaft fitted with propeller blades is provided in the lower part of the still, below the liquid level. The oil is simultaneously dehydrated and fractionated.

L. A. COLES.

Production of sulphonated products [emulsifying agents etc.]. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 303,281, 13.1.28).—Oxidation products of paraffin waxes, separated or not from unsaponifiable matter, are sulphonated with oleum or chlorosulphonic acid to give emulsifying and wetting-out agents.

C. HOLLINS.

Apparatus for refining oils. J. PRIMROSE, Assr. to FOSTER WHEELER CORP. (U.S.P. 1,693,156, 27.11.28. Appl., 21.6.22).—An oil-heating apparatus consists of a combined furnace and tube chamber separated by a bridge wall over which heating gases enter the tube chamber at the top, leaving by an outlet at the bottom. Oil is pumped from an external tank through a bank of horizontal tubes disposed at successively higher levels in the tube chamber, and thence back into the chamber itself.

H. S. GARLICK.

Manufacture of hydrocarbons and substances containing adsorbed hydrocarbons. GEN. CARBONALPHA Co. (B.P. 278,745, 7.10.27. Holl., 7.10.26).—Hydrocarbons are produced by heating active carbon with hydrogen, or a gas containing hydrogen, at between 150° and 600° and under ordinary or slightly higher pressures. When an excess of active carbon is used the hydrocarbons are adsorbed thereon and a plastic or solid material is produced, which may be used as a fuel or illuminant. The active carbon is obtained by heating carbon monoxide at between 230° and 600°. If desired, catalysts may be used in the production both of the active carbon and of the hydrocarbons.

A. B. MANNING.

Revivification of [earthy] filtering material [used for filtering mineral oils]. L. W. NAYLOR, Assr. to CONTINENTAL OIL Co. (U.S.P. 1,693,206—7, 27.11.28. Appl., [A] 31.8.22, [B] 3.3.23).—The material is treated in the filtering chamber with a current of benzol flowing in the reverse direction to the mineral oil when the filter is in normal use, and, when the discharge is nearly colourless, the material is submerged in benzol for a period of time depending on the relative proportions of benzol and material. The benzol is finally drawn off and the residue treated with a current of steam.

L. A. COLES.

Treatment of spent clays [from oil-treating processes]. R. A. DUNHAM, Assr. to UNION OIL Co. OF CALIFORNIA (U.S.P. 1,694,971, 11.12.28. Appl., 30.10.26).—The spent clay is brought into intimate contact with the quantity of water, as determined experimentally, capable of causing the maximum separation of oil.

L. A. COLES.

Production of high-viscosity oils from mineral oils and tar oils of any origin. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 303,776, 8.9.27).—The initial materials are freed from alcohols, primary and secondary bases, phenols, or other ionisable substances, and subjected in the coherent liquid phase to the action of alternating currents of frequencies lying between 500 and 10^4 periods/sec. H. S. GARLICK.

Production of hydrocarbons of low b.p. from those of high b.p. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 303,761, 3.9.27 and 25.2.28).—Readily volatile hydrocarbons are obtained from hydrocarbons of any origin, including tars, by subjecting them to the action of a gaseous halogen hydride at temperatures above 100° in the presence of metals such as aluminium, copper, lead, magnesium, iron, cobalt, chromium, or alloys of these, activated by a solution of a salt of a less electropositive metal, and with or without the addition of a metallic chloride. The speed of the initial material is chosen so low that considerable quantities of hydrocarbons of b.p. below 70° are formed. This is augmented by increasing the rate of flow of the halogen hydride. Introduction of the materials counter-current to one another is advantageous.

H. S. GARLICK.

Lubricants for low-temperature expansion machines in which benzol is separated from coke-oven gases. GES. F. LINDE'S EISMASCHINEN A.-G. (B.P. 277,378, 12.9.27. Ger., 13.9.26).—A lubricant having a low temperature of solidification and preventing the separation of solid ice, benzene, or naphthalene in the cylinder or valves of the expansion machine is produced by the addition of toluene, other homologues of benzene, or a hydrogenated naphthalene, and a glycol, ketone, or alcohol to the ice-machine oil.

A. B. MANNING.

Oil-gas apparatus. A. J. BASSETT, ASSR. to BRUCE MACBETH ENGINE Co. (U.S.P. 1,694,910, 11.12.28. Appl., 31.5.24).—Oil is cracked by the heat produced by its partial combustion within a closed retort. The tube conveying the oil-air mixture into the retort projects into a wider retort tube which is closed at the further end. The gases and vapours formed therefore pass back through the annular space between the two tubes and then forward again between the outer tube and the retort to the outlet.

A. B. MANNING.

Treatment [cracking] of hydrocarbons. G. EGLOFF (U.S.P. 1,692,203, 20.11.28. Appl., 19.7.18. Renewed 21.4.28).—Hydrocarbon oil is cracked at 230 – 260° in presence of 1–2% of aluminium chloride (generated *in situ* by action of hydrogen chloride on aluminium powder in presence of mercuric chloride); the gasoline vapours escape to a condenser while the unvaporised oil and aluminium chloride are withdrawn continuously from the bottom of the still and returned through a spray nozzle at the top. R. BRIGHTMAN.

Production of gasoline and other light hydrocarbons from heavier hydrocarbons. B. ORMONT, ASSR. to B. ORMONT ASSOCIATES, INC. (U.S.P. 1,691,300, 13.11.28. Appl., 9.10.23).—Hydrocarbon oil and water are vaporised independently under pressure, *e.g.*, at 180° , and in such proportion that for the production

of gasoline the total latent heat of the oil is approximately equal to that of the water, *i.e.*, a ratio of oil/water of 7–10/1; for the production of lubricating oils the latent heat of water is in excess (oil/water ratio of 7–1/1). The unvaporised oil flows into the steam-coil where it is completely vaporised, and the resultant mixtures are passed through cracking coils. R. BRIGHTMAN.

Purification of benzol, petrol, and the like. K. COX and P. J. McDERMOTT (B.P. 303,991, 8.12.27. Addn. to B.P. 269,242; B., 1927, 436).—The oils or spirits are treated in the washer or agitator with ferric sulphate, and, after filtering, the filtrate is neutralised with alkali prior to distillation. H. S. GARLICK.

Purification of the wax residues of petroleum and shale oil distillation and apparatus therefor. STEEL BROS. & Co., LTD. From D. ARMSTRONG and G. C. G. DOBBIE (B.P. 303,812, 8.7.27).—An apparatus for sweating or purifying paraffin wax or scale comprises a chamber containing a tank or vat fitted with a steam inlet and having a bottom, inclined to one or more drain points provided with cocks, above which is a horizontal shelf of wire cloth. Above the shelf are situated multiple layers of horizontal piping arranged in a series of closely-spaced vertical supports for the wax, which is thus prevented from forming a compact mass. Suitable means are provided for circulating cooling or heating fluids through the coils.

H. S. GARLICK.

Bleaching of montan wax. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 303,080, 22.9.27).—The crude or deresinified wax is heated with an aqueous solution containing chromic acid and an organic acid such as acetic or benzenesulphonic acid. The chromic acid may be replaced by the equivalent amount of a chromate.

A. B. MANNING.

Bleaching of montan wax, fractions thereof, or wax alcohols or acids obtained therefrom. A. RIEBECK'SCHE MONTANWERKE A.-G., and T. HELLTHALER (B.P. 303,036, 26.8.27).—The materials are treated with an oxidising agent, *e.g.*, hydrogen peroxide or chromic acid, in the presence of aqueous sulphuric acid.

A. B. MANNING.

Treatment of oil-fuel refuse as obtained after cleaning and washing out of tanks or bunkers. H. W. WILDISH (B.P. 301,405, 28.7.27).—Oil-fuel residues are pumped through automatically cleanable strainers to remove sand and heavy sediment, then heated to 82° to separate water and dirt held in suspension (which is discharged through a sand filter), and the floated oil is finally passed through a centrifugal separator.

H. S. GARLICK.

Method of carbonisation or destructive distillation. S. McEWEN, ASSR. to INTERNAT. COAL CARBONISATION Co. (Re-issue 17,182, 1.1.29, of U.S.P. 1,481,140, 15.1.24).—See B., 1924, 166.

Decolorising carbon. E. URBAIN, ASSR. to URBAIN CORP. (U.S.P. 1,700,342, 29.1.29. Appl., 10.7.26. Fr. 25.7.25).—See B.P. 255,871; B., 1928, 6.

Purification of gases. W. H. FULWEILER, ASSR. to U.G.I. CONTRACTING Co. (U.S.P. 1,700,698, 29.1.29. Appl., 1.8.24).—See B.P. 237,920; B., 1925, 837.

Emulsification of tar, bitumen, creosote, petroleum, heavy oils, etc. W. E. BILLINGHAME (U.S.P. 1,700,581, 29.1.29. Appl., 21.11.25. U.K., 27.11.24).—See B.P. 252,449; B., 1926, 655.

Vertical-chamber coke oven. C. OTTO (U.S.P. 1,695,204, 11.12.28. Appl., 2.11.26. Ger., 14.10.25).—See B.P. 259,968; B., 1927, 436.

Pulverised fuel burners. H. E. YARROW (B.P. 304,079, 18.4.28).

Means [valve] for automatically controlling the temperature of a suction gas producer. H. C. READING and T. G. TULLOCH (B.P. 302,033, 16.11.27).

Charging furnaces [water-gas generators] with solid material. POWER-GAS CORP., LTD., and N. E. RAMBUSH (B.P. 302,852, 13.4.28. Addn. to B.P. 283,238).

Device for extracting impurities from lubricating oils. F. R. SIMMS and B. C. JOY (B.P. 303,076, 25.8.27).

Filter (U.S.P. 1,688,326).—See I. Lubrication of textile fibres (B.P. 277,637).—See V. Mixed fertiliser (B.P. 303,916). Manure and insecticide (B.P. 303,957).—See XVI.

III.—ORGANIC INTERMEDIATES.

Detection of isopropyl alcohol by means of mercuric sulphate solution (Denigès' reagent). H. MATTHES and P. SCHÜTZ (Pharm. Ztg., 1929, 74, 44—45).—A criticism of the work of Stainer and Lauwaet (B., 1928, 835). Mercuric sulphate solution gives with pure isopropyl alcohol a white, not a yellow, precipitate, which consists of mercurous sulphate and an indefinite compound of mercuric sulphate with the acetone formed by oxidation of the alcohol. Saturated hydrocarbons give no precipitate; unsaturated hydrocarbons and tertiary alcohols give yellow and red precipitates. The test is therefore not sufficiently specific. S. I. LEVY.

Colour reaction of diphenylamine and detection of this compound in Powder B. L. DESVERGNES (Ann. Chim. analyt., 1929, [ii], 11, 1—4).—A solution of diphenylamine in 95% alcohol gives a green coloration when treated with a few drops of chlorine water; the colour slowly changes to dark violet on keeping or on warming. Aniline under similar conditions gives a pale yellow colour, ethylaniline a pale rose to violet, and diethylaniline a pale mauve colour becoming yellow on warming. In testing Powder B for the presence of diphenylamine this substance should be removed by shaking the mixture with ether; the ethereal solution is then warmed with water to expel ether and the precipitated substance dissolved in alcohol for testing with chlorine. A. R. POWELL.

See also A., Feb., 140, Volatility with steam of water-soluble organic substances (VIRTANEN and PULKKI). 141, Synthesis of carbamide from ammonia, carbon dioxide, and water (TERRES and BEHRENS). 152, Autoxidation of benzaldehyde (KUHN and MEYER). 153, Catalysts for formation of alcohols from carbon monoxide and hydrogen (FROLICH and others). Oxidation of ethylene (REYERSON and

SWERINGEN). 162, Titration of amino-acids and -salts. (KAPPELMEIER). 173, Catalytic hydrogenation under reduced pressure (ESCOURROU). 178, Analysis of carbamide (TAYLOR). 181, Reduction of nitro-compounds by aromatic ketols (NISBET). Metallic complexes of *o*-amino- and *o*-hydroxyazo-derivatives (CRIPPA). Action of phthalic anhydride on aminoazo-derivatives (CRIPPA and GALIMBERTI). Thio-carbamido-derivatives in the azo series (CRIPPA). 184, Naphthenic acids of Japanese petroleum (KUWATA). Catalytic reduction of nitriles and oximes (HARTUNG). Naphthalic acid derivatives (DZIEWONSKI and KOCWA). 200, Substituted μ -methylbenzthiazoles and dyes therefrom (SCHULOFF and others). 205, Determination of anthraquinone in mixtures with benzanthrones (SOKOLOV and GUREVICH).

Thermal decomposition of methane; and of benzene and phenol. KUSAMA and UNO; KOSAKA.—See II. Abietic anhydride. NAGEL.—See XIII.

PATENTS.

Manufacture of concentrated acetic acid. SOC. ANON. PROGIL (F.P. 622,680, 6.2.26).—Dilute acetic acid is mixed with a substance, such as butyl or amyl alcohol, mesitylene, methyl isobutyl ketone, butyl acetate, etc., which boils below 150°, which when mixed with more than 50% of water vapour boils below 95°, and which has a solubility in water of less than 10 g./100 c.c. The mixture is distilled through a rectifying column, and the mixture of water vapour and solvent vapour obtained is separated in a second column.

A. R. POWELL.

Manufacture of dioléfines. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 303,323, 30.4.28).—Butadiene and other diolefines are separated from hydrogen, methane, etc. by absorption in aqueous solutions of salts of metals of groups I and II, and are recovered by heating or by reducing the pressure. With cuprous chloride solutions butadiene gives a solid precipitate, and may thereby be separated from ethylene, propylene, and butylene. C. HOLLINS.

Oxidation of hydrocarbons. Manufacture of organic acids from petroleum hydrocarbons. A. W. BURWELL, Assr. to ALOX CHEM. CORP. (U.S.P. 1,690,768—9, 6.11.28. Appl., [A] 13.9.22, [B] 31.5.23).—(A) Fluid hydrocarbons containing an aliphatic chain, e.g., petroleum distillates, are agitated in the liquid phase above 100° at 100—320 lb./in.² in a current of air or other oxidising gas until the total acid content is about 20%. (B) The initial products insoluble in the hydrocarbon mixture are separated and the oxidation is continued. As example, distillate, *d* 0.8139, from Pennsylvanian crude oil yields 5% of formic acid, 5% of acids C₁₇H₁₄O₂ to C₁₅H₂₄O₂, and 90—95% of liquid acids, mol. wt. above 300; wax affords 5—10% of formic acid, 5—10% of other volatile acids, and 100—110% of acids, m.p. 45°. R. BRIGHTMAN.

Manufacture of acyl derivatives of β -ketonic esters and β -diketones. IMPERIAL CHEM. INDUSTRIES, LTD., and S. COFFEY (B.P. 302,750, 6.10.27).—Sodio-derivatives of β -ketonic esters or β -diketones react

with carboxylic acid anhydrides to give in good yield mainly *C*-acyl derivatives. The preparation of ethyl diacetoacetate, b.p. 104–106°/20 mm., ethyl *C*-propionylacetoacetate, and *C*-butyrylacetoacetate is described.

C. HOLLINS.

Hydrogenation of products containing phenol, benzene, or naphtha. C. LAILLET and J. GIUSTINIANI (F.P. 622,637, 1.2.26).—The substance is heated with hydrochloric acid and bituminous limestone. Hydrogen is stated to be evolved according to the reaction: $\text{CaCO}_3 + 2\text{HCl} = \text{CaCl}_2 + \text{CO}_2 + \text{O} + \text{H}_2$.

A. R. POWELL.

Manufacture of solid alkali-metal salts of organic compounds. K. DOBMAIER, Assr. to I. G. FARBENIND. (U.S.P. 1,685,191, 25.9.28. Appl., 19.1.28. Ger., 18.1.27).—The organic compound is ground with sodium phenoxide, and the phenol extracted with ether or alcohol. Sodium *p*-nitromercuriphenoxide, sodium cyanomercuriphenoxide, and sodium nitrophenylstibinate are thus obtained from the free phenolic compounds and sodium phenoxide. R. BRIGHTMAN.

Purification of benzoic acid and its derivatives. A. O. JAEGER, Assr. to SELDEN Co. (U.S.P. 1,685,634, 25.9.28. Appl., 19.10.27).—Benzoic acid and its chloro- and nitro-derivatives are separated from phthalic acid and its corresponding derivatives by passing the aqueous solution or dispersion in countercurrent with an organic solvent.

R. BRIGHTMAN.

Catalytic oxidation of anthracene. A. O. JAEGER, Assr. to SELDEN Co. (U.S.P. 1,685,635, 25.9.28. Appl., 23.12.27).—Anthracene is oxidised to anthraquinone in presence of a zeolite catalyst which may be diluted with a porous diluent, such as kieselguhr, siliceous powders, etc. The catalytically-active element may be present in chemical combination with or in the zeolite, or non-catalytic zeolite may be impregnated or incorporated during formation with suitable catalysts. Alkalinity of the zeolites may be avoided by effecting the zeolite reactions in only faintly alkaline solution or by treatment of the product with an acid gas at 400–500° in presence of air or other oxidising medium. If necessary, the zeolite catalyst may be strengthened mechanically with water-glass. Zeolite catalysts containing vanadium in non-exchangeable form as a metallic oxide component are preferred.

R. BRIGHTMAN.

Manufacture of wetting, cleansing, and emulsifying agents and the like. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 302,258, 8.9.27).—Aromatic or hydroaromatic non-hydroxylated compounds or their sulphonic acids are condensed with polyhydric alcohols or their esters or ethers containing at least one free hydroxyl group, or with unsaturated alcohols, or with olefines containing several double linkings, with a subsequent sulphonation if necessary. Examples are: naphthalene with $\alpha\gamma$ -butylene glycol or glycol mono-propyl ether.

C. HOLLINS.

Manufacture of thiocarbamide from cyanamides. COMP. DE L'AZOTE ET DES FERTILISANTS SOC. ANON. (Swiss P. 119,471, 11.2.26).—Calcium cyanamide and calcium sulphide in the theoretical proportions are added slowly to about five times their weight of water,

and the solution is treated with carbon dioxide until all the calcium is precipitated as carbonate. The mixture is then heated at 75° for 1–1½ hrs. with vigorous stirring, filtered, and evaporated for the recovery of thiocarbamide.

A. R. POWELL.

Liquid solution of thiocarbamide. H. GRAY, Assr. to B. F. GOODRICH Co. (U.S.P. 1,690,166, 6.11.28. Appl., 28.4.27).—Binary and ternary etc. mixtures of amines and diamines dissolve 20–40% of the thiocarbamide. Examples are: aniline with dimethyl-*p*-phenylenediamine; aniline with dimethyl-*p*-phenylenediamine and xylidine; aniline with *o*- and *p*-toluidines.

R. BRIGHTMAN.

Production of nitro-, amino-, and hydroxyl-amino-derivatives of cymene. J. SCHNIDELMEISER and J. A. F. BEAVIS (B.P. 300,760, 18.10.27).—Cymene is dissolved, e.g., in an equal weight of sulphuric acid, and nitrated with the theoretical amount or a slight excess of an organic nitrate, particularly "diacetyl nitric acid," the nitrocymene being subsequently reduced by known methods.

R. BRIGHTMAN.

Hydrogenation of naphthalene. E. A. PRUDHOMME (F.P. 599,827, 19.5.24).—A mixture of naphthalene vapour and hydrogen or water-gas is passed through a tube packed with Laming's material and heated at 190–225°, then over nickel pumice. According to the working conditions the resulting product consists of more or less of the various hydrogenation products from di- to deca-hydronaphthalene.

A. R. POWELL.

Manufacture of *N*- ω -aminoalkylamino-naphthalenecarboxylic [-naphthoic] acids. I. G. FARBENIND. A.-G., and W. HENTRICH (B.P. 302,212, 12.9.27. Addn. to B.P. 230,457; B., 1925, 983).—Alkylenediamines are condensed with hydroxy- or amino-naphthoic acids (other than those containing the hydroxyl or amino-groups *ortho* to the carboxyl group) in presence of sodium bisulphite. 2- β -Aminoethylamino-6-naphthoic acid and 2- δ -aminobutylamino-6-naphthoic acid are described; they couple with diazotised *p*-nitroaniline-*o*-sulphonic acid to give a blue-violet and a reddish-blue dye, respectively.

C. HOLLINS.

Manufacture of 1:8-naphthoxyphenanthrophen [peri-naphththioindoxyl] compounds. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 300,771, 25.10.27).—8-Carboxy- α -naphthylthioglycolic acid, or its nuclear substitution derivatives, is cyclised by heating with water at 150–200° in a closed vessel. *peri*-Naphththioindoxyl, m.p. 84–85°, and a bromo-derivative, m.p. 130°, prepared from brominated thioglycolic acid, m.p. 230°, are described.

R. BRIGHTMAN.

Purification of camphor and similar volatile substances. E. G. LOOMIS (U.S.P. 1,693,243, 27.11.28. Appl., 27.8.25).—Molten camphor is vaporised by blowing on to its surface a gas heated at below its b.p., and the gas saturated with camphor vapour is drawn by suction into a condensing chamber.

L. A. COLES.

Manufacture of acetic acid. H. DREYFUS (U.S.P. 1,697,109, 1.1.29. Appl., 27.5.26. U.K., 13.6.25).—See B.P. 259,641; B., 1926, 1013.

Recovery of concentrated acetic acid. H. SUIDA

(U.S.P. 1,697,738, 1.1.29. Appl., 16.3.27. Austr., 31.7.26).—See B.P. 275,158; B., 1927, 956.

Quantitative halogenisation of perylene and its derivatives. A. PONGRATZ and A. ZINKE, Assis. to F. BENSA (U.S.P. 1,697,137, 1.1.29. Appl., 30.9.25. Austr., 19.12.24).—See B.P. 244,739; B., 1926, 974.

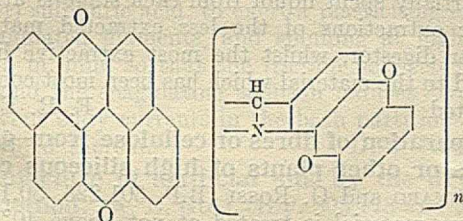
Cyanogen chloride (B.P. 303,469).—See VII.

IV.—DYESTUFFS.

See A., Feb., 183, **Triphenylcarbinol** or "aniline" dyes (MOIR). 190, **Colour of quinhydrones** (WEITZ). **Indoquinonanthrene** (MEYER). 197, **Carbocyanine dyes** (HAMER). 200, **New heterocyclic polymethine dyes** (SCHULOFF and others).

PATENTS.

Manufacture of vat dyes of the anthanthrone series. I. G. FARBENIND. A.-G. (B.P. 296,373, 29.8.28. Ger., 30.8.27).—Fast bright-brown vat dyes (annexed formula; $n = 1$ or 2) of the anthanthrone series are obtained by condensing with 1-aminoanthraquinone-2-aldehyde the mono- or di-halogenated anthanthrones prepared, e.g., according to the process of B.P. 287,020 (B., 1928, 398) in presence of an acid-fixing agent, e.g., sodium acetate, a solvent, and copper or a copper



compound as catalyst. *Dyes* from mono- and di-bromo- and dichloro-anthanthrone are described.

