

BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

MAY 11, 1928.

I.—GENERAL; PLANT; MACHINERY.

Porosity and permeability as characteristics of porous bodies. O. PHILIPP (Chem. Fabr., 1928, 152—153; cf. Howe and Hudson, B., 1928, 39).—An apparatus is described for determination of permeability by measuring the volume of air which passes through per m.² per min. at a pressure of 25 mm. The results are compared for porous plates of the same thickness prepared by binding particles of definite sizes with varying proportions of binder. S. I. LEVY.

Filter system [for the removal of small quantities of fine solids from large volumes of liquid]. K. KELLER (Chem.-Ztg., 1928, 52, 111—113).—The filter consists of a large closed chamber of sheet metal containing a number of thin vertical filter elements, the insides of which are connected with a receiving tank for clarified liquid. The elements consist of stout metal frameworks on both sides of which are stretched sheets of fine wire gauze. To start the filter a volume of liquid equal to the capacity of the chamber is stirred vigorously in the feed tank with a quantity of fibrous material, such as asbestos, equivalent to 150 g./m.² of filter surface; this mixture is then pumped into the filter chamber under a pressure of 5 m. of water, whereby a thin film of filtering material is formed over the wire gauze surfaces of the filter elements. After this film has formed, filtration may be carried on continuously, the liquid being passed to the filter from a feed tank situated 2—3 m. above it. After operations have ceased, the cake of solids may be readily removed in one piece from the surface of the gauze. A. R. POWELL.

Properties of powders. IX. Scattering of light by graded particles in suspension. T. M. LOWRY and M. C. MARSH (Trans. Faraday Soc., 1928, 24, 195—201).—See B., 1928, 175.

PATENTS.

Regenerative reversing furnace. J. KENNEDY (U.S.P. 1,657,401, 24.1.28. Appl., 7.5.21).—During the first half of each regenerative cycle the outgoing hot gases are passed through the entire space of one regenerator while the incoming air is passed first through one portion and thereafter through another portion of the other regenerator, and during the second half-cycle similar operation is effected with the flow through the furnace reversed and the functions of the regenerators interchanged. H. HOLMES.

Furnaces or gas-producers burning pulverised solid or liquid fuel. E. S. SUFFERN, GASIFIED FUEL, LTD., H. E. HAZELHURST, and O. MARGETSON (B.P. 284,738, 1.9.26 and 10.2.27).—The fuel is incompletely burnt in a primary combustion chamber, into which the

fuel is projected at an angle, and is deflected from the walls so that the path of the fuel and primary air forms a loop; the outlet to the secondary combustion or heating chamber is restricted so that the temperature of the primary chamber will be maintained and the flame passing through the construction not extinguished. The primary chamber may be portable and applied to the front of a Lancashire or similar boiler. B. M. VENABLES.

Combined drying-chamber plant and grate furnace. G. HERRMANN (B.P. 285,546, 15.11.26).—A firing chamber, heat-absorbing checker-work chamber, a drying chamber, and a chimney are arranged adjacent to each other. The checker-work is first heated by the fire, the gases not passing through the drying chamber. After the fire is extinguished air is drawn through all three chambers. B. M. VENABLES.

Drying channel or tunnel. H. WINKLER (B.P. 284,747, 28.10.26).—A drying channel is divided into various zones with re-heating elements alongside. A portion of the air in each zone circulates continually through the drying channel and heater of that zone, but a portion is taken from the pressure side of the fans or wind wheels and delivered to the next heating zone. B. M. VENABLES.

Conical crushing mill. C. F. SMITH, A. C. THIELE, and L. P. WALKER, ASSRS. to SMITH ENGINEERING WORKS (U.S.P. 1,663,355, 20.3.28. Appl., 21.5.26).—The mill comprises a rotating conical casing with a conical crusher inside it mounted on a shaft set at an angle to the axis of the casing. The supports for the shaft are situated beyond the ends of the casing, one acting as a pivot and the other constructed so as to allow a certain freedom of movement of the shaft and crusher. L. A. COLES.

Vibrating apparatus for screening, sorting, drying, etc. A. KUHN (B.P. 285,638, 2.2.27).—A W-shaped spring for supporting the vibrating frame in flexible relation to the fixed support is described. The supporting rod for the frame is secured to the centre points of the W-springs. Springs of other shape (e.g., helical) may be used. B. M. VENABLES.

Separating or classifying machine. W. A. RIDDELL (U.S.P. 1,661,501, 6.3.28. Appl., 10.12.25).—A hopper is provided with a number of longitudinal rotating rollers, the distance between which is capable of adjustment, together with a number of longitudinal guide plates held firmly above the gaps between the rollers. A. R. POWELL.

Treatment of granular material in mixing and filtering vats. J. CARLIER (B.P. 285,979, 24.11.26).—Fluid under pressure is supplied to the mass through a

hollow rake which is gradually lowered into the vat while rotating. B. M. VENABLES.

Centrifuges. L. ALTPETER (B.P. 284,831—2, 24.12.26).—(A) In a centrifuge of which the bowl comprises two cones base to base which are separated to discharge collected solids, a method of sealing the joint is described in which the packing material is the collected solid itself. (B) In a centrifugal bowl, methods are described by which clear, separated liquid may be drawn off through outlets which are part of the bowl, but which may be adjusted to different depths while the bowl is running. B. M. VENABLES.

Centrifugal separators. LAUGHLIN FILTER CORP., ASSEES. OF W. C. LAUGHLIN (B.P. [A] 279,896, 29.10.27. U.S., 30.10.26. [B] 283,918, 8.11.27. U.S., 20.1.27).—The material is fed through a hollow shaft (which may be horizontal) to the annular and triangular space within a frusto-conical rotor, and thence through ports to the exterior thereof. On the exterior is a helical blade or upstanding flange which is in close contact with an outer frusto-conical rotor. The two rotors are driven positively at slightly different speeds (the outer one being on a sleeve shaft), so that the heavy collected material is pushed by the helix to the small end of the outer cone and there discharged. The lighter material is discharged round an annular baffle extending inwards at the base of the outer cone. In (B) holes are provided at or near the root of the helix at the smaller end, so that semi-separated material has a chance to flow back and become properly separated. B. M. VENABLES.

Centrifugal drying apparatus. E. D'HOOGHE (B.P. 283,466, 9.1.28. Belg., 8.1.27).—The whole machine is slung by ball and socket bolts so as to be quite free from rigid restraint. The drive is by friction bevels, which are moved out of engagement for stopping, and a band brake is provided; both are operated by the same lever. B. M. VENABLES.

Washing of minerals by means of liquid streams. A. FRANCE (B.P. 285,987, 24.11.26).—The pulp flows in a launder of inclination suitable to produce stratification, and the heavier mineral drops through slots in the bottom of the launder against a rising stream of water, and is re-treated by other rising streams of water in a separate apparatus. B. M. VENABLES.

Controlling the movement of masses of solids of various sizes. L. E. W. PIODA (U.S.P. 1,663,173, 20.3.28. Appl., 26.12.23).—Air entrapped by solids of unequal size in their movement towards an outlet at the bottom of a container is released and passed to vents before the solids reach the outlet. F. G. CLARKE.

Making and delivering quantitative mixtures. T. MACRAE (U.S.P. 1,663,206, 20.3.28. Appl., 25.6.23).—Predetermined charges of materials, after separation from bulk, are spread in the form of thin parallel sheets and mixed by forcibly impacting the sheets against each other. The mixture is separated into charges which are successively mixed with water in a chamber and discharged at the place of use under pressure. F. G. CLARKE.

Emulsification apparatus. G. C. HURRELL (B.P. 285,159, 13.11.26).—The emulsifier, suitable for manufacture in small sizes, comprises a piston pump with an

automatic inlet valve, but no outlet in the ordinary sense, the emulsion being forced through the working clearance between the cylinder and piston. B. M. VENABLES.

Emulsifying machine. A. C. E. ANDERSEN-ORRIS (B.P. 284,910, 17.5.27).—The materials are passed through small circuitous passages formed between a rapidly-rotating disc and a plate screwed thereto. B. M. VENABLES.

Automatic hydraulically-operated extraction presses. SOC. ANON. DES ATELIERS ARMAND & DÉOUNE (B.P. 262,072, 1.11.26. Fr., 26.11.25).—The material is pressed between a hydraulic ram and a fabric-covered end bed-plate, being surrounded by a sliding collar. The ram being withdrawn, the material is charged by gravity through an aperture in the collar; during the first motion of the ram this aperture is closed, the ram continues and expresses the liquid, the ram is slowly withdrawn, and meanwhile the collar is moved in the same direction at a faster speed by means of auxiliary rams. The pressed cake is thus freed and can be withdrawn either upwards or downwards by moving the filter cloth, which is in the form of a long strip wound on rollers at each end. The collar and, if desired, the face of the ram are lined with filter fabric. B. M. VENABLES.

[Edge] filters. E. W. PATISON. FROM METAL EDGE FILTER CORP. (B.P. 285,127, 9.11.26).—In an edge filter of which the pack is composed of metal sheets or the like, spacing of the sheets is effected by electro-deposition of metal on them locally, the spots being formed by coating the rest of the surface with insulating material which is removed after the electrodeposition. B. M. VENABLES.

Filtering apparatus and filters for gasoline or other liquid fuels. SOC. DU CARBURATEUR ZÉNITH (B.P. 279,382, 30.5.27. Fr., 23.10.26).—A float-operated valve is provided to discharge air or gases from the prefilter to the filtrate side, in cases where the pressure available across the filter is insufficient to force the gas through the filter. B. M. VENABLES.

Carrying out catalytic chemical processes. J. TRAUTMANN (B.P. 261,787, 20.11.26. Ger., 21.11.25).—In carrying out chemical reactions in which a molten metal, alloy, or salt in a finely-divided form is used as a catalyst, a bath of the molten catalyst is formed in the reaction chamber and subjected to a centrifugal or threshing operation so as to break up the catalyst into fine spherical particles which are brought into contact with the reacting materials. Means are provided for heating the charge electrically with either external or internal heating elements. A. R. POWELL.

Catalytic apparatus. A. O. JAEGER, Assr. to SELDEN Co. (U.S.P. 1,660,511, 28.2.28. Appl., 19.1.27).—An apparatus for carrying out catalytic reactions comprises at least one automatic gas-cooled converter with means for providing a cooling effect which increases with the velocity of the reacting gases through the converter, and at least one converter of much less effective cooling capacity, the connexions between the two converters being also provided with means for cooling the gases as they pass from one to the other. The first converter contains a layer of catalyst in which are embedded heat-exchanging elements, and means are

provided for passing the reacting gases through these elements out of direct heat-exchange with the catalyst and back through part of the elements in direct heat-exchange with the catalyst, thence through the catalyst.

A. R. POWELL.

Production of cold. K. BERGL and W. DIETRICH (B.P. 268,358, 23.3.27. Ger., 29.3.26).—An inexpensive organic fluid, which is soluble in water and which will evaporate at about 0° in a moderate vacuum, is placed in a closed container surrounded by the material to be chilled and evaporated by means of a water-jet pump. The liquid is preferably soaked up by an absorbent material in the cooling chamber.

B. M. VENABLES.

Manufacture of friction bodies for brake and clutch purposes. KIRCHBACH'SCHE WERKE KIRCHBACH & Co. (B.P. 272,478, 24.5.27. Ger., 9.6.26).—Blocks adapted to minimise overheating are composed of impregnated asbestos fibres mixed with finely-divided grey cast-iron, the metal being preferably in excess. The impregnating material is a bakelite or other artificial resin varnish.

H. HOLMES.

Adsorption treatment of fluids for the purification thereof or separation of valuable constituents therefrom. H. HOLLINGS, S. PEXTON, W. A. VOSS, and GAS LIGHT & COKE Co. (B.P. 284,758, 2.11.26 and 26.1.27).—Adsorbent material, such as the activated charcoal used for extraction of benzol from coal gas, is protected from the deleterious action of iron carbonyl and other "adventitious" impurities by a pre-filter or other means, and formation of iron carbonyl is prevented in the absorbing vessel by coating (or constructing) the walls with iron-free material.

B. M. VENABLES.

Colloidal dispersion of materials in fluids. J. BOURDAIS (B.P. 285,258, 1.3.27).—The material is forced through a fixed or rotating grid-like structure preferably by means of a centrifugal rotor provided with jets.

B. M. VENABLES.

Introduction of semi-liquid materials into high-pressure vessels. SYNTHETIC AMMONIA & NITRATES, LTD., and H. A. HUMPHREY (B.P. 286,324, 27.9.26).—An auxiliary pressure-resisting vessel is filled with the material, which is then forced out of the auxiliary vessel into the main vessel by means of another fluid at high pressure. The two fluids may be in direct contact, or the auxiliary vessel may comprise the smaller cylinder of a two-diameter hydraulic piston operated by the high-pressure fluid.

B. M. VENABLES.

Air classifiers. A. H. STEBBINS (U.S.P. 1,660,682—7, 28.2.28. Appl., [A] 8.1.26, [B, C] 24.9.26, [D] 29.1.27, [E, F] 1.2.27).—Various forms of air separator without inherent moving parts are described; in (A) the heavier particles are separated by their inertia in a straight line, and in (B—F) centrifugally.

B. M. VENABLES.

Production of foam for fire-extinguishing purposes. EXCELSIOR FEUERLÖSCHGERÄTE A.-G., and O. TREICHEL (B.P. 263,812, 23.12.26. Ger., 24.12.25).—A suspension of a foam developer, *e.g.*, saponin, in a protective colloid, *e.g.*, albumin solution, is added either dry or in solution to a water-gas mixture; alternatively, the foam developer as a powder is mixed with a powder insoluble in water, *e.g.*, china clay.

W. G. CAREY.

Gas analysis recorder. O. RODHE, ASSR. to SVENSKA AKTIEBOLAGET MONO (U.S.P. 1,661,049, 28.2.28. Appl., 29.11.22. Swed., 6.12.21. Renewed 14.1.28).—The indicating member of the recorder, operating discontinuously, is controlled by a valve in connexion with a float. Means are provided for opening the valve in one extreme position of the float to release the indicating member, and for closing the valve in the other extreme position of the float to lock the indicating member.

H. HOLMES.

Pyrometer. A. A. GRUBB, ASSR. to OHIO BRASS Co. (U.S.P. 1,660,504, 28.2.28. Appl., 6.8.25).—A base-metal couple is enclosed in a tapering metal sheath which is compressed at its lower end to form an intimate contact with the hot junction and inside which the elements are insulated from each other and from the sheath.

A. R. POWELL.

[Continuous] viscosimeters. W. A. NIVLING (B.P. 274,479, 13.7.27. U.S., 13.7.26).—The liquid, of which the viscosity is to be continuously recorded, is pumped at a constant rate into a closed vessel in which air or gas is trapped, and which is provided with a constricted outlet for the liquid, the pressure of the gas is then a measure of the viscosity. A thermometer and excess-pressure safety device may be provided.

B. M. VENABLES.

Hydrometer. C. E. LINEBARGER (B.P. 284,916, 27.5.27).—A hydrometer tube, preferably containing "Chaslyn balls," is adjustably attached to the vent plug of an accumulator (or other vessel) so that it can be used to indicate the level of the liquid as well as its density.

B. M. VENABLES.

Apparatus for testing permeability of materials. A. ABRAMS (U.S.P. 1,660,024, 21.2.28. Appl., 4.5.27).—Material to be tested is releasably clamped in an opening in an exposed lateral face of a container for liquid. The container is secured to a base and has connexions for the supply and discharge of liquid and for maintaining a head of liquid. The clamp is operable without disturbing either connexions or container.

H. HOLMES.

Centrifugal machine. V. REDLICH (U.S.P. 1,663,731, 27.3.28. Appl., 4.5.26. Austr., 19.5.25).—See B.P. 252,339; B., 1926, 775.

Apparatus for treatment of gases. E. STRÖDER, ASSR. to I. G. FARBENIND. A.-G. (U.S.P. 1,663,734, 27.3.28. Appl., 29.2.24. Ger., 6.4.23).—See B.P. 213,521; B., 1924, 456.

[Charging hopper for] kilns. E. SOBEK (B.P. 286,956, 15.7.27).

Extraction of vapour, particles, etc. from [engine] gases. D. McC. SHANNON (B.P. 285,928, 26.8.26).

II.—FUEL; GAS; TAR; MINERAL OILS.