R. BRIGHTMAN.

***N*- ω -Aminoalkylaminonaphthoic acids** (B.P. 302,212).—See III.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Electrical conduction in textiles. I. Dependence of the resistivity of cotton, silk, and wool on relative humidity and moisture content. E. J. MURPHY and A. C. WALKER (J. Physical Chem., 1928, 32, 1761—1786).—Data showing the variation of the insulation resistance of cotton, silk, and wool with R.H. and moisture content are recorded. The logarithm of the resistance plotted against the logarithm of the moisture content gives a linear curve, the slope of which is independent of the form of the sample (short threads, individual fibres, and standard cotton-insulated wires) and the amount of impurity present, but which is characteristic of the kind of material investigated. The resistance at a given humidity is dependent on the amount of impurities, indicating that conduction occurs largely through aqueous paths. For samples of cotton, the insulation resistance at 1% R.H. is approx. 10^{12} greater than that at 99%, and in the range 20—80% is an exponential function of R.H. The conductance of a cotton thread is equal to the sum of the conductances of the constituent fibres, directly proportional to its

length, and is apparently independent of any contact resistances. Resistance decreases with a rise in temperature, but is little affected by small changes in tension of the fibres. Equations by which the resistances of cotton, silk, and wool can be calculated are given. The rate of change in resistivity with moisture content is greater for silk and wool than for cotton, and for a given moisture content the resistivity of silk or wool is greater than that of cotton, in spite of their greater hygroscopicity. This is explained by assuming that the effective conducting water channels in a textile consist of elementary filaments which are alternately expanded and constricted lengthwise, and that the resistivity is determined by the cross-sectional area of the narrowest parts of the channel, which are smaller in silk and wool than in cotton. L. S. THEOBALD.

Substances accompanying cellulose. I. F. W. KLINGSTEDT (Biochem. Z., 1928, 202, 106—114).—Cellulose preparations (sulphited cellular material of pine wood) can be completely freed from pentosans by treatment with sufficient 17—18% sodium hydroxide for 1 hr. With 6% sodium hydroxide, the first treatment of crude cellulose removes about half of the pentosans, and 90% is removed by two treatments. Saturated baryta at 50° removed only about one quarter of the pentosans. The cellular material obtained from rye straw by successive chlorinations contains large amounts of pentosans, which can be removed by treatment with 17% sodium hydroxide. P. W. CLUTTERBUCK.

Chemistry of the sulphite-cellulose cooking process. E. HÄGGLUND (Papier-Fabr., 1929, 27, 49—54).—Methods of determining the constituents of wood are discussed. Pine wood consists of cellulose about 42%, polysaccharides 24%, lignin 28%, acetic acid 2%, and rosin, ash, protein, etc. about 4%, the amounts varying somewhat with the method of determination. In the cooking of sulphite-cellulose, about three fourths of the hemicellulose originally present goes into solution as easily hydrolysed polysaccharides, whilst the other fourth remains in the cellulose. In the formation of lignosulphonic acids from the wood lignin, considerable amounts of sulphurous acid and lime are absorbed by the lignin and stable chemical compounds are formed. By treatment with hot dilute acids the greater part of the lignin is converted into lignosulphonic acids in solution. The ratio of sulphur to methoxyl in this material is about 0.5, whilst that found for ordinary sulphite waste-liquor is about the same, so that the lignin in the wood is already completely sulphonated at a relatively early stage of the cooking. The separation of the lignosulphonic acids in the dissolved state is dependent on the acidity and temperature of the cooking liquid, and this separation under the influence of acid is probably hydrolytic in nature, a solid lignosulphonic acid being first formed which subsequently goes into solution. Separation of the lignin is best produced by the use of cooking liquor of low hydrogen-ion concentration, e.g., sodium bisulphite solution, but under these conditions longer cooking is necessary, although yields of 60% of easily defibreable, very white sodium bisulphite-cellulose can be obtained. With ordinary cooking liquor such high yields cannot be obtained as the greater

acidity causes dissolution of the hemicellulose. With calcium bisulphite yields of 55% of cellulose with 7–8% of lignin may be obtained. The lignin, hemicellulose, and cellulose are all affected by overcooking, and not only is the yield of cellulose poor, but its strength is reduced. The formation of sugars during cooking and the fluorescence and reddening of the cellulose due to the presence of lignosulphonic acids are discussed.

B. P. RIDGE.

Alteration of sugar-like substances in sulphite-cellulose cooking. I. E. HÄGGLUND and T. JOHNSON (Svensk Kem. Tidskr., 1929, 41, 8–11).—The variation of the sugar content of spent sulphite liquors from cellulose manufacture depends mainly on (a) the hydrolysing action of the acid used, which in turn depends on the hydrogen-ion concentration, and hence on the concentrations of sulphite and sulphur dioxide, and (b) the degrading action of the acid on dissolved sugar-like substances. The latter depends not on the acidity of the sulphite solution used, but on the oxidising action of the bisulphite ion which oxidises the sugars to the corresponding aldo-acids in accordance with the scheme $2\text{HSO}_3^- + 2\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow \text{S}_2\text{O}_3^{2-} + 2\text{C}_6\text{H}_{12}\text{O}_7 + \text{H}_2\text{O}$. This oxidising action depends on the concentration of the bisulphite ion, which is governed by the proportion of lime in the sulphite liquor. If the latter is deficient in lime a point is soon reached when it is all used up in combination with the lignosulphonic acids formed, and the sulphite-ion concentration is greatly diminished, so that the sugars produced are not oxidised but are found in the spent lye. When a high proportion of lime and a longer heating period are used a considerable quantity of the aldo-acids are found in the spent lye, and their isolation as calcium salts is described. J. W. BAKER.

Factors affecting the sizing of paper pulp. R. ESCOURROU (Chim. et Ind., 1928, 20, 1039–1042).—A review of previous work in this field. D. J. NORMAN.

See also A., Feb., 175, **Constitution of flax cellulose** (RIGBY). **Acetylation of beech wood** (HORN).

PATENTS.

Treatment of plant stems to obtain fibres therefrom. C. E. BAHRE (B.P. 302,052, 14.12.27).—Stem fibres are disaggregated by boiling with alkali under pressure, with the addition of cholesterol or substances rich in cholesterol, such as fish oil, egg yolk, wool fat, etc., which protect the fibre from decomposition by the alkali. F. R. ENNOS.

Spinning of linen, hemp, and other fibres. G. PETROV and N. ALEXEV (F.P. 628,626, 5.2.27).—To accelerate the absorption of moisture the fibres are treated with water containing small quantities of aromatic sulphonic acids with or without the addition of hydrocarbons, sulphonic acids of aromatic hydrogenated hydrocarbons (octahydroanthracene), naphthasulphonic acids, aromatic fatty acids, alcohols, etc., or their derivatives (salts). F. R. ENNOS.

Lubrication of textile fibres. STANDARD DEVELOPMENT Co., Assees. of A. E. BECKER and DE V. STONAKER (B.P. 277,637, 22.8.27. U.S., 14.9.26).—Fibres are lubricated, previous to spinning, weaving, knitting, etc., with an emulsion containing a hydrocarbon having a

viscosity of 50–200 sec. Saybolt at 38° and 0.15–0.20% of an alkali soap as a dispersing agent. A. J. HALL.

Treatment of [pile] fabrics. BRIT. CELANESE, LTD., G. H. ELLIS, H. C. OLPIN, and E. E. WALKER (B.P. 302,208, 12.9.27).—For the production of ornamental effects in pile fabrics consisting of a cellulose acetate pile on a backing of other material, a solvent such as lactic, formic, or acetic acid, acetone, etc., with the addition of a suitable material to prevent spreading, is applied to the back of the fabric to weaken the loops of the pile filaments without damaging the other material. The pile filaments from the treated portion are afterwards removed by mechanical means. F. R. ENNOS.

Extraction of cellulose or paper pulp from fibrous vegetable matter containing the same. E. SPENCER (U.S.P. 1,690,954, 6.11.28. Appl., 10.2.28. Brit. India, 20.1.27).—The cellulosic material is introduced into a number of digestors which can be put into communication with one another. The digesting liquor is added to one and, after dissolution of part of the soluble matter in the material, it is blown down by means of the steam into the next digester containing the less extracted material and replaced by liquor of greater concentration, of higher temperature, and under greater steam pressure. This process of reverse extraction is continued so that the partially spent liquor from each stage is utilised in similar extractions of the less extracted material in another digester, whilst the most extractive liquor is applied to the material which has been most completely extracted. F. R. ENNOS.

Preparation of fibres or cellulose from graminaceous or other plants of high siliceous content. U. GENNARO and G. ROSSI (B.P. 301,226, 30.12.27).—The raw material is treated at not above 40° with a reagent, e.g., 3–4% caustic soda solution, which dissolves silica. After removal of the excess of reagent, by washing or by neutralisation, the material is retted, either by bacteria or enzymes, and allowed to season. D. J. NORMAN.

Decomposition of wood with nitric acid. E. STERZL (Austr. P. 107,590, 23.3.25).—Wood fibres are heated for about 1 hr. at 90–100° with about 8% nitric acid, removed from the acid, washed, bleached, and worked up as desired. The used acid is neutralised with potassium hydroxide and lime, volatile acids are removed by evaporation, potassium nitrate which crystallises on cooling is removed, and calcium oxalate is recovered from the mother-liquor by the further addition of lime. L. A. COLES.

Production of cellulose esters. E. ELÖD (B.P. 275,641, 4.8.27).—Cellulose is treated with 98–100% formic acid at 5–30° in the presence of an esterifying catalyst, e.g., gaseous hydrochloric acid or phosphoric anhydride, and at least 40% (on the weight of cellulose) of a swelling agent such as zinc chloride or calcium bromide. When esterification has reached the desired degree (1–4 hrs., depending on temperature) the reaction is immediately stopped by the addition of 25–33% (on the weight of the reaction mixture) of water, and the product is washed and dried. D. J. NORMAN.

Production of cellulose acetate and mixed cellulose esters containing acetyl and other carboxylic

radicals. C. RUZICKA (B.P. 303,432, 3.10.27).—Glacial acetic acid is treated with dry chlorine at below 30° in the presence of a lower fatty acid anhydride and/or one or more halogen compounds of acetic or other lower fatty acid. Dry cellulose is then treated with this chlorinated acid at not above 50° and, when chlorination and hydration of the cellulose have proceeded to the required degree, the product is acetylated at not above 30° by means of acetic anhydride and a suitable catalyst, e.g., zinc chloride or sulphuryl chloride.

D. J. NORMAN.

Cellulose esters containing unsaturated organic acid groups. H. T. CLARKE and C. J. MALM, ASS'ES. TO EASTMAN KODAK Co. (U.S.P. 1,690,620, 6.11.28. Appl., 4.5.27).—Cellulose is treated, e.g., in presence of chloroacetic anhydride and magnesium perchlorate at 60–65° with an unsaturated monocarboxylic acid, affording, e.g., cellulose crotonate, cellulose cinnamate. Mixed esters, such as cellulose crotonate stearate, cellulose acetate undecenoate, and cellulose acetate crotonate are similarly obtained. Esterification may be effected in chloroform or in chlorobenzene at 155–157°.

R. BRIGHTMAN.

Spinning of artificial silk and the like. J. HUEBNER and K. F. DIEHL (B.P. 303,421, 28.6.27).—Fine filaments of artificial silk (0.5 denier) are obtained by using a coagulating solution containing, e.g., 50% (or stronger) sulphuric acid, to exert a plasticising effect on the coagulated filaments, and spinning at high speed, e.g., 125 m./min. so that the friction between the filaments and the coagulating solution induces stretching. To prevent eddy currents in the bath partitions should be provided therein.

D. J. NORMAN.

Manufacture of artificial silk by the dry-spinning method. A. E. GULL (B.P. 303,778 and 303,821, [A, B] 5.10.27).—Air is drawn into one end of a drying chamber, consisting of a central tube surrounded by a larger annular space, and is heated by passing through a duct having (A) variable electrical heating elements, or (B) both variable and invariable elements. It then passes through the central tube in contact with and in the same direction as the extruded filaments, the exit end of which is maintained at a higher temperature than the inlet.

F. R. ENNOS.

Production of artificial filaments or threads. BRIT. CELANESE, LTD., E. KINSELLA, J. BOWER, W. I. TAYLOR, and H. DREYFUS (B.P. 300,998, 23.5.27).—In the production of artificial filaments by the dry-spinning process, collector devices are fitted at the top of the spinning chamber to cause the whole of the air or other evaporative medium to flow in close proximity to the spinning nozzle. In this way it is possible to utilise practically the whole of the evaporative capacity of the air, and at the same time to exercise a stricter control on the cross-section of the filaments. Various types of collector devices are described.

D. J. NORMAN.

Knitting of rayon fibres. H. WADE. From STANDARD OIL Co. (B.P. 303,841, 6.7.27).—A mixture of a low-viscosity mineral oil, oleic acid, an emulsifying agent, e.g., an oil-soluble alkali salt of a sulphonated mineral oil, and an anti-oxidant, e.g., β -naphthol, is applied to the fibres to soften them and for lubrication purposes.

F. R. ENNOS.

Preparation of artificial textile products with reduced lustre from viscose. G. BONWITT (B.P. 285,066, 7.9.27. Holl., 11.2.27).—Before spinning, the viscose is treated with a mixture of mono- and di-chlorobenzene having substantially the same density as itself, and the whole is then emulsified.

F. R. ENNOS.

Manufacture of sheets or films of composition containing cellulose esters or ethers. SPICERS, LTD., and H. J. HANDS (B.P. 301,439, 30.8.27).—The sheets or films are passed through a bath containing dilute solutions of caustic soda (0.5–1%) or of sodium hydrogen sulphate, the whole being electrically earthed. A softening agent, e.g., alcohol, and an oxidising agent, e.g., hydrogen peroxide, may also be added to the bath, or the oxidation may be carried out subsequently in a separate bath.

F. R. ENNOS.

Production of strips composed of cellulose derivatives carrying monochromatic or multi-coloured figuring. I. G. FARBEININD. A.-G. (B.P. 288,592, 2.9.27. Ger., 13.4.27).—Figuring is applied to a supporting surface, e.g., by printing or spraying with a pigment (preferably suspended or dispersed in a cellulose acetate solution), and after being dried the supporting surface is covered with a solution of cellulose acetate by pouring or spraying on to the moving surface. When the film is stripped from the support it carries the figuring with it. Other cellulose derivatives may be used.

C. HOLLINS.

Treatment of fabrics containing cellulose derivatives. BRIT. CELANESE, LTD. (B.P. 302,363, 14.12.28. U.S., 16.12.27. Addn. to B.P. 274,074; B., 1928, 811).—Ornamental effects are produced on fabrics containing cellulose esters by locally applying a hydrolysing agent, e.g., a paste composed of caustic alkali thickened with gum, steaming, washing, and finally subjecting the fabric to a carbonising agent, such as an acid or an acid salt solution, to remove the cellulose.

F. R. ENNOS.

Regeneration of spent liquor in the preparation of sodium bisulphite cellulose. E. L. RINMAN (F.P. 627,691, 18.1.27).—The spent liquor is freed from a number of constituents, concentrated by evaporation, and the solid matter is ignited to convert sodium salts into sodium sulphide containing carbonate. The sulphide is dissolved in water and converted into carbonate by passing carbon dioxide, and finally into bisulphite by treatment with sulphur dioxide from the combustion gases or the cooker.

F. R. ENNOS.

Recovery of resinous by-products in the manufacture of wood pulp. E. H. FRENCH (U.S.P. 1,693,586, 27.11.28. Appl., 15.8.25).—The alkaline liquor from the manufacture of wood pulp is acidified with waste sulphur dioxide or nitre cake, and the precipitated resin acid is separated by filtration or decantation, dissolved in a hydrocarbon, e.g., benzol, kerosene, the solution distilled *in vacuo*, and the solvent and rosin are collected separately.

F. R. ENNOS.

Production of wood pulp. C. B. THORNE (U.S.P. 1,691,682, 13.11.28. Appl., 5.4.26).—Wood chips are heated in a digester with a preheated sulphite liquor under pressure of an external gas, which also causes the

liquor to circulate or pulsate through a tank and back again to the digester. F. R. ENNOS.

Manufacture of chemical pulp. J. S. BATES (U.S.P. 1,691,511, 13.11.28. Appl., 2.3.25).—In the making of kraft pulp the melt of black ash and sodium sulphate is dissolved in dilute alkali solution from a previous operation so that the concentration is above that which is advantageous for causticising. The liquid while hot (90—100°) is allowed to settle, and the precipitate is washed for recovery of the alkali, the washings being added to the clear liquid, which is then causticised. F. R. ENNOS.

Production of a cellulose product. W. W. CARTER, Assr. to H. T. NELSON (U.S.P. 1,693,573, 27.11.28. Appl., 27.12.22).—For use in the manufacture of toughened, waterproof paper the fibre stock is immersed in a sodium hydroxide solution containing a size emulsion. After being removed from the solution and allowed to age, the product is xanthated. F. R. ENNOS.

Treatment of fibrous material. J. MCINTOSH, Assr. to DIAMOND STATE FIBRE CO. (U.S.P. 1,697,077, 1.1.29. Appl., 30.1.26).—Fibrous sheets are passed through a solution of cellulose ester, the solvent is evaporated, and the dried sheets are superposed and heated under pressure. J. S. G. THOMAS.

Manufacture of a [mouldable] composition of matter [from cellulose]. E. C. R. MARKS. From STABILIMENTI CHIM. IND. (B.P. 298,793, 15.11.27).—A highly resistant material capable of being moulded under heat and pressure is made by treating cellulose with a solution of sulphuric and nitric acids. After washing and drying, the product is steeped first in phenol and then in formaldehyde, neutralised if necessary, drained, dried, and finally mixed with 2% of *p*-dichlorobenzene. F. R. ENNOS.

Manufacture of derivatives of cork. I. G. FARBERIND, A.-G. (B.P. 291,773, 8.6.28. Ger., 8.6.27).—Dry cork meal, suspended in an indifferent medium, *e.g.*, chlorobenzene, is esterified, whereby an insoluble plastic material is obtained. F. R. ENNOS.

Manufacture of waterproof paper board. E. BACHE, Assr. to WALDORF PAPER PRODUCTS CO. (U.S.P. 1,691,752, 13.11.28. Appl., 8.5.25).—Paper pulp is treated with ferric chloride (0.7% by wt. of the dry material) to render it electropositive, and mixed with emulsified bitumen, which bears a negative charge, by forcing the two at high velocity through an annular orifice the width of which does not exceed 0.05 in. F. R. ENNOS.

Treating papermaking fibres in the making of certain kinds of paper. R. MCNEILL (B.P. 301,682, 6.3.28).—In order to avoid the production of "fluff" in the manufacture of certain bulky antique and other papers, a jelly consisting of starch, glue, sodium silicate, and water is thoroughly mixed with the fibre in the beater before the addition of alum. F. R. ENNOS.

Production of paper and paper stock. L. GRAFFLIN, Assr. to BALL BROS. CO. (U.S.P. 1,692,774, 20.11.28. Appl., 18.6.25).—For paper of increased strength, straw is disintegrated by heating with a dilute solution of

sodium sulphate, and after adding a quantity of pulp suitable for ordinary paper the mixture is matted into sheets while still wet with residual sulphate liquor. F. R. ENNOS.

Newsprint paper. W. H. MILLSPAUGH (B.P. 288,212, 4.4.28. U.S., 4.4.27).—Newsprint paper of increased strength is made from ordinary stock by simultaneously forming two wet sheets of half the usual thickness, combining them by pressing, and drying. F. R. ENNOS.

Production of stencil sheets for use in duplicating. A. DE WAELE (B.P. 303,631, 6.12.27).—Yoshino paper is coated with a mixture of a cellulose derivative, particularly nitrocellulose, and a hydroxy-fatty acid, *e.g.*, ricinoleic acid. F. R. ENNOS.

De-inking process. W. LEWIS (U.S.P. 1,696,639, 25.12.28. Appl., 6.9.27).—Newspaper etc. saturated with an alkaline solution is reduced to pulp and subjected to pressure between surfaces impervious to the pulp but pervious to the ink and solution. L. A. COLES.

Mechanism for use in treatment ["filling"] of fabrics. N. ISHERWOOD (B.P. 304,433, 7.12.27).

Machine for making sheet cellulose from aqueous cellulose solutions. C. RUZICKA (B.P. 304,374, 21.10.27).

[Cutting non-fraying tape from] fabrics made of or containing cellulose derivatives. BRIT. CELANESE, LTD. (B.P. 298,207, 5.10.28. U.S., 5.10.27. Addn. to B.P. 293,858 and 297,712).

Method and machine for manufacture of pulp board. J. J. HINDE (B.P. 304,171, 14.7.27).

Treatment of roads (B.P. 303,433).—See IX. **Moulded products** (B.P. 284,232).—See XIII. **Deposition of viscose and oxycellulose** (B.P. 303,765).—See XIV.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Dye sensitisers and bleaching. MUDROVČIČ.—See XXI.

PATENTS.

Treatment of fabrics consisting of or containing acetyl silk. BLEACHERS' ASSOC., LTD., W. KERSHAW, F. L. BARRETT, and R. GAUNT (B.P. 303,286, 21.1.28).—Lustre pattern effects are obtained by completely delustring cellulose acetate silk fabric and then embossing it in the usual manner at about 150°, the fabric being then preferably wetted and lightly calendered whereby the embossing marks are removed. The process may be combined with those described in B.P. 301,567—8 (B., 1929, 127). A. J. HALL.

Imparting a linen-like effect to cotton. H. EGLI, Assr. to A.-G. SEERIET (U.S.P. 1,690,572, 6.11.28. Appl., 2.1.26).—Cotton yarns and webs formed of threads the fineness of which does not exceed English yarn no. 60 are subjected at 0—5° to the action of sulphuric acid (*d* 1.51—1.54) for not less than 4 min., and after washing are treated while under tension with caustic alkali (*d* 1.12) at ordinary temperatures. F. R. ENNOS.

Plant for cooling liquids particularly for use in mercerising fabrics. S. S. HAMMERSLEY and J. A.

BOLTON (B.P. 302,004, 12.10.27).—A liquid such as a caustic mercerising bath is withdrawn from the treatment or mangle tank, passed through a strainer and pump, and cooled in a separate vessel or "evaporator," then returned to the treatment tank. The evaporator is kept cool by the evaporation of a refrigerant in coils, and the compressor for the refrigerant is preferably thermostatically controlled. The contents of the evaporator may be withdrawn by the circulating pump into a storage tank to permit of cleaning the cooling coils by flushing.

B. M. VENABLES.

Dyeing machines. J. SYKES & SONS, LTD., and E. P. SYKES (B.P. 302,486, 1.12.27).

Dyeing and like machines. C. S. BEDFORD (B.P. 304,088, 2.5.28. Addn. to B.P. 290,138).

Dye becks and like apparatus for liquid treatment of textile yarns or fabrics. T. PARKINSON (B.P. 304,460, 13.1.26).

Dye sticks and the like. C. CALLEBAUT and J. DE BLICQUY (B.P. 302,857, 10.5.28).

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Reaction mechanism in the sulphuric acid contact process and the action of promoters. B. NEUMANN (Z. Elektrochem., 1929, 35, 42—51; cf. B., 1928, 891; 1929, 51).—In continuation of recent work (*loc. cit.*) on the use of various metallic oxide catalysts for the sulphuric acid contact process, the view is now developed that the behaviour of the catalyst depends on the alternate reduction of the oxide and oxidation of the reduction product, with simultaneous liberation of sulphur trioxide. With iron oxide, the following series of reactions is assumed to occur: $\text{SO}_2 + 3\text{Fe}_2\text{O}_3 = 2\text{Fe}_3\text{O}_4 + \text{SO}_3$; $2\text{Fe}_3\text{O}_4 + 4\text{SO}_2 + 2\text{O}_2 = 2\text{FeSO}_4 + 2\text{Fe}_2\text{O}_3 + 2\text{SO}_3$; $2\text{FeSO}_4 = \text{Fe}_2\text{O}_3 + \text{SO}_3 + \text{SO}_2$; SO_2 (nascent) + $\frac{1}{2}\text{O}_2 = \text{SO}_3$. At temperatures above 605° the ferrous sulphate decomposes as follows: $2\text{FeSO}_4 = \frac{1}{3}\text{Fe}_2(\text{SO}_4)_3 + \frac{2}{3}\text{Fe}_2\text{O}_3 + \text{SO}_2$; $\frac{1}{3}\text{Fe}_2(\text{SO}_4)_3 = \frac{1}{3}\text{Fe}_2\text{O}_3 + \text{SO}_3$. The fact that small quantities of ferrous sulphate are found in the used contact mass when iron oxide is employed as the catalyst is cited as evidence in favour of the above view. The easy formation and decomposition of the ferrous sulphate is the most important factor of the catalysis, and represents the real "intermediate reaction" of the process. The mechanism of the reaction with vanadic acid as catalyst is similar. The intermediate compound is probably vanadyl sulphate, traces of which are found in the used contact mass. Similarly, with titanate oxide, titanate sulphate and titanate sulphate are assumed to be formed. The action of promoters in mixed catalysts is discussed, with special reference to the cases of silver and vanadic acid and of tin oxide and chromic oxide. It is considered that, with mixed catalysts, the sulphuric acid contact process consists of a continuous alternating reduction and oxidation; with an inefficient contact substance the reaction velocity of either the oxidation or the reduction is slow, and the action of a promoter is to accelerate the velocity of the slow reaction. L. L. BIRCUMSHAW.

Extraction of phosphorus pentoxide. U. ORLANDI

(Notiz. Chim.-ind., 1928, 3, 343—344; Chem. Zentr., 1928, ii, 1024).—Phosphorite, silica, and a flux (alkali sulphate etc.) are treated with oleum containing a high proportion of sulphur trioxide until reaction is complete, the temperature rising to 300°; phosphorus pentoxide and metaphosphoric acid are then sublimed in an electric furnace at 600°, whilst removal of sulphur di- and tri-oxides is effected at 1000°.

A. A. ELDRIDGE.

Removal of carbon dioxide from the atmosphere by electrolytic transport. E. MÜLLER, H. MARKERT, and F. HEINRICH (Z. Elektrochem., 1929, 35, 3—13).—The possibilities of regenerating electrolytically caustic alkali solutions which have been used for the absorption of carbon dioxide from the air are investigated, and several difficulties encountered are discussed. Electrolysis of an alkali carbonate solution, using a divided cell with a porous diaphragm, yields a solution of alkali hydroxide in the cathode compartment, and of alkali hydrogen carbonate in the anode compartment. The reactions occurring on electrolysis when (a) both anolyte and catholyte are carbonate solutions, (b) both are bicarbonate solutions, and (c) the anolyte is bicarbonate and the catholyte carbonate, are examined. In (a) bicarbonate is first formed at the anode; this then decomposes with liberation of carbon dioxide, so that eventually a point is reached where as much bicarbonate is formed as is decomposed in unit time. If at this point as much carbonate is added to the anolyte as is converted into bicarbonate, while at the same time the OH' in the catholyte is neutralised by the introduction of carbon dioxide, then the equilibrium condition represented by the following equation will be realised with a current consumption of 4 Faradays: $[\text{3CO}_2 + 2\text{H}_2\text{O}]$ (catholyte) + K_2CO_3 (anolyte) = $[\text{K}_2\text{CO}_3 + 2\text{H}_2]$ (catholyte) + $[\text{2CO}_2 + \text{O}_2]$ (anolyte). This method has been used for the removal of carbon dioxide from a continuous air stream, and details are given of a small-scale apparatus for this purpose. A current yield of over 90% may be obtained from a catholyte 10.5N with respect to potassium carbonate and 1.06N to free potassium hydroxide, and an anolyte 2.2N with respect to potassium bicarbonate and 0.2N to potassium carbonate, since tests have shown that these solutions fulfil the equilibrium conditions determined by the above equation.

L. L. BIRCUMSHAW.

See also A., Feb., 140, **Transformation of chromates into dichromates** (CARRIÈRE and CASTEL). 153, **Activity of metallised silica gels** (REYERSON and SWEARINGEN). 154, **Electrolysis of sodium sulphide solutions** (FETZER). 155, **Formation of ozone by cathode rays** (MARSHALL). 156, **Preparation of cuprous sulphate** (DRUCE and FOWLES). 159, **Synthesis of hypophosphoric acid** (MILOBEDZKI and WALCZYŃSKA). 162, **Titration of ammonium salts** (KAPELMEIER). 163, **Volumetric determination of arsine** (KUBINA). 164, **Determination of lead by means of 8-hydroxyquinoline** (MARSSON and HAASE). 165, **Analysis of tungsten compounds** (SPITZIN and KASCHTANOV).

Indicator for absorption systems. MACKERT.—See I. **Vanadium and molybdenum compounds**

in clays. PALMER.—See VIII. Ammonia production by soil fungi. THAKUR and NORRIS.—See XVI.

PATENTS.

Manufacture of sulphuric acid [oleum etc.]. S. ROBSON, B. LAMBERT, and NAT. PROCESSES, LTD. (B.P. 303,459, 3.10.27).—Sulphurous gases are passed through electrostatic dust depositors and/or filters and then, in admixture with air or oxygen, over the catalytic material described in B.P. 301,853 (B., 1929, 94).

L. A. COLES.

Manufacture of sulphuric acid. R. VETTERLEIN (F.P. 628,923, 28.12.26. Ger., 19.7.26).—In the manufacture of sulphuric acid from sulphur dioxide and nitrosulphuric acid, one or more empty chambers or towers are interposed between the end of the reaction chambers and the absorption chambers. A chamber may also be built above the filling material in the last oxidising tower.

A. R. POWELL.

Manufacture of hyposulphurous acid and its salts and derivatives. H. KAUTSKY and A. PFANNENSTIEL (G.P. 444,063, 12.10.24).—An aqueous solution of sulphur dioxide, alkali sulphites or bisulphites, or of aldehyde or ketone derivatives thereof is treated with calcium silicide in the presence of suitable salts.

A. R. POWELL.

Recovery of hydrochloric acid from waste liquors of the fuller's earth industry. E. MAAG (G.P. 451,531, 5.8.26. Addn. to G.P. 449,993; B., 1929, 54).—The liquor in either or both stages of the evaporation is sprayed on to a layer of hot coke which is continually replenished as it becomes encrusted with separated salts. The used coke is withdrawn from the bottom of the container and is used for heating further quantities of liquor.

A. R. POWELL.

Manufacture of hydrogen peroxide. P. ASKENASY (F.P. 628,360 and 628,441, 1.2. and 3.2.27. Ger., [A] 2.2. and [B] 4.2.26).—(A) Barium peroxide is treated for 30 sec. with carbon dioxide under at least 20 atm. pressure. (B) An aqueous suspension of impure barium peroxide is treated with carbon dioxide. In both cases a 4% solution of hydrogen peroxide may be obtained and the barium carbonate may be reconverted into peroxide for use again.

A. R. POWELL.

Purification of salt and recovery of by-products. V. YNGVE (U.S.P. 1,697,336, 1.1.29. Appl., 9.4.25).—Brine is treated with excess of sodium hydroxide, and after removal of the precipitated hydroxides is concentrated, the salt so produced being washed with neutral brine; the brine mother-liquor after removal of sodium sulphate is used for treating further brine.

W. G. CAREY.

Production of sodium carbonate sulphate. A. W. GAUGER and H. H. STORCH, Assrs. to BURNHAM CHEM. CO. (U.S.P. 1,689,526, 30.10.28. Appl., 9.1.26).—A Californian brine containing potassium, sodium, sulphate, and carbonate ions is evaporated by the sun in a deep pond, so that its temperature does not rise above 20–25° and sodium chloride only is deposited. When saturated with sodium potassium sulphate, the brine is run into a shallow pond, so that its temperature rises to 30°, and sodium carbonate sulphate is deposited.

The mother-liquor may be run off from the warmer pond at the same rate as the brine is introduced, little evaporation taking place as a crust of sodium chloride is formed.

F. G. CLARKE.

Manufacture of sodium magnesium carbonate. H. RUBINSTEIN (U.S.P. 1,684,782, 18.9.28. Appl., 23.9.26).—Finely-divided natural or artificial magnesite (1 mol.) is suspended in a solution of sodium chloride (0.2 mol.) at 60–70°, and sodium carbonate (2 mols.) is added slowly over a period of several hours, whereby a crystalline precipitate of $MgCO_3 \cdot Na_2CO_3$ is obtained.

A. R. POWELL.

Manufacture of Javelle water [sodium hypochlorite solution]. H. D. LEVINE (U.S.P. 1,694,711, 11.12.28. Appl., 7.5.25).—Sodium hydroxide solution is cooled rapidly to about 0°, and is maintained at this temperature during treatment with chlorine.

L. A. COLES.

Production of ammonium phosphates. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 303,455, 4.7.27).—Crude phosphates are dissolved in an acid which forms a readily soluble calcium salt, e.g., hydrochloric or nitric acid, and, after filtration, the solution is partially neutralised by the addition of calcium phosphate to precipitate calcium mono- or di-hydrogen phosphate, which, after separation from the liquor, is treated with ammonia, with ammonia and carbon dioxide, or with ammonium salts of acids forming insoluble calcium salts, to yield ammonium phosphates.

L. A. COLES.

Production of cyanamides of the alkaline-earth metals and magnesium. N. CARO and A. R. FRANK, Asses. of STICKSTOFFWERKE G.M.B.H. (B.P. 281,611, 30.9.27. Ger., 2.12.26. Addn. to B.P. 279,812; B., 1929, 53).—Alkaline-earth or magnesium oxides, or compounds yielding these on heating, are heated above 400°, preferably at 650–850°, in the presence of gas mixtures which yield hydrogen cyanide, e.g., mixtures of ammonia and carbon monoxide, at the ordinary or raised pressure. Water and catalyst poisons, e.g., sulphur compounds, are also added, and the reaction is effected in apparatus constructed of materials which do not accelerate the decomposition of the reacting gases, e.g., of ceramic material or zinc.

L. A. COLES.

Manufacture of calcium carbide and phosphorus. A. CHAGNON (F.P. 628,793, 23.4.26).—The charge is heated in a high-frequency induction furnace which is so constructed that it can be continuously replenished and the gases evolved in the reduction continuously removed.

A. R. POWELL.

Separation of lead from solutions [containing, e.g., ferrous chloride and lead chloride]. S. I. LEVY and G. W. GRAY (B.P. 304,054, 10.2.28).—Lead is recovered from solutions obtained, e.g., by treating iron pyrites residues with hydrochloric acid, by electrolysis using an iron anode and an *E.M.F.* less than that required to decompose the ferrous chloride, or by the addition of an iron-copper couple.

L. A. COLES.

Manufacture of copper sulphate [briquettes]. HUNGÁRIA MŰTRÁGYA, KÉNSAV ÉS VEGYI IPAR RÉSZVÉNYTÁRSASÁG, and L. DEUTSCH (B.P. 304,052, 10.2.28).—Copper sulphate crystals 0.25–5.0 mm. in length

are formed into briquettes by the application of low pressure in moulds in the presence of adhering mother-liquor or added copper sulphate solution, with or without the addition of binding agents, *e.g.*, sodium sulphate, and the briquettes are removed and dried.

L. A. COLES.

Decomposition of aluminous minerals with nitric acid. METALLBANK U. METALLURGISCHE GES. A.-G., Assees. of C. FRH. VON GIRSEWALD and R. KAISER (G.P. 451,117, 15.11.25).—Minerals containing alumina are heated with an excess of nitric acid, and the resulting solution is heated under pressure with an excess of the powdered mineral to obtain a neutral solution free from iron salts and from silica.

A. R. POWELL.

Dissolving and purifying materials containing alumina, applicable also to other ores. M. BUCHNER (B.P. 282,772, 23.12.27. Ger., 24.12.26).—Clay, bauxite, etc. is extracted with nitric acid in a vessel constructed of an alloy of iron, nickel, and chromium, and preferably containing tungsten or a similar metal in addition, the bauxite etc. being present in excess. The extraction is started at 80–100°, and the pressure and temperature are raised gradually until the latter reaches 150–160°.

L. A. COLES.

Manufacture of beryllium sulphate. METALLBANK U. METALLURG. GES. A.-G., Assees. of C. FRH. VON GIRSEWALD and W. SIECKE (G.P. 451,346, 21.5.26).—A mixture of finely-divided beryl and lime or magnesia equivalent to half the weight of beryllia present is sintered in a rotating furnace and the powdered product is digested with sulphuric acid.

A. R. POWELL.

Manufacture of desiccating material. H. WADE. From E. THOMAS (B.P. 303,263, 9.12.27).—The material comprises magnesium perchlorate deposited upon a carrier, *e.g.*, upon 3 pts. of barium perchlorate per 1 pt. of magnesium perchlorate, the mixture being dried at 180–300° under the ordinary or reduced pressure to yield a granular product.

L. A. COLES.

Preparation of titanium and like compounds [oxides and hydroxides]. J. BLUMENFELD (B.P. 275,672, 9.8.27. U.S., 9.8.26).—Solutions obtained by the decomposition of ilmenite etc. with sulphuric acid, containing, *e.g.*, 200 g. TiO_2 and 500 g. H_2SO_4 (free and combined) per litre, are introduced at 100–110° into about one quarter of their volume of boiling water at a uniform rate during about 10 min., the mixture being well stirred during the addition and then boiled for 2–3 hrs. to precipitate colloidal titanium hydroxide. The product may be dispersed as described in B.P. 247,296 (B., 1926, 373). Compounds of the rare-earth metals may be similarly prepared.

L. A. COLES.

Manufacture of white titanate acid [oxide]. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 303,468, 4.10.27).—In the recovery of titanate oxide from ilmenite etc. the hydrolysis is effected in the presence of a weak reducing agent, *e.g.*, sodium sulphite or sulphurous acid, which does not convert titanium from the quadrivalent into the trivalent form, in quantity sufficient to reduce trivalent iron and other oxidising agents, including dissolved oxygen, and the product is washed with a dilute solution of the reducing

agent. A portion of the weak reducing agent may be replaced by a stronger agent, *e.g.*, iron. L. A. COLES.

Mining of boron compounds. H. BLUMENBERG, JUN. (U.S.P. 1,696,075, 18.12.28. Appl., 24.10.27).—Deposits of kernite ($Na_2B_4O_7 \cdot 4H_2O$) are treated *in situ* with a hot solution of sodium carbonate under pressure whereby the very soluble sodium metaborate is formed. The resulting liquors are treated with carbon dioxide and allowed to crystallise to recover borax, the mother-liquor containing sodium carbonate being heated and returned to the process.

A. R. POWELL.

Decomposition of salts of complex hydrofluoric acids [fluosilicates]. A. F. MEYERHOFER (B.P. 303,760, 28.7.27).—Fluosilicates are decomposed into metal fluorides and silicon tetrafluoride by heating in thin layers under reduced pressure at a temperature below the sintering point so that the material remains as a loose powder, or sufficiently high to melt it completely. The decomposition may be promoted by the introduction of gases, *e.g.*, air, steam, oxygen, flue gases, etc.; by the addition of organic material etc. which evolves gases on heating; or by admixture of the fluosilicates with fluorspar or other silicates prior to heating. The decomposition chamber is preferably constructed of alloys containing iron, nickel, and chromium, and having a low carbon content.

L. A. COLES.

Concentration of sulphur. E. H. NUTTER and J. W. LITTLEFORD, Assis. to MINERALS SEPARATION NORTH AMERICAN CORP. (U.S.P. 1,697,402, 1.1.29. Appl., 20.4.28).—Material containing sulphur is heated to cause particles of sulphur to unite and is ground to a size suitable for froth flotation; an aqueous pulp of the material is then agitated and the sulphur-bearing froth is separated.

W. G. CAREY.

Sulphur-silica composition. W. H. KOBBE, Ass. to FLEURON, INC. (U.S.P. 1,693,714, 4.12.28. Appl., 26.11.26).—Equal parts by wt. of sulphur and silica are mixed, the silica being comminuted so that 43% passes 320-mesh and 7.2% is held on 80-mesh.

W. G. CAREY.

Preparation of "calcicated" iodine. W. L. CHANDLER (U.S.P. 1,689,775, 30.10.28. Appl., 1.5.24).—A clear or slightly cloudy solution of calcium hydroxide is agitated with excess of sublimed iodine. The solution gives an active form of iodine when acid is added.

F. G. CLARKE.

Manufacture of cyanogen chloride. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 303,469, 4.10.27).—The product is obtained by the action at below 8° of a (sodium) cyanide solution on chlorine hydrate, which is prepared by passing chlorine into water at 0°. The water may contain a dissolved electrolyte, *e.g.*, sodium chloride, to lower the f.p., or may be mixed with a non-reacting organic liquid, *e.g.*, carbon tetrachloride. The resulting solution may be used direct, or the cyanogen chloride may be recovered by distillation.

L. A. COLES.

Production of large crystals. P. SEIDLER (U.S.P. 1,697,543, 1.1.29. Appl., 23.11.26. Ger., 30.11.25).—Vegetable substances are added to salt solutions, which are then concentrated by heat and allowed to cool slowly,

the crystals formed being removed from the mother-liquor and dried by centrifugal action.

H. ROYAL-DAWSON.

—**Contact sulphuric acid process.** SELDEN Co., Asses. of A. O. JAEGER (B.P. 296,048, 11.10.27. U.S., 24.8.27).—See U.S.P. 1,675,309; B., 1928, 783.

—**Production of phosphorus pentoxide and phosphoric acid.** G. PISTOR, H. LANG, and R. SUCHY, Assrs. to I. G. FARBENIND A.-G. (U.S.P. 1,700,703, 29.1.29. Appl., 11.10.26. Ger., 22.10.25).—See B.P. 260,225; B., 1927, 601.

—**Recovering barium as barium carbonate from barium silicates.** C. DEGUIDE (U.S.P. 1,697,722, 1.1.29. Appl., 25.3.26. Fr., 3.4.25).—See G.P. 429,169; B., 1926, 788.

—**Manufacture of calcium nitrate.** K. BLUMRICH, Assr. to I. G. FARBENIND A.-G. (U.S.P. 1,700,116, 29.1.29. Appl., 7.11.25. Ger., 11.11.24).—See B.P. 242,990; B., 1926, 926.

—**Recovery of chromium [as chromate] from chromiferous waste materials [chrome leather scrap etc.].** A. TREUSCH and R. WÜRTENBERGER, Assrs. to J. MAYER & SOHN (U.S.P. 1,700,657, 29.1.29. Appl., 1.6.25. Ger., 16.6.24).—See B.P. 235,548; B., 1925, 714.

—**Hydrocarbons and ammonia (B.P. 302,620).**—See II. **Removal of magnesium oxide from zinc sulphate electrolytes (F.P. 629,216).** **Electrolysis of ferrous chloride (B.P. 304,053).**—See XI.

VIII.—GLASS; CERAMICS.

—**[Heat] insulation of roofs of glass furnaces.** R. D. PIKE (J. Amer. Ceram. Soc., 1929, 12, 56—61).—A description is given of a method of test as applied to a portion of the roof of a tank furnace while in operation in order to show whether or not insulation is safe. The effect of the application of insulation on the life of the roof bricks is considered.

J. A. SUGDEN.

—**Production of colour in glass and in gems by X-rays and radium rays.** M. C. REINHARD and B. F. SCHREINER (J. Physical Chem., 1928, 32, 1886—1887).—Intense X-rays and the β - and γ -radiations from radon produce no change of colour in topaz, aquamarine, amethyst, garnet, and white and brown diamonds. The white diamond gives a blue fluorescence when exposed to the radiations from radon, but none of the other gems showed fluorescence. Natural quartz is unchanged, but fused quartz is coloured brown in an irregular manner by exposure to X-rays.

L. S. THEOBALD.

—**Fractional crystallisation of technically pure glasses.** H. JEBSEN-MARWEDEL (Naturwiss., 1929, 17, 84).—Paragenesis of β -wollastonite and cristobalite is found to occur in technical soda-lime glass.

W. E. DOWNEY.

—**Vanadium and molybdenum compounds in clays.** L. A. PALMER (J. Amer. Ceram. Soc., 1929, 12, 37—47).—Development of green efflorescence in certain face bricks is due to the presence of soluble alkali

vanadates. Only a small amount of molybdenum is present in the efflorescence. Eight kinds of clays examined contained insoluble vanadium and molybdenum compounds which are rendered soluble during firing. Efflorescence is prevented by firing in a reducing atmosphere or by hard firing. The effect of such treatment on shade or colour may be objectionable, and a chemical treatment of the clay is more economical. When added to the extent of 1%, calcium fluoride or sodium fluosilicate is both effective and cheap.

J. A. SUGDEN.

—**Plasticity and related properties of clays.** D. R. IRVING and W. F. DIETRICH (J. Amer. Ceram. Soc., 1929, 12, 14—29).—Applying the Talwalkar-Parmelee method of measuring plasticity (B., 1928, 193), the effect of water content, ageing, and addition of non-plastic materials on a number of clays has been studied. The plastic torsional strength decreases and deformation below rupture increases with increase of water content. Ageing decreases the strength but increases the deformability. The addition of up to 50% of finely-ground quartz increases the strength and decreases the deformability, but beyond 50% the strength rapidly decreases, with little change in deformability. The strength increases with fineness of the non-plastic material. The plasticity test distinguishes between non-plastic clays and clays the plasticity of which has been reduced by the addition of non-plastic materials, and serves also to differentiate various types of clays. There appears to be some connexion between plastic strength and vitrification temperature. No correlation was found between the adsorption of malachite-green and methylene-blue by various clays, nor between dye absorption and plasticity, drying, or firing shrinkages.

J. A. SUGDEN.

—**Rate of oxidation of porcelain and ball clays.** H. M. KRANER and E. H. FRITZ (J. Amer. Ceram. Soc., 1929, 12, 1—13).—Small dried test bars were heated in a laboratory tube furnace under conditions of temperature rise, atmosphere (4% oxygen-nitrogen mixture), and rate of atmospheric change which prevail in a kiln. The carbon dioxide and water evolved were absorbed by phosphorus pentoxide and soda-lime. The porcelain body contained (approx.) 25% each of ball clay, china clay, flint, and felspar. It was found that oxidation proceeds more rapidly at low temperatures than has been generally considered. Advantage may be taken of this fact to attain more economical firing. A porcelain or ball clay-flint body may be completely oxidised at 600—650° and a close-grained ball clay may be 90% oxidised at 650° and completely oxidised at 700—800°. The rate of oxidation appears to be dependent almost entirely on temperature, and the time factor is involved only in thick pieces. Oxidation seems to proceed more rapidly in a dry atmosphere. The carbon content is not necessarily a criterion of the probable rate of oxidation of a clay.

J. A. SUGDEN.

—**Influence of hydrogen-ion concentration and electrolytes on the turbidity, sensitivity, and settling rates of certain Pleistocene clays.** H. C. GRAHAM and J. N. PEARCE (Proc. Iowa Acad. Sci., 1927, 34, 217—218).—The amount of clay which can be held in aqueous suspension depends on the stratum from which the clay was obtained, on the hydrogen-ion con-

centration, and on the concentration of the electrolyte present in the suspension. Generally the turbidity is maximal at p_H 10.5. CHEMICAL ABSTRACTS.