Laboratory methods for the determination of the yields of coke and by-products from coal. K. BRÜGGEMANN (Brennstoff-Chem., 1928, 9, 59—61; cf. Müschenborn, B., 1927, 576).—The difficulties in the determination of the yields of coke and by-products from the carbonisation of coal in the laboratory so that the results shall be directly applicable to large-scale practice are discussed. The yield of coke is readily determined with accuracy, but the determination of the

yields of tar and benzol from the carbonisation of 15–20 g. of coal is subject to comparatively large errors. Even when the heating conditions are adjusted to approximate closely to those in the coke oven itself the yield of tar may, on account of unavoidable losses, be 20–25% below that obtained on the large scale. The ammonia can be determined sufficiently accurately when account is taken of the ammonium chloride which has condensed with the tar. One calcium chloride tube only is insufficient for drying the gas before absorbing the benzol, and the interposition of a phosphorus pentoxide tube is recommended. For the benzol absorption either two tubes of active charcoal or "potash" bulbs charged with paraffin oil and maintained at 0° may be used. The latter method gives yields more closely agreeing with large-scale practice than the former, which may give values 20–25% too high. The gas yield, like that of the tar, depends on suitable control of the heating, and it is recommended that gas heating be replaced by electrical heating in all laboratory determinations.

A. B. MANNING.

Progress in research on the properties of coke for blast-furnace use. R. A. MOTT (Gas World, 1928, 88, Coking Sect., 44–49).—A review of the progress in oven design and operation followed by preliminary results of research carried out at Sheffield University on behalf of the Blast-Furnace Coke Research Committee, Yorkshire and Derbyshire Coalfields. Cokes of known blast-furnace value have been selected and a number of tests applied designed to measure their mechanical strength and manner of burning under blast-furnace conditions. A shatter test, indicative of the resistance of a coke to break-up on dropping or impact, is carried out by dropping 50 lb. of coke of a size greater than 2 in. four times from a height of 6 ft. on to a steel plate. The residue is sieved and the percentage remaining on a 2 in. screen is called the "shatter index." The mean of three tests is a reliable index of the general blast-furnace value of a coke. Losses obtained in an abrasion test were insufficient to account for the large differences in coke consumption occurring in practice. Combustibility tests comprising the analyses of gas made by the combustion of coke in a furnace at specified rates of air supply show that the better blast-furnace cokes have lower combustibility values than poor blast-furnace cokes, and that easy combustibility is not desirable. The combustibility value gives the percentage gaseous carbon as a percentage of the maximum possible.

H. S. GARLICK.

Melting of fuel ash. K. BUNTE and K. BAUM (Gas-u. Wasserfach, 1928, 71, 97–101, 125–130).—Three points can be distinguished in the melting of an ash sample moulded into a cone: the softening point as shown by the base, the melting point when the cone has settled into a ball, and the fluid point when all shape is lost. The m.p. is lowest with a semi-reducing atmosphere as on a furnace grate, and such should be used. The authors use a cylindrical test specimen 30 mm. long and 30 mm. diam. placed within a vertical heating tube in an electric furnace and having graphite electrodes in contact with the upper and lower ends of the specimen. The upper one is movable, and its position is recorded on a revolving drum so that a record of the length of the specimen

during heating is obtained. Temperatures are recorded by a thermocouple. The specimen is prepared from ash which passes 400-mesh and is moulded in a bronze mould with 10% of dextrin. Finer grinding makes no difference. Uniform heating is essential, but no difference was noticed between a rate of 5° and 8° per min. The specimen showed a slight expansion before softening, then a sharp drop which in some cases was in two stages. A high-silica ash of this type showed a softening interval of no less than 470° due presumably to chemical changes. Possible chemical compounds that may occur in ash are discussed, and the difficulty of forecasting the m.p. from the elementary composition is indicated. The authors' results are compared with those of other workers, and the conclusion is drawn that the most that can be done by such tests is to arrange a series of coals in order of fusibility of the ash.

C. IRWIN.

Melting points of coal ash. D. J. W. KREULEN (Chem. Weekblad, 1928, 25, 192–194).—The finely-powdered ash is ignited at a red heat, cooled, moistened with water, moulded into a slender pyramid which is mounted on a clay base, and heated in a Meker muffle, temperatures being recorded by a thermocouple. Details of the manipulation and apparatus are given.

S. I. LEVY.

Conversion of methane into hydrogen and carbon monoxide. F. FISCHER and H. TROPSCH (Brennstoff-Chem., 1928, 9, 39–46).—The effect of 20 different catalysts on the reaction $\text{CH}_4 + \text{CO}_2 \rightarrow 2\text{CO} + 2\text{H}_2$ at 850° has been studied. Copper, iron, molybdenum, and tungsten had a negligible catalytic effect; cobalt and nickel were equally active, giving a 50% conversion under the experimental conditions, but their activity was greatly increased by the addition of alumina, a nickel-alumina catalyst giving a 95% conversion. Porous pot proved to be the most suitable support for the catalyst, other materials breaking down after a time. By mixing a purified coke-oven gas with carbon dioxide in the proportion 4:1 and passing the mixture over one of the more active catalysts at 850–870°, the methane was almost completely converted into hydrogen and carbon monoxide. At the same time the unsaturated hydrocarbons were completely decomposed and the organic sulphur compounds were converted into hydrogen sulphide. By the passage of a mixture of coke-oven gas and water vapour over the same catalysts at 860–930° the reaction $\text{CH}_4 + \text{H}_2\text{O} \rightarrow \text{CO} + 3\text{H}_2$ was made to proceed almost to completion, and a gas was thereby obtained of composition suitable for the benzine synthesis. It was not possible to bring about a complete decomposition of the methane by passage of this mixture over heated coke, even at 1000° with a large excess of water vapour and a slow rate of passage of the gas.

A. B. MANNING.

Continuous vertical-retort practice at Oldbury. J. POULSON (Gas J., 1928, 182, 50–59).—Comprehensive results are given of a series of tests with an installation of Glover-West vertical retorts on certain commercially available coals. The tests comprised the carbonisation of (a) North Staffordshire coals, (b) Derbyshire coals for the production of gas of 450 B.Th.U. gross per cub. ft., (c) Yorkshire coals for the production of gas of 450 and

475 B.Th.U. gross per cub. ft., (d) a mixture of North Staffordshire, Derbyshire, and Yorkshire coals with North Wales slack, for the production of gas of 460 B.Th.U. per cub. ft.; a continuous test was made of the operation of a Spencer-Bonecourt horizontal waste-heat boiler, during the period of the above tests. All procedure and analyses follow as closely as possible the routine and methods of the Fuel Research Board, and the results demonstrate the superiority of the continuous vertical system of carbonisation over the intermittent system.

H. S. GARLICK.

Walther Feld [ammonium] polythionate process [for coal gas]. E. TERRES and F. OVERDICK (*Gas-u. Wasserfach*, 1928, 71, 49—53, 81—86, 106—110, 130—136; cf. B., 1912, 430).—The Feld process for the removal of ammonia and sulphur from coal gas by washing with ammonium tetrathionate, work on which ceased with the inventor's death in 1914, has been re-examined, with especial reference to temperature and concentration conditions and reaction velocities. The analytical work, involving the determination of sulphate, sulphite, thiosulphate, and polythionates in aqueous solution, is complex. Thiosulphate may be detected quantitatively by mixing the solution with an equal volume of 10% ammonium molybdate and pouring over concentrated sulphuric acid. A deep blue ring at the surface of contact distinguishes it from sulphite and polythionate. Trithionate may be distinguished from tetra- and pentathionate with mercurous nitrate solution. Mercuric chloride solution also reacts differently with the different acids, and on this methods of determination are based, the free acid liberated being titrated. The regeneration step, in which ammonium thiosulphate in saturated solution is converted by the action of sulphur dioxide into polythionate, was performed at 0°, 25°, and 35°. With small concentrations of sulphur dioxide sulphur separates and sodium sulphite is formed in solution; with higher concentrations the latter disappears. Sodium tetrathionate then separates, whilst the solution contains thiosulphate in decreasing proportions with increase of sulphur dioxide content. The reaction was greatly accelerated by the presence of a trace of potassium arsenite. It affords a convenient means of preparing pure tetrathionate. The partial pressures of these solutions with respect to ammonia, sulphur dioxide, and water vapour at various sulphur dioxide concentrations were determined. That of ammonia was always very small. At 35° the sulphur dioxide partial pressure was less than at 25° for similar concentrations, and was such that burner-gas containing 10—12% SO₂ might be used for the reaction. If ammonia is present in excess in the solution the conversion of thiosulphate into tetrathionate does not occur, the solid salt deposited being either the thiosulphate or the sulphite. If the liquor is now used for washing ammonium sulphide from coal gas, sulphur is precipitated and thiosulphate remains in solution and can be regenerated as usual. A series of solubility curves of the systems ammonium thiosulphate-ammonium sulphite-water and the same with addition of sulphur dioxide is given. The absorption reaction in which ammonia, ammonium sulphide, and ammonium carbonate interact with ammonium tetrathionate with production of thiosulphate is next studied in a similar

way, the temperature being maintained at 25°. A slight initial decomposition of tetrathionate into sulphate and sulphur occurs, followed on the introduction of further ammonia or ammonium salts by conversion into thiosulphate. With ammonia alone the Feld reaction would, therefore, gradually pass into the Burkheiser reaction, proceeding afterwards as indicated above. Under practical conditions there is at least the ammonia equivalent of hydrogen sulphide present. In this case the reaction proceeds smoothly; with excess of hydrogen sulphide more slowly. Partial pressures are much lower than with ammonia alone. The reaction with ammonium carbonate is slow and complicated, the products in addition to ammonium thiosulphate including the sulphate and trithionate. This reaction is, however, considered to be unimportant in practice. Accumulation of ammonium sulphate in solution reduces the solubility of ammonium tetrathionate. It is concluded that the regeneration step is practicable with the help of potassium arsenite as catalyst, and that the absorption proceeds smoothly if ammonia and hydrogen sulphide are equivalent; if the latter is in excess a following treatment with ammonium sulphate will remove it. C. IRWIN.

Desulphurising action of silica gel and failure of the lamp combustion [method for the determination of sulphur] in the presence of mercaptans. H. I. WATERMAN and M. J. VAN TUSSENBROEK (*Brennstoff-Chem.*, 1928, 9, 37—39; cf. B., 1927, 179).—By shaking kerosene containing sufficient ethyl sulphide to bring its sulphur content to about 1% with 50% of its weight of silica gel about 33% of the sulphur was removed. Similar results were obtained with kerosene solutions of propyl sulphide and the corresponding disulphides, but the adsorptive power of the gel appears to decrease as the mol. wt. of the dissolved sulphur compound increases. The fineness of subdivision of the gel had little effect on the amount of sulphur removed. Treatment with silica gel removed sulphur also from kerosene solutions of mercaptans, but no accurate quantitative results were obtained owing to the failure of the lamp method for determining sulphur in the oils. In the presence of mercaptans this method gave low results, due probably to the formation of asphalt-like substances containing sulphur which were deposited on the wick.

A. B. MANNING.

Reducing power of adsorptive carbons. J. VAŠÁTKO (*Z. Zuckerind. Czechoslov.*, 1928, 52, 221—226).—Decolorising carbons not only have a marked adsorbent capacity for iron salts, but in varying degree they bring about reduction. On shaking them with dilute ferric chloride solution, the adsorptive equilibrium is usually attained in a few minutes; but reduction, although rapid at first, continues slowly for some hours. In experiments described, twelve different carbons, in amounts from 1 to 6 g., were shaken for 3 hrs. at 20° with 100 c.c. portions of 0.5% ferric chloride solution slightly acidified with hydrochloric acid. With 1 g. of the samples the proportion of the total iron reduced ranged from 39% (Carbo animalis) to 11% (Carboraffin H), except for bone char ("Spodium K"), which reduced only 3%. The carbons tested were the same as those employed in previous experiments on the decomposition of sucrose (B., 1928, 29), and it was observed that those

most active in decomposing sucrose were least active in reducing ferric salts, and *vice versa*. J. H. LANE.

☞ **Corrosion in gas-supply practice.** F. C. SMITH (Gas J., 1928, 182, 118—123).—Investigation into the cause of corrosion of gas-supply mains and services showed that iron tubing does not corrode in the absence of liquid water. Oxygen and water will bring about corrosion; the presence of carbon dioxide is not essential for the production of iron oxide, but its presence greatly accelerates the rate of corrosion. In conditions obtaining in a gas main, iron would, in the presence of carbon dioxide, pass into solution in water as ferrous carbonate, and be precipitated by any oxygen in the gas. The finely-divided oxide thus formed is easily transported by gas moving at the usual velocities, and is carried forward to build up an obstruction at any point of resistance. The best methods for preventing corrosion are either to dry the gas, thus rendering the oxygen and carbon dioxide harmless, or to remove the oxygen, thus leaving ferrous bicarbonate in solution. A method of measuring the rate of corrosion of specimens of iron is illustrated, in which the fall in resistance in ohms of a conductivity cell containing iron immersed in water saturated with carbon dioxide is plotted against the time in hours. H. S. GARLICK.

Chemical processes occurring in the hydrogenation of sphagnum under pressure. H. I. WATERMAN and J. N. J. PERQUIN (Brennstoff-Chem., 1928, 9, 57—59; cf. B., 1926, 974).—A mixture of 50 g. of sphagnum and 150 g. of oil (Edeleanu extract) was heated at 450° with hydrogen under pressure. Comparison of the product with that from a blank experiment on the Edeleanu extract alone showed that the yield of oil from the hydrogenation of the sphagnum amounted to over 14%, calculated on the dry, ash-free material; in addition, considerable quantities of carbon monoxide, carbon dioxide, and water were evolved. After being kept for some days the oil deposited an asphalt-like substance which was insoluble in xylene. A similar phenomenon has been observed in oils produced by the berginisation of coal. Precautions should be taken to prevent such a deposition during hydrogenation, which would lead to the formation of coke in the bomb. It is advisable, therefore, to work in a stable fluid medium, to avoid too high a temperature and too long a period of heating, and if possible to remove the light-boiling products as they are formed. Vegetable oils are hydrogenated under pressure without difficulty, owing to their low oxygen content. A. B. MANNING.

☞ **Ultramicroscopical examination of asphalt.** F. J. NELLENSTEYN and J. P. KUIPERS (Chem. Weekblad, 1928, 25, 190—192).—The examinations were carried out at a magnification of 1000, with cedar oil immersion. Artificial asphalts do not readily show active motion, but after shaking with Portland cement give the same results as the natural asphalts; the colloidal structure of asphalts is not due to the inorganic constituents. The activity depends on the solubilities and on the surface tensions of both the asphalt and the solvent; the best results are obtained when the surface tension of the solvent is somewhat higher than that of the solute. Hence the results with a solution of coal tar in carbon

disulphide are not comparable with those obtained with a solution of asphalt in the same solvent; for strict comparison, a solvent of surface tension about 30 should be used with asphalt, and of about 42 with coal tar.

S. I. LEVY.

Composition of the products obtained in the synthesis of petroleum. F. FISCHER and H. TROPSCH [with H. KOCH] (Brennstoff-Chem., 1928, 9, 21—24).—The gasol, benzene, and petroleum fractions of the synthetic petroleum obtained by the catalytic reduction of carbon monoxide at ordinary pressures (B., 1926, 475) have been examined. The gasol consists of ethane, propane, and butane, together with the corresponding olefines; after 24 hrs.' operation an iron-copper catalyst gave a product containing 26.5% of olefines, whilst after 65 hrs. the proportion rose to 36%. The benzene (initial b.p. 59°), of which 95% distilled below 185°, had d_4^{20} 0.7135, iodine value 161, and contained 65% of unsaturated hydrocarbons. The latter are probably simple olefines, the benzene being stable to light and air and showing no tendency to discolour or deposit gums. By varying the experimental conditions it is possible to obtain more highly saturated benzenes if desired. *n*-Octane, *n*-nonane, and *isomonane* were identified in the saturated hydrocarbons remaining after exhaustive extraction with fuming sulphuric acid of a fraction of boiling range 125—150°. The iodine value of the petroleum fraction varied considerably with the experimental conditions, *e.g.*, from 8.7 to 64.7. It increased with the gas velocity and with the age of the catalyst. The water-soluble organic products of the reaction amounted at most to 2% of the total products, and consisted principally of aldehydes and ketones. In addition to theories of the mechanism of the reaction previously suggested (*loc. cit.*), the possibility of the formation of hydrocarbons of high mol. wt. which subsequently undergo a type of cracking process is briefly discussed.