Cyanite as found in Western North Carolina. A. H. FESSLER and W. J. McCAUGHEY (J. Amer. Ceram. Soc., 1929, 12, 32—36).—A brief description is given of the deposits, formations, geology, and economic values of the mineral. J. A. SUGDEN.

Terra cotta kiln slab investigation. R. L. CLARE, G. H. BROWN, and F. B. ALLEN (J. Amer. Ceram. Soc., 1929, 12, 62—68).—The constitution of a good kiln slab was determined under actual service conditions and correlated with nature and size of grog, thermal expansion, and initial cross-breaking strength. Best results were obtained with porous and vitreous grogs with particles varying widely in size. Highly siliceous grog causes premature failure. Mechanical strength is an indication of probable life. Insufficient data is available to show the effect of a number of firings on the strength. J. A. SUGDEN.

Prevention of disintegration of blast-furnace linings. R. P. HEUER (J. Amer. Ceram. Soc., 1929, 12, 30—31; cf. Mitra and Silverman, B., 1928, 570).—Exception is taken to the statement that ferrosiferrous oxide is immune to reduction and therefore cannot be catalytically active in carbon deposition. The author records the deposition of 1.1% of carbon on a sample of naturally occurring magnetite, and, further, has succeeded in producing the eutectic of the system $FeO-Al_2O_3 \cdot 2SiO_2$ (at about 1100°) in blast-furnace bricks. This, it is considered, is a much safer constituent than any of the free oxides, and laboratory tests show no deposition of carbon even after prolonged exposure. J. A. SUGDEN.

See also A., Feb., 163, **Decomposition of silicates by strontium salts** (KAVINA).

PATENTS.

Enamel-coated article. J. A. ANDERSON, Assr. to CENTRAL OIL & GAS STOVE Co. (U.S.P. 1,693,130, 27.11.28. Appl., 5.12.23).—A refractory enamel for coating iron and steel articles subjected to high temperatures comprises 60.96% SiO_2 , 13.06% B_2O_3 , 12.23% Na_2O , 6.47% Al_2O_3 , 5.81% CaO , 0.86% CoO , and 0.43% NiO . This enamel is stated to resist cracking or peeling at 1000°. A. R. POWELL.

Kiln. B. H. GREENE (U.S.P. 1,694,650, 11.12.28. Appl., 30.12.27).—A kiln for firing large pottery or earthenware articles is provided with a series of refractory shelves near the side walls but spaced therefrom at their rear ends. A. R. POWELL.

[Endless conveyor for] **lehrs, annealing furnaces, and the like.** CANNING TOWN GLASS WORKS, LTD., and J. J. PARNABY (B.P. 304,381, 18.4.28).

Treatment of liquids (U.S.P. 1,691,458). **Flat glass bulbs for instruments** (B.P. 302,034).—See I.

IX.—BUILDING MATERIALS.

Slag wool. GUTTMANN.—See X.

PATENTS.

Cement. C. P. BACCOVICH (U.S.P. 1,696,899, 1.1.29. Appl., 16.2.24. Japan, 28.3.23).—Acidic rocks con-

taining substantial alkaline contents are crushed, dried at 200—500°, pulverised to a condition finer than commercial Portland cement, and intimately mixed with Portland cement containing silica in excess of alumina. W. G. CAREY.

Production of hydraulic cement. N. V. S. KNIBBS (B.P. 303,639, 16.12.27).—A finely-divided mixture of highly aluminous material and caustic lime is treated under pressure with steam, and the product is heated in a shaft or vertical kiln at 1000—1400°, fusion being avoided. W. G. CAREY.

Waterproofing of lime and cement mortars, wood, etc. SYND. INTERNAT. DU CIMENTOILS (F.P. 624,296, 5.3.26).—The waterproofing material comprises a mixture of rosin dissolved in linseed oil which has been boiled with litharge, resin oil, masout, and petroleum containing dissolved paraffin wax and coal tar. Linseed oil is omitted from mixtures which are to be used for treating cement and mortar. A. R. POWELL.

Manufacture of porous material. B. GRANVILLE (U.S.P. 1,691,280, 13.11.28. Appl., 26.7.26).—Porous artificial stone is made by casting a wet cement mixture containing gas-producing substances into a closed mould, applying suction to the mould so as to cause the mass to swell and fill the mould, and maintaining the suction until the mass has set. A. R. POWELL.

Porous building material. E. C. BAYER (Austr. P. 106,712, 2.9.24. Denm., 21.1.24).—Mineral substances, such as natural or artificial clay mixtures, which do not set on mixing with water are mixed with burnt clay, sand, and a froth-forming substance. A. R. POWELL.

Treatment of the surface of roads with sulphite lixivium and a hygroscopic substance. R. KARLBERG (B.P. 303,433, 3.10.27).—Sulphite lixivium, from paper pulp mills, concentrated to 50%, and calcium chloride are applied to the road in mixture or separately. W. G. CAREY.

Artificial stone. R. ULLMANN (Austr. P. 107,589, 12.1.25).—A mixture of 3 pts. of magnesia with 2 pts. of a filling material containing at least 30% of colloidal silica is bonded with magnesium chloride solution and cast into suitable moulds. A. R. POWELL.

Glazing of artificial stone surfaces. MINERAL A.-G. (Swiss P. 121,764, 9.3.26).—The surface of cement, concrete, mortar, or compressed shale articles is treated with phosphoric or boric acid or with a solution of a heavy-metal salt, then coated with a glaze of a coloured resinous material, e.g., phenol-formaldehyde or -furfuraldehyde resin. A. R. POWELL.

Impregnation of wood. SOC. DE RECHERCHES ET DE PERFECTIONNEMENTS IND. (F.P. 592,827, 9.4.24).—The impregnating material comprises a mixture of a substance with purely antiseptic properties (e.g., creosote, cresol, or phenol), a substance of great diffusibility (e.g., petroleum, masout, shale oil, or resin), and a substance of high viscosity (e.g., coal tar or petroleum pitch). A. R. POWELL.

Impregnation of wood. SOC. DE RECHERCHES ET DE PERFECTIONNEMENTS INDUSTRIELS (F.P. 598,267,

29.8.24).—Wood is impregnated with aqueous emulsions, suspensions, or solutions containing dyes or antiseptics, or mixtures of these, preferably with the addition of material with good moistening properties, *e.g.*, petrol-eum etc., and of material of low surface tension, *e.g.*, saponin, soap, sulphite-cellulose waste-liquor, etc.

L. A. COLES.

Impregnation of [fibrous] building materials. S. TCHAYEV (F.P. 624,776, 17.11.26).—Wood or compressed straw pulp is impregnated with solutions containing sodium dichromate, potassium ferrocyanide, sodium fluoride, nitrophenols, etc. to prevent the growth of fungi.

A. R. POWELL.

Colouring the surface of wood. M. SPARKS (U.S.P. 1,697,026, 1.1.29. Appl., 21.11.25).—Oregon pine or a similar wood is treated with a solution of ferrous sulphate and, after drying, with an ammoniacal solution of potassium dichromate.

A. R. POWELL.

Wood-preserving agent. R. JUMENTIER (F.P. 617,263, 20.10.25).—The material is made by heating together 750–900 pts. of tar, 70–120 pts. of resin, and 20–70 pts. of sulphur; 50 pts. of graphite may also be added if the wood is to be used in a damp place.

A. R. POWELL.

Regeneration of hardwood. RICHTER, GUTZWILLER & Co. (F.P. 627,227, 6.11.26).—Wood which has deteriorated by exposure to the weather is revived by treatment with a solution containing oxalic, citric, and tartaric acids, together with glycerol and alcohol.

A. R. POWELL.

Drying apparatus for wood. O. ENGELBREKTSO (B.P. 288,262, 15.3.28. Swed., 5.4.27).

Manufacture of surface coverings particularly for use on floors. Manufacture of floor coverings. ARMSTRONG CORK Co., Assees. of C. F. HUMPHREYS and J. C. MCCARTHY (B.P. 283,946–7, 26.9.27. U.S., 22.1.27).

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Cottrell-Möller plant for the separation of dust from the flue gases of the Siemens-Martin furnace. S. SCHLEICHER and E. GÖBEL (Stahl u. Eisen, 1929, 49, 33–37).—The results of a series of tests on the removal of dust from flue gases using a Cottrell-Möller electrostatic plant indicate that the most efficient separation of dust is obtained with the highest possible potential and the lowest commercially practicable rate of flow of the gases through the plant. The addition of moisture has relatively little effect unless the amount present exceeds the saturation limit, when trouble is caused by condensation throughout the plant and in the flues. A purer gas is obtained by treatment at 110–120° than at higher temperatures.

A. R. POWELL.

Oxidation of iron in water by the action of oxygen and carbon dioxide. N. M. GAVRILOV, S. K. and P. K. MEL (J. Chem. Ind. Moscow, 1928, 5, 697–700).—The mechanism of corrosion of iron is considered to be as follows:—The iron, on contact with air and water, becomes covered with ferrous oxide,

which becomes oxidised to ferric oxide, which gradually becomes reduced by the iron, the metal becoming simultaneously oxidised. The action of water saturated with carbon dioxide on iron results in rapid dissolution of superficial oxides and slow dissolution of iron, with oxidation of ferrous hydrogen carbonate to ferric hydroxide. After a long period under ferrous hydrogen carbonate solution and subjection to the action of carbon dioxide, iron becomes quasi-passive; shaking detaches the film of oxides and activity is regained. When gases containing 5% of oxygen are blown on to iron covered with water, the metallic surface becomes covered with insoluble oxides and the concentration of iron in the solution is lowered. Corrosion is specially favoured if the gas contains not more than 5% of oxygen, and not less than 14–15% of carbon dioxide, the temperature being low. CHEMICAL ABSTRACTS.

Corroding action of solutions of various chlorides on cast iron and lead. B. K. PERSHKE and G. I. CHUFAROV (J. Chem. Ind. Moscow, 1928, 5, 523–528).—The corroding effect on cast iron of solutions of sodium, potassium, and magnesium chlorides decreases in that order; corrosion is maximal at about 1%, and is greatly increased by stirring or saturation with air. It is also increased by the action of light and by periodical drying, but the rate remains unchanged with time. A tar coating reduced corrosion to 20%. Lead is attacked by chloride solutions to about 11% of the extent of iron corrosion. CHEMICAL ABSTRACTS.

Corrosion of steel at high temperatures. L. LOSANA and G. REGGIANI (Notiz. Chim.-ind., 1928, 3, 346–352; Chem. Zentr., 1928, ii, 1030).—Tempering normally increases resistance to oxidation. A mixture of $10\text{CO}_2 + 4\text{CO} + 2\text{O}_2 + 48\text{N}_2 + \text{SO}_2$ (traces) + hydrocarbons (traces), saturated with water vapour at 16–20°, is more corrosive than air. Experiments were performed also with the more resistant nickel, chromium, and tungsten steels. A. A. ELDRIDGE.

Influence of tin on the quality [rolling properties] of Siemens-Martin mild steel. W. KELLER (Stahl u. Eisen, 1929, 49, 138–139).—The mechanical properties of steel with 0.06–0.8% C and 0–0.8% Sn have been systematically investigated. The metal can be rolled to thin sheets without cracking along the edges when the tin content does not exceed 0.6–0.7%, but when more than about 0.3% Sn is present the welding properties are deleteriously affected. The bending test is satisfactory up to 0.6% Sn, and with up to 0.8% Sn the metal forges well. Tin increases slightly the tensile strength and decreases the ductility of mild steel. With increasing carbon content the bad effect of tin becomes much more pronounced. A. R. POWELL.

Apparatus for the determination of silica in steel and iron by the chlorine method. P. DICKENS (Chem. Fabr., 1929, 51–52).—The apparatus comprises a gas-purification train for the chlorine, an electric tube furnace in which the metal is heated in a current of pure chlorine, and a vessel for collecting the volatilised chloride. Purification of the chlorine is effected by passing it through wash-bottles packed with glass beads moistened with concentrated sulphuric acid, then

through a tube packed with charcoal and heated at 1000° to convert any oxygen into carbon monoxide, which is without action on the metal, and finally through a drying tower, the lower part of which is filled with sulphuric acid and the upper part with calcium chloride and phosphorus pentoxide. A. R. POWELL.

Ehn's cementation test [for steels]. R. WASMUHT and P. OBERHOFFER (Stahl u. Eisen, 1929, 49, 74—77).—Ehn's method of testing the quality of steel by examining the structure of the surface after cementation with wood charcoal and barium carbonate is shown to be unreliable except possibly in the case of mild steels. With high-carbon steels or alloy steels no difference can be discerned between "good" and "bad" metal (as determined by mechanical tests) after cementation or between steels containing varying proportions of oxygen. The effects of the method of deoxidation of the steel and of the presence of various non-metallic impurities on the progress of cementation are shown to be greater than the effect due to the actual oxygen content. A. R. POWELL.

Tungsten steel for magnets. K. G. BRECHT, R. SCHERER, and H. HANEMANN (Stahl u. Eisen, 1929, 49, 41—42).—The most suitable heat treatment for a tungsten steel of the following composition has been investigated: 0.67% C, 0.26% Si, 0.25% Mn, 0.4% Cr, and 6.62% W. The best working properties were obtained by annealing at 650° and quenching in water, but the highest magnetic properties were obtained only after soaking for sufficient time at 820° to allow the cementite to go completely into solid solution and then quenching in water. The resulting steel had a fine hardenite structure, showing that tungsten steel is not sensitive to overheating. The fall in coercivity obtained by annealing above 820° was found to be due to a coarsening of the martensite grains and not to the presence of unchanged non-magnetic austenite. Micrographical examination showed that no change in the distribution of the two tungsten carbides present took place during the recommended heat treatment, and hence these compounds are without effect on the magnetic properties of the alloy. A. R. POWELL.

Properties and uses of slag wool. A. GUTTMANN (Stahl u. Eisen, 1929, 49, 97—101).—For the preparation of the best quality slag wool, mobile slags with a high content of silica and a low content of calcium sulphide are most satisfactory. The physical properties of five such wools are tabulated. The heat-insulating power of slag wool depends on the fineness of its fibres, which should be such that about 93% of the apparent volume of the wool is air-space. Wool of this texture has a higher insulating power than most other heat insulators, and, except in the presence of excess moisture, does not accelerate the corrosion of iron. A. R. POWELL.

Technical properties of metals melted in a vacuum furnace. W. ROHN (Z. Metallk., 1929, 21, 12—18).—A review of the development of vacuum melting of metals and alloys, showing the advantages to be gained by this procedure and the improvement effected in the properties of the metals. A. R. POWELL.

Technological significance of gases in metals.

E. H. SCHULZ (Z. Metallk., 1929, 21, 7—11).—A review showing the deleterious effects of gases in metal castings, with especial reference to the effect of oxygen on the properties of steels. A. R. POWELL.

Effect of cold-working on chemical properties, especially of metals. G. TAMMANN (Z. Electrochem., 1929, 35, 21—28).—Previous work by the author and others on the subject is reviewed. In particular, the following properties are discussed: the change of potential of metals on cold-working, *e.g.*, the surfaces of copper, silver, lead, etc. become less noble when polished (Tammann and Wilson, A., 1928, 958); the relationship between the velocity of deposition of radium-*F* and the condition of the precipitating metal, the precipitation velocity being greater for the hard form of a metal than for the soft (*ibid.*, 963); the fact that mercury wets silver and its mixed crystals with gold, tin, and cadmium more quickly when they are in the hard condition than in the soft (Tammann and Dahl, A., 1925, ii, 502); the chemical changes at the slip planes and cleavage planes of crystals, with special reference to the fact that in mixed crystals of certain metals the limiting composition for resistance to chemical agents is modified in the direction of a higher proportion of the noble metal by cold-working (Tammann, A., 1924, ii, 25); the fact that the velocity of dissolution of iron in dilute acids is increased by cold-working; the increase in the dissolution velocity on the cleavage planes; the influence of cold-working on the velocity of reduction of silver bromide; the effect of plastic deformation on the velocity of adsorption of hydrogen by palladium, iron, and nickel; and the colour changes of certain mixed crystals (*e.g.*, gold-silver-copper alloys) caused by cold-rolling. The phenomenon of triboluminescence is also discussed. The effects of cold-working disappear completely on heating; with metals, when one third, and with salts (silicates and silver salts), when half, the absolute temperature of the m.p. has been reached. L. L. BIRCUMSHAW.

Study of annealing of metals by a new sensitive differential dilatometer. S. TOGINO and K. YAMAGUCHI (Bull. Inst. Phys. Chem. Res. Tokyo, 1929, 8, 34—43).—For soft metals having no transition point, the usual differential galvanometer is unsuitable by reason of its lack of sensibility and also the deformation produced by the spring. In a new form of dilatometer, the action of the spring is replaced by a component of gravity acting on a pendulum, which reduces the pressure on the test piece to the order of 0.3 g./mm.² This allows of determinations at temperatures approaching the m.p. of a metal. The instrument is extremely sensitive, as the change in length per cm. of the specimen can be magnified for reading to 24,000 times. C. A. KING.

Studies on sherardising. M. KURODA (Bull. Inst. Phys. Chem. Res. Tokyo, 1929, 8, 12—18).—During the process of sherardising, the degree of oxidation is harmless either to the powder or to the product as the maximum depth of oxide is only a few mm. and the product has a bright silvery lustre. The process is conducted best at 370—380° for about 30 min., as at this temperature the physical properties of the metal

are not affected adversely. Slight variation in temperature has little influence on the thickness of the zinc coating.

C. A. KING.

Physico-chemical principles of soldering. L. ROSTOSKY and E. LÜDER (*Z. Metallk.*, 1929, 21, 24—25).—The joining power of a solder may be due to any of the following three actions: (a) the solder and the object to be soldered form solid solutions with one another, e.g., brass solder and copper; (b) the solder forms intermetallic compounds with the metal being soldered, e.g., tin-lead solder and copper; and (c) the solder dissolves the metal being soldered only in the liquid state, and, on cooling, the last-named metal crystallises out in the solder layer, e.g., tin solder and zinc. Photomicrographs of characteristic joints of these three types are given and discussed. Further, it is shown that the m.p. of a solder need not necessarily be lower than that of a metal to be soldered; thus copper may be used to solder two sheets of silver together, the soldering action being due to the formation of the readily-fusible eutectic at the junction of the silver and copper layers.

A. R. POWELL.

Preparation of synthetic bodies from metal powders. F. SAUERWALD [with J. HUNCZEK] (*Z. Metallk.*, 1929, 21, 22).—In the preparation of articles from metal powders by high pressure, stronger articles are obtained if the pressure is applied or maintained while the article is heated than if the powder is compressed cold and the resulting body annealed at a temperature at which crystal growth commences.

A. R. POWELL.

Reciprocal displacement of metals. DAUVÉ (*Ann. Chim. analyt.*, 1929, [ii], 11, 5—9).—An account is given of the principles and mechanism of the replacement of one metal from its salts by another metal.

A. R. POWELL.

Influence of hydrogen-ion concentration on recovery in simple flotation systems. A. M. GAUDIN (*Min. and Met.*, 1929, 10, 19—20).—In the presence of xanthates complete recovery by flotation of chalcocite is effected within the p_H range 1—12, whereas complete recovery of pyrite is obtained within the range p_H 1—6.2 only; in more alkaline solutions no flotation of pyrite occurs at all. In the presence of isoamylamine the percentage recovery curve for chalcocite rises steeply to 100% between p_H 6 and 10, then falls abruptly; a similar curve is obtained for zinc blende. An 80% recovery of malachite from admixture with calcite is obtained in solutions of p_H 9—11 in the presence of amyl xanthate, but no sulphidising agent. Felspar is floated by sodium oleate over a very narrow p_H range with about 20% recovery, but if copper sulphate is added to the pulp recovery is complete in solutions of p_H 6.5—10. Quartz is activated by copper sulphate within the range p_H 6—11. A small amount of copper sulphate activates blende in an acid circuit, whereas a large amount activates it both in acid and alkaline circuits when xanthates are present. These results indicate that the surfaces of mineral particles adsorb hydrogen or hydroxyl ions under certain conditions, and that thereby their power of adsorbing the flotation agent is considerably modified.

A. R. POWELL.

Determination of the platinum metals in ores and concentrates. H. R. ADAM (*J. Chem. Met. Min. Soc. S. Afr.*, 1928, 29, 106—114).—Attempts which have been made in South Africa to determine the total content of platinum metals in an ore or concentrate by collecting the metals in lead and cupelling the button with or without silver are examined. When silver is used the resulting bead is parted by heating with slightly diluted sulphuric acid until effervescence ceases; the insoluble residue is collected, washed, ignited, and weighed. The results are generally high owing to retention of silver, and, if heating with the acid is too prolonged, dissolution of part of the palladium may take place. When no silver is added the cupelled beads are heated at 1300° for 1 hr. in a small hole in a cupel placed in a small electric muffle. The beads still retain up to 10% of lead, especially if palladium is present. The use of gold instead of silver as a collector during cupellation followed by determination of the increase of weight of the gold leads to erratic results due to gold losses during cupellation and to retention of impurities by the bead.

A. R. POWELL.

Assay for platinoids in ores. J. WATSON (*J. Chem. Met. Min. Soc. S. Afr.*, 1928, 29, 115—118; cf. preceding abstract).—Details are given for fluxing Transvaal platinum ores and for parting the silver bead obtained by cupelling the lead button produced in the pot-running; 90% sulphuric acid is recommended for the parting, and the washed residues from this operation are dried at 120—140° for weighing.

A. R. POWELL.

Age-hardening aluminium alloys. W. FRAENKEL and L. MARX (*Z. Metallk.*, 1929, 21, 2—5).—Comparative age-hardening tests have been made on aluminium alloys containing (A) 4% Cu, (B) 4% Cu and 0.5% Mg, (C) 8% Zn, (D) 8% Zn and 0.5% Mg, and (E) 8% Zn and 0.2% Li. Maximum hardness after quenching from 500° was obtained by ageing (E) at 50°, (D) at 100°, and (B) and (E) at 150°, whereas (C) hardened slightly at 50° and became softer again at higher temperatures. The hardening effect in (E) decreased appreciably with increase of temperature, and that in (D) decreased with time at 150° after reaching a maximum in 20 hrs. The increase of hardness of all the alloys on ageing at the ordinary temperature after a short immersion (0.5—60 min.) in boiling water is shown in a series of graphs to be very irregular. As a result of these tests the authors consider that the simple precipitation theory of age-hardening does not explain all the facts, and suggest that, in some cases, the slow formation of a compound in the solid solution may be the cause of the increase of hardness observed.

A. R. POWELL.

Intercrystalline corrosion of nickel. W. KÖSTER (*Z. Metallk.*, 1929, 21, 19—21).—When nickel is heated in an atmosphere containing sulphur dioxide the intercrystalline corrosion is shown to be due to the formation of the nickel-nickel sulphide eutectic which penetrates into the metal along the grain boundaries. The rate of penetration increases with the temperature up to 800°, and once a quantity of the sulphide is formed subsequent annealing in an atmosphere free from sulphur causes further penetration. The sulphide being hard and brittle

renders the whole of the metal brittle and leads to intercrystalline fracture when the metal is worked.

A. R. POWELL.

Electrolysis of nickel. B. BOGITCH (Compt. rend., 1929, 188, 328—329).—Nickel rods 20 mm. in diam. and containing over 99.92% Ni have been prepared from nickel alloys containing 10% of impurities (sulphur, arsenic, oxygen, phosphorus) by deposition from a solution of nickel chloride ($d\ 1.2$) at above 65° , with cathodes of thin nickel wire 0.5 mm. in diam. The impure electrolyte from the anode compartment is purified for further use by means of nickel hydroxide, which precipitates iron, arsenic, and most of the cobalt, any nickel entrained in the precipitate being used for the production of more hydroxide. The copper is found in the anode mud.

J. GRANT.

Construction and operation of Kathner [steel] normalising furnaces. C. P. MILLS (Proc. Eng. Soc. W. Pa., 1928, 44, 305—329).

Cementation of steels by special manganese alloys. J. COURNOT (Rev. Mét., 1928, 25, 669—670).—See B., 1928, 673.

See also A., Feb., 141, **Iron-zinc system** (OGAWA and MURAKAMI). **System tungsten-carbon** (BECKER). 160, **Reduction of tungsten by hydrogen** (MEIERSON). 161, **Spectroscopic analysis of alloys** (NEGRESKO). **Wood's metal as cathode in electrolysis** (PIETERS). 164, **Determination of lead by means of 8-hydroxyquinoline** (MARSSON and HAASE). 165, **Determination of molybdenum** (DOERNER; KASSLER). **Determination of tungsten** (SPITZIN). 166, **Determination of palladium** (OGBURN).

Blast furnace linings. HEUER.—See VIII. **Health hazards in chromium plating.** BLOOMFIELD and BLUM.—See XXIII.

PATENTS.

Preheating the charge in shaft furnaces. A. L. FEILD, Assr. to LINDE AIR PRODUCTS Co. (U.S.P. 1,695,953, 18.12.28. Appl., 25.4.24).—A current of preheated air deficient in oxygen is blown into the furnace above the smelting zone.

A. R. POWELL.

Annealing furnace. F. T. COPE, Assr. to ELECTRIC FURNACE Co. (U.S.P. 1,694,684, 11.12.28. Appl., 9.11.25).—The furnace comprises a muffle with electric resistance units adjacent to the side walls and a device whereby, when the articles are to be cooled in the furnace, two water-cooled screens may be moved up through the bottom of the furnace so as to cut off the heat from the resistors and prevent it reaching the goods.

A. R. POWELL.

[Annealing] furnace. C. H. CARPENTER, Assr. to WESTINGHOUSE ELECTRIC & MANUF. Co. (U.S.P. 1,695,950, 18.12.28. Appl., 17.7.26).—The furnace comprises an inclined muffle electrically heated at the top and at the lower end of the bottom and provided with a vertical discharge chute at the lower end. The hearth of the furnace consists of a metal plate with longitudinal corrugations down which the articles being treated slide, and means are provided to agitate this plate up and down to promote the sliding of the articles through the furnace.

A. R. POWELL.

Heating furnace. R. E. BISSELL, Assr. to THOMPSON PRODUCTS, INC. (U.S.P. 1,692,614, 20.11.28. Appl., 20.11.25).—An electric annealing muffle is heated by means of transverse resistances inside the top, and is provided with a series of parallel longitudinal tubes along the bottom and with means for inclining the furnace so that the articles just slide through at a pre-determined rate. The discharge chute to the quenching bath is provided with a trap-door to keep out vapours from the muffle.

A. R. POWELL.

Heat-treatment of metals. A. S. MACDONALD, Assr. to SNEAD & Co. (U.S.P. 1,695,433, 18.12.28. Appl., 11.10.24).—The metal in the form of rod or wire is heated by passing sufficient current through it to bring it to a temperature at which the desired grain-growth takes place, then quenched without switching off the current.

A. R. POWELL.

Heat-treatment of metals. K. FISCHER and M. HOLSBOER (Austral. P. 755, 27.2.26).—The metal to be heat-treated is passed continuously through a long furnace in the upper part of which gases are burnt to heat the walls of the furnace; the metal is heated by radiation from the walls or by means of a current of gas preheated by contact with the walls.

A. R. POWELL.

Retort [for heat-treatment of metals]. E. P. VAN STONE, Assr. to GEN. ALLOYS Co. (U.S.P. 1,689,808, 30.10.28. Appl., 7.4.27).—A rotating retort for heat-treating small metal articles comprises a horizontal, cylindrical body closed at one end with a flat circular disc and at the other end with a narrow tubular neck flared to engage a flange provided on the body of the retort.

A. R. POWELL.

Furnace for the reduction of iron. C. M. DAY and C. J. SCULLIN (U.S.P. 1,694,376, 11.12.28. Appl., 19.4.26).—A cupola for melting iron comprises a melting chamber above which is a combustion chamber in which the carbon monoxide is burnt and from which the waste gases pass to a recuperator above the combustion chamber. The preheated air from the recuperator passes downward through an annular space surrounding the walls of the melting chamber partly to the melting chamber and partly to the combustion chamber. Undue radiation of heat from the melting chamber is thus avoided, and the air used in the primary melting and in the secondary preheating of the charge in the combustion chamber is itself preheated.

A. R. POWELL.

Separation of gases [sulphur dioxide] or suspended matter from the discharge gas from metallurgical or other furnaces. F. L. WILDER, E. MORRIS, E. SCHIFF, and E. S. KING (B.P. 302,386, 15.9.27).—The gases are passed into a pressure chamber partly filled with water and terminating in a long column through which a downward current of water is passed to the chamber to maintain the pressure. The soluble constituents, e.g., sulphur dioxide, are dissolved at the high pressure, and the valueless residual gas is removed still under pressure. The saturated solution is continuously pumped to regions of lower pressure, where the dissolved sulphur dioxide is removed, and the water is then returned to the circuit.

A. R. POWELL.

Manufacture of steel. H. MEYER (B.P. 281,621,

27.10.27. Ger., 6.12.26).—To reduce the tendency to blue fracture and brittleness by ageing, steel of the type used for boiler-plating, tubes, etc. is strained as by cold-rolling and then annealed at 700–950°. Hot-forging or rolling between 700° and the Ar3 point may be substituted for the cold-straining. [Stat. ref.]

C. A. KING.

Refining process [for iron]. I. G. FARBENIND. A.-G., Assecs. of A. CURS (G.P. 452,630, 2.4.26).—Ferric oxide obtained by the combustion of iron carbonyl forms an efficient refining agent for iron, rapidly removing the carbon, silicon, phosphorus, and sulphur, and yielding a product from which non-porous castings may be obtained directly.

A. R. POWELL.

Hardening iron, steel, and other ferromagnetic materials. EISEN- U. STAHLWERK HOESCH A.-G., and W. HEIDENHAIN (B.P. 282,750, 17.12.27. Ger., 28.12.26).—The article is heated in the upper part of an inclined furnace, being retained there by means of an electromagnet outside the furnace. When the temperature of the article exceeds that of the magnetic transformation point, the article commences to slide down the furnace and finally falls into a quenching bath. The inclination of the furnace and the temperature at its lower end are so arranged that the article reaches its correct hardening temperature just as it leaves the furnace.

A. R. POWELL.

Production of iron and iron alloys having a very low percentage of carbon. Production of dense iron and iron alloys directly from oxide ores. H. G. FLODIN and E. G. T. GUSTAFSSON, Assrs. to H. G. E. CORNELIUS (U.S.P. 1,691,273–4, 13.11.28. Appl., [A, B] 22.6.25. Swed., [A] 11.5.25, [B] 26.5.25).—(A) Briquettes of finely-divided iron ore, lime and other fluxes, with or without the addition of an oxide or ore of an alloying element, e.g., chromite for obtaining iron–chromium alloys, are smelted with carbonaceous material in an electric furnace to obtain iron or an iron alloy of low carbon content, and a slag with a high content of ferrous oxide and oxide of the alloying element. Addition of ferrosilicon in suitable quantities is then made to reduce to metal the oxide of the alloying element and most of the iron oxide in the slag; the resulting alloy or metal contains < 0.2% C. (B) A high-grade steel is made directly from titaniferous iron ore by smelting briquettes composed of the ore, lime, and carbon in an electric furnace and refining the iron under a basic slag in the same furnace to remove phosphorus and vanadium if present.

A. R. POWELL.

Reduction of ores to obtain ferro-alloys. A. E. WHITE. From S. G. ALLEN (B.P. 303,207, 30.8.26).—Ferromanganese and similar alloys are obtained by the blast-furnace smelting of suitable materials, using a higher ratio of ore to coke than in normal practice, and supplying oxygen to the blast and to a point or points above the mantle of the furnaces so that the temperature of the flue gases is maintained between 120° and 205°, preferably at 150°.

A. R. POWELL.

Manufacture of vanadium steel. A. L. FEILD, Assr. to ELECTRO METALLURGICAL Co. (U.S.P. 1,697,759, 1.1.29. Appl., 12.12.25).—Vanadium oxide is added to

a bath of molten steel and maintained in contact therewith until the reducing agents normally present in the steel have caused the desired quantity of vanadium to enter the molten metal.

A. R. POWELL.

Chromium–manganese steel. M. BAEKE, Assec. of F. RAPATZ (Austr. P. 107,312, 17.10.23. Ger., 1.11.22).—A steel containing 0.4–1.0% C, 8–25% Cr, and 20–5% Mn is claimed. This retains an austenitic structure when quenched from 950–1200°.

A. R. POWELL.

Reducing or arresting rust on iron or steel surfaces. R. EBERHARD (B.P. 303,035, 26.7.27).—The metal surface is sprayed with a solution containing uric acid, urea, and formaldehyde, together with reduced acidic compounds of molybdenum, tungsten, or chromium produced by the action of powdered zinc, copper, lead, or aluminium on the uric acid solution.

A. R. POWELL.

Production of metal coatings on iron or steel or alloys thereof. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 303,034, 25.6.27).—The article is provided with a thin coating of nickel, then plated with chromium, and heated at 1100–1300° in hydrogen or *in vacuo*, whereby the coatings diffuse into the surface layer rendering it highly resistant to corrosion. Similar results are obtained by plating first with chromium, then with cobalt, and heating as described.

A. R. POWELL.

Colouring of non-rusting steel rifle hammers. SIMON & Co. (G.P. 452,763, 16.4.26).—The articles are provided with a thin coating of iron by the metal-spray process, and this coating is treated by any of the known methods to obtain on it a black film of ferrosferrous oxide. Such a film cannot be produced directly on non-rusting steels.

A. R. POWELL.

Manufacture of electrolytic iron free from brittleness. C. TSCHAEPPET (Swiss P. 121,383, 23.9.26).—Hollow cathodes heated by circulation of hot water through them or by means of internal electrical resistances are used for the deposition of iron from the usual electrolytes, while the bath is kept cool by promoting evaporation from its surface, by addition of cold water, or by direct water-cooling devices.

A. R. POWELL.

Rust-resisting [tinned-iron] can. N. HARRIS (U.S.P. 1,694,820, 11.12.28. Appl., 21.12.25).—Previous to tinning, the metal is treated by a suitable process, e.g., pickling in a solution of ferric and antimony chlorides, to obtain a black, rust-resisting film. The ordinary hot-dipped tin coating adheres well to the treated surface, and danger of rusting due to perforation of the tin layer is avoided.

A. R. POWELL.

Copper–silicon alloys. A. L. MOND. From METALLBANK U. METALLURGISCHE GES. A.-G. (B.P. 303,684, 29.2.28).—A copper alloy contains 1–4% Si, 4–6% Fe, 1–5% Ni, and not more than 20% Zn or 1% Sn, Mn, or Al. The alloy, which may also contain 0.001–0.5% of an alkali or alkaline-earth metal is quenched from 750–950° and reheated at 350–600°.

C. A. KING.

Extracting nickel from its alloys. Soc. ANON. "LE NICKEL" (B.P. 288,605, 3.4.28. Fr., 13.4.27).—The alloy, e.g., ferronickel, is first purified by known

methods, *e.g.*, preferential oxidation, to obtain a metal containing 90–95% Ni. This is cast into anodes and electrolysed in a divided cell, using a nickel chloride or sulphate electrolyte in both compartments. The anolyte is continuously removed from the cell to a vessel where it is treated with nickelic hydroxide or with nickelous hydroxide and a current of air to precipitate iron and other impurities. The filtered purified solution then passes to the cathode compartment, in which it is kept neutral by the addition from time to time of nickelous hydroxide. When the proportion of nickel in the catholyte falls below a predetermined value the solution is returned to the anode compartment and replaced by purified anolyte.

A. R. POWELL.

Metallurgy of ores or materials containing tin.

E. A. ASHCROFT (B.P. 302,851, 5.4.28).—Tin ores, concentrates, slags, or residues are heated with zinc or ferrous chloride and a reducing agent, such as zinc powder or sponge iron, with or without a carbonaceous material, to such a temperature that the tin is converted into stannous chloride which distils out of the mass. The tin may be recovered from the distillate by electrolysis in the fused state or in solution in water, by treating the fused stannous chloride with metallic zinc or by treating the aqueous solution with ammonia and reducing with carbon the resulting hydroxide precipitate. The residues from the distillation may be heated with carbon to reduce the iron oxides therein to sponge iron, which is then magnetically separated from the gangue for use again. When ammonia is to be used as precipitant it may be advantageously obtained by heating ammonium chloride with sponge iron so as to obtain a mixture of iron and ferrous chloride for treating further quantities of ore. The ammonium chloride is subsequently recovered by evaporating the filtrate from the stannous hydroxide.

A. R. POWELL.

Purification of antimonial lead alloys and other antimonial metals.

H. HARRIS (B.P. 303,328, 29.5.28).—The molten alloy is treated at temperatures between the m.p. and 550° with a mixture of 3 pts. of sodium hydroxide and 1 pt. of sodium chloride, with or without agitation by means of a current of air. Arsenic is removed first, then the tin, and, by suitable adjustment of the treatment, slags may be obtained from which these metals may be recovered separately.

A. R. POWELL.

Manufacture of non-ferrous alloys [lead bronzes].

METROPOLITAN-VICKERS ELECTRICAL CO., LTD., ASSEES. OF W. J. MERTEN (B.P. 291,462, 2.6.28. U.S., 4.6.27).—A lead bronze bearing alloy containing 10–28% Pb, 2–10% Sn, and 88–62% Cu is rendered homogeneous by treating it just prior to casting with about 2% of calcium carbide, which serves to eliminate oxides and adsorbed gases and to cause the lead to remain in a highly dispersed form throughout the casting.

A. R. POWELL.

Lead-base bearing metal containing zinc. J. NEURATH (Austr. P. 107,316, 16.6.26).—The alloy consists of lead with tin and antimony and up to 5% Zn, preferably 1–3% Zn, together with one or more metals of the first and second groups of the periodic system. The alloy is melted in the usual way, and is

allowed to cool slowly and free from vibration through the range 360–340° so as to cause the zinc to crystallise in the α -form, which increases the tensile and compression strength of lead much more than does the β -form.

A. R. POWELL.

Recovering vanadium [from ores].

I. M. PAUL, ASSR. TO METAL & THERMIT CORP. (U.S.P. 1,696,923, 1.1.29. Appl., 12.8.26).—The ore is heated with crystals of sodium sulphide until the latter melt in their water of crystallisation and the mixture finally dries to a solid mass. Extraction of this mass with water yields a solution containing the vanadium.

A. R. POWELL.

Recovery of precious metals from ores.

W. R. B. GIESEN (Austral. P. 621, 18.2.26).—The ore pulp is allowed to flow down a series of inclined plates coated with sodium amalgam, which is continually renewed from an electrolytic apparatus in which a solution of sodium chloride is electrolysed between a carbon anode and a mercury cathode.

A. R. POWELL.

Coating and colouring of metals.

A. PACZ (B.P. 302,943, 22.6.27).—Iron, aluminium, tin, lead, magnesium, zinc, or cadmium may be provided with a protective, coloured coating by immersion in a solution containing a soluble molybdate and one or more of the following acids or their salts: oxalic, hydrofluoric, hydrofluosilicic, silicic acid. Before treatment with this solution iron articles may be provided with a smooth coating of copper, and after treatment the coating may be further coloured by immersing the article in a solution of a chromate.

A. R. POWELL.

Purification [filtering] of [light] metals.

BRIT. MAXIMUM, LTD. (B.P. 300,164, 21.3.28. Fr., 7.11.27).—Light metals may be filtered in the molten state by passing them through a metal gauze covered superficially with an alloy or amalgam having m.p. below 190°. A suitable amalgam is composed of 2 pts. of tin, 1 pt. of lead, and 1 pt. of mercury; it may also contain metals the presence of which is useful in the filtered metal. The metal gauze is first pickled, then tinned, again pickled, *e.g.*, with hydrofluoric acid, and finally dipped in the amalgam.

M. E. NOTTAGE.

Protective compositions for lining metal moulds.

L. J. BARTON (B.P. 303,205, 31.8.27).—A mixture of a heavy oil and a refractory material, such as fireclay, lime, quartz, ganister, dolomite, or carbonaceous material, is claimed.

A. R. POWELL.

Electrolytic manufacture of metal powders.

H. WADE. FROM SOC. ANON. TREFILERIES ET LAMINOIRS DU HAVRE, ANC. ETABL. L. WEILLER, SOC. CO-OPÉRATIVE DE RUGLES, ET LA CANALISATION ELECTRIQUE RÉUNIS (B.P. 303,984, 3.12.27).—The electrolyte is treated with finely-divided charcoal, or with colloidal carbon such as is obtained by the action of sulphuric acid on glucose. From baths so treated copper, zinc, cadmium, tin, or lead may be obtained in a form which is readily broken up to a powder which will pass 250-mesh.

A. R. POWELL.

Production of magnetic dust cores.

G. W. EIMEN, ASSR. TO BELL TELEPHONE LABS., INC. (U.S.P. 1,695,041, 11.12.28. Appl., 17.12.26).—A magnetic metal is atomised and the spray is collected in water,

whereby fine spherical particles of metal are obtained. These are dried, heated to oxidise the surface, and pressed into magnetic cores. A. R. POWELL.

Increasing the electrical conductivity and the flexibility of [aluminium] metals or alloys. K. HALLMANN (U.S.P. 1,695,044, 11.12.28. Appl., 21.9.22. Ger., 11.8.22).—Aluminium alloys containing 0.5–1.0% Si, up to 0.2% Fe, and 0.1–0.7% Mg are hot-rolled at 540–560° to 10–20 mm. rods, which are quenched, aged for several days at 20°, drawn down to wire of finished size, and annealed for 8–12 hrs. at 160–200°. A. R. POWELL.

Chromium-plated tools. BRIT. THOMSON-HOUSTON Co., LTD., Assecs. of H. P. HOLLNAGEL (B.P. 278,734, 7.10.27. U.S., 8.10.26).—Cutting tools such as reamers etc. are first cleaned by cathodic electrolysis in an alkaline bath, then dipped into 10% hydrochloric acid solution, washed, and plated with chromium in a bath containing 3 g. of chromium sulphate, 7 g. of chromium carbonate, and 270 g. of chromic acid per litre. A current density of 100–280 amp./ft.² is used with a combined lead and chromium anode, the work being revolved at 35 r.p.m. during plating. A. R. POWELL.

Hardness testing and hardening of metals. E. G. HERBERT (B.P. 301,762, 29.8.27).—The article to be tested is subjected to bombardment by a shower of hardened steel balls moving at a velocity just insufficient to indent surfaces possessing the desired degree of hardness; softer surfaces are then easily recognised by their roughened appearance. Alternatively, the balls are ejected on to the surface at a greater velocity such that all parts are indented, hard parts only slightly and soft parts more deeply; if the velocity of the balls is known the diameter of the depression is a measure of the hardness of the metal at that spot. The bombardment method may be used for "superhardening" the surface of metal objects by repeatedly bombarding them with balls at a gradually increasing velocity just above that required to cause indentation at every stage of the process. Apparatus for carrying out the hardness test and for hardening is described and claimed.

A. R. POWELL.

Heat-treatment of metals and alloys. W. S. SMITH, H. J. GARNETT, and J. A. HOLDEN (U.S.P. 1,700,547—8, 29.1.29. Appl., [A] 21.11.25, [B] 29.5.26. U.K., [A, B] 3.10.25).—See B.P. 263,923; B., 1927, 224.

Treatment of low-carbon steel etc. A. FRY, Assr. to F. KRUPP A.-G. (U.S.P. 1,700,674, 29.1.29. Appl., 8.9.26. Ger., 7.7.26).—See B.P. 274,016; B., 1927, 912.

Wet magnetic separation of ores and other mixtures of materials on drum separators. G. ULLRICH, Assr. to F. KRUPP GRUSONWERK A.-G. (U.S.P. 1,697,375, 1.1.29. Appl., 1.8.24. Ger., 13.9.23).—See B.P. 227,069; B., 1925, 177.

[Apparatus for the hot] forging of metals [with resistance heating]. L. RENAULT (B.P. 303,340, 27.7.28. Fr., 7.1.28).

Hardening of metal surfaces [gear wheels]. A. E. SHORTER, C. L. BOUCHER, and PATENT GEAR HARDENING Co., LTD. (B.P. 303,196, 29.9.27).

["Grease pot" device for] manufacture of tin plates. W. H. PHILLIPS and W. DAVIES (B.P. 303,846, 11.10.27).

Separating lead from solutions (B.P. 304,054). Dissolution of ores (B.P. 282,772).—See VII. Enamel-coated article (U.S.P. 1,693,130).—See VIII.

XI.—ELECTROTECHNICS.

Electrical conductivity of kerosene and gasoline as a function of the temperature. C. A. MOREHOUSE (Proc. Iowa Acad. Sci., 1927, 34, 271–272).—The increase in conductivity of kerosene with rise of temperature is expressed by the equation $R = 290.53 \times (1 - 0.0161t + 0.000068t^2)$. The resistance of gasoline decreases very rapidly with rise of temperature.

CHEMICAL ABSTRACTS.

See also A., Feb., 126, **Hall effect and magnetic induction in electrolytic iron (PUGH). Monel metal (SCHULZE; KUSSMANN). 145. Photo-electric cells of thallium (MAJORANA and TODESCO). 161. Wood's metal as cathode in electrolysis (PIETERS). 164. Electrodeposition of cadmium and zinc (BRENECKE). 166. Electric arc in gases at low pressures (NEWMAN). Potentiometric measurement of alternating current resistance (DENINA).**

Resistivity of textiles. MURPHY and WALKER.—See V. **Removal of carbon dioxide from air.** MÜLLER and others.—See VII. **Cottrell-Möller plant for flue gases.** SCHLEICHER and GÖBEL. **Steel for magnets.** BRECHT and others. **Electrolysis of nickel.** BOGITCH.—See X. **Conductimetric study of beet juices.** STANĚK and ŠANDERA; also NETUKA. **Determination of sugar.** TRYLLER.—See XVII.

PATENTS.

Electric furnace. J. C. WOODSON, Assr. to WESTINGHOUSE ELECTRIC & MANUF. Co. (U.S.P. 1,697,486, 1.1.29. Appl., 10.2.25. Renewed, 26.10.28).—Independent resistor members comprising electric resistors interlocked with refractory members are supported by a resistor unit supporting member held in position by the bottom wall of the furnace, and are arranged in substantially parallel rows and in open, skeletal, spaced relation above the bottom wall. J. S. G. THOMAS.