A. B. MANNING.

Alumina gel as a desulphurising agent in petroleum refining. J. K. CHOWDHURY and R. C. BAGCHI (J. Indian Chem. Soc., 1928, 5, 111—125).—Alumina gel (water content 6%), activated under optimum conditions by the ignition of aluminium hydroxide at 350—400°, absorbs a large number of sulphur compounds from their solutions in petroleum, and more especially those in which the sulphur is contained in an oxidised form. Thus a preliminary oxidation of solutions of bivalent sulphur compounds by the passage of air in the presence of alumina gel leads to more complete adsorption (cf. G.P. 405,850; B., 1925, 179). Adsorption is also increased by the use of large amounts of very finely-divided alumina gel, but these modifications involve loss of petroleum and difficulties of filtration. Admixture of activated carbon with the gel yields an adsorbent which is more efficient than either of its components. More pronounced results are obtained by the use of a mixture of alumina and silica gels, prepared by the precipitation of alumina gel on silica gel followed by ignition at 230—235°. No increase in activity is obtained by the precipitation of the alumina on an inert surface such as powdered glass or pumice. Alumina gel may be reactivated by treatment with superheated steam and air. The application

of Freundlich's equation in the examples in which the pure gel is used show that the action is one of true adsorption.

G. A. C. GOUGH.

Determination of aromatic and unsaturated hydrocarbons in light petroleum. E. H. RIESENFELD and G. BANDTE (Brennstoff-Chem., 1928, 9, 30).—Kattwinkel (B., 1928, 78) has overlooked a later publication of the authors in which some of their previous results are corrected (cf. Auto-Technik, 1927, 16, 7).

A. B. MANNING.

Standardisation of oil testing. H. SCHLÜTER (Chem.-Ztg., 1928, 52, 261—264).—An apparatus is described by the use of which uniform results are obtained in the open flash-point test, the chief cause of variations in the existing method being the lack of precision in placing the thermometer with relation to the bottom of the vessel.

S. I. LEVY.

Ammonium sulphate. SCHRAMM, also WEINDEL.—See VII. **Concrete in gas works.** ORTHAUS.—See IX. **Active carbons.** MRASEK, also NOSEK.—See XVII.

PATENTS.

Coke ovens. N. V. SILICA EN OVENBOUW MIJ., Asses. of C. OTTO & Co. G.M.B.H. (B.P. 272,942, 16.6.27. Ger., 16.6.26).—In coke ovens with adjacent upflow and downflow heating flues connected at the top and bottom, the openings at the bottom are provided with regulating devices, e.g., sliding bricks, which can be adjusted from the outside, so that the supply of waste gas can be readily controlled. A. B. MANNING.

Coking retort oven. J. VAN ACKEREN, Assr. to KOPPERS Co. (U.S.P. 1,660,658, 28.2.28. Appl., 13.10.22).—A coking retort oven is made up of a number of coking chambers having heated walls constituted alternately of intercommunicating vertical combustion flues and outflow chambers, which communicate with a system of recuperators and regenerators.

C. O. HARVEY.

Carbonising and gas-making apparatus. P. PLAN-TINGA (CLEVELAND TRUST Co., Exors.) (U.S.P. 1,663,522, 20.3.28. Appl., 21.12.22).—The apparatus consists of a carbonising chamber surrounded by a jacket, both of which communicate with a gas producer.

C. O. HARVEY.

Apparatus for treatment of marine algæ. G. J. B. CHAMAGNE (B.P. 275,998, 11.8.27. Fr., 11.8.26).—Marine algæ are carbonised in a furnace in which they slide under their own weight down an inclined bed as they burn, the supply of air being so regulated that only incomplete combustion at a low temperature occurs, and loss of volatile iodine and bromine compounds is avoided. The material passes from the inclined bed to a horizontal bed where the carbonisation is completed, and thence to an extinguisher arranged below the inclined bed of the furnace, in which the carbonised material cools. Water tubes within the carbonisation chamber provide means for cooling the latter and at the same time recovering part of the heat liberated therein.

A. B. MANNING.

Production of high-grade products from raw coal. F. L. KÜHLWEIN, Assr. to CHEM. FABR. IN BILLWÄRDER VORM. HELL & STHAMER A.-G. (U.S.P.

1,660,009, 21.2.28. Appl., 21.3.27. Ger., 30.12.26).—A mixture containing coal and clayey ingredients is separated by dispersing the clayey matter with a weakly alkaline solution of a xanthate. C. O. HARVEY.

Preparation of liquid fuels for combustion. F. B. DEHN. From GASONE CORP. (B.P. 286,386, 9.12.26).—An emulsion of the fuel with an expansible medium is produced by passage through a system of pumping cylinders and mixing chambers, wherein the initial pressure of mixing is about 100 lb./in.², and the final pressure may be as high as 3000 lb./in.² E.g., an emulsion of oil, water, and air of predetermined composition may be produced, the pressure being released only at the moment of injection into the cylinder of an internal-combustion engine. C. O. HARVEY.

Drying of fuel gases. C. COOPER and W. C. HOLMES & Co. (B.P. 285,936, 21.10.26).—The gases are passed through a washer containing a hygroscopic liquid, and means are provided for circulating the liquid independently through (a) a heat-exchanger in order to dissipate the heat developed during absorption of moisture from the gas, and (b) an evaporator for reconcentrating the liquid. A. B. MANNING.

Purification of illuminating gas. SOC. DU GAZ DE PARIS (B.P. 278,700, 29.9.27. Fr., 11.10.26).—The gas is passed first through a mixture of a solution of a ferrous salt with milk of lime, and then through a suspension of the powdered solid, consisting of ferric hydroxide mixed with sulphur and calcium salts, obtained by filtering the product from the first stage and oxidising the residue in air. The hydrocyanic acid, together with part of the hydrogen sulphide, is removed in the first stage, and the remaining hydrogen sulphide in the second. The suspension used in the second stage is regenerated at intervals by the passage of air. A. B. MANNING.

Simultaneous absorption of ammonia and hydrogen sulphide from industrial gases. W. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 285,999, 26.11.26).—Ammonia and hydrogen sulphide are recovered from industrial gases by simultaneous absorption in an aqueous ammonium sulphite-bisulphite solution with an NH₃:SO₂ ratio between 1.2:1 and 1.75:1. The ammonia is converted into sulphite and the hydrogen sulphide principally into thiosulphate. The process can be carried out in two stages, using a solution of lower NH₃:SO₂ ratio in the first stage, and one of the highest permissible ratio in the second. It is an advantage to maintain the temperature of the solution at 60—70° in the first stage, and to cool the gas before treatment in the second stage. A. B. MANNING.

Treatment of gases. O. L. BARNEBEY, Assr. to AMER. SOLVENT RECOVERY CORP. (U.S.P. 1,660,642, 28.2.28. Appl., 2.1.20. Renewed 11.5.27).—The gas is adsorbed by means of activated carbonaceous material, whence it is expelled in a closed system and liquefied. C. O. HARVEY.

Manufacture of a decolorising carbon. C. H. CHANDLER (U.S.P. 1,663,000, 20.3.28. Appl., 18.6.20).—Sugar-cane pith is softened and carbonised, and the product extracted. L. A. COLES.

Distillation of solid bituminous materials. E. PIRON (B.P. 275,178, 13.6.27. U.S., 27.7.26).—Coal is

distilled by heating a layer $\frac{1}{4}$ to $\frac{3}{8}$ in. in depth on a surface the temperature of which is maintained at 590—790°, the volatile decomposition products being evolved at 427—538°, and carbonisation being complete in about 5 min. A high yield of tar is obtained, having a larger proportion of valuable light constituents and low-boiling tar acids than tars produced by processes using thicker layers of coal. A. B. MANNING.

Manufacture of agents for emulsifying, cleansing, wetting, etc. I. G. FARBENIND. A.-G. (B.P. 271,474, 17.5.27. Ger. 19.5.26).—A mixture of a brown coal tar oil and an aromatic or hydroaromatic hydrocarbon is sulphonated, preferably by the addition of chlorosulphonic acid to the cooled mixture, and the sulphonic acid isolated as the sodium salt. A. B. MANNING.

Cracking of hydrocarbon [oils]. J. E. BELL and E. W. ISOM, Assrs. to SINCLAIR REFINING Co. (U.S.P. 1,660,856, 28.2.28. Appl., 14.3.25).—The oil is circulated and heated to a cracking temperature under pressure in two stages, the evolved vapours are refluxed, and the condensate is returned to the first stage. The heat is supplied by indirect contact with hot gases, a portion of which is recirculated after mixing with the heating gases in the first stage. C. O. HARVEY.

Cracking of hydrocarbons. E. W. ISOM, Assr. to SINCLAIR REFINING Co. (U.S.P. 1,661,073, 28.2.28. Appl., 15.5.25).—A stream of oil is passed once only through a long heating conduit heated by contact with the products of combustion from a furnace which pass over the outer surface of the conduit in a direction generally opposite to that of the flow of oil within the conduit. The temperature of the gases leaving the heater is below that of the heated oil flowing out from the conduit. A part of the residual heating gases is recirculated in admixture with the fresh hot products of combustion. C. O. HARVEY.

Combined distillation and cracking process [for hydrocarbons]. M. J. TRUMBLE (U.S.P. 1,659,930, 21.2.28. Appl., 8.9.24).—Raw material, capable of giving off vapours too heavy for use alone in a "prime mover," is supplied to a heated retort, and the evolved vapours are mixed with those obtained from an oil-cracking still before use. C. O. HARVEY.

Cracking of oil. R. S. PERSHING (U.S.P. 1,661,196, 6.3.28. Appl., 28.10.24. Renewed 21.7.27).—The oil is cracked by spraying it upon an electrically-heated metallic drum situated within a still. C. O. HARVEY.

Conversion of high-boiling hydrocarbons into low-boiling hydrocarbons. Motor fuel and refining of oils. L. EDELEANU, Assr. to ALLGEM. GES. F. CHEM. IND. (U.S.P. 1,661,565—6, 6.3.28. Appl., [A] 28.6.26, [B] 24.3.27).—(A) Before subjecting the oil to the usual cracking process the sulphur, nitrogen, and asphaltic compounds are removed by extracting the crude oil with liquid sulphur dioxide. (B) Commercial petrol is redistilled at 160°, and the non-volatile portion treated with liquid sulphur dioxide to remove the aromatic and unsaturated hydrocarbons, which are recovered by distilling off the sulphur dioxide, and added to the portion of the original oil distilling below 160° to obtain a fuel which has a much reduced tendency to knock.

The residue from the sulphur dioxide treatment is purified to obtain a high-grade kerosene.

A. R. POWELL.

Separation of oils. J. K. PIERCE, Assr. to W. S. PIERCE (U.S.P. 1,660,235, 21.2.28. Appl., 5.4.26).—An apparatus for the continuous chemical treatment of oils and for separating the oil from the reagent consists of two interconnected vertical tanks having a constant-level device whereby the upper surface of the liquid reagent is maintained on a level with the pipe connecting the two tanks, the oil spaces being above this level. The inlet for the oil is situated at the base of the first tank, and immediately above this inlet is a baffle plate which is submerged in the chemical solution. The interconnecting tube is fitted with a trap for receiving the chemical solution, and is also adapted to carry bottom settlings from the first to the second tank. The weakened chemical solution is circulated back, through a heater, from the second tank to the first, where it meets the incoming oil in counter-current. The treated oil may be withdrawn from the top of both tanks.

C. O. HARVEY.

Treatment of emulsified oils. C. C. MONGER, Assr. to J. S. J. LYELL (U.S.P. 1,660,230, 21.2.28. Appl., 27.11.25).—Oil is separated from a foreign liquid by projecting the mixture at a high velocity against a stationary solid object which is entirely immersed in water. C. O. HARVEY.

Mixing of [acid] sludge. R. BEATTIE, Assr. to TEXAS PACIFIC COAL & OIL Co. (U.S.P. 1,660,248, 21.2.28. Appl., 6.6.27).—Acid sludge and similar residues are mixed with liquid hydrocarbons, and the mixture flows through a passageway wherein it is agitated with sufficient violence to produce a homogeneous liquid mixture. C. O. HARVEY.

Transference of gases and [hydrocarbon] vapours. G. E. FOX, Assr. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,659,948, 21.2.28. Appl., 9.12.25).—Hydrocarbon vapours are transferred from a heating coil to an enlarged reaction chamber (at a pressure of about 350 lb./in.²) by passing the product from the coil partly in vapour phase into a conduit at a pressure not exceeding 50 lb./in.², introducing into the conduit in the direction of travel a stream of gas at a pressure of about 1000 lb./in.², constricting the flow for a brief period, and then allowing expansion into the enlarged chamber. C. O. HARVEY.

Preparation of a [hydrocarbon] oil composition. Treatment of hydrocarbon residues. R. T. GOODWIN, Assr. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,660,294—5, 21.2.28. Appl., [A] 20.1.25, [B] 25.4.25. Renewed [A] 12.10.27).—Heavy oils or cracked hydrocarbon oil residues, liable to form carbonaceous sediments on being kept, are mixed with (A) an oil containing a small percentage of mineral acid or (B) small amounts of an acidic substance in non-sludge-forming concentration, whereby relatively rapid precipitation of the sediment is effected, and the clear liquid is withdrawn. C. O. HARVEY.

Purification of petroleum oils for removal of sulphonated compounds. R. C. MORAN, Assr. to VACUUM OIL Co. (U.S.P. 1,659,782, 21.2.28. Appl.,

23.2.27).—The acid-treated petroleum oil is extracted with ethylene glycol. C. O. HARVEY.

Apparatus for discharging gas or coke retorts. C. HOLLANDER and GIBBONS BROS., LTD. (B.P. 286,846, 5.2.27).

Washing of minerals (B.P. 285,987). **Liquid-fuel filter** (B.P. 279,382). **Treatment of fluids** (B.P. 284,758). **Gas analysis recorder** (U.S.P. 1,661,049).—See I. **Lead tetra-alkyl** (U.S.P. 1,661,809 and 1,661,810). **Lead tetra-ethyl** (U.S.P. 1,664,021).—See VII. **Briquettes** (B.P. 286,334).—See IX. **Rubber goods** (B.P. 286,171).—See XIV.

III.—ORGANIC INTERMEDIATES.

Catalytic reduction of nitrobenzene to aniline in the gaseous phase. G. B. SEMERIA and M. MILONE (Annali Chim. Appl., 1928, 18, 68—77).—The reduction of nitrobenzene vapour to aniline by means of hydrogen in presence of coppered or silvered asbestos is exothermic, and the best yield is obtained at temperatures not exceeding 350° with copper and at 400° with silver. The yield at first increases rapidly and then remains constant as the quantity of catalyst increases. The influence of increase of the amount of hydrogen used on the yield becomes larger as the temperature is raised and as the catalyst is increased in quantity. The yield is not changed much by variation in the hourly supply of nitrobenzene. The catalyst retains its initial activity for months. The aniline obtained in presence of copper is always slightly coloured by the presence of traces of nitrobenzene, but the silver catalyst gives pure aniline in quantitative yield. T. H. POPE.

PATENTS.

Production of acetone. K. RÓKA, Assr. to HOLZVER, KOHLUNGS-IND. A.-G. (U.S.P. 1,663,350, 20.3.28. Appl. 12.12.26. Ger., 10.12.24).—Ethyl alcohol and water vapour are made to react in the presence of a catalyst at 250—650°. H. ROYAL-DAWSON.

Manufacture of unsaturated hydrocarbons. I. G. FARBENIND. A.-G. (B.P. 264,827, 17.1.27. Ger., 19.1.26).—Unsaturated aliphatic hydrocarbons are produced by passing saturated aliphatic hydrocarbons, and in particular methane, at atmospheric or higher pressures, over a catalyst, e.g., salts or hydroxides of the alkaline-earth metals, magnesium, or beryllium, compounds of selenium, tellurium, or thallium, or active carbon or silica, or mixtures of these, at 700—1000°, at a sufficiently rapid rate to preclude further condensation of the primary products into higher-molecular, e.g., aromatic, hydrocarbons. A. B. MANNING.

Guanidine compound. R. V. HEUSER, Assr. to AMER. CYANAMID Co. (U.S.P. 1,663,128, 20.3.28. Appl., 24.4.26).—Substituted guanidines having at least one aminic hydrogen atom are treated with carbon disulphide and then oxidised to a diguanylthiuram disulphide; in particular *N*-phenyl-*N*-ethylguanidine gives a phenyl-ethylguanylthiuram disulphide which is oxidised to diphenyl-diethylguanylthiuram disulphide. C. HOLLINS.