[Three-phase current] electric induction furnace. M. SURJANINOV (B.P. 279,883, 27.10.27. Austr., 30.10.26).—The furnace container is wound so that between each pair of turns or groups of turns connected in the same direction to the mains there lies a third in reverse connexion with the main, so that an approximately constant magnetic field travels transversely to the turns. J. S. G. THOMAS.

Electric conductors of high negative temperature coefficient. H. ANDRE (B.P. 292,152, 17.4.28. Fr., 17.6.27. Addn. to B.P. 280,862; B., 1929, 61).—The contact pieces fixed to the conductor previously described are formed of a conducting type of carbon, e.g., retort carbon or graphite, whereby sulphuration and the segregation of sulphur from the conductor are prevented. J. S. G. THOMAS.

Magnetic pyrometer. T. SPOONER, Assr. to WESTINGHOUSE ELECTRIC & MANUF. CO. (U.S.P. 1,697,148, 1.1.29. Appl., 14.8.26).—Windings upon a core comprising sections of different magnetic characteristics are connected to means which are responsive to temperature changes in the core. J. S. G. THOMAS.

Arc-welding electrodes. ALLOY WELDING PROCESSES, LTD., and E. H. JONES (B.P. 303,996, 13.12.27).—The electrodes are coated with a film impervious to moisture by dipping into varnish, cellulose lacquer, etc. J. S. G. THOMAS.

[Acid electrolyte for] zinc-lead electric accumulator. A. POUCHAIN (B.P. 290,665, 9.5.28. Ger., 19.5.27).—During operation of the accumulator the acidity of the electrolyte is maintained at 80—280 g. of free sulphuric acid per litre. Thus the electrolyte initially may have the composition: water 1 litre, sulphuric acid 80—150 g., zinc sulphate 450—650 g., and 15—30 g. of substances having catalytic and complex actions, e.g., aluminium sulphate or boric acid. J. S. G. THOMAS.

Photosensitive cell. Photo-electric cell. S. RUBEN (U.S.P. 1,694,189 and 1,694,190, 4.12.28. Appl., [A] 6.12.27, [B] 18.10.28).—(A) A cathode, an anode, and a control device consisting of cuprous oxide are mounted in an electrical discharge tube. (B) A control device comprises a metal body coated with a photosensitive compound of the oxygen series of the sixth periodic group. J. S. G. THOMAS.

Treatment of magnetic materials. W. E. BEATTY. From BELL TELEPHONE LABS., INC. (B.P. 303,928, 14.10.27).—Nickel-iron alloys containing 60—80% Ni are heated at 600—900° for at least 2 hrs., and then cooled at a rate not exceeding 10° per min., whereby they acquire a magnetic permeability which is constant at field strengths up to 0.1 gauss. J. S. G. THOMAS.

Removal of magnesium oxide from zinc sulphate electrolytes. NORSKE ZINK KOMPANI A./S. (F.P. 629,216, 17.2.27. Nor., 18.12.26).—A quantity of the circulating liquor in the electrolytic recovery of zinc from ores is periodically removed from the circuit, neutralised with limestone, and filtered. The zinc in the filtrate is precipitated by addition of slaked lime, and magnesium salts are recovered from the filtrate. The zinc precipitate is returned to the main circuit. A. R. POWELL.

Anode for electrolysis of copper solutions. F. LAIST and F. F. FRICK (U.S.P. 1,697,771, 1.1.29. Appl., 21.7.26).—The anodes are composed of alloys of lead, antimony, and arsenic. H. ROYAL-DAWSON.

Electrolysis of ferrous chloride. S. I. LEVY and G. W. GRAY (B.P. 304,053, 10.2.28).—A concentrated solution of ferrous chloride is electrolysed at 90—100° in an electrolytic cell having a suitable cathode on which iron is deposited and a carbon or like anode surrounded by a concentrated solution of a stable chloride, e.g., of calcium, sodium, magnesium. Chlorine evolved at the anode is collected, and the solution of ferrous chloride flows through the cell at such a rate that the issuing spent liquor contains about 20% by wt. of ferrous chloride. The current density employed is 10—25 amp./sq. ft. at 2.3—3.0 volts. J. S. G. THOMAS.

Manufacture [ageing] of electric incandescence lamps. GEN. ELECTRIC CO., LTD., Assees. of PATENT-TREUHAND-GES. F. ELEKTR. GLÜHLAMPEN M.B.H. (B.P. 294,242, 9.7.28. Ger., 21.7.27).

[Forming] filaments for electric incandescence lamps. FALK STADELMANN & Co., LTD., Assees. of NEUE GLÜHLAMPEN GES.M.B.H. (B.P. 297,052, 24.7.28. Ger., 13.9.27).

Electroplating of annular articles and apparatus therefor. DUNLOP RUBBER CO., LTD., and H. TREVASKIS (B.P. 304,029, 19.1.28).

Determination of combustible gas (B.P. 282,080). **High-viscosity oils** (B.P. 303,776).—See II. **Separation of lead from solutions** (B.P. 304,054).—See VII. **Heating furnace** (U.S.P. 1,692,614). **Hardening of ferromagnetic materials** (B.P. 282,750). **Metal coatings** (B.P. 303,034). **Electrolytic iron** (Swiss P. 121,383). **Extracting nickel from its alloys** (B.P. 288,605). **Precious metals from ores** (Austral. P. 621 of 1926). **Metal powders** (B.P. 303,984). **Aluminium alloys** (U.S.P. 1,695,044). **Chromium-plated tools** (B.P. 278,734).—See X. **Moulded insulators** (B.P. 284,232).—See XIII. **Introducing chemicals into rubber** (B.P. 303,564).—See XIV.

XII.—FATS; OILS; WAXES.

Absorption spectra and fluorescence of fats. H. P. KAUFMANN (Chem. Umschau, 1929, 36, 34—35).—A preliminary announcement is given of work on the examination of cacao butter and its adulterants by absorption and fluorescence spectroscopy. E. LEWKOWITSCH.

Solution of the butyrometer problem. G. ROEDER (Milch. Forsch., 1928, 5, 258—297; Chem. Zentr., 1928, ii, 1280).—The amount of fat attacked and taken up by the sulphuric acid is given by the expression $0.0233f - 0.00362f^2$, or in presence of protein (cream) $0.01218f - 0.00148f^2$, where f is the quantity of fat observed with 21 c.c. of acid. A. A. ELDRIDGE.

Theory and practice of tung oil [gelation]. R. BÜRSTENBINDER (Chem. Umschau, 1929, 36, 35—38).—The theory of the gelatinisation and re-liquefaction of tung oil is discussed in the light of the methods employed in practice to hinder gelling. Gelling of wood oil appears to begin with an esterification (absorption of glycerol) accompanied or followed by polymerisation and condensation (elimination of glycerol); the changes of colloidal character are only secondary phenomena. Linseed oil and rosin (or their fatty acids) are considered to hinder gelling by a process of esterification or formation of mixed glycerides; the liquefying action of inert substances (e.g., mineral oils) is supposed to be one of simple syneresis. E. LEWKOWITSCH.

Some Mackey tests on cottonseed oil. H. ASPEGREN (Oil & Fat Ind., 1929, 6, 19—23).—The Mackey curves (temperature developed-time) were plotted for hardened refined cottonseed oil at various stages of hydrogenation: the rate of temperature rise was less as the proportion of linoleic acid decreased, being very low when the linoleic acid content fell to 16%, and there appeared to be no tendency to

spontaneous heating when this acid had disappeared, although 83% of oleic and isooleic acids was present. When mixtures of the original and hardened (3% linoleic acid) oils were compared with hardened oils of the same linoleic acid content, the former tended to develop the steeper heating curves. Experiments on other oils confirmed the conclusion that linoleic acid was principally responsible for the heating tendency. The stearine (iodine value 88) separated from a winter oil showed a greater tendency to spontaneous heating than the demargarinated or the original oil (iodine value 109.2). Crude cottonseed oil showed no tendency to oxidise, the typical heating curves only appearing from refined oils.

E. LEWKOWITSCH.

Oil from the seeds of *Adenanthera pavonina*. A source of lignoceric acid. S. M. MUDDIDI, P. R. AYYAR, and H. E. WATSON (J. Indian Inst. Sci., 1928, 11A, 173—180).—Extraction of the kernel (49.7% of whole seed) of the seed (av. wt. 0.24 g.) of *Adenanthera pavonina* yields 28% of oil. The whole seed yields 14% of oil having d_{15}^{20} 0.9168, n_D^{60} 1.4570, acid value 0.56, iodine value 87.9, saponif. value 181.4, unsaponifiable matter 1.4% (sitosterol 46%), acetyl value 3.4, Reichert-Polenske value 1.22, Polenske value 0.24, and viscosity (Redwood) 188 sec. The relation between iodine value and refractive index at different stages of hydrogenation of the refined oil is given. The mixed fatty acids of the oil have titre 58.4°, n_D^{60} 1.4541, mean mol. wt. 301, unsaturated acids 64% (mean mol. wt. 286), saturated acids 36% (mean mol. wt. 328), iodine value of unsaturated acids 111, Hehner value 95.5, and consist of myristic (0.4%), palmitic (9.0%), stearic (1.1%), lignoceric (25.5%), oleic (49.3%), and linoleic (14.7%) acids. Almost pure lignoceric acid, m.p. 80°, may be obtained from the mixed fatty acids by one crystallisation from alcohol.

E. H. SHARPLES.

Oxidation and polymerisation of sunflower oil. G. NEMIROVSKI (Oil & Fat Ind. Russia, 1928, No. 4, 23—26; Chem. Zentr., 1928, ii, 717—718).—When a current of air is passed through the oil at 115—120° or 130—135° the content of oxy-acids and (less rapidly) the viscosity increase with time of exposure and with rise of temperature. Catalysts (cobalt > lead > manganese salts) accelerate the reaction. Lead linoleate is more effective than the acetate. These compounds are considered to activate the true catalyst, of unknown nature, present in the oil.

A. A. ELDRIDGE.

Determination of the iodine value [of oils]. I. V. KUBELKA, J. WAGNER, and S. ZURAVLEV (Collegium, 1929, 17—30).—The iodine values of a number of different oils have been determined by the method of (a) Hanus (B., 1901, 1246), (b) Margosches and others (B., 1924, 639, 680), and (c) Rosenmund and Kuhnhehn (B., 1924, 23). All three gave concordant results for oils with an iodine value < 100, but varying results for oils with higher values. The value obtained varies with the amount of oil used in the determination. Method (b) gives the lowest results when a greater weight of oil is used, whilst method (a) is least sensitive to this variation, an excess of 100% on the prescribed weight of oil being permissible.

D. WOODROFFE.

See also A., Feb., 220, Biochemical production of fats (KULIKOV).

Action of silent discharge on oils. RABEK.—See II.

PATENTS.

Production of emulsions from fatty materials. H. E. POTTS. From V. A. T. FAURSKOV (B.P. 304,256, 12.10.27).—Fatty materials may be emulsified, and hardened fats rendered plastic, by feeding the materials on to a pair of rolls, rotating in opposite directions with a peripheral velocity not less than 30 m./min. Emulsification is effected by the mixing action in the groove between the rolls, followed by pressure as the material passes between the revolving surfaces.

E. LEWKOWITSCH.

Treatment of oil seeds and the like. E. A. ANDRÉ (B.P. 279,122, 17.10.27. Fr., 15.10.26).—Oil seeds having an oil content of 30% or more and aleurone grains (e.g., linseed, sunflower, etc.) are crushed and the oil is extracted by a neutral hydrocarbon solvent in the absence of water; the methods of dressing (methodical bolting) employed in milling are applied to the oil-free meal to obtain graded nutritive products.

E. LEWKOWITSCH.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Oxidation of oil of turpentine. J. TERPOUGOV (Bull. Inst. Pin, 1928, 103—105; Chem. Zentr., 1928, ii, 1039).—A deposit from Portuguese turpentine oil consisted of zinc formate, iron salts and oxides, abiatic acid, and acids of high mol. wt. The acids were oxidation products arising from the catalytic or electrolytic effect of the galvanised iron vessel, formic acid probably having been produced by degradation of soluble long-chain compounds.

A. A. ELDRIDGE.

[Oleo-casein] emulsion vehicles. H. WAGNER and J. KESSELRING (Farben-Ztg., 1929, 34, 947—954).—A comprehensive dissertation on the preparation and properties of oleo-casein water-paint vehicles. The qualitative and quantitative influence of alkalis on the consistency of casein solutions, and the specific effects of various preservatives are detailed. Casein and alkali caseinates are converted into insoluble calcium caseinate by the action of lime, but excess of lime has a peptising action and the caseinate becomes soluble, a significant factor in casein water-paint technique. The emulsification of casein solutions is discussed from the points of view of influence of concentration and acidity of the casein solution, concentration and nature of emulsoid (phase reversal being negligible in the type of material considered), and behaviour of the emulsions when treated with water, photomicrographs illustrating the different behaviour of various emulsions being included. Tung oil produces markedly different results from linseed oil. The properties of a range of commercial casein emulsions are tabulated. The general colloid-chemical relationships involved are discussed.

S. S. WOOLF.

Distribution and properties of resinous substances in various parts of the trunk of pine trees (*Pinus sylvestris*) according to seasons. I. V. FILIPOVICH and V. A. VUISOTZKI (J. Chem. Ind. Moscow,

1927, 4, 953—960).—The resinous material extracted by ether from the heartwood is yellow, and from the sapwood greenish and more stable. The former deposits crystalline precipitates of higher acid and saponif. values than the original. The difference between the saponif. value and the acid value of the resinous material is: heartwood 0—8, sapwood 6—28; the unsaponifiable matter in sapwood resinous material is the higher. Acid values of rosin vary with the season: heartwood 132—163, sapwood 52—151. The quantity of substances which can be saponified and salted out is for the heartwood rosin always higher than the unsaponifiable matter; for sapwood rosin it may be lower. The composition of the rosin depends on the position of the cutting. Heartwood rosin has a lower m.p. in summer; the sp. gr. of both heartwood and sapwood rises in midsummer and drops in autumn; the value of α is negative in winter and positive in summer. The acid and saponif. values, and the percentage of substances which can be salted out, also vary with the season.

CHEMICAL ABSTRACTS.

Cause of the low m.p. of colophony obtained by extraction. E. LJUBARSKI (Oil & Fat Ind. Russia, 1928, No. 4, 26—30; Chem. Zentr., 1928, ii, 716).—On account of chemical transformations leading to an increase in the amount of turpentine of b.p. $>180^\circ$, which remains in the residue after steam-distillation of the oil, colophony extracted from the dead tree has a lower m.p. than that drawn from the living tree. The colophony is preferably saponified, the oil of high b.p. forming an emulsion and being removed by distillation with steam.

A. A. ELDRIDGE.

Resin acids. G. ROUIN (Bull. Inst. Pin, 1928, 121—130; Chem. Zentr., 1928, ii, 1222).—The resin of *Pinus Laricio* afforded *d*-pimaric acid, m.p. 209—210°, whilst *l*-pimaric acid was not isolated; optical data indicate that the two acids are present in the proportion 74 : 26.

A. A. ELDRIDGE.

Abietic anhydride. W. NAGEL (Chem. Umschau, 1929, 36, 33—34).—The product obtained by treating abietic acid (isolated from rosin by cold extraction or by distillation) with acetic anhydride was proved conclusively to be an anhydride. The recrystallised product had m.p. 148—150°, acid value 0; the saponif. value agreed approximately with the theoretical requirements. Fonrobert and Pallauf's observations (B., 1926, 594) on the anhydride are confirmed, except that hydrolysis of the compound was found to be difficult; the anhydride can even be recrystallised from boiling alcohol.

E. LEWKOWITSCH.

See also A., Feb., 178, **High-molecular condensation products of carbamide and formaldehyde** (SCHEIBLER and others). 191, **New compounds from oil of turpentine** (WIENHAUS).

PATENTS.

[Cellulose ester] lacquer compositions. (Sir) G. C. MARKS. From CARBIDE & CARBON CHEM. CORP. (B.P. 285,049, 1.9.27).—The compositions comprise a solvent, a cellulose ester, and a polymerised substituted olefine, e.g., polymerised vinyl acetate or a polymerised mixture of 30% of vinyl chloride and 70% of vinyl acetate.

L. A. COLES.

Preparation of a softening agent for coating compositions containing nitrocellulose etc. Coating compositions. E. C. R. MARKS. From ALCOX CHEM. CORP. (B.P. 303,560 and 303,566, 6.10.27).—(A) A petroleum of about C_{20} is oxidised in the liquid phase at 135—140° with air at 150—350 lb./in.² in presence of a catalyst such as manganese oleate. The terminal carbon atom is removed as formic acid, leaving a high-molecular carboxylic acid soluble in petroleum, together with ketones and aldehydes, but further oxidation, which would result in hydroxy-acids insoluble in petroleum, is avoided. (B) The product is used as a plasticiser for coating compositions of nitrocellulose for artificial leathers, or is esterified to give a castor-oil substitute.

C. HOLLINS.

Manufacture of condensation products from formaldehyde and thiourea or a mixture of thiourea and urea. SOC. CHEM. IND. IN BASLE (B.P. 275,995, 10.8.27. Switz., 11.8.26).—Clear products are obtained by condensing not less than 1 mol. of thiourea or urea, or mixtures of these, with 1.6 mols. of formaldehyde by heating in aqueous solution at the ordinary or at raised pressure and at a temperature not much below 100°, until a sample yields a precipitate on dilution with water, when the solution is concentrated and the residue is hardened by the usual method. Alternatively, after initial condensation of 1 mol. of urea etc. with not more than 2 mols. of formaldehyde, a quantity of urea etc. is added to bring the proportion to not less than 1 mol. per 1.6 mols. of formaldehyde, after which the solution is concentrated and the residue hardened.

L. A. COLES.

Manufacture of moulded products [for use as electrical insulators]. BRIT. THOMSON-HOUSTON CO., LTD., Assees. of H. L. WATSON (B.P. 284,232, 9.1.28. U.S., 25.1.27).—Dried felt material, e.g., kraft sulphate wood-pulp sheet, is impregnated with a solution of a natural or artificial resin, e.g., Bakelite, and, after removal of the solvent, the product is moulded by heat and pressure.

L. A. COLES.

Production of new derivatives of [resinous] condensation products of aldehydes and phenols. H. BUCHERER (U.S.P. 1,697,713, 1.1.29. Appl., 18.4.21. Ger., 10.6.18).—See B.P. 148,139; B., 1922, 110 A.

Ink from hydrocarbons (B.P. 286,207).—See II. **Titanium etc. compounds** (B.P. 275,672). **Titanic oxide** (B.P. 303,468).—See VII.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Freezing of raw rubber. I. A. VAN ROSSEM and J. LOTCHIUS. II. J. R. KATZ (Kautschuk, 1929, 5, 2—5, 6—9).—I. The sp. gr., hardness, and light-absorption of frozen rubber undergo a sudden marked decrease between 36° and 38°, probably due to the fusion of the crystalline constituent. The existence of a crystalline fraction in frozen rubber is supported by the much lower water-absorption of this relative to ordinary rubber. A distinct latent heat of fusion can also be detected on inducing thawing of frozen rubber by the addition of toluene in a Bunsen ice-calorimeter. The m.p. is lower for recently frozen samples than for rubber which has been in a frozen state for years; this difference is

attributed to the effect of crystal size which would become greater with time.

II. The *X*-ray interference phenomena with frozen rubber show this to contain crystalline material, whereas unfrozen rubber is amorphous. Immersion in a solvent, *e.g.*, benzene or carbon tetrachloride, rapidly converts frozen rubber into the completely amorphous condition, as also does repeated stretching or bending. The disappearance of the crystal-interferences on warming coincides with the later portion of the fall in the sp. gr. curve. The "freezing" of rubber is therefore regarded as representing merely crystallisation of the material. The difficulty of isolating large crystals is explained by the activity of solvents in effecting conversion of rubber from the crystalline into the amorphous state.

D. F. TWISS.

Oxidation of vulcanised rubber. A. VAN ROSSEM and P. DEKKER (*Kautschuk*, 1929, 5, 13—21).—Systematic investigation of the chemical changes in vulcanised rubber on storage shows that the proportion removable by alcoholic potassium hydroxide from the benzene-swollen and previously acetone-extracted material is a sensitive index to the degree of oxidation in its earlier stages. Equal volumes of benzene and alcoholic potash are desirable. The alcoholic potash extract contains fatty acids, arising from acetone-insoluble esters in the rubber, in addition to the oxidation products; the latter are separable by evaporating the alcoholic potash extract to small bulk, diluting with water, acidifying, extracting with ether, removing this solvent and heating the residue with alcoholic potash, when the oxidation products remain undissolved. The earlier oxidation products contain 3.5—5.5% O and are soluble in ether, but the later products containing 7—8% O are insoluble. Extraction with alcoholic potash therefore constitutes a valuable test for the quality of vulcanised rubber particularly in such articles as cannot conveniently be subjected to mechanical tests.

D. F. TWISS.

Topochemical reactions with racked rubber. F. KIRCHHOF (*Kautschuk*, 1929, 5, 9—13).—Thin strips of smoked sheet rubber, which had been "racked" to 600%, when immersed in sulphuric acid (*d* 1.8) for 4 months darkened and lost the power of contraction in warm water; a fibrous structure was still evident both from visual examination and the production of a distinct point-diagram with *X*-rays. Treatment of similar racked rubber with bromine water also yielded a product with superficial fibrous character, but *X*-rays revealed no sign of any structure, even the "amorphous ring" being lacking. Bromination apparently causes a complete structural disturbance both in the amorphous constituent and in the crystallites, whereas with sulphuric acid the action appears to be confined mainly to the amorphous phase.

D. F. TWISS.

PATENTS.

Manufacture of goods from aqueous dispersions of or containing rubber and similar resins. DUNLOP RUBBER Co., LTD., E. A. MURPHY, and D. F. TWISS (B.P. 303,544, 5.10.27).—Pasty or creamy products formed directly, from emulsions or dispersions containing rubber or similar materials, by operations such as dipping, spreading, or electrophoresis, are substantially de-

hydrated and set by the osmotic action of a concentrated solution or melt of a salt or salts, with or without the addition of an acid.

D. F. TWISS.

Manufacture of tubes from india-rubber, gutta-percha, balata, or similar materials, or compounds thereof and apparatus therefor. Manufacture of transparent vulcanised rubber. DUNLOP RUBBER Co., LTD., D. F. TWISS, and E. A. MURPHY (B.P. 303,545—6, 5.10.27).—(A) By forming deposits or products directly from a mixture of rubber latex, sulphur, and an ultra-accelerator of the zinc salt type, *e.g.*, zinc diethyl-dithiocarbamate, and vulcanising, the rubber is obtained in a transparent condition. Any additional compounding ingredients should be substantially soluble in the rubber hydrocarbon or should be removable by subsequent treatment with hot alkali solution or water. The deposits may be treated with a dehydrating and setting medium before completion of the drying and vulcanisation (cf. preceding abstract). (B) A flexible or rigid core of suitable composition is led through a bath of concentrated and/or compounded aqueous dispersion of rubber, gutta, or similar material; the coating is then dried, after previous treatment in a dehydrating and setting medium if desired; the formed tube is subsequently removed from the core. The coating and treatment in the dehydrating and setting medium may be repeated to produce greater thicknesses.

D. F. TWISS.

Production of sheet rubber, gutta-percha, balata, and other analogous vegetable resins and fabrics coated therewith. DUNLOP RUBBER Co., LTD., D. F. TWISS, and E. A. MURPHY (B.P. 302,201, 12.8.27).—Concentrated and, if desired, compounded latex is spread on a moving backing and set by heating, the effect being sufficiently rapid, in the case of a backing of fabric, substantially to prevent penetration. Several layers may be superposed, and the products may be vulcanised during drying or subsequently, and with or without removal from the backing.