Manufacture of substituted guanidines. W. CARPMAEL. From CHEM. FABR. AUF ACTIEN (VORM. E. SCHERING) (B.P. 285,932, 16.10.26, and Addn. B.P.

286,196, 15.10.26).—(A) *S*-Alkylisothiocarbamides react with liquid or solid, basic, primary or secondary monoamines in approximately equimolecular proportions to give guanidines; excess of amine or addition of alkali is unnecessary. The following guanidines are described: *N*-β-hydroxyethyl-, *N*-β-acetoxyethyl-, *N*-methyl-*N*-β-hydroxyethyl- (hydrochloride, m.p. 78°; hydrobromide, m.p. 103°; picrate, m.p. 166°; picrolonate, decomp. 236—237°), *N*-methyl-*N*-β-acetoxyethyl-, *N*-ethyl-*N*-β-hydroxyethyl- (picrate, m.p. 158°; hydrochloride), *N*-β-hydroxyethyl-*N*-isoamyl- (picrate, m.p. 117—118°; hydrochloride), *NN'*-dimethyl-*N'*-β-hydroxyethyl- (picrate, picrolonate, hydrochloride, hydrobromide, hydriodide), *N*-ββ-diethoxyethyl- (hydrobromide, m.p. 53—54°; hydriodide, m.p. 60°; picrate, m.p. 201°), *N*-methyl-*N*-ββ-dihydroxyethyl- (picrate, m.p. 116°), *N*-methyl-*N'*-ββ-dihydroxyethyl- (picrate, m.p. 107°), *N*-2-pyridyl- (hydrobromide), *NN''*-di-*p*-nitrobenzoyl-*N'*-*N'*-diethyl-, m.p. 181°, *NN''*-dicarbethoxy-*N'*-benzyl-, m.p. 35°, *NN''*-dibenzoyl-*N'*-methyl-*N'*-β-hydroxyethyl-; also 1-guanylpiperidine (hydrochloride, m.p. 166°; hydrobromide, m.p. 122°; picrate, m.p. 248°), guanylpyrrolidine (picrate, m.p. 211°; hydrochloride; hydrobromide; hydriodide), and 4-guanidino-1-phenyl-2:3-dimethyl-5-pyrazolone (from antipyrine). (B) In place of *S*-alkylisothiocarbamides cyanamide may be used for the manufacture of the guanidino-alcohols; e.g., cyanamide and β-methylaminoethyl alcohol give *N*-methyl-*N*-β-hydroxyethylguanidine. C. HOLLINS.

Production of mercaptans of the furfuryl series. E. C. R. MARKS. From INTERNAT. NAHRUNGS- U. GENUSSMITTEL A.-G. (B.P. 286,152, 25.7.27).—Difurfuryl disulphide, m.p. 10—10.5°, b.p. 112—115°/0.5 mm., obtained by the action of aqueous-alcoholic ammonium or sodium hydrosulphide on furfuraldehyde, is reduced by aluminium amalgam and water, or sodium and alcohol, to furfuryl mercaptan, b.p. 45—47°/12 mm. (silver, lead, and zinc salts; *p*-nitrobenzoate, m.p. 76—77°). 5:5'-Dimethyldifurfuryl disulphide, m.p. 42°, b.p. 150°/0.5 mm., 5-methylfurfuryl mercaptan, b.p. 61—62°/13 mm. (*p*-nitrobenzoate, m.p. 82—83°), 5:5'-bishydroxymethyl-difurfuryl disulphide, m.p. 136—137°, 5-hydroxymethyl-difurfuryl mercaptan, b.p. 115—118°/0.5 mm., 5:5'-bismethoxymethyldifurfuryl disulphide, m.p. 36—37°, and 5-methoxymethylfurfuryl mercaptan, b.p. 78—80°, are similarly prepared. The compounds are used to give coffee aroma. C. HOLLINS.

Manufacture of isatins of the naphthalene series. W. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 286,358, 1.12.26).—Naphthyloxamic chlorides are converted into naphthisatins by warming with an acid condensing agent (aluminium chloride, ferric chloride, etc.) in presence or absence of a solvent (nitrobenzene). α- and β-Naphthisatins, 9-chloro-α-naphthisatin, m.p. 239°, 6:9-dichloro-α-naphthisatin, m.p. 275—276°, 9-chloro-5-bromo-α-naphthisatin, m.p. 279°, and 9-methoxy-α-naphthisatin, m.p. 264°, are thus prepared from the corresponding oxamic chlorides. C. HOLLINS.

Manufacture of diazosulphamic acids of the cyclic series. I. G. FARBENIND. A.-G. (B.P. 266,388, [A] 22.2.27. Ger., 22.2.26, and Addn. B.P. 269,582, [B] 14.4.27. Ger., 15.4.26).—(A) By treating sulphamic acids from aromatic polyamines with nitrous acid, one

sulphonic group may be removed, giving diazosulphamic acids, which may be coupled in the usual manner and subsequently hydrolysed to aminoazo compounds. Examples of polyamines used are *o*- and *p*-phenylenediamines, *m*-tolylenediamine, benzidine, 1:5- and 1:8-naphthylenediamines. (b) Instead of polyamines, nitroarylamines are converted into sulphamic acids, and then reduced in neutral solution and diazotised. Examples are *m*- and *p*-nitroanilines, and 6-nitro-*o*-toluidine.

C. HOLLINS.

Manufacture of vanillin. SOC. ANON. PROD. CHIM. COVERLIN, Assees. of R. H. BOTS (B.P. 271,818, 2.2.27. U.S., 25.5.26).—See U.S.P. 1,643,805; B., 1927, 924.

Manufacture of sulphonamides of 2:3-hydroxynaphthoic arylamides. J. B. PAYMAN and H. WIGNALL, Assrs. to BRIT. DYESTUFFS CORP., LTD. (U.S.P. 1,663,725, 27.3.28. Appl., 15.9.27. U.K., 20.9.26).—See B.P. 281,795; B., 1928, 118.

Sulphonated fatty acids (B.P. 263,117).—See XII. **Acetone and butyl alcohol** (B.P. 268,749). **Dihydroxyacetone** (B.P. 282,347). **Acetone from vinasses etc.** (B.P. 277,932).—See XVIII. **Polyamino-compounds** (B.P. 286,087). **2-Chloropyridine** (B.P. 281,050).—See XX.

IV.—DYESTUFFS.

PATENTS.

Manufacture of [vat] dyes [of the dibenzanthrone series]. R. F. THOMSON, J. THOMAS, and SCOTTISH DYES, LTD. (B.P. 286,323, 24.9.26).—Di- and tetrachlorodibenzanthrones (B.P. 278,834; B., 1928, 9) are condensed with glycols (ethylene glycol, trimethylene glycol, glycerol) in presence of alkali (potassium carbonate) and copper in nitrobenzene to give reddish-blue vat dyes. C. HOLLINS.

Manufacture of azo dyes and their chromium compounds. I. G. FARBENIND. A.-G. (B.P. 279,429, 7.10.27. Ger., 22.10.26).—1:2-Aminonaphthol or one of its diazotisable derivatives is diazotised and coupled with 1:8-naphtholsulphonic acid. The product from 1:2:4-aminonaphtholsulphonic acid gives a red on wool, becoming grey on chroming, or if first converted into its chromium compound it dyes wool greenish-blue. The product from nitrated diazotised 1:2:4-aminonaphtholsulphonic acid, after boiling with chromium formate, dyes wool in fast black shades. C. HOLLINS.

Manufacture of new solid diazo salts. I. G. FARBENIND. A.-G. (B.P. 265,985, 11.2.27. Ger., 12.2.26).—*p*-Chlorobenzenesulphonic acid (or its salts) when added to a diazotised nitroaniline, chloronitroaniline, chloro- or nitro-toluidine, nitroaminophenyl alkyl ether, *o*-aminophenyl aryl ether, or a non-sulphonated derivative of one of these, precipitates a crystalline, water-soluble, stable diazonium *p*-chlorobenzenesulphonate, which may be dried at a moderate temperature (cf. B.P. 273,352; B., 1927, 352). C. HOLLINS.

Manufacture of new indigoid dyes. W. CARPMAEL. I. G. FARBENIND. A.-G. (B.P. 286,359, 1.12.26).—9-Halogeno- α -naphthisatins (cf. B.P. 286,358; B., 1928, 327), or their 2-anils or 2-chlorides are condensed with the usual reactive methylene compounds to give fast violet

to black vat dyes. Examples are 9-chloro- α -naphthisatin 2-chloride with 6-chloro-4-methylthioindoxyl (violet), 5:8-dichloro- α -naphthisatin with β -naphthathioindoxyl (olive), and 9-chloro-5-bromo- α -naphthisatin 2-chloride with 1-acetylindoxyl (greyish-blue). C. HOLLINS.

Preparation of biological stains, bactericidal agents, etc. R. W. FRENCH and W. C. HOLMES, Assrs. to W. F. KEOHAN (U.S.P. 1,661,568, 6.3.28. Appl., 9.2.26).—Reactive forms of basic dyes, e.g., their leucobases or acetyl derivatives, are caused to interact either in solution or in a molten mass with cyclic compounds containing an acid or phenolic group. A. R. POWELL.

Red disazo dyes for cotton printing. W. NEELMEIER and H. SCHNEIDER, Assrs. to GRASSELLI DYESTUFF CORP. (U.S.P. 1,663,950, 27.3.28. Appl., 23.3.25. Ger., 4.4.24).—See B.P. 231,885; B., 1925, 954.

Manufacture of tetrakisazo dyes. NEWPORT CO. (B.P. 265,553, 20.12.26. U.S., 6.2.26).—See U.S.P. 1,615,551; B., 1927, 246.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Pulping of pine wood by the sulphite process. II. E. HÄGGLUND (Cellulosechem., 1928, 9, 38—43; cf. B., 1927, 294).—Pine wood, after extraction with benzene or ether, still contains substances soluble in acetone or alcohol which prevent uniform pulping by the ordinary sulphite process. When boiled with concentrated sodium bisulphite solution, pine wood affords a product which is satisfactory in pulping properties and in yield, but, due to its high resin content, is unsuitable for paper manufacture. The "Keebra" method of wood digestion (cf. Clark, B., 1926, 781) gives very poor results when applied to pine wood. Pretreatment with alkali at 105° results in the formation of formic and acetic acids; thus, with saturated lime water, about 1% of acetic acid (on the weight of wood) is obtained. Pine wood treated with alkali yields in the sulphite process a product of normal lignin content, but of high ash content, whilst Scotch pine wood extracted with benzene and acetone yields a poorer product after treatment with lime water than before. Extraction with benzene alone and lime treatment gives a very inferior product, and pretreatment with hydrochloric acid is also disadvantageous. Treatment of unextracted Scotch pine wood with alkali at 105° yields in the sulphite process a badly pulped product which contains much lignin, ash, and resin.

W. J. POWELL.

Sulphite cooking. W. H. BIRCHARD (Canad. Chem. Met., 1928, 12, 31—34).—The more important factors in sulphite cooking are discussed, and it is suggested that the lime present in the cooking liquor acts not only as a neutralising agent for acids formed during digestion, but also later, when sulphonation is complete, as an alkaline hydrolysing agent, the normal calcium sulphite dissociating at about 128° into free lime and sulphur dioxide. That calcium hydroxide is precipitated as such at about 128° (though it recombines to form calcium sulphite on cooling, and is found in this form on the fibre) is shown by an analysis of the precipitate obtained by heating sulphite liquor (free SO₂ 3.84%, combined SO₂ 1.31%) to 137° and under 80 lb./in.², and drawing off as much as possible of the supernatant liquor while

the temperature is still above that at which the lime and sulphur dioxide recombine to form calcium sulphite.

D. J. NORMAN.

Degradation of cellulose by sulphite acid. W. H. BIRCHARD (J.S.C.I., 1928, 47, 49—52 τ).—Experimental cooks by the sulphite process on cellulose in various forms, viz., bleached and unbleached wood pulps, straw pulp, bleached and unbleached rag stock, and pure and raw cotton, show that, in general, the higher the α -cellulose content of the untreated pulp the greater is the degrading action of sulphite acid: e.g., unbleached sulphite pulp (85% of α -cellulose) lost only 1% of α -cellulose on digestion, whilst pure cotton (99.2% of α -cellulose) lost 28.1% of α -cellulose. This effect may be due to the protective action of carbohydrates, principally sugars, which are closely associated with wood cellulose, but are not present in cotton. In all cases the pulps showed a considerable loss of fibre length (69—88%), but were unaltered as regards the diameter of the fibres. The depolymerisation of the cellulose molecule into β - and γ -cellulose, caused by sulphite acid under ordinary cooking conditions, appears to reach an equilibrium, further depolymerisation being arrested until either the β - or the γ -cellulose is destroyed. This theory is supported by the observation that β -cellulose is only slightly affected when cooked by the sulphite process, whilst 100% α -cellulose is degraded to such an extent that the determination of α -cellulose in the cooked product is impracticable.

D. J. NORMAN.

Determination of α -, β -, and γ -cellulose. G. PORRVIK (Papier-Fabr., 1928, 26, 81—85, 120—124, 133—139, 151—157, 179—183).—The influence of various factors (e.g., ratio of sodium hydroxide to cellulose used; moisture content and condition of swelling of the material; addition of alcohol to, and concentration of, the sodium hydroxide used) on results obtained by the ordinary methods of analysis has been determined. Results vary with the degree of kneading of the material with sodium hydroxide, time of treatment, temperature of drying, etc.; a personal factor is also involved. The determination of α -, β -, and γ -cellulose by a titration method is described, an essential feature of which is the washing of the material previously treated with 18% sodium hydroxide with a solution of the same concentration instead of with water as in the Jentgen method. Results for the α -cellulose content depend on the concentration of sodium hydroxide used, a minimum value being found for an 11% solution, for which also the β -cellulose value is a maximum, whilst for γ -cellulose the results are approximately constant over the range 11—24%; the values for the α - and β -portions, however, are also dependent on the degree of swelling of the material. In Jentgen's method (and others) a change in concentration from 18 to about 9.5% is involved, hence values near to the minimum for α -cellulose are obtained, the exact result depending on several experimental factors, but being about 2% lower than is obtained by the titration method. The former method also gives lower α values the greater the concentration of the sodium hydroxide solution, whilst the reverse is the case for the latter for solutions more concentrated than 11%. Residues having different properties (e.g., copper number) are obtained by treatment

of samples of the same material with either concentrated or dilute alkali so that in both cases the same amount is dissolved. Through the action of sodium hydroxide a slow change of β - into γ -cellulose takes place, prolongation of the time of reaction giving decreased α , approximately constant β , and enhanced γ values. Two new gravimetric methods for determining α -cellulose and a volumetric method for the determination of gum number are elaborated.

B. P. RIDGE.

Determination of α -cellulose. C. G. SCHWALBE (Papier-Fabr., 1928, 13, 189—198).—Different methods for determining α -cellulose have been examined and compared, considerable variations in results on the same material being obtained. The determination of this substance is a conventional procedure owing to the impossibility of separating wood, gum, resin, fat, lignin residues, etc. from the cellulose. Comparable results are only obtainable, therefore, by following exactly an agreed procedure. A large number of factors, such as sampling, drying, mercerisation, swelling, temperature, dilution of the sodium hydroxide, filtration, washing, etc., affect the values given. Bubeck's method was found to give somewhat more satisfactory results than that due to Jentgen, whilst the use of a thermostat and washing with sodium hydroxide are unnecessary complications of these methods.

B. P. RIDGE.

Determination of the copper number of paper. B. W. SCRIBNER and W. R. BRODE (Papier-Fabr., 1928, 26, 130—132).—Paper (1.5 g.) in the form of meal is heated with Fehling's solution at 100° for 30 min., collected on a filter while hot, washed, transferred to a beaker, and treated with a solution of sodium molybdate and phosphoric acid in sulphuric acid. The pulp is again washed on a filter with cold water until all the molybdenum-blue has disappeared, and the blue liquid is titrated with standard potassium permanganate solution, the blue colour disappearing just before the end-point. The copper number of the material is calculated from the permanganate titration in the usual manner.

B. P. RIDGE.

Synthesis of α -pine lignin. P. KLASON (Papier-Fabr., 1928, 26, 208—211; Ber., 1928, 61, [B], 171).—See A., 1928, 277.

Hydrogenation of sphagnum. WATERMAN and PERQUIN.—See II. **Hygiene and artificial silk manufacture.** POMILIO.—See XXIII.

PATENTS.

Manufacture of hard, grainless fibre products. W. H. MASON, Assr. to MASON FIBRE CO. (U.S.P. 1,663,505, 20.3.28. Appl., 18.9.25).—Wood or woody material is disintegrated almost wholly into the fibrous state and converted into a dense, grainless product. During manufacture little loss of material occurs and moisture is almost completely eliminated.

F. G. CLARKE.

Manufacture of artificial silk and like filaments. K. HAGIWARA (B.P. 286,086, 1.3.27).—The speed of filtering or spinning of colloidal solutions of artificial silk is considerably accelerated by utilising an electric current of high voltage, e.g., a high-frequency current from an induction coil, to produce a cataphoresis effect. Thus, in spinning, the passage of such current (frequency

4800 cycles/min.) regulated to a spark gap of 5–10 mm. between an anode placed in the spinning nozzle and a cathode in the coagulating bath renders it possible to increase the spinning speed by 100% or more, and to obtain filaments of 25, 12–15, and 8–10 deniers at speeds of 15–20, 30, and 45 m./min., respectively, from a nozzle ordinarily used for filaments of 6–7 deniers. Further, the gases which collect on the surface of the filament during coagulation are decomposed by the electrical discharge and rendered innocuous. The silk is more uniform in thickness and shows improved physical properties due to the parallel arrangement of the colloid particles.

D. J. NORMAN.

Manufacture of viscose artificial silk. H. J. J. JANSSEN, and HARBENS (VISCOSE SILK MANUFERS.), LTD. (B.P. 285,958, 20.11.26).—In the manufacture of viscose filaments by the process in which a small quantity of a coagulating agent, *e.g.*, solutions of acids or salts, is added to the viscose before spinning, improved results are obtained if a predetermined proportion of the coagulating solution is pumped into and intimately mixed with the viscose as the latter passes to the spinning nozzle. The mixing device may be jacketed to facilitate temperature control. Suitable apparatus is described.

D. J. NORMAN.

Treatment of cellulosic material. F. C. NIEDERHAUSER and H. B. KLINE, ASSRS. to INDUSTRIAL RAYON CORP. (U.S.P. 1,661,493, 6.3.28. Appl., 18.12.26).—An alkaline solution of an alkali zincate is incorporated with viscose solution prior to the ripening operation.

D. J. NORMAN.

Treatment of cellulosic material. F. C. NIEDERHAUSER and H. B. KLINE, ASSRS. to INDUSTRIAL RAYON CORP. (U.S.P. 1,661,574, 6.3.28. Appl., 20.9.27).—To obtain viscose threads which dye evenly, a zinc salt is added to the usual sulphuric acid–sodium sulphate setting bath in such quantity that the liquid contains not more than 0.9% Zn.

A. R. POWELL.

Manufacture of laminated fabric. Treatment of cellulose fabrics. D. DE GÖNCZ and A. S. JONES, ASSRS. to ARNOLD PRINT WORKS (U.S.P. 1,661,880—1, 6.3.28. Appl., [A] 19.2.25, [B] 9.12.26).—(A) Webs of cellulose fibre may be joined together by treating them with a caustic alkali, immersing them in a solution containing a cuprammonium compound, and bringing them together prior to the completion of the reaction. (B) Natural cellulose fibre fabrics are impregnated with a solution of a caustic alkali, dried, and subjected to the superficial action of a solution containing a cuprammonium compound.

A. R. POWELL.

Treatment [weighting] of materials made with or containing cellulose derivatives. BRIT. CELANESE, LTD., H. DREYFUS, and G. H. ELLIS (B.P. 285,941, 23.10.26. Addn. to B.P. 281,084; B., 1928, 227).—Improved results are obtained if the solution of the loading metal contains thiocyanate in a proportion not exceeding that which is chemically equivalent to the loading metal present. Thus the loading solution may contain per litre 280 g. of stannic chloride ($\text{SnCl}_4 \cdot 5\text{H}_2\text{O}$) and 243, 182, or 121 g. of ammonium thiocyanate, which quantities are approximately those required for the

formation of the salts $\text{Sn}(\text{CNS})_4$, $\text{Sn}(\text{CNS})_3\text{Cl}$, and $\text{Sn}(\text{CNS})_2\text{Cl}_2$, respectively.

D. J. NORMAN.

Manufacture of carbohydrate derivatives. W. HARRISON (B.P. 286,331—2, 30.10.26).—Xanthates of cellulose, starch, or other carbohydrates are treated cold or warm (*e.g.*, 60°) with (A) ammonia or its inorganic derivatives, such as hydroxylamine, (B) with organic derivatives of ammonia containing at least one unsubstituted hydrogen atom attached to nitrogen, such as primary and secondary amines, carbamide, cyanamide, guanidine, acetamide, etc., in presence of an oxidising agent (ferricyanide, hypochlorite, air with a catalyst, electrolytic nascent oxygen, etc.) which converts the xanthate into the more reactive dixanthogen compound. The products are not ammonium salts, but are of the type, $\text{RN}:\text{C}(\text{OR}')\cdot\text{S}_2\cdot\text{C}(\text{OR}'):\text{NR}$, or, in the case of arylamines at the higher temperatures, ethers of 1-hydroxy-

benzthiazole, $\text{Ar} \begin{array}{c} \diagup \text{N} \\ \diagdown \text{S} \end{array} \text{C} \cdot \text{OR}'$, R' being the carbohydrate residue.

C. HOLLINS.

Manufacture of structural insulating boards of exploded lignocellulose fibre. W. H. MASON, ASSR. to MASON FIBRE CO. (U.S.P. 1,663,503—4, 20.3.28. Appl., [A] 19.6.25, [B] 18.9.25).—(A) Lignocellulose is exploded at pressures above 275 lb./in.² The fibrous product is converted into sheet form in hot water, passed through press rolls, and dried. (B) Lignocellulose fibre is exploded under high pressure and dried at elevated temperature and pressure. The product contains the greater part of the lignins of the original material and is porous throughout, but its exterior is less porous, stronger, and harder than the interior.

F. G. CLARKE.

Manufacture of powdered plastic material. SOC. CHIM. DES USINES DU RHÔNE (B.P. 275,558, 12.4.27. Fr., 3.8.26).—Finely-powdered fillers, colouring agents, and plasticising agents are suspended in a solution of a cellulose ester or ether and the whole is precipitated by, *e.g.*, the addition of water. The cellulose ester or ether solvent should be without solvent action on the fillers etc. The product is separated, washed, and dried, and can be moulded by heat and pressure.

D. J. NORMAN.

Freeing cellulose fibres from vegetable material. W. I. CHIDESTER (U.S.P. 1,659,809, 21.2.28. Appl., 11.1.27).—The material is cooked under pressure in a digester and then blown through a conduit into a tank containing a liquid at a lower temperature and pressure. The conduit should extend to a considerable distance below the surface of the liquid in the discharge tank, so that the fibrous material becomes disintegrated as it leaves the conduit.

D. J. NORMAN.

Treatment of fibrous material, *e.g.*, for the manufacture of paper. S. D. WELLS (B.P. 285,277, 20.4.27).—Fibrous material, *e.g.*, wood, is opened up, without breaking or cutting the ultimate fibres to any serious extent, by passing the softened material through a roller mill. Softening may be effected by mild digestion under such conditions that the intercellular cementitious substances are softened, but not completely dissolved: *e.g.*, loblolly pine chips may be impregnated

under 100 lb. hydrostatic pressure for about $\frac{1}{2}$ hr. with a liquor containing, per 100 pts. of dry wood, 10 pts. of sodium sulphite and 2 pts. of caustic soda; after removing the excess of liquor the chips are digested at 160° for about 2 hrs. The resulting "lignocellulose" pulps contain 63—91% of cellulose and 32—8% of lignin, and are obtained in yields of 60—85% depending on the type of wood and the severity of the softening treatment. Cereal straws may be softened in the roller mill itself by admitting hot water or steam and sodium carbonate or milk of lime.

D. J. NORMAN.

Treatment of waste liquors of paper manufacture for the recovery of caustic alkali therein. W. and E. BARRS (B.P. 285,933, 18 and 28.10.26 and 14.7.27).—The liquor is passed through concentration towers where it is exposed in a relatively finely-divided state to a counter-current of a hot gaseous evaporant, preferably waste flue gases. The moisture-saturated but still hot gases leaving the tower are further utilised to heat, *e.g.*, atmospheric air for use in the process. The concentrated liquor from the tower is fed direct to liquid-fuel burners and burnt to ash, with or without the aid of supplemental fuel, the hot gases from this process being used in the evaporating tower. In order to reduce the tendency of the ash to sinter in the incinerator, a stream of air is directed on to the flame from the burner to effect sudden cooling of the gaseous suspension of the products of combustion. A complete soda recovery plant embodying these principles is described.

D. J. NORMAN.

Centrifugal apparatus for spinning artificial silk. A. H. RAILING and H. J. ELEY (B.P. 286,927, 15.12.26).

Spinning boxes for spinning artificial silk. J. BRANDWOOD and T. W. HOLT (B.P. 287,183, 13.9.26).

Straining pulp for papermaking etc. D. RUSSELL and J. R. HAPPER (B.P. 286,814, 28.12.26).

Bleaching [wood pulp] (U.S.P. 1,662,951).—See VI. Cellulose ester solvents (B.P. 257,258).—See XIII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

PATENTS.

Bleaching [of fibres]. C. TAYLOR (B.P. 286,567, 12.10.27).—Cotton, artificial silk, or other vegetable material in yarn of fabric form is circulated in a liquor containing an alkali carbonate and hypochlorites or chlorine gas (preferably with addition of borax and ammonia), and, when saturated, is stored for a period up to 12 hrs., after which it is washed and, if desired, soured. When necessary, the cycle of operations may be repeated. Fibres so treated are less deleteriously affected, and are subsequently more readily dyed to an even shade.

D. J. NORMAN.

Bleaching of animal and vegetable materials. A. O. BRAGG, Assr. to INTERNAT. BLEACHING CORP. (U.S.P. 1,662,951, 20.3.28. Appl., 5.9.25).—The material, *e.g.*, ground wood pulp, is circulated in an aqueous solution containing a bisulphite, free sulphurous acid, and another acid, and is subsequently washed with water.

D. J. NORMAN.

Dyeing and mordanting of materials made of or containing cellulose derivatives. H. DREYFUS (B.P. 285,948, 12.11.26).—Cellulose esters or ethers are treated with swelling agents (formic, acetic, glycollic, or lactic acid, alcohol, acetone, "diacetone alcohol," diacetin, mono- and poly-hydric phenols, thiocyanates, cyanates, thiocarbimides, carbimides, carbamides, urethanes, thiocarbamides, thiourethanes, guanidines) before mordanting and dyeing with a mordant dye.

C. HOLLINS.

Dyeing, printing, or stencilling of materials made of or containing cellulose esters or ethers. H. DREYFUS (B.P. 285,942, [A] 23.10.26; 285,968—9, [B, C] 23, and 25.11.26).—(A) Cellulose esters or ethers are treated with a swelling agent (formic, acetic, glycollic, or lactic acid, alcohol, acetone, "diacetone alcohol," diacetin, mono- or poly-hydric phenols, thiocyanates, etc.) and then dyed with an aqueous dispersion of an insoluble coloured compound which has been previously treated with a dispersing agent (*e.g.*, sulphoricinoleic acid or salts); diazotisation and development on the pretreated fibre is also included. (B) Hydroxylated *N*-alkyl derivatives of coloured compounds, other than azo dyes and containing no carboxyl group in the alkyl substituent are used for the dyeing etc. of cellulose esters or ethers. The methods of earlier patents (*e.g.*, using sulphoricinoleic acid as solubilising agent) may be employed, or sufficient hydroxyl groups may be introduced to render the compound water-soluble. Examples are: 1-amino-4- β -hydroxyethylaminoanthraquinone (bluish-violet), 1- β -hydroxyethylaminoanthraquinone (scarlet), 1:4-bis- β -hydroxyethylaminoanthraquinone (blue), 1- β -hydroxypropylaminoanthraquinone (bluish-red); 1-anthraquinonylhydrazones of hydroxyacetone and glycolaldehyde (yellow to brown); 3:3'-bis- β - γ -dihydroxypropylaminoindanthrone (blue), bis- β -hydroxyethylbenzanthrone (yellow), condensation product from anthrapyrimidone and ethylene chlorohydrin (yellow); 1:1'-bis- β -hydroxyethylindigo (from *N*- β -hydroxyethylanthranilic acid condensed with chloroacetic acid and fused with alkali; blue), 5:5'-bis- β -hydroxyethylaminoindigo (blue); the product from Acridine Yellow G and galactose (greenish-yellow); the Nile Blue derivative obtained from nitrosodiethyl-*m*-aminophenol and β -hydroxyethyl- α -naphthylamine (greenish-blue). These compounds, except where otherwise indicated, are prepared from chloro- or bromo-derivatives and β -aminoethyl alcohol, or from amino-derivatives and ethylene oxide or propylene oxide. (C) The compounds used here are hydroxylated alkyl ethers or thioethers obtained from coloured phenols or thiophenols (other than azo compounds) by the action of suitable chlorohydrins, alkylene oxides, or acetone. Examples are: 1- β -hydroxyethylthiolanthraquinone (yellow), 1- β - γ -dihydroxypropylthiolanthraquinone (yellow), 1-methylamino-4- β - γ -dihydroxypropylthiolanthraquinone (reddish-orange), 1-acetamido-4- β -hydroxyethoxyanthraquinone (golden-yellow), 1- β - γ -dihydroxypropylthiolanthrapyridone (from chloroanthrapyridone and β - γ -dihydroxypropyl mercaptan; yellow).

C. HOLLINS.

Discharge printing of dyed acetate silk. O. Y. IMRAY. From SOC. CHEM. IND. IN BASLE (B.P. 285,973,

23.11. and 7.12.26).—Zinc formaldehydesulphoxylate, with or without an acid (tartaric acid) or alkali (potassium carbonate), together with the usual thickening agents is used for printing white discharges on acetate silk dyed with azo colours. Addition of a suitable dye to the printing paste produces a coloured discharge.

C. HOLLINS.

Hair dye. W. KRITCHEVSKY (U.S.P. 1,663,202, 20.3.28. Appl., 29.3.26).—A shampoo-dye consists of soap, glycol, and *p*-phenylenediamine. Suitable compositions may consist of soap, solvents, and homocyclic bases having three substituents which may be a hydroxy- or an amino-group, or either of these groups further substituted, two of the nuclear substituents being in positions capable of giving a quinonoid structure.

F. G. CLARKE.

Treatment of fabrics. HEBERLEIN & Co. A.-G. (B.P. 284,686, 4.10.27. Ger., 4.2.27. Addn. to B.P. 276,352; B., 1928, 260).—The wool-like effect obtained by the prior process is enhanced if the material is treated with caustic soda solution of mercerising strength at a raised temperature, *e.g.*, at 40° for 5 min. This treatment may be preceded or followed by a treatment with caustic alkali solution at the ordinary temperature.

D. J. NORMAN.

Production of pattern effects on textile goods. HEBERLEIN & Co., A.-G. (B.P. 268,389, 28.3.27. Ger., 27.3.26).—Textile material composed of or containing cellulosic fibres is passed between embossing rollers heated above 100°, and is then subjected to the action of a mercerising solution. Those parts of the fabric which have been exposed to heat and pressure are less affected by the solution than is the remainder of the fabric.

D. J. NORMAN.

Spot-dyeing of yarn. Dyeing of yarn. ECLIPSE TEXTILE DEVICES, LTD., Assees. of [A] J. P. GAREY, and [B] J. P. GAREY and L. P. HASBROUCK (B.P. 269,146—7, 11.3.27. U.S., 8.4.26).

Continuously scalding and dyeing cotton in bundles or waste. J. ANNICQ (B.P. 287,011, 27.10.27).

Machine for dyeing or similarly treating fabrics with liquids. J. BAILEY and W. H. WADSWORTH (B.P. 287,233, 17.12.26).

Treating materials made with cellulose derivatives (B.P. 285,941).—See V. **Sulphonation of fatty acids** (B.P. 263,117).—See XII. **Coloration of lacquers** (B.P. 275,969).—See XIII.