D. F. TWISS.

Manufacture of an elastic caoutchouc-like body. J. BAER (B.P. 302,399, 16.9.27. Addn. to B.P. 279,406).—Saturated, halogenated derivatives of the paraffin hydrocarbons, *e.g.*, methylene or ethylene dihalides, mixed or singly, are polymerised by the action of sulphides of the alkali or alkaline-earth metals or ammonium in the presence of alkaline, alcoholic, or other solvent.

D. F. TWISS.

Formation of articles by deposition from emulsions of rubber and viscose or oxycellulose compounds. DUNLOP RUBBER Co., LTD., and W. H. PAULL (B.P. 303,765, 7.10.27 and 18.2.28).—Articles containing rubber and viscose or oxycellulose compounds, if desired together with other ingredients such as zinc oxide, amorphous carbon, vulcanising agents and accelerators, are formed from aqueous emulsions or dispersions of these by electrophoresis and/or by dipping. Further proportions of rubber may be incorporated in the deposits so obtained, *e.g.*, on a mixing mill. Especial reference is made to boots, shoes, and tyre treads.

D. F. TWISS.

Method of introducing chemicals into rubber etc. IMPERIAL CHEMICAL INDUSTRIES, LTD., A. J.

HAILWOOD, W. J. S. NAUNTON, and A. SHEPHERDSON (B.P. 303,564, 7.10.27).—Substances which by anodic oxidation are converted into accelerators are added to a rubber latex or mixture of latex and cellulose ester emulsion for electrodeposition. A metal salt of a leuco-vat dye may be used in conjunction with the accelerator-producing compound. An example is sodium diethyl-dithiocarbamate which gives the thiuram disulphide accelerator at the anode.

C. HOLLINS.

New compounds and their application as vulcanisation accelerators for rubber. IMPERIAL CHEM. INDUSTRIES, LTD., W. J. S. NAUNTON, and J. B. PAYMAN (B.P. 303,535, 31.8.27).—*Morpholine morpholyl-dithiocarbamate*, m.p. 187°, prepared from morpholine and carbon disulphide, is oxidised to *dimorpholylthiuram disulphide*, m.p. 146–147°, from which the *monosulphide*, m.p. 125–136°, is obtained by action of sodium cyanide, or is treated with sulphur monochloride to give the “*tetrasulphide*,” or converted into the zinc or other heavy metal salts. All these compounds and their analogues from *C*-substituted morpholines are used as vulcanisation accelerators.

C. HOLLINS.

Ebonite and the treatment thereof, more particularly ebonite sheets for wireless apparatus. BRIT. HARD RUBBER CO., LTD., and P. E. WELLS (B.P. 303,814, 6.9.27).—Ebonite immune to the action of light is produced by applying to the surface of ordinary ebonite a thin coating of any synthetic resin, e.g., of the phenol-aldehyde type.

D. F. TWISS.

XV.—LEATHER; GLUE.

Smoke tannage. Effect of wood smoke on combining capacity of hide substance for chromium trioxide, vegetable tannin, and sodium hydroxide. L. S. TS'AI and E. O. WILSON (J. Amer. Leather Chem. Assoc., 1929, 24, 21–36).—Smoke tannage is effected by subjecting wet delimed pelt to the action of the smoke from green straw, the pelt is then folded, laid aside, and allowed to cool. The treatment is repeated three or four times. The product may be retanned with vegetable tannins. Smoke-tanned leather has a smell of smoke, is yellowish-brown, soft, and pliable, but has a harsh grain. It does not withstand the boiling test. Hide powder treated with wood smoke combines with less basic chromium salt, less vegetable tannin, and more sodium hydroxide, respectively, than untreated powder. These properties are attributed to the inactivation of the basic groups in collagen by the smoke tannage, with consequent activation of the acidic groups. The effect of the smoke tannage on hide powder agrees with that of formaldehyde observed by Gerngross (B., 1922, 149 A, 426 A). The tanning action of smoke is attributed chiefly to formaldehyde and certain phenols in it, which are known to possess tanning properties. D. WOODROFFE.

Determination of non-tans [in tannin analysis]. L. KEIGUELOUKIS (Collegium, 1929, 30–33).—A glass cylinder (200 c.c.), containing the equivalent of 6–25 g. of dry hide powder and ten times its weight of distilled water, is fitted with a rubber stopper, shaken for 1 hr., the necessary amount of chrome alum solution added, well shaken for several hours, and allowed to remain

overnight. A porcelain-headed filter candle is then inserted in the cylinder, the chroming liquor is drawn off, and the powder washed with distilled water and pressed (by means of the candle) until its weight is <26·25 g. Air is then drawn through the filter candle until the adhering powder is sufficiently dried to be removed with a glass rod. The cylinder and chromed powder are weighed and the latter is made up to 26·25 g. with distilled water. Tan liquor (100 c.c.) is added, the cylinder shaken for 10 min., and the non-tans are drawn off through a filter-candle and collected. A second filtration is not necessary in the case of non-tans. The method obviates the handling of the powder, and can be used for ready-chromed hide powder.

D. WOODROFFE.

See also A., Feb., 137 and 138, **Swelling of gelatin** (KESTENBAUM; KUNITZ).

PATENT.

Deposition of rubber, viscose, or oxycellulose (B.P. 303,765).—See XIV.

XVI.—AGRICULTURE.

Determination and significance of buffering power of soils poor in carbonate. K. MAIWALD (Kolloidchem. Beih., 1928, 27, 251–343).—An investigation has been made of 14 kinds of soil of glacial origin, containing 1–29·5% of raw clay and 2·6–52·7% of “*schluff*,” thus comprising a series ranging from light sandy soils to heavy clay soils. Robinson's method (A., 1922, i, 1228) was used to determine the colloid content of the soils, and the unusually high values 12–39% were obtained. The soils may be divided into three groups: (1) saturated, alkaline and neutral soils with low carbonate content, (2) intermediate soils showing acidity by displacement adsorption in potassium chloride solution, and (3) carbonate-free, unsaturated soils. All the soils had a content of replaceable bases (calcium, magnesium, potassium, and sodium) of 21·4–4·8 milliequivalents per 100 g. of soil. The hydrogen-ion concentration of the soils suspended in water and in *N*-potassium chloride with and without addition of acid and alkali was measured, and from the titration curves the following conclusions were reached: (a) the final value is attained only after some days (at least 72 hrs.), (b) the curves show no turning point over the region examined, (c) the curves differ completely from that obtained under similar conditions with quartz-sand in absence of buffers, thus indicating a good buffering capacity, and (d) the titration curves are more or less symmetrical on both the acid and alkaline sides. In those soils which are poor in carbonate, the buffering power is not dependent on the buffer system carbonic acid/bicarbonate, but depends on inorganic and organic complexes—mainly clay and humus compounds. In such cases the degree of buffering is determined by the following factors: (1) chemical character of the colloid complex, expressed as the absolute base-binding capacity, (2) content of adsorbed displaceable bases, (3) colloid content per g. of soil (clay and “*schluff*”—loam give the best and sand and sandy loam the worst buffering), (4) state of subdivision of the reactive part of the colloid and its alteration with the course of the

titration, (5) the nature and relative proportions of the adsorbed displaceable bases (this factor also influences the state of subdivision, and the tendency to change during the titration), (6) the nature of the acid or alkali added. The electrometric determination of hydrogen-ion concentration in the above systems has been improved by the following devices: a simple potentiometer as compensation instrument, ensuring the rapid reading of potential in a series of measurements; simultaneous use of a small bundle of electrodes instead of a single electrode, giving much more trustworthy values; calculation of the titration reagents in true normalities; extension of the time during which the reagent acts on the soil to at least 72 hrs. to attain an end-point. The numerical expressions of the buffering capacities have been calculated by Jensen's method of "buffering surfaces" (B., 1925, 328), and they vary on the acid side from 76.5 cm.² to 27.3 cm.² A new method of expressing buffering capacity is developed on the following lines. The hydrogen-ion concentration *a* of the titrating acid is determined at various normalities, and also the hydrogen-ion concentration *b* after addition of the soil to the acid (measured after 72 hrs.). The values of *a* and *b* are expressed as gram-ions of hydrogen per litre (not as *p*_H), and the expression $c = 100b/a$ gives the "remaining acid" as a percentage of the original hydrogen-ion concentration. The values of *c* are plotted as ordinates against those of *a* as abscissæ. The properties of the curves so obtained with the soils examined are described. Comparison of the curves with the "buffering surfaces" of Jensen shows that soils with equal "buffering surfaces" may differ in their true buffering properties.

E. S. HEDGES.

Biochemical study of some soil fungi with special reference to ammonia production. A. K. THAKUR and R. V. NORRIS (J. Indian Inst. Sci., 1928, 11A, 141—160).—The mechanism of ammonia production by fungi has been examined particularly with reference to an amidase isolated from *Aspergillus flavus*. The reaction was found to be typically autocatalytic. Of the fifty species of fungi isolated from an Indian soil, three gave negative results when examined for their ability to fix atmospheric nitrogen.

E. A. LUNT.

Nitrogen-fixing micro-organisms of an arid soil. E. G. CARTER and J. D. GREAVES (Soil Sci., 1928, 26, 179—197).—Although azotobacter is absent from arid soils, active nitrogen fixation takes place. Twenty-seven organisms are described, all but one of which are capable of nitrogen fixation.

H. J. G. HINES.

Value of nitrification tests on soils representing extreme contrast in physical and chemical properties. W. V. HALVERSEN (Soil Sci., 1928, 26, 221—231).—Nitrification tests employing ammonium sulphate have been criticised on the grounds that the quantity of ammonium sulphate used is abnormal, and the buffering power of the soil is inadequate to counteract the acidity so produced. Data are given which show that these criticisms are invalid except for light sandy soils, and that for normal soils ammonium sulphate can safely be used in the quantities recommended.

H. J. G. HINES.

Fertiliser studies with early potatoes. G. V. HOUGHLAND (Soil Sci., 1928, 26, 199—215).—It is recommended that part of the nitrogen should be supplied in an organic form. High-grade potash salts are preferable to the crude forms, and the effect of fertilisers is enhanced by green manuring.

H. J. G. HINES.

Potato plants grown in mineral nutrient media. E. S. JOHNSTON (Soil Sci., 1928, 26, 173—177).—The necessity of adding boron to water cultures is demonstrated.

H. J. G. HINES.

Determination of volume-weight of different soils in the soil profile. J. S. JOFFE and L. L. LEE (Soil Sci., 1928, 26, 217—219).—A correction is made for pebbles giving a value named the active volume weight (cf. Lebedev, B., 1928, 538).

H. J. G. HINES.

Hydrometer method for making a very detailed mechanical analysis of soils. G. J. BOUYOUCOS (Soil Sci., 1928, 26, 233—238).—The method previously described (B., 1928, 683) has been extended to the construction of distribution curves.

H. J. G. HINES.

Effect of fertilisation with iodine on the growth and composition of food plants. E. MAURER, W. SCHROPP, and H. DUCRUE (Münch. Med. Woch., 1928, 75, 1246—1247; Chem. Zentr., 1928, ii, 1027—1028).—By fertilisation with potassium iodide the iodine content of the plants was increased without causing any important undesirable changes in the composition or condition of the plants. The most marked increase was observed with spinach and mangold; it was less evident with savoy, yellow beet, and lettuce, but was not observed with beans, peas, cauliflower, or kohlrabi.

A. A. ELDRIDGE.

Analysis of insecticides. Liquid insecticides non-miscible with water: hydrocarbon mixtures, carbon tetrachloride, nitrobenzene, naphthalene, methyl salicylate. M. FRANÇOIS and (Mlle.) L. SEGUIN (J. Pharm. Chim., 1929, [viii], 9, 49—58; cf. B., 1928, 382, 550, 724).—Methods for the identification and isolation of aromatic and aliphatic hydrocarbons, nitrobenzene, naphthalene, rosin, and methyl salicylate in insecticides are given. The identification of turpentine and the determination of nitrobenzene by reduction to aniline followed by bromometric titration and of carbon tetrachloride by decomposition with alcoholic potassium hydroxide and determination of the chlorine with silver nitrate are described.

E. H. SHARPLES.

Tobacco frencing, a nitrogen deficiency disease. W. D. VALLEAU and E. M. JOHNSON (Ky. Agric. Exp. Sta. Bull., 1927, 28, 179—253).—Prevention of tobacco frencing by addition to the soil of certain minimal quantities of nitrogen compounds is described; chlorotic diseases of other plants are regarded as being of similar nature.

CHEMICAL ABSTRACTS.

See also A., Feb., 222, **Amino-acid synthesis in plants** (LOEHWING).

Citric acid solubility of slag. KERSTEN.—See X.

PATENTS.

Mixed fertilisers. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 303,916, 12.9.27).—Potassium

nitrate is mixed with sodium nitrate, the amount of the sodium salt being not more than 60%, preferably 20–50%, of the mixture.

W. G. CAREY.

Manure and insect-destroying composition. R. TOYER (B.P. 303,957, 8.12.27).—Soot, lime, sand, and sawdust in the proportion 2:2:1:1 are mixed with coal tar or wood-tar oil and paraffin.

W. G. CAREY.

Preparation of fertilisers. F. ROTHE and H. BRENEK, Assrs. to VER. CHEM. FABR. A.-G. (U.S.P. 1,696,975, 1.1.29. Appl., 26.1.27. Ger., 23.6.24).—See B.P. 235,860; B., 1925, 731.

XVII.—SUGARS; STARCHES; GUMS.

Effect of the drying of fresh beet cossettes on the content of nitrogenous compounds in the exhausted cossettes. O. SPENGLER and W. PAAR (Z. Ver. deut. Zucker-Ind., 1928, 796–800).—A 10 kg. batch of fresh beet slices was divided into two equal parts, one of which was dried on trays to a moisture content of 4%, and both were then extracted with hot water in a small battery of three glass vessels until the extract run off contained only 0.4% of solids. The drying of the cossettes was found to have no effect on the amount of total nitrogen or true proteins (precipitable by cupric hydroxide) present. Extraction removed 49.8% of the total nitrogen and 25.7% of the true proteins from the fresh cossettes, and 42.2% of the total nitrogen and only 7.7% of the true proteins from the dried cossettes.

J. H. LANE.

Behaviour of oxalic acid in the purification of [beet] juices. O. SPENGLER and C. BRUNDEL (Z. Ver. deut. Zucker-Ind., 1928, 729–746).—Calcium oxalate is a frequent constituent of evaporator incrustations in beet sugar factories. If a 12% solution of pure sucrose containing oxalic acid is treated by the methods employed in the purification of beet juices, it is found that after liming and heating at 85° as much as 0.08% of calcium oxalate may remain in solution, but this quantity is reduced to 0.001% by the first carbonation. Larger proportions than this must remain in factory thin juices to account for the amounts sometimes found in evaporator incrustations; possibly colloidal matters interfere with the precipitation of oxalate by carbonation. The oxalate which escapes precipitation, however, should not be deposited during evaporation if the final alkalinity of the thin juice is due to alkali carbonate, as it should be (B., 1928, 421), and not to free lime; for in the former case it should be present as soluble alkali oxalate during evaporation.

J. H. LANE.

Formation of molasses. O. SPENGLER, F. TÖDT, and C. SHEN (Z. Ver. deut. Zucker-Ind., 1928, 749–759).—The formation of molasses is believed to be due mainly to the influence of salts, colloids, in the amounts present, being unable to prevent crystallisation although they may retard it. The solubility of sucrose in water is, in general, diminished by low concentrations of mineral salts and increased by high concentrations. The former effect is attributable to the competing affinities of salts on the one hand, and sugar on the other, for water, and

therefore varies with the hydration values of different salts. The increased solubility of sucrose at higher salt concentrations is attributed by the authors to the predominance of a third affinity, that of sugar for salts, evidence for which is obtained from a study of the influence of sucrose on the electric conductivity and mol. vol. of salts in aqueous solution.

J. H. LANE.

Laboratory apparatus with conductimetric indication for the study of saturation and filtration [of beet juices]. V. STANEK and K. ŠANDERA (Z. Zuckerind. Czechoslov., 1928, 53, 129–133).—The apparatus comprises a jacketed carbonation vessel of 3 litre capacity with stirring mechanism, pump, and motor, an electrode vessel with glow-lamp indicators for conductimetric measurements, and a bronze filter press in an attemperating bath. The effects of variations in the conditions of liming, saturation, and filtration can be studied with considerable precision with this apparatus.

J. H. LANE.

Conductimetric control of the rendement of centrifuged [beet] sugar. V. NEFUKA (Z. Zuckerind. Czechoslov., 1928, 53, 134–136).—By polarisation and conductimetric ash determinations the rendement of the first centrifugal charge of raw sugar from a given massecuite can be ascertained within 10 min., in time to serve as a guide in the centrifuging of later charges of the same massecuite, thus enabling a factory to attain greater uniformity in the rendement of the raw sugar produced throughout a campaign.

J. H. LANE.

Potentiometric determination of [reducing] sugar. H. TRYLLER (Z. Spiritusind., 1929, 52, 27–28).—In the determination of reducing sugars by titration against Fehling's solution the end-point is ascertained electrically by the vanishing of *P.D.* between two thick copper wires (electrodes) one of which is immersed directly in the boiling reaction liquid and the other is enclosed in a tube containing a similar solution free from copper, closed at the bottom by a porous plug and also immersed in the reaction liquid. The free electrode and the tube containing the enclosed one pass through the stopper of the reaction flask, which also has an opening for admission of sugar solution from a burette and for escape of steam. The two electrodes are wired to a galvanometer. As the end-point of the reaction is approached the galvanometer deflection approaches zero and becomes extremely sensitive to slight changes of copper-content of the reaction liquid, so that the end-point can be easily ascertained to within 0.1 c.c. of sugar solution.

J. H. LANE.

Starch factory control. [Moisture determination.] SPROCKHOFF (Z. Spiritusind., 1929, 52, 27).—In the German starch trade the official method for determining moisture in starch is to dry 5 g. in a shallow dish for 1 hr. at 50° and then for 3 hrs. at 120°. Results accurate enough for factory control can be obtained within 1 hr. by means of an oven described, in which the weighed sample, 10 g., hangs suspended by a wire or chain passing through a hole in the top of the oven and attached to one end of a balance beam mounted above the oven, the other arm of the beam forming a pointer

which moves over a scale as the sample loses weight. The oven is kept at 90–100° for the first 15–20 min. and then at 140–150° for 25–35 min. Accuracy to within 0.2–0.4% is claimed, and the oven can be used also to determine moisture in exhausted potato pulp.

J. H. LANE.

Determination of dextrose. W. D. HORNE (Planter Sugar Mfr., 1928, 81, 1).—The cyanide method is modified, the boiled alkaline copper solution being diluted while hot and an aliquot part removed for titration by means of a pipette graduated to compensate for temperature.

CHEMICAL ABSTRACTS.

See also A., Feb., 174, **Detection of lævulose in presence of other carbohydrates** (EKKERT). 175, **Triacetyl starch** (TSUZUKI). **Reaction between sugars and amino-acids** (VON EULER and BRUNIS). 205, **Determination of maltose and dextrose** (BRAUN and others). 216, **Effect of polarised light on starch hydrolysis**. 218, **Fermentation of dextrose** (PEDERSON and BREED).

Sugar-like substances in sulphite-cellulose cooking. HÄGGLUND and JOHNSON.—See V.

PATENTS.

High-purity crystalline dextrose and its manufacture. E. C. R. MARKS. From CORN PRODUCTS REFINING Co. (B.P. 300,698, 19.8.27).—Crystalline dextrose is obtained from syrups of high purity (preferably above 94%) by boiling in a vacuum pan at substantially constant temperature, which depends on the form of the sugar required, viz., about 58° for β -anhydrous, about 50° for α -anhydrous, and about 45° for α -hydrated dextrose. After the syrup has been brought to the correct concentration and temperature, which depend to some extent on the purity of the syrup as well as on the form of dextrose required, formation of grain is induced by rapid boiling, usually with a seeding of the appropriate type of crystals, and when sufficient grain is present the density of the syrup is somewhat reduced and crystallisation is continued, without the formation of fresh grain, by slow boiling under a suitable vacuum. Additional syrup may be drawn in as required to feed the crystals, and, after a certain stage, syrup of lower purity than the original one may be used for this purpose, and boiling may be accelerated under a higher vacuum. Crystallisation may be completed by cooling under atmospheric pressure. The masseccutes obtained are easily purged, the crystals being well developed and in most cases single.

J. H. LANE.

Preparation of betaine hydrochloride etc. [and glutamic acid from residual liquors of the beet sugar industry]. D. K. TRESSLER, Assr. to LARROWE CONSTRUCTION Co. (U.S.P. 1,685,758, 25.9.28. Appl., 13.7.25).—See B.P. 265,831; B., 1927, 423.

XVIII.—FERMENTATION INDUSTRIES.

Influence of temperature and duration of storage on the fermentative power, cell increase, and acid

production of top-fermentation yeasts. F. WINDISCH (Woch. Brau., 1929, 46, 31–36).—Three top-fermentation yeasts were investigated by methods similar to those employed in the corresponding researches on bottom yeasts (B., 1928, 31, 207, 424). The behaviour of two of these was also tested after storage under beer in addition to storage under water. As with bottom yeasts storage at low temperatures is most favourable to subsequent fermentation increase and acid production, and under water 0° is the best temperature. Under beer 4° was the optimum for the strain Happold 28A and 8° for race 468 (Hochschul-Brauerei). Generally cell increase and acid production were proportional to the attenuation. The detrimental effect of storage at relatively high temperatures (13–18°) is more marked when beer is used as the storage medium.

F. E. DAY.

Substitute for beer-wort as yeast medium. J. C. WELDIN (Proc. Iowa Acad. Sci., 1927, 34, 89–90).—Yeasts produce gas abundantly in a medium containing malt extract (Difco) 15 g., potassium monohydrogen phosphate 1 g., ammonium chloride 1 g., distilled water 1000 c.c., adjusted with citric acid to p_H 5.4–5.6; they grow vigorously on a solid medium containing malt extract 15 g., potassium monohydrogen phosphate 3 g., ammonium chloride 1 g., agar 20 g. (e.g.), adjusted with citric acid to p_H 5.4–5.6.

CHEMICAL ABSTRACTS.

Formation of ammonia during brewing processes. W. WINDISCH and P. KOLBACH [with K. BAUMANN] (Woch. Brau., 1929, 46, 41–45).—The total (Kjeldahl), formol, and ammonia nitrogen were determined on the cold-water extracts of two barleys and of the malts prepared from them, also on the unboiled, boiled, and boiled and fermented laboratory worts from the malts. Ammonia nitrogen was determined by adding excess of magnesium oxide and distilling *in vacuo* at 40°. The results, calculated on the original dry matter of the barleys, were (%): in the barleys 0.0053, 0.0054; in the malts 0.0063, 0.0053; in the unboiled worts 0.0083, 0.0090; in the boiled worts 0.0207, 0.0196; and in the fermented worts 0.0133, 0.0168% of ammonia nitrogen, respectively. The unboiled worts, of about 11.3% concentration, contained 1.28 and 1.36 mg./100 c.c., respectively, and in that from a third malt 1.32 mg./100 c.c. were found, which increased steadily to 1.92 mg./100 c.c. on prolonging the period of mashing at 45° (protein rest) from 0.5 hr. to 3 hrs. That this effect is enzymatic is probable from the uniform increase of the amount of ammonia nitrogen with increase of time, and since no such increase occurred in a previously boiled wort. Prolonging the protein rest also increased the amount of those substances which give rise to ammonia during boiling. In normal laboratory worts the ammonia nitrogen increased from about 1.3 mg./100 c.c. to about 3.0 mg./100 c.c. during 2 hrs.' boiling, but only by about 0.3 mg./100 c.c. during a further similar period. There was no corresponding change in the formol nitrogen during boiling. A single brewery wort examined contained more ammonia nitrogen than the laboratory worts, the amounts, calculated to 12% wort, being 2.30 and 4.24 mg./100 c.c.,

respectively, before and after boiling. The increase in ammonia nitrogen during boiling was unaffected by varying the reaction between p_H 5.01 and 6.04.

F. E. DAY.

See also A., Feb., 176—8, **Specific action of erepsin and trypsin-kinase** (ABDERHALDEN and others). 180, **Hydrolysis of polypeptides** (ABERHALDEN and BROCKMANN). 216, **Amylase from Cholam (*Sorghum vulgare*)** (PATWARDHAN and NORRIS). **Nature of amylase** (NARAYANAMURTI and NORRIS). 217, **Vegetable oxidoreductase** (MICHLIN). **Hydrolytic action of Ricinus lipase** (PIUTTI and DE' CONNO). **Rate of multiplication of yeast at different temperatures** (RICHARDS). **Production of acids by *Aspergillus fumigatus*** (SCHREYER). 218, **Citric acid formation by moulds** (BERNHÄUER and SCHÖN). **Fermentation of dextrose by *Serratia marescens*** (PEDERSON and BREED). 219, **Acetic acid fermentation** (WIELAND and BERTHO). 220, **Biochemical production of fats** (KULIKOV).

Ammonia production by soil fungi. THAKUR and NORRIS.—See XVI. **Lactose-fermenting yeasts in milk.** TRÜPER.—See XIX.

XIX.—FOODS.

Lactose-fermenting yeasts in milk. E. TRÜPER (Milch. Forsch., 1928, 6, 351—402; Chem. Zentr., 1928, ii, 1276).—To a greater extent than yeasts of winter milk those of summer milk favour higher organic compounds (peptone rather than asparagine) as sources of nitrogen, producing alcohol, lactic acid, pyruvic acid, volatile acids, and a rennin-like enzyme. Lactose, galactose, dextrose, sucrose, and raffinose, but not maltose or arabinose, are attacked. Casein is a source of carbon and nitrogen; other proteins are strongly attacked, but casein only after consumption of fat, which is decomposed by a specific lipolytic enzyme. Protective treatment of the milk is discussed.

A. A. ELDRIDGE.

Influence of saprophytic and parasitic life on the acidoproteolytic power of pathogenic bacteria. C. GORINI (Lait, 1928, 8, 465—474; Chem. Zentr., 1928, ii, 948).—Different strains cause coagulation of milk by different mechanisms.

A. A. ELDRIDGE.

Inoculation of pasteurised milk. A. WOLFF (Milch. Zentr., 1928, 57, 357—364; cf. B., 1929, 70).—Further experiments are described in which pasteurised milk is treated with lactic acid bacteria which have not been heated in a previous pasteurisation process.

F. R. ENNOS.

Alkali value of cow's milk. F. E. NOTTBOHM (Milch. Forsch., 1927, 4, 336—351; Chem. Zentr., 1928, ii, 1276).—The alkali value ($Na_2O:K_2O$) of milk is 2—10; the value for colostrum is generally greater than 2. Towards the end of lactation lower values are obtained. Immediately after establishment of equilibrium or excessive values for sodium the content of lactose falls and that of chlorine rises.

A. A. ELDRIDGE.

Solubility of copper in milk. E. J. SOLOMAN and G. N. QUAM (Proc. Iowa Acad. Sci., 1927, 34, 216—217).—The degree to which copper sheet is dissolved by milk increases with rise of temperature.

CHEMICAL ABSTRACTS.

Determination of silicic acid in milk. O. KETTMANN (Milch. Forsch., 1927, 5, 73—106; Chem. Zentr., 1928, ii, 1280).—Milk contains 1.6 mg. of silica per kg. (0.021% of the ash), with fairly wide variations independent of those of other ash constituents, but dependent on the silica content of the fodder. In colostrum the silica content is above the average. Inflammation of the udder greatly reduces the silica content of the milk.

A. A. ELDRIDGE.

Diffusion of sodium chloride in cheese. O. MROZEK (Milch. Forsch., 1927, 4, 391—402; Chem. Zentr., 1928, ii, 1277—1278).—The distribution of sodium chloride and water after immersion of the cheese in salt solution and slow ripening is described.

A. A. ELDRIDGE.

Evaluation of rennin. E. MUNDINGER (Süddeut. Molkerei-Ztg., 1927, No. 19, 4 pp.; Chem. Zentr., 1928, ii, 1280).—The influence of p_H , calcium oxide and protein content, and dispersion is considered.

A. A. ELDRIDGE.

Action of rennin. E. MUNDINGER (Milch. Forsch., 1927, 4, 369—390; Chem. Zentr., 1928, ii, 1280).—“Degree of acidity” and p_H are both of importance in the preparation of rennin. Sunlight confers on rennin solutions the ability to decompose hydrogen peroxide.

A. A. ELDRIDGE.

Fluorescence and conservation of irradiated foodstuffs. Infant foods. SPOLVERINI (Riv. Ital. Actinol., 1927, 2, 1—19; Chem. Zentr., 1928, ii, 1275).—Ultra-violet irradiation of foods causes physical and chemical changes tending to greater stability, and facilitates their conservation. The foods become more or less radioactive. With certain foods irradiation is harmful.

A. A. ELDRIDGE.

Economic possibilities of rice grass (*Spartina Townsendii*). III. Composition and nutritive value. F. KNOWLES (J. Min. Agric., 1929, 35, 934—939).—Results of analyses made on *Spartina* are given with reference to the following contents: moisture, fibre, protein, ether extract, and ash, the chemical composition of which is also given. Feeding experiments indicate that poor *Spartina* is as digestible and nutritive as poor meadow hay.

E. A. LUNT.

See also A., Feb., 204, **Composition and characteristics of proteins** (SØRENSEN). **Volumetric determination of protein solutions** (TREADWELL and EPPENBERGER). 209, **Lipin content of butter** (REWALD). 219, **Proteolytic bacteria in milk** (FRAZIER and RUPP). 221, **Effect of ethylene on vitamin-B content of celery** (BABB). **Vitamin-B content of wheaten bread baked with varying amounts of yeast** (SCHEUNERT and SCHIEBLICH). 222, **Destruction of vitamin-E in a diet of natural foodstuffs** (WADDELI and others). **Effect of ethylene on bananas during**

ripening (REGEMBAL and others). Ripening of rice seed (TADOKORO).

Butyrometer problem. ROEDER.—See XII.

PATENTS.

Preservation of eggs for the use of bakers and confectioners. PULVO, LTD., W. F. BOLTON, and C. V. B. READ (B.P. 303,530, 4.7.27).—Eggs are shelled, disintegrated to form a homogeneous mixture of yolk and white, and preheated to 59°. Salt (0.5–3%) is added and the mixture heated *in vacuo* at 54° (e.g., for 10 min.). Finally, 0.25–2% of lactic acid solution (*d* 1.2) is sprayed in. Yolks may be treated separately, in which case the whites are desiccated. Suitable apparatus is described.

B. FULLMAN.

Preparation of fresh fruit for market. E. M. BROGDEN and M. L. TROWBRIDGE, Asses. to BROGDEN Co. (U.S.P. 1,693,575, 27.11.28. Appl., 2.12.25).—Citrus fruit is protected from blue mould and other forms of decay by immersion in a solution of soap and borax.

F. R. ENNOS.

Food product. H. F. WEISS, Assr. to WOOD CONVERSION Co. (U.S.P. 1,695,445, 18.12.28. Appl., 20.4.18).—A stock food consists of the concentrated products of hydrolysis of Western larch wood, including galactose, along with finely-divided, hydrolysed larch wood residue.

W. J. BOYD.

Drying of long-fibred substances, such as corn. TROCKNUNGS-ANLAGEN GES.M.B.H. (B.P. 298,148, 13.1.28. Ger., 4.10.27).

Manufacture of beverages comprising a mixture of milk and cocoa or a cocoa preparation. C. E. NORTH (B.P. 303,187, 27.7.27).

Devices for attaining a uniform temperature throughout the length of chilling rolls of margarine-making machines or the like. A. A. POSTNIKOFF and W. R. A. PICKERSGILL (B.P. 303,191, 20.9.27).

Crystallisation of gums, fondants, sweetmeats, etc. A. G. HULME, BAKER PERKINS, LTD., ANC. ETABL. A. SAVY, JEANJEAN & CIE. (B.P. 303,605, 7.11.27).

Sterilisation and like [heat] treatment of food and like products [put up in containers]. SUTAX, LTD., and J. W. SUTCLIFFE (B.P. 304,389, 27.10.27).

Pasteurisation of liquids (U.S.P. 1,693,034).—See I. Treatment of oil seeds (B.P. 279,122).—See XII.

XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Testing some common antiseptics. E. S. ROSE (Amer. J. Pharm., 1929, 101, 52–55).—The antiseptic powers of a number of commercial ointments, liquids, and soaps have been measured by observation of the time taken to kill specially prepared cultures of *Staphylococcus aureus*. Of the soaps, only those which contain active germicides such as mercury salts are antiseptic. Zinc oxide, sulphur, ichthyol, compound resorcinol, and tar ointments are only feebly antiseptic. Among the

solutions used for external application, spirit of camphor, alcohol, bay rum, and aluminium chloride solution are antiseptic, whereas witch hazel, boric acid solution, and saturated solution of magnesium sulphate are not. A 2% aqueous solution of mercurochrome is not antiseptic in accordance with the author's interpretation.

E. H. SHARPLES.

Gravimetric determination of colocynthin in extractum colocynthidis. P. RÓZSA (Ber. Ungar. pharm. Ges., 1928, 4, 196–207; Chem. Zentr., 1928, ii, 701).—The extract (1 g.) is washed twice with ether (5 c.c.), dissolved in warm absolute alcohol (20 c.c.), the solution boiled with animal charcoal (2 g.), filtered, and the filtrate evaporated to a syrup. The residue is extracted with chloroform, and the solvent removed; the residue is then dissolved in distilled water (20 c.c.), mixed with barium sulphate (0.5 g.), and filtered; the filtrate is evaporated to dryness and heated at 50–60° to constant weight. The fruit yields 25–30% of extract containing about 6% of colocynthin. A. A. ELDRIDGE.

Evaluation of sweet spirit of nitre. L. VAN ITALLIE, A. J. STEENHAUER, and A. HARMSMA (Pharm. Weekblad, 1929, 66, 15–22).—A critical examination of the chlorate oxidation method of determining the ethyl nitrite content of the pharmaceutical preparation. It is recommended to modify the method by addition of a known quantity of silver nitrate before adding the nitric acid, and titrating the excess of silver after precipitation of the chloride is complete. An iodometric method for determining the excess of potassium chlorate is also found to give accurate results.

S. I. LEVY.

Determination of the ethereal oil of *Folia menthae piperitæ*. HORKHEIMER (Pharm. Ztg., 1929, 74, 45).—Some precautions used in carrying out the distillation and subsequent extraction with pentane are described.

S. I. LEVY.

See also A., Feb., 135, Preparation of colloidal gold solution (KILDUFFE and HERSOHN). 173, Selective reduction of citral, geraniol, and limonene (ESCOURROU). 192, Tricyclene group (KOMPPA). 195, Indole derivatives (KEMATSU and others). 200, Micro-chemical reactions of theobromine and caffeine (WAGENAAR). Lupinine (KARRER and others). 201, Alkaloids from *Carnegie gigantea* (HEYL). Synthesis of bases of berberine type (SPATH and KRUTA). Strychnine and brucine (CIUSA). Micro-crystallographic identification of yohimbine (DENIGÈS). Alkaloids of Indian aconites (SHARP). 202, Heterocyclic arsenic compounds (STICKINGS; PHILLIPS). 215, Determination of morphine in biological material (BALLS and WOLFF). 221, Examination of insulin for vitamin-B (STUCKY). 222, Activation of ergosterol (BILLS and others).

PATENTS.

Manufacture of solutions of the active principle of the ovary or like glands. I. G. FARBENIND. A.-G. (B.P. 279,123, 17.10.27. Ger., 15.10.26).—Ovarian extract, obtained by saponification of the fats and cholesterol ester of ovaries, is treated with water and

extracted with ether. The residue after evaporation of the ether is dissolved in a water-soluble, nitrogen-free ether or ester of a polyhydric alcohol (diethylin, diacetin), and any cholesterol present is precipitated by addition of water.

B. FULLMAN.

Production of alkylresorcinols. A. R. L. DOHME, Assr. to SHARP & DOHME, INC. (U.S.P. 1,697,168, 1.1.29. Appl., 16.4.25. Renewed 31.10.28).—See B.P. 250,892; B., 1927, 156.

Manufacture of double salts of carboxylic acids of aromatic sulphonic halogen-alkali-amides. F. PROSCHKO, Assr. to ESSEFF CHEM. IND.-U. HANDELS-A.-G. (U.S.P. 1,697,139, 1.1.29. Appl., 16.1.26. Austr., 25.2.25).—See B.P. 248,339; B., 1927, 59.

Pharmaceutical products. W. SCHOELLER, A. FELDT, M. GEHRKE, and E. BORWARDT, Assrs. to CHEM. FABR. AUF ACTIEN (VORM. E. SCHERING) (U.S.P. 1,685,341—2, 25.9.28. Appl., [A] 9.5.25, [B] 1.6.26. Ger., [A, B] 2.6.24).—See B., 1925, 692.

Purification of camphor (U.S.P. 1,693,243).—See III.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Dye sensitizers and related dyestuffs in the bleaching-out process. M. MUDROVČIČ (Z. wiss. Phot., 1928, 26, 171—192).—The influence of a large number of organic compounds on the bleaching by light of dyes of the thiazine, oxazine, axine, phthalein, and triphenylmethane series in aqueous and alcoholic solution on paper and in gelatin and collodion has been studied.

H. F. GILLBE.

Mercuric cyanide as desensitizer. H. MEYER and R. WALTER (Z. wiss. Phot., 1928, 26, 165—170).—Mercuric cyanide may be employed as a desensitizer by addition to any ordinary organic developer, with the exception of pyrogallol. The mercury exists in the developer in the form of an alkali-mercuric cyanide complex which is not reducible by the developing agent, but exerts an oxidising influence on the colloidal silver; to this influence the desensitising action is to be ascribed.

H. F. GILLBE.

Metallic lustre tinting effects on gelatin photochemically mordanted. A. REYCHLER (Bull. Soc. chim. Belg., 1928, 37, 403—408).—A gelatin plate (thickness of gelatin, 0.0026 cm., of *d* 1.36), sensitized by treatment with potassium dichromate and ammonium carbonate, is exposed to light under a silver negative, which leaves a plate mordanted with chromic oxide. If this is immersed in an acid dye (eosin or acid-violet 3BN), a coloured positive is obtained which, if subsequently treated with a basic dye (malachite-green, fuschin, or crystal-violet, which by direct action on the plate would give a coloured negative), gives, after washing, a negative image of metallic lustre by reflected light, but showing only a coloured positive by transmitted light. The best results are obtained with the following pairs of dyes, eosin-malachite-green, eosin-

crystal-violet (0.05% solutions), or acid-violet (0.06%)-crystal-violet (0.04%). With dyes which are only slightly attacked by dichromate the process may be simplified and modified as follows: the plate is sensitized with the usual dichromate-carbonate mixture to which 0.075—0.125% of eosin has been added. Exposure for a short period under a negative yields (after washing) a positive slightly tinted with eosin. If this is well washed with very dilute ammonia and finally with very dilute hydrochloric acid (1 drop of *N*-acid/50 c.c.), dried, and treated with malachite-green, a positive image which gives a metallic negative by reflected light is obtained. If, on the other hand, the washing with ammonia is omitted and, at the right moment, the dried plate is treated with a neutral bath of malachite-green, it yields a metallic positive. These metallic images are formed by the interaction of the two dyes, and a similar compound (which like the image is soluble in alcohol) is obtained *in vitro* from the two dye solutions. The theory of the formation of these images is discussed.

J. W. BAKER.

Selenium toning processes. A. SEDLACZEK (Brit. J. Phot., 1928, 75, 784—785; 1929, 76, 4—6, 29—31, 44—46).—A brief review of the chemical properties of the chief selenium compounds, and a complete summary of the literature dealing with the many toning processes employing selenium and tellurium.

J. W. GLASSETT.

Determination of the ripened nucleus silver in photographic emulsions. H. KIESER (Z. Elektrochem., 1929, 35, 51—53).—The work of Weigert and Lühr (B., 1929, 73) is discussed, and it is contended that although the "primary" silver postulated by these authors probably does exist in the silver halide, it was not actually determined by the method used by them. Evidence is adduced that the substance determined was in reality silver sulphide. The author's method of determining silver in medium-free silver bromide is described (cf. A., 1928, 1339), and the presence of silver sulphide in the precipitate is ascribed to the adsorption of sodium silver thiosulphate on the silver sol, which accelerates the decomposition of the thiosulphate. It is maintained that so far no satisfactory method has been devised for the determination of small amounts of silver in silver halides.

L. L. BIRCUMSHAW.

See also A., Feb., 135, **Highly sensitive negative emulsions** (KIESER).

PATENTS.

Manufacture of photographic anti-halation plates or films. I. G. FARBENIND. A.-G. (B.P. 292,990, 9.3.28. Ger., 29.6.27).—A backing, which readily strips off in the developer as a coherent skin, may be prepared by coating the rear side of the support for the sensitive emulsion with a mixture made by adding to an alkaline casein solution formaldehyde and a colouring material such as acid black 2B, water-soluble nigrosin D, wool black 4B, or lamp-black.

J. W. GLASSETT.

Reproduction of images on photographic films bearing microscopic refractive elements. Soc.

CIVILE POUR L'ÉTUDE DE LA PHOTOGRAPHIE ET DE LA CINÉMATOGRAPHIE EN COULEURS (B.P. 288,290, 30.3.28. Fr., 8.4.27).—Means are described to avoid the "watering" marks obtained during the reproduction of reticulated films on similar film blanks. J. W. GLASSETT.

XXII.—EXPLOSIVES; MATCHES.

Condenser chronograph [for explosives]. H. RUMPF (Z. ges. Schiess- u. Sprengstoffw., 1929, 24, 13—17).—A method for determining detonation velocities in short lengths of explosive (1—6 cm.) is described in which the arrival of the detonation wave at a certain point of the length of explosive stops the charging of a condenser from a battery. The condenser then discharges through a resistance till the detonation wave reaches a second point in the explosive, when the discharge is stopped. The residual charge of the condenser is then measured, and from it the time taken for the wave to travel between the two points in the explosive can be found. The error in the detonation velocity does not exceed 2% by this method when the distance between the two points in the explosive is known to an accuracy of 1 mm. Experiments on instantaneous fuse gave larger values for the detonation velocity per m. when measured over 5—6 cm. than when measured over 1—2 cm. S. BINNING.

Apparatus for stability tests of smokeless powder at 135° and 120°. J. VON MEERSCHIEDT-HÜLLESSEM (Z. ges. Schiess- u. Sprengstoffw., 1929, 24, 10—13).—The apparatus consists of a covered copper bath fitted with a reflux condenser. To the underside of the cover are soldered a number of metal tubes closed at the bottom but open at the top. The test tubes containing the explosives under examination are inserted in these metal tubes, and a device is provided for removing them simultaneously for examination. The heating medium in the bath is an aqueous solution of glycerin, which has the advantage of being unflammable. Temperatures of 135° and 120° are obtained by taking solutions having d_{21}^{21} 1.24 and 1.20, respectively. S. BINNING.

Determination of the Stauchprobe of explosives. K. F. MEYER (Z. ges. Schiess- u. Sprengstoffw., 1929, 24, 6—10).—Comparison between the methods of Kast and Hess showed that the latter method had certain advantages chiefly in ease of operation. By both methods the amount of compression of the metal cylinder varied with the position of the initiator in the column of explosive under test, being greatest when the initiator was placed in the explosive as far away as possible from the cylinder. By analogy, the primer cartridge in a borehole charge should be at the mouth of the borehole. Experiments with various types of explosive lead to the generalisation that the value of the Stauchprobe in comparing explosives is limited, but when used with explosives of the same type this test gives useful results as a higher compression always implies greater brisance. No such deduction can be made when the explosives tested are of differing types. S. BINNING.

See also A., Feb., 154, **Changes in nitrocellulose when exposed to light** (COFMAN and DE VORE).

Detection of diphenylamine in Powder B. DESVERGNES.—See III.

PATENTS.

Explosive shells. O. MATTER (B.P. 303,975, 25.11.27).—The shell contains a bursting-charge of a compressed brisant explosive, e.g., pentaerythritol tetranitrate, tetryl, etc., and an initiating charge of compressed lead azide or other metallic azide over a compressed brisant explosive, e.g., pentaerythritol tetranitrate. In small-calibre shells the bursting-charge may be initiated by a percussion fuse containing a compressed metallic azide. S. BINNING.

Explosive priming mixtures. REMINGTON ARMS Co., INC., Assees. of J. E. BURNS (B.P. 287,517, 10.2.28. U.S., 23.3.27).—A non-corrosive priming mixture for ammunition contains normal lead styphnate, mercury fulminate, a non-corrosive oxidising ingredient (barium nitrate), and a combustible (antimony sulphide). Lead chromate or the nitrates of lead or potassium may replace the barium nitrate, and the thiocyanates of lead and copper the antimony sulphide. S. BINNING.

XXIII.—SANITATION; WATER PURIFICATION.

Digesting sewage sludge at its optimum p_H and temperature. C. E. KEEFER and H. KRATZ, JUN. (Eng. News-Rec., 1929, 102, 103—105).—A series of samples of fresh sludge (p_H 6.4—8.4) were kept at 28° and the rate of digestion was determined by measurement of the decrease in volatile solid content and of the gas evolved. It is concluded that with p_H 6.8—7.6 digestion is complete in about 30 days, and that about 450 c.c. of methane per g. of fresh volatile solid are evolved. The p_H values were adjusted with lime or hydrochloric acid. Unadjusted sludge (p_H 5.0) was still incompletely digested after 163 days.

C. IRWIN.

Health hazards in chromium plating. J. J. BLOOMFIELD and W. BLUM (U.S. Pub. Health Rep., 1928, 43, 2330—2351).—An atmosphere containing more than 1 mg. of chromium trioxide in 10 m.³ is injurious; injury can be decreased by use of solutions of sodium thiosulphate or hydrogen sulphite, or ammonium polysulphide, and application of oils. Methods of ventilation are described.

CHEMICAL ABSTRACTS.

See also A., Feb., 165, **Determination of thallium [in rat-poisons]** (STICH).

PATENTS.

Treatment of water or sewage. G. ORNSTEIN (B.P. 300,898, 30.10.28. Ger., 19.11.27).—An arrangement is described by means of which chlorine may be dissolved in water and used directly at a predetermined rate, or the chlorine water may be led into a vessel containing broken pieces of metal and the metallic salt thus produced added to the water or sewage, or, again, the two reagents may be applied together at varying rates. C. JEPSON.