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

Examination of sulphuric acid for selenium. R. C. WELLS (J. Washington Acad. Sci., 1928, 18, 127—128).—0.5—1.0 g. of potassium bromide is dissolved in 3—4 c.c. of bromine water and distilled with 100 g. of sulphuric acid from a retort. The distillate is collected in 3—4 c.c. of concentrated hydrochloric acid saturated with sulphur dioxide and cooled. Selenium bromide comes over as a yellow liquid which deposits red selenium in contact with sulphur dioxide. As little as 1 pt. in 10⁷ of selenium can be detected. The method is preferred to the colour test with aspidosperm-

ine, which gives variable coloration according to acid strength and time of heating.

C. IRWIN.

Synthesis of ammonia under high pressure. F. MÜLLER (Arch. Eisenhüttenw., 1927—8, 1, 517—523; Stahl u. Eisen, 1928, 48, 405—406).—A review, with brief descriptions of the Haber-Bosch, Claude, Casale, and Mont Cenis methods of synthesising ammonia under high pressure. The possibility of recovering hydrogen from coke-oven gas by treating it with liquid nitrogen is discussed.

A. R. POWELL.

Effect of concentration and temperature on the germicidal efficiency of sodium hydroxide. M. LEVINE, J. H. BUCHANAN, and G. LEASE (Iowa State Coll. J. Sci., 1927, 1, 379—394).—The experiments were conducted with an organism isolated from spoiled ginger ale in simulation of the conditions experienced in automatic bottle-washing machines. The germicidal effect increased with length of time of exposure. (Cf. B., 1928, 70, 246.)

CHEMICAL ABSTRACTS.

Coloration of and free acid in coke-oven ammonium sulphate. I. E. SCHRAMM. II. A. WEINDEL. III. E. SCHRAMM (Brennstoff-Chem., 1928, 9, 46—47, 48, 48—49; cf. Weindel, B., 1927, 363).—I. The impurities which cause the coloration of coke-oven ammonium sulphate consist principally of metallic sulphides; metallic compounds containing pyridine, cyanogen, and amines are also present. They are formed in the pipes leading to the saturator, and are conveyed into the latter by the liquor which condenses in the pipes. The effects of impurities in the sulphuric acid used and of the presence of phenols on the colour of the salt are of minor importance. Attempts to prepare an acid-free salt by sprinkling the mass with ammonia solution while in the centrifuge give a dark-coloured product owing to the precipitation of sulphides by the ammonium sulphide present in the crude ammonia. Addition of solid soda or ammonium carbonate produces a salt with an odour of ammonia and pyridine. Neutralisation of the excess acid is best carried out by pure gaseous ammonia. II. Schramm's conclusions are briefly discussed and criticised. III. A reply.

A. B. MANNING.

Conversion of methane into hydrogen and carbon monoxide. FISCHER and TROPSCH. **Ammonium polythionate.** TERRES and OVERDICK.—See II.

PATENTS.

Manufacture of sulphuric acid. H. PETERSEN (B.P. 267,885, 25.11.26).—In the manufacture of sulphuric acid wherein use is made of only one production tower, one denitrating tower, and nitrogen oxide absorption towers, the acid leaving the production tower is subdivided so that the portion for commerce is passed to the denitrating tower, while the excess is passed through the absorption towers and back to the production tower. Part or all of the excess acid may be sent first to the denitrating tower and then to the absorption towers, or part of the acid leaving the production tower and the absorption towers may be re-circulated.

W. G. CAREY.

Production of molybdic and tungstic acids from ores. METALLWERK PLANSEE G.M.B.H., Assees. of

DEUTS. GLÜHFADENFABR. R. KURTZ & P. SCHWARTZKOPF G.M.B.H. (B.P. 269,947, 26.4.27. Ger., 26.4.26).—Wholly or partly roasted molybdenite is melted in an inclined rotating crucible, and, after vapours of sulphur compounds cease to be evolved, the temperature is raised to 1000° and a rapid current of air is blown over the surface of the molten oxide, thereby causing rapid volatilisation. The fumes are led into a large glass-lined tank in which pure molybdenum trioxide in a dense form suitable for immediate reduction to metal is deposited. Tungsten trioxide may be purified in a similar way, but a much higher temperature is required.

A. R. POWELL.

Production of soluble alkali hydroxides. A. F. MEYERHOFER, Assce. of M. BUCHNER (B.P. 271,440, 3.5.27. Ger., 19.5.26).—Soluble alkali fluorides are converted into hydroxides by treatment with magnesia or an alkaline-earth oxide which has been converted into hydroxide by treatment with steam under pressure and subsequently wind-screened.

A. R. POWELL.

Manufacture of potassium carbonate and other potassium salts. J. H. BRÉGEAT (B.P. 286,172, 22.9.27).—Potassium chloride (75 pts.) is heated together with 130 pts. of quartz sand and 10 pts. of wood charcoal to obtain potassium silicate, the solution of which in water is decomposed by treatment with a current of carbon dioxide. The precipitated silica may be separated and used again in the process. The potassium carbonate in the solution is recovered by evaporation or is converted into other potassium salts by treatment with the corresponding acid or by double decomposition with a solution of the calcium salt.

A. R. POWELL.

Treatment of calcium cyanide. P. W. GRIFFITH, Assr. to AMER. CYANAMID Co. (U.S.P. 1,663,125, 20.3.28. Appl., 24.2.26).—The content of cyanogen in crude calcium cyanide is increased by agitating the compound with excess of liquid hydrocyanic acid, and distilling off the uncombined acid.

H. ROYAL-DAWSON.

Separation of cyanides from mixtures. G. H. BUCHANAN, Assr. to AMER. CYANAMID Co. (U.S.P. 1,660,667, 28.2.28. Appl., 8.7.24).—Sodium cyanide is separated from a mixture of the cyanide with sodium chloride by evaporating a solution of the mixture until about 60% of the chloride is precipitated, removing the chloride, and again evaporating until about 40% more of the chloride is precipitated, separating the chloride, and finally evaporating the mother-liquor.

C. O. HARVEY.

Concentration of barytes. W. O. BORCHERDT, Assr. to NEW JERSEY ZINC Co. (U.S.P. 1,662,633—4, 13.3.28. Appl., [A] 27.8.24, [B] 19.10.27).—Barytes is recovered from material containing it by froth flotation using a selective flotation agent containing (A) soap or (B) cotton-seed oil pitch.

A. R. POWELL.

Utilisation of titanium materials containing iron. TITAN Co. A./S. (B.P. 275,580, 2.7.27. Norw., 3.8.26).—A mixture of ilmenite and a compound of magnesium, the alkalis, or alkaline earths is heated together with a reducing substance or in a reducing atmosphere to such a temperature that nearly the whole

of the iron is reduced to metal without appreciably reducing the titania. The product is ground and leached with 74% sulphuric acid, which dissolves the titanium compounds, leaving a residue from which iron may be recovered by magnetic separation. By carrying out the reduction in an atmosphere of nitrogen, nitrides are formed which are decomposed by the acid with the production of ammonium sulphate.

A. R. POWELL.

Manufacture of lead tetra-alkyl. (A) K. P. MONROE and (B) K. P. MONROE and K. WILLIAMS, Assrs. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 1,661,809—1,661,810, 6.3.28. Appl., [A] 25.3.24, [B] 15.10.25).—(A) An alloy of 1 at.-pt. of lead with 2 at.-pts. of an alkali metal is caused to react with an alkyl chloride in the presence of less than 5.1 mol.-% of a neutral hydroxylic compound soluble in the alkyl chloride. (B) An alloy of lead and an alkali metal is treated with an alkyl halide and an alcoholic solution of potassium hydroxide.

A. R. POWELL.

Manufacture of lead tetra-ethyl. W. S. CALCOTT, A. E. PARMELEE, and F. B. LORRIMAN, Assrs. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 1,664,021, 27.3.28. Appl., 3.11.26).—Lead, intimately mixed with sodium and potassium, is treated with ethyl chloride.

H. ROYAL-DAWSON.

Manufacture of bismuth tartrates. P. A. KOBER, Assr. to G. D. SEARLE & Co. (U.S.P. 1,663,201, 20.3.28. Appl., 28.5.26).—A basic bismuth compound is treated at normal temperature or below with an alkali and tartaric acid.

F. G. CLARKE.

Production of alumina. METALLBANK & METALLURGISCHE GES. A.-G., Asses. of G. SCHOENBERG (B.P. 279,870, 26.10.27. Ger., 26.10.26).—Crude alumina, substantially free from titania and silica but containing iron oxide, is obtained by treating aluminous materials with mineral acids, separating the insoluble material, and treating the solution with a basic substance, or evaporating it to dryness and heating the residue. The calcined precipitate is purified by fusion in an electric furnace with less than 3% of its weight of sulphur or a sulphide, or in a current of gases containing sulphur compounds.

A. R. POWELL.

Recovery of bromine. J. P. ANDREW, Assr. to GEN. MOTORS CORP. (U.S.P. 1,662,355, 13.3.28. Appl., 22.10.25).—A solution containing bromide is treated with a slight excess of chlorine, and the liberated bromine is precipitated as an insoluble compound by the addition of a suitable reagent.

A. R. POWELL.

Powder adapted to liberate iodine. K. VAN ALLEN (U.S.P. 1,661,640, 6.3.28. Appl., 24.4.26).—A mixture of iodic acid, a reducing agent, and a filler is claimed.

A. R. POWELL.

Production of hydrofluoric acid from substances containing fluorine and silicon. M. BUCHNER, Assr. to A. F. MEYERHOFER (U.S.P. 1,664,348, 27.3.28. Appl., 18.6.25. Ger., 2.6.24).—See B.P. 234,852; B., 1925, 670.

Oxidation of ammonia by means of oxygen. F. G. LILJENROTH (U.S.P. 1,663,914, 27.3.28. Appl., 13.6.27. Swed., 19.8.26).—See B.P. 276,295; B., 1927, 907.

Treatment of marine algæ (B.P. 275,998).—See II. Caustic alkali recovery (B.P. 285,933).—See V. Ozone (B.P. 277,637 and 277,651).—See XI. Refining of crystals (B.P. 280,152).—See XVII. Nitrogen from vinasses etc. (B.P. 277,932).—See XVIII.

VIII.—GLASS; CERAMICS.

Influence of carbon dioxide under pressure on glass. O. K. BOTVINKIN (J. Russ. Phys. Chem. Soc., 1928, 60, 221—228).—Experiments were carried out with glass containing 50.84% SiO₂, 3.12% Al₂O₃, 0.20% Fe₂O₃, 27.94% PbO, 1.40% CaO, 0.82% MgO, 15.19% Na₂O, 1.53% K₂O. The reaction takes place according to the equations (1) Na₂SiO₃ + 2H₂O = 2NaOH + H₂SiO₃; (2) 2NaOH + CO₂ = Na₂CO₃ + H₂O. It was impossible to calculate the velocity coefficient as it decreased steadily owing to diffusion. The temperature coefficient of the reaction of decomposition of glass and a constant showing the relationship between the degree of decomposition and the pressure of carbon dioxide were obtained. The degree of decomposition was found to be proportional to the surface area. 10% of the total alkalis of the glass were dissolved in the cases of maximum decomposition. A. RATCLIFFE.

Porosity and permeability. PHILIPP.—See I.

PATENTS.

Manufacture of mirrors. G. F. and W. H. COLBERT (U.S.P. 1,662,564—5, 13.3.28. Appl., [A] 30.7.26, [B] 3.5.27).—A light-absorbing, glare-free mirror is obtained by treating a clean glass surface with a freshly prepared mixture of solutions of (A) a lead salt, sodium hydroxide, and thiourea, or (B) a salt of a heavy metal, ethyl alcohol, and an alkali thiourea. In a short time the glass becomes coated with a uniform, lustrous deposit of metal sulphide. A. R. POWELL.

Pottery kiln. A. C. WARD (U.S.P. 1,664,142, 27.3.28. Appl., 4.5.27).—The kiln consists of a floor heated from below, the door being supported by tiers defining tortuous passages in between, with flues between the tiers and the floor. H. ROYAL-DAWSON.

Apparatus for producing clay products. M. LANG (U.S.P. 1,663,309, 20.3.28. Appl., 11.4.24).—An arched kiln with an open bottom is provided with an endless conveyor close to the bottom, and with a series of adjustable burners at intervals along the kiln. L. A. COLES.

Manufacture of refractory articles [crucibles]. A. F. HOTTINGER, ASSR. to CHICAGO CRUCIBLE CO. (U.S.P. 1,663,660, 27.3.28. Appl., 8.12.24).—A mixture of carbonaceous matter, clay, and a flux is coated with a composition which is fusible near the ignition temperature of the carbonaceous matter, and contains also a constituent fusible at the vitrifying temperature of the clay. H. ROYAL-DAWSON.

Heat-treatment of alumina and other [refractory] materials. T. S. CURTIS, ASSR. to PACIFIC-SOUTHWEST TRUST & SAVINGS BANK (U.S.P. 1,662,739, 13.3.28. Appl., 7.4.25).—Alumina and other materials having a high m.p. are rendered denser and more refractory by making them into small rough shapes and causing a mixture of a combustible gas and air to burn within the pores of the mass on the principle of surface combustion. A. R. POWELL.

IX.—BUILDING MATERIALS.

Modern Portland cement plant. H. GUTTERIDGE (Proc. Inst. Mech. Eng., 1927, [4], 781—826).—A comprehensive account is given of cement manufacture, comprising raw materials, flow sheets of the wet and dry processes, descriptions of kilns, coolers, grinding, storing, and packing plants. W. G. CAREY.

Destruction of concrete and ferroconcrete [in gas works]; its origin, prevention, and cure. ORTHAUS (Gas-u. Wasserfach, 1928, 71, 145—156).—The compounds having the greatest destructive effect on concrete in gas works are sulphur dioxide, carbon dioxide, sulphates, and ammonium salts. In contact with Portland cement sulphur compounds in a gaseous form or in solution react with the free lime, and eventually convert it into calcium sulphate, the crystallisation of which in the concrete mass causes it to swell and crack; in the case of ferroconcrete the cracks allow corrosive media, both liquids and gases, to come into contact with the iron, which is thereby rapidly destroyed. Water containing soluble sulphates reacts with the calcium aluminate present to form calcium sulphaaluminate, which has an even greater expansion than gypsum. Water saturated with carbon dioxide dissolves the free lime as calcium hydrogen carbonate and renders the cement porous; ammonium salts have a similar action. For gas works and chemical works it is recommended that the concrete used should be made with a cement free from free lime and rich in alumina, e.g., containing 35—45% CaO, 5—10% SiO₂, 35—55% Al₂O₃, 5—15% Fe₂O₃, and 2—3% TiO₂. With this cement basalt or a well-graded chamotte should be used as ballast. Further protection is afforded by coating the concrete immediately after setting by spraying it with a thick viscous liquid, e.g., by the Contex process. A. R. POWELL.

Hydration of cements. II. Microscopical study of the hydration of the rapid-hardening cements. T. YOSHIOKA and K. KUMAGAE (J. Soc. Chem. Ind. Japan, 1927, 30, 671—678).—Hydration of commercial aluminous cements and super-cements of Portland cement type has been microscopically studied, using Keiserman and Blumenthal's staining method. Y. TOMODA.

PATENTS.

Manufacture of asphalt concrete. N. V. KONINKLIJKE STEARINE KAARSENFABR. GOUDA (B.P. 286,552, 29.8.27. Holl., 2.8.27).—Coarse (5—10 mm. diam.) and fine (0—2 mm. diam.) crushed stone are mixed separately with bituminous emulsion to which protein has been added to reduce the rate of coagulation, and the mixtures are then rolled together, or, alternatively, the coarse stone is mixed with the emulsion, and the fine stone is then worked into the mixture. L. A. COLES.

Mixing quick-setting cementitious materials. G. M. THOMSON, ASSR. to PENNSYLVANIA GYPSUM CO. (U.S.P. 1,660,242, 21.2.28. Appl., 16.2.27).—The time of setting is controlled by regulation of the rate of agitation during mixing. B. M. VENABLES.

Manufacture of building material. INTERNAT. COPPERCLAD CO., ASSEES. OF T. ROBINSON (B.P. 278,691, 22.9.27. U.S., 5.10.26).—A product suitable for building purposes, e.g., in the form of shingles, comprises a non-

metallic core of hardened plastic material, *e.g.*, crushed slate, sand, or other finely-divided solid mixed with an asphalt binder, and a jacket of fibrous material, *e.g.*, water-proofed coarse paper. A. B. MANNING.

Building material. R. P. PERRY, Assr. to BARRETT Co. (U.S.P. 1,663,095, 20.3.28. Appl., 10.7.20).—A mixture of a fibrous substance with an aqueous emulsion of a bituminous substance and an emulsifying agent is formed into sheets, dried, and waterproofed by treatment with a suitable mixture having a larger proportion of volatile constituents than the bituminous substance. A. R. POWELL.

Manufacture of paving material. F. MORTON (B.P. 286,949, 5.7.27).—A mixture of 80–95% of heated granite chippings and 20–5% of molten blast-furnace or coal-tar pitch is claimed. H. ROYAL-DAWSON.

Production of cellular building materials. G. M. THOMSON, Assr. to PENNSYLVANIA GYPSUM Co. (U.S.P. [A] 1,660,243, [B] 1,660,280, [C] 1,660,402, [A, B] 21.2.28, [C] 28.2.28. Appl., [A] 18.3.27, [B, C] 10.8.26).—A slurry is mixed in one chamber and passes to another chamber in which subdivided air or inert gas is blown through it from a perforated false bottom. The normal setting properties of the material may be maintained or the water of the slurry may be "colloidised." B. M. VENABLES.

Manufacture of plastic sheets or slabs [resembling tiles]. NEWTILE CORP., Assees. of N. E. NEWMAN (B.P. 267,150, 5.3.27. U.S., 5.3.26).—Slabs formed of a mixture of asbestos with cement as a binder are moulded and coated with nitrocellulose. H. ROYAL-DAWSON.

Manufacture of bricks, blocks, slabs, artificial stone, fuel briquettes, ovoids, etc. A. R. DAVIES, W. K. HUGHES, and A. G. MORGAN (B.P. 286,334, 1.11.26).—The treatment with carbon dioxide at different stages of the manufacture of moulded articles from lime and gravel etc. is effected in a closed circuit, and the residual gas is returned to the generator or stored for further use. L. A. COLES.

Impregnation of timber. J. T. HUGHES-JONES (B.P. 285,699, 18.5.27).—A naturally-occurring oil containing sulphur (*e.g.*, Kimmeridge shale oil) in an emulsified form is used, to which has been added manganese, cobalt, or nickel resinate, or a lead oxide etc., to accelerate polymerisation or hardening of the oil coating on exposure to air. B. FULLMAN.

Manufacture of bitumen-pitch type emulsions. L. KIRSCHBRAUN (B.P. 286,844, 31.1.27).—See U.S.P. 1,615,303; B., 1927, 301.

Apparatus for drying, dyeing, fireproofing, or otherwise treating timber. C. GOODALL (B.P. 286,833, 18.5.27).

Furnaces and kilns (B.P. 271,889).—See I. **Insulating boards** (U.S.P. 1,663,503—4).—See V.

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

Direct production of steel by means of methane. D. PERIETZEANU (Anal. min. Romania, 1927, No. 6—8).—The process eliminates the use of the blast furnace, and replaces the coke by methane. Methane at 900°

is passed, at the lowest possible pressure, through the fused metal at 1600–1700°, the process being carried out continuously in a rotatory mixer of the Wellman or Talbot type. The quantity of metal must be such that its temperature does not fall by more than 100°; after carburisation, fresh ore or scrap steel is added, and the crude steel is refined. CHEMICAL ABSTRACTS.

Technical and economic factors in the dressing of spathic iron ore from the San Fernando mine. W. LUYKEN and E. BIERBRAUER (Arch. Eisenhüttenw., 1927—8, 1, 487—482; Stahl u. Eisen, 1928, 48, 262—263).—The ore as mined contains 32.7% Fe, 6.7% Mn, 0.33% Cu, and 13.9% of insoluble matter, the copper being present as cupriferous pyrites. After crushing by stages to 22 mm., the clean ore is removed by hand-picking and the fines are further crushed and treated on jigs, tables, and magnetic separators. The iron product thus obtained contains 35.2% Fe, 7.2% Mn, 0.25% Cu, and 7.5% of insoluble matter; the recovery of iron and manganese exceeds 95%. The recovery of copper from the intermediate products is about 23%. A. R. POWELL.

Recrystallisation of transformer steel. M. VON MOOS, P. OBERHOFFER, and W. OERTEL (Stahl u. Eisen, 1928, 48, 393—403).—Recrystallisation diagrams of a transformer steel containing 4.07% Si, 0.05% C, 0.08% Mn, 0.007% P, and 0.006% S have been obtained for annealing periods of 1 hr. and 4 hrs. Recrystallisation commences at 500° when the metal has been subject to a 20% deformation by compression, and at 800° after a deformation of 5%. The new crystals begin to grow along the boundaries of the old grains and along the slip planes, but the latter seem to be the determining factor in the recrystallisation; after hot deformation of coarse-grained metal, owing to the almost complete absence of slip planes, very little recrystallisation takes place during annealing. With transformer steel of the above composition, there seems to be no critical amount of cold work required to induce recrystallisation. A. R. POWELL.

Resistance to corrosion, and mechanical properties of grey iron containing a small proportion of copper. P. B. MIKALOV (Viestn. Metallspr., 1926, No. 9—10, 5—21).—Addition of copper (1.3%) does not reduce the strength, density, or homogeneity of the iron, but reduces its brittleness; 0.7% or more increases the hardness. Addition of 0.5—1.7% increases resistance to corrosion by sulphuric, hydrochloric, or acetic acid, or (in presence of bronze) sodium chloride solution, but not by alkalis, nitric acid, or water. Copper dissolves completely in grey iron; it does not affect the structure of grey iron with a high silicon content, but hinders the formation of cementite when the silicon content is low. CHEMICAL ABSTRACTS.

Thermal expansion of alloys of the stainless iron type. P. HIDNERT and W. T. SWEENEY (U.S. Bur. Stand., Sci. Paper 570, 1928, 22, 639—647).—The curves showing the expansion up to 1000° of nine samples of stainless iron containing 11.9—16.4% Cr and 0.09—0.13% C are all approximately straight lines up to the transformation point at 750—850°, where a sharp contraction takes place, followed by a further expansion, the curve for which is nearly parallel to but below that

extending from 0° to the transformation point. An increase in the chromium content tends to raise the transformation temperature and to decrease the contraction that then takes place. The average coefficients of thermal expansion $\times 10^{-6}$ for the samples tested over various temperature ranges were as follows:—20—100°, 10.0; 20—300°, 10.8; 20—500°, 11.6; 20—700°, 12.3; and 20—800°, 12.5. A. R. POWELL.

Characteristics of low-carbon manganese steel.

V. N. KRIVIBOK, B. M. LARSEN, W. B. SKINKLE, and W. C. MASTERS (Amer. Inst. Min. Met. Eng. Tech. Pub., 1927, No. 24, 1—30).—Experiments with steels containing up to 0.35% C and 1.4—3.96% Mn showed that the manganese lowered the transformation temperatures and retarded the rate of the changes. Quenching and drawing develop the best mechanical properties. Preliminary experiments on impact and fatigue showed better results for steels containing 1.75% Mn than for those of normal manganese content. The microstructures are discussed. CHEMICAL ABSTRACTS.

Analysis of acid-resisting bronze and antimonial lead. II.

R. F. SMITH (Pulp and Paper Mag., 1928, 26, 389—390; cf. B., 1928, 197).—For the determination of tin and antimony in Babbitt metal, 0.5 g. is dissolved in 10 c.c. of concentrated sulphuric acid, 5 c.c. of water, and 20 c.c. of hydrochloric acid (d 1.18) are added, and the solution is boiled for 15 min. in a 500-c.c. conical flask carrying a thermometer which should read 105—110° about 2 in. above the surface of the liquid. After cooling and diluting with 130 c.c. of water, the antimony is titrated with permanganate. The solution is treated with 6 c.c. of sulphuric acid and 60 c.c. of hydrochloric acid, and the tin reduced by boiling with soft iron wire and titrated with iodine in the usual manner.

A. R. POWELL.

Effect of small additions of tin and cadmium on the properties of lead.

J. COURNOT (Compt. rend., 1928, 186, 867—869).—The addition of up to 3% of tin and/or cadmium to lead does not affect its corrosion by concentrated sulphuric acid, whilst concentrated hydrochloric acid and 30% nitric acid have less effect than on pure lead if cadmium or tin alone is used. Cadmium alone increases the resistance to ammonium sulphide, and produces an elevation of mechanical resistance and elasticity. It also produces a decrease in malleability and an increase in oxidisability, both of which are checked by the addition of tin. The properties of the alloys are tabulated for varying proportions of these metals. Antimony does not enter into solid solution in the lead. J. GRANT.

Nephelometric determination of small quantities of lead in presence of zinc by means of potassium chromate. L. S. VAN DER VLUGT (Chem. Weekblad, 1928, 25, 194—196).—The method is based on the comparison of the opalescence given with potassium chromate by the solution to be examined with that given by a standard dilute solution of lead nitrate, the acidity being so adjusted that no precipitation of zinc ensues. S. I. LEVY.

Working-up [and analysis] of gold and silver scrap. W. ADOLPHI (Chem.-Ztg., 1928, 52, 109—110).

Coke for blast furnaces. MOTT. **Corrosion in gas mains.** SMITH.—See II.

PATENTS.

Manufacture of pure iron. A. MITTASCH, C. MÜLLER, and W. SCHUBARDT, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,663,916, 27.3.28. Appl., 12.5.26. Ger., 10.6.25).—Iron obtained by decomposition of iron carbonyl and contaminated with carbon and oxygen is purified by heating at 500° or over in an atmosphere free from oxidising gases. F. G. CROSSE.

Welding of cast iron. H. V. WILLE (U.S.P. 1,660,246, 21.2.28. Appl., 31.7.22).—The weld area is first coated with a metal which will not harden under welding conditions and then welded with ferrous metal containing sufficient carbon to leave free graphite in the fused metal. B. M. VENABLES.

Ferrous alloy. C. MEIER (U.S.P. 1,662,158, 13.3.28. Appl., 20.6.25).—An iron alloy suitable for casting into steel moulds contains 2—4% C, 2.5% Si, 1—3% Ti, 0.5—1% Al, 0.5—3% Mn, 0.25—1% P, and 1—3% of 60% ferrochromium. A. R. POWELL.

Manufacture of a steel alloy [for permanent magnets].

E. PAKULLA, Assr. to DEUTS. EDELSTAHLWERKE A.-G. (U.S.P. 1,661,907, 6.3.28. Appl., 18.9.24. Ger., 9.6.23).—The alloy contains chromium and at least one of the elements, tungsten, molybdenum, or cobalt; it is heated to a temperature above lowering temperature and quenched in a mild, non-aqueous hardening fluid. A. R. POWELL.

Heat-treatment of alloys. K. J. JACOBI, Assr. to PACIFIC COAST BORAX CO. (U.S.P. 1,664,175, 27.3.28. Appl., 9.6.26).—Alloy steels are subjected to a fused bath of an alkaline-earth borate. F. G. CROSSE.

Manufacture of alloys.

A. CORRADINI, and Soc. METALLURGICA G. CORRADINI (B.P. 287,369, 1.7.27).—The alloy, suitable to replace bronze, consists of 50—60% Cu, 40—30% Zn, 2—6% Mn, 2—6% Ni, 0.25—1.50 Fe, and 0.25—1.50% Pb. F. G. CROSSE.

Copper-beryllium alloys and their [heat] treatment.

SIEMENS & HALSKE A.-G. (B.P. 271,454, 9.5.27. Ger., 21.5.26).—Copper alloys containing up to 12% Be together with not more than 10% Ni and/or quantities of tin, aluminium, or zinc within the β -solid solution range are quenched from temperatures above 580°, and subsequently tempered at 300—500° in order to obtain great strength and hardness. In order to work the alloys they are annealed below 580° and allowed to cool slowly. A. R. POWELL.

Manufacture of beryllium or its alloys by electrolysis of fused salts.

SIEMENS & HALSKE A.-G. (B.P. 278,723, 6.10.27. Ger., 7.10.26).—An electrolytic bath for the production of compact beryllium comprises a mixture of barium, calcium, and/or alkali fluorides with beryllium oxyfluoride. The bath should contain 7—8% Be, and is operated at about 1300°, the beryllium being deposited on a water-cooled cathode. The vapours evolved from the operation are collected in an electrostatic precipitation plant and returned, together with further quantities of beryllium oxyfluoride, to the bath as required. To deposit beryllium alloys, a salt of the

other metal is added to the bath or a layer of the metal to be alloyed may first be produced electrolytically on the cathode and the beryllium then deposited on this layer.

A. R. POWELL.

Alloys for turbine blades and machine parts exposed to similar conditions. HERÆUS VACUUM-SCHMELZE A.-G., and W. ROHN (B.P. 286,367, 3.12.26).—A suitable alloy consists of 10–40% Cr, 40–85% Ni, 1–40% Fe, and practically no carbon. Other constituents may be up to 15% W, up to 12% Mo, up to 6% Al, 2–20% Co, or a combination of these elements.

C. A. KING.

Production of aluminium or aluminium alloys from alumina. METALLBANK & METALLURGISCHE GES. A.-G. (B.P. 277,640, 26.8.27. Ger., 18.9.26).—The slow solubility of crystallised alumina in the electrolytic bath for the production of aluminium is overcome by quenching the alumina while molten in water.

C. A. KING.

Purification of magnesium and high-percentage magnesium alloys. I. G. FARBENIND. A.-G. (B.P. 280,530, 1.11.27. Ger., 13.11.26. Addn. to B.P. 182,948; B., 1922, 715).—The molten metal is treated at 700° with 0.5% of calcium and stirred under the refining salt layer claimed in B.P. 219,287 (B., 1925, 75) until most of the impurities have been removed and only about 0.1% Ca remains in the metal. After skimming, a further quantity of the refining salt is added followed by sufficient manganese chloride to produce an alloy containing 1% Mn; the mass is stirred at 900° until the alloy contains a maximum of 0.4% Mn, the flux removed, and a further quantity added, and finally the metal is cooled to casting temperature, skimmed, and poured.

A. R. POWELL.

Manufacture of a magnesium alloy. W. R. VEAZEY, Assr. to DOW CHEMICAL CO. (U.S.P. 1,663,963, 27.3.28. Appl., 8.12.24).—Magnesium is alloyed with 0.15% V.

F. G. CROSSE.

Refining of light metals, e.g., magnesium, aluminium, and their alloys, and recovering such metals from scrap. A. BECK, Assr. to I. G. FARBENIND. A.-G. (U.S.P. 1,661,526, 6.3.28. Appl., 4.4.27. Ger., 15.1.26).—The metal to be refined is melted and stirred under a molten flux consisting of calcium chloride and fluoride in such proportions that the eutectic mixture, 82% CaCl₂, 18% CaF₂, is avoided.

A. R. POWELL.

Purification of metallic antimony. C. A. ROSE and C. L. READ, Assrs. to AMER. SMELTING & REFINING CO. (U.S.P. 1,662,439, 13.3.28. Appl., 24.8.26).—Crude antimony is treated with chlorine at a temperature just above the m.p., whereby the impurities are converted into chlorides, which are removed from the surface of the metal and treated for the recovery of any valuable constituents.

A. R. POWELL.

Apparatus for smelting the metallic dust in and recovering the heat from blast-furnace gases. J. M. SCHUTZ, Assr. to C. G. HAWLEY (U.S.P. 1,662,939, 20.3.28. Appl., 5.2.24).—The apparatus comprises a bottom bowl in combination with superimposed multiple tuyère rings to which high-pressure air and gas are supplied and above which is an overhanging annular abutment.

A. R. POWELL.

Extraction of tin from ores etc. H. L. SULMAN and H. F. K. PICARD (B.P. 286,795, 13.12.26; cf. B.P. 276,743, B., 1927, 847).—Fine tin ores or concentrates are formed into briquettes with a carbonaceous reducing agent and a binder, and the briquettes are heated in a current of hydrogen chloride in an inclined retort at such a temperature (610–630°) that the tin is volatilised as stannous chloride, substantially free from chlorides of other metals. When evolution of fumes has practically ceased, the hydrogen chloride is replaced by a current of steam, which serves to decompose other chlorides formed in the retort, with the regeneration of hydrogen chloride for further use, and to volatilise a further small quantity of stannous chloride. The alternating treatment with hydrogen chloride and steam may be repeated as often as is necessary for the almost complete removal of the tin from the charge.

A. R. POWELL.

Treatment of refractory ores containing precious metals. G. W. B. EVANS, Assr. to EVANS ORE REDUCTION CO. (U.S.P. 1,664,067, 27.3.28. Appl., 13.8.26).—The ores are mixed with lime, salt, and ammonium chloride, and the agitated mixture is heated in an atmosphere of hydrogen, whereby the precious metals can be separated.

F. G. CROSSE.

Sintering of zinc ores. H. J. STEHLI (U.S.P. 1,661,813, 6.3.28. Appl., 9.10.26).—Zinc sulphide ores are roasted until the sulphur content is reduced below that at which sintering can be carried out, the product is mixed with sufficient retort residues to furnish carbon for heating the mixture and reducing the sulphates present, and the mixture is subjected to blast-roasting in an oxidising atmosphere to decompose the sulphates and sinter the mass.

A. R. POWELL.

Dissociation of zirconium ores. RHENANIA-KUNHEIM VER. CHEM. FABR. A.-G. (B.P. 282,023, 2.11.27. Ger., 13.12.26).—The finely-powdered ore is mixed with 1–1.5 pts. of calcium carbonate and about 10% of calcium fluoride or chloride and the mixture is heated at 1200–1300° in a revolving furnace; a lower temperature may be used if steam is introduced into the furnace. After this treatment 95% of the zirconia is soluble in acid.

A. R. POWELL.

Manufacture of an abrasive-resisting metal. L. J. BARTON (U.S.P. 1,662,357, 13.3.28. Appl., 1.9.26).—The alloy comprises iron with 0.8–1.3% C, 0.3–0.6 Si, 0.6–1% Mn, and less than 0.08% (S + P). It is prepared by melting steel scrap in an acid-lined electric furnace, adding carbonaceous material, sand, lime, and cast iron, pig iron, or ferromanganese until the slag becomes yellowish-green in colour and the gases are removed from the metal, deoxidising with 0.8–1.5% of ferromanganese, adding 0.3–0.6% of crushed ferro-silicon, and finally dropping in small pieces of aluminium as the alloy is poured into moulds.

A. R. POWELL.

Coating [for metallic] moulds. H. M. WILLIAMS, Assr. to GEN. MOTORS RES. CORP. (U.S.P. 1,662,354, 13.3.28. Appl., 10.1.25).—A mould dressing comprising a finely-divided refractory material combined with a suitable bond is applied in a thin coating to the surface of the moulds, which are then heated.

A. R. POWELL.

Surface-treatment of metal articles. M. FOURMENT (B.P. 262,439, 1.12.26. Fr., 5.12.25).—In order to coat the surface of a metal article with another metal which imparts hardness or corrosion-resisting properties, the article is heated in a powder containing the coating metal in a finely-divided form, the heating being carried out in a high-frequency induction furnace.

A. R. POWELL.

Manufacture of [metallic] catalysts. I. G. FARBENIND. A.-G. (B.P. 286,123, 6.5.27. Addn. to B.P. 281,218; B., 1928, 235).—Finely-divided metallic catalysts are obtained by displacing the metal from a solution of one of its salts by treatment with a more electropositive metal or with hydrogen under pressure in the presence of an organic base or an acid amide. When hydrogen is used a small amount of the finely-divided metal to be deposited may be added as an accelerator.

A. R. POWELL.

[Electric] bright-annealing furnaces. SIEMENS-SCHUCKERTWERKE G.M.B.H. (B.P. 262,444, 2.12.26. Ger., 3.12.25).—The protecting hood rests on a packing or sealing ring composed of an easily fusible mixture of sand and salts. A mixture with sand of cuprous chloride (66%) and calcium chloride or sodium chloride (34%) is specified. The ring is preferably heated electrically.

H. HOLMES.

Method of galvanising. J. BLACKBURN and A. ALBRECHT, Assr. to J. BLACKBURN (U.S.P. 1,663,037, 20.3.28. Appl., 7.12.25).—A bundle of articles is pickled, dipped into a bath of molten metal, and heated in a flame on removal from the bath. After separation of the articles from one another by jarring, the bundle is cooled by continuous passage through oil and into water.

J. S. G. THOMAS.

Electrodeposition of chromium. SIEMENS & HALSKE A.-G., Assees. of C. G. FINK (B.P. 275,223, 23.7.27. U.S., 27.7.26).—To obtain bright deposits of chromium plating a current density of 0.5–1.5 amp./in.² is required, and this can conveniently be applied only to relatively small surfaces. Hence to plate large surfaces only a portion of the surface is plated at a time, although the whole surface is immersed in the electrolyte and behaves as a cathode; the high current density required for depositing the chromium on the article is obtained by using a small travelling anode working from the top to the bottom of the bath so that, while chromium is being deposited on those parts of the cathode in close proximity to the anode, the remaining parts of the cathode are kept bright by the evolution of hydrogen.

A. R. POWELL.

Production of electrolytic deposits of metals or alloys. L. MELLERSH-JACKSON. From SIEMENS & HALSKE A.-G. (B.P. 286,457, 8.3.27).—Chromium, nickel, tungsten, molybdenum, and alloys of these metals with one another or with silicon or boron are obtained by electrolysis of fused alkali borates, cyanides, sulphates, or silicates in which the oxide of the metal is dissolved. Thus, for the deposition of chromium on iron the electrolyte comprises a mixture of 20 pts. of borax, 40 pts. of magnesium metaborate, 20 pts. of sodium metaborate, and 15 pts. of chromic oxide, or a mixture of 1000 pts. of potassium cyanide and 120 pts. of chromic oxide. In

the latter case by the addition of sodium silicate a deposit of chromium-silicon alloy may be obtained.

A. R. POWELL.

Preventing scorification of fire-bars, grate surfaces, etc. R. HOPFELT, Assr. to METALLISATOR BERLIN A.-G. (U.S.P. 1,663,944, 27.3.28. Appl., 29.1.25. Ger., 28.2.24).—See G.P. 410,158; B., 1925, 639.

Process and apparatus for casting metal into moulds. KRAFTMETALL ARTEBOLAGET, Assees. of R. KOLB (B.P. 282,047, 3.12.27. Ger., 7.12.26).

Washing of minerals (B.P. 285,987).—See I. Molybdc and tungstic acids (B.P. 269,947).—See VII.

XI.—ELECTROTECHNICS.

Power factor in high-frequency spark induction furnaces. R. DUFOUR (J. Phys. Radium, 1927, [vi], 8, 508–521).—A study of the schematic function of the furnace is made, based on certain hypotheses which enable a mathematical treatment of the subject to be developed, from which the time of charge of the condensers, the number of charges per sec., the intensities of the current and heat liberated at the end of the charge or discharge, and eventually the power factors are calculated successively. The variation of the power factor with the tension of the spark, and the relation of the number of wave-trains per sec. to the phase-angle, are also derived.

J. GRANT.

Transformer steel. VON MOOS and others.—See X. **Measurement of colour.** SANDERA.—See XVII.

PATENTS.

Electrical furnaces. Electrical heating apparatus. AMER. RESISTOR CORP., Assees. of H. N. SHAW (B.P. 257,949 and 257,950, 3.9.26. U.S., 3.9.25).—(A) A unitary resistance heating element is supported by a butt-ended engagement of terminal members with its ends. The ends of the element extend into apertures in the furnace walls so that there is a free space between the peripheries of the ends and the aperture walls. (B) The terminal or mounting is free to expand when heated, without causing appreciable deterioration of the electrical contact between the heating element and the terminal or mounting.

J. S. G. THOMAS.

Generation of ozone. SIEMENS & HALSKE A.-G. (B.P. 276,637 and 277,651, [A] 15.7.27, [B] 8.9.27. Ger., [A] 26.8.26, [B] 14.9.26).—(A) High-frequency current derived from a generator circuit is tuned to the working frequency, the secondary of a coreless transformer being arranged with the ozone generator in an oscillation circuit which is tuned to the frequency of the current fed to the primary of the transformer. (B) Inert, pulverulent or granular insulating material, e.g., glass beads, is filled into the space between the two discharge surfaces of the ozoniser, so that development of a brush discharge is prevented.

J. S. G. THOMAS.

[Electrolyte for] secondary battery or accumulator. E. A. SALAZAR, Assr. to MANUEL CONTE DE MIERES (U.S.P. 1,662,866, 20.3.28. Appl., 14.12.25).—A solution of zinc chloride is mixed with another halogen salt of zinc having less heat of formation than the chloride.

J. S. G. THOMAS.

Filament for incandescence lamps. G. W. MEISTER, Assr. to WESTINGHOUSE LAMP Co. (U.S.P. 1,663,560, 27.3.28. Appl., 20.2.26).—A solid solution of tungsten and a small proportion of molybdenum is claimed, the solid solution having a lower vapour pressure than tungsten at the same temperature. J. S. G. THOMAS.

[Treatment of] refractory metal filaments. M. N. RICH, Assr. to WESTINGHOUSE LAMP Co. (U.S.P. 1,663,564, 27.3.28. Appl., 30.10.25).—The surface of the metal is cleaned and hydrogen eliminated after swaging; the wire is then formed into filaments which are again treated for removal of impurities introduced during this process before being reduced to their final size. J. S. G. THOMAS.

[Clean-up material for] electron-discharge device. G. D. O'NEILL, Assr. to WESTINGHOUSE LAMP Co. (U.S.P. 1,663,561, 27.3.28. Appl., 3.3.27).—A mixture of a refractory metal and aluminium is claimed. J. S. G. THOMAS.

Electron-emitting [refractory] material. C. V. IREDELL, Assr. to WESTINGHOUSE LAMP Co. (U.S.P. 1,663,553, 27.3.28. Appl., 24.2.27).—From 1 to 3% of thorium oxide and 0.5–4% of cerium oxide (based on the thorium oxide content) are incorporated with tungsten. J. S. G. THOMAS.

Activation of refractory material [thoriated metal]. W. B. GERO, Assr. to WESTINGHOUSE LAMP Co. (U.S.P. 1,663,547, 27.3.28. Appl., 17.7.23).—The material is treated in an atmosphere which is reducing with respect to thoria before being drawn to final size. J. S. G. THOMAS.

Production of thin electric insulating layers having a high resistance to leakage. A. JOFFÉ (B.P. 287,039, 8.9.26).—The surface of a dielectric which reacts with oxygen is treated with an oxidising medium. Thus cobalt or manganese siccative is added to the surface of linseed oil varnish which has been polymerised, and the surface treated with oxygen at 200°. Layers of the oil, so treated, 0.001 mm. thick will withstand electric fields of strength up to 10⁸ volts/cm. J. S. G. THOMAS.

Impregnation of insulating materials. SOC. ITAL. PIRELLI (B.P. 276,985, 25.8.27. Italy, 31.8.26).—Air is expelled from the dried insulating material by a gas, e.g., carbon dioxide, propane, acetylene, which is very soluble in the impregnating insulating compound used, e.g., oil, after which the gas is expelled and the material impregnated with the insulating compound from which gas has been driven off. J. S. G. THOMAS.

Heat-treatment of loaded conductors. W. E. BEATTY. From WESTERN ELECTRIC Co., INC. (B.P. 286,767, 6.12.26).—A conductor loaded with magnetic material, e.g., with an alloy containing 3% Cr, 78.5% Ni, and 8.5% Fe, is heated above the magnetic transition temperature of the loading material, e.g., 900°, and subsequently cooled in stages down to about 300° at a rate considerably slower than would be the case if the conductor were cooled freely in air. The conductor is then cooled to air temperature. The treatment increases the magnetic permeability of the alloy. J. S. G. THOMAS.

Electric furnace. I. RENNERFELT (U.S.P. 1,664,132, 27.3.28. Appl., 18.8.26. Swed., 1.9.25).—See B.P. 276,823; B., 1927, 850.

Electric incandescence lamps [for use in light-houses]. GEN. ELECTRIC Co., LTD., and C. HIGGINS (B.P. 287,299, 21.2.27).

Electrodes for electric batteries. COMP. FRANÇ. POUR L'EXPLOIT. DES PROC. THOMSON-HOUSTON (B.P. 271,034, 29.12.26. Fr., 17.5.26).

[Closure-plates for] electric accumulators. G. H. TROTTER (B.P. 286,863, 19.2.27).

Hydrometer (B.P. 284,916).—See I. Artificial silk (B.P. 286,086).—See V. Steel alloy (U.S.P. 1,661,907). **Beryllium and its alloys** (B.P. 278,723). **Annealing furnaces** (B.P. 262,444). **Chromium** (B.P. 275,223). **Electrodeposition of metals or alloys** (B.P. 286,457).—See X.

XII.—FATS; OILS; WAXES.

Relation between the properties of soaps and their compositions. I. Soaps of stearic and oleic acids.

II. Surface tension and emulsifying power of stearic, oleic, and lauric acid soaps. M. HIROSE (J. Soc. Chem. Ind. Japan, 1927, 30, 734–42, 742–746).—I. The drop number (with Hillyer's stalagmometer), the surface tension (with du Nouy's apparatus), the viscosity (with Ostwald's viscosimeter), the lathering power (with the modified Stiepel's flask), and the washing power (compared by using indigo-lanolin cloth) of the mixed soaps of sodium stearate and oleate in various proportions have been measured. Among the samples tested the mixed soap of equal parts of stearate and oleate was the best in quality.

II. Among the mixed soaps of varying composition of sodium stearate, oleate, and laurate, the greatest lowering of the surface tension of water was observed in the case of stearic acid-oleic acid soaps; the presence of sodium laurate generally diminished this lowering.

Y. TOMODA.

Formation of iso-acids during the hydrogenation of fatty oils. IV. Presence of iso-acids in hardened plaice oil. S. UENO and Z. OKAMURA (J. Soc. Chem. Ind. Japan, 1927, 30, 817–819).—Isomerides of acids of the oleic series were found in the samples of hardened plaice oil prepared under various conditions. The amount of the iso-acids formed increases with the temperature and time of hydrogenation. Y. TOMODA.

Effect of various compounds on rate of development of rancidity in fats and oils. W. J. HUSA and L. M. HUSA (J. Amer. Pharm. Assoc., 1928, 17, 243–247).—The rate of development of rancidity in oil of sweet almonds is reduced by the addition of quinol, which also reduces the rate in lard about 50%. The following compounds have no effect on the rate: salicylic acid, acetylsalicylic acid, β -naphthol, liquefied phenol, *dl*-alanine, pyrogallol, and resorcinol. All the above substances were added in amounts of 0.5% of the fat, and rancidity was detected by the Kreis test and by the odour. E. H. SHARPLES.

Exploitation of whales. J. LUND (Chem.-Ztg., 1928, 52, 241–242).—The distribution of oil in the

blubber, tongue, entrails, bones, and flesh is described, and methods of extraction are discussed. S. I. LEVY.

Determination of sulphur dioxide in fatty substances. A. W. KNAPP and R. J. PHILLIPS (Analyst, 1928, 53, 149).—When rancid fats may be present in samples being examined for sulphur dioxide, unless a rough sorting test only is required, the gravimetric process should be used, since three 25 g. samples of very rancid cows' butter gave absorption figures equivalent to 29 pts. of sulphur dioxide per million by the volumetric process, but no trace by the gravimetric process. Moderately fresh cacao butter (25 g.) and cows' butter showed, respectively, 10 and 6 p.p.m. and an 8 months' old full-cream milk powder 19 p.p.m.

D. G. HEWER.

Calamary oil of Hokkaido. M. TSUJIMOTO and K. KIMURA (J. Soc. Chem. Ind. Japan, 1927, 30, 865—868; cf. *ibid.*, 1924, 27, 1300).—The oil is prepared from the intestines of the calamary, *Ommastrephes sloani pacificus*, of Hokkaido. The intestines contain about 20% of oil, or the liver separately about 30%; calamary oil consists mainly of liver oil. The oil, which is liquid at 20° and has an odour like that of fish liver oils, has d_{4}^{20} 0.9300, n_{D}^{20} 1.4833, iodine value 179.5 (the pyridine dibromide sulphate method), acid value 18.2, saponif. value 176.9, unsaponifiable matter 4.20%, colour reaction with sulphuric acid—pale reddish-violet, colour reaction with antimony trichloride in chloroform—pale greenish-blue. The fatty acids are crystalline solids having m.p. 31° (approx.), neutralisation value 188.6, iodine value 185.2, ether-insoluble bromide 76.29%, and bromine content of ether-insoluble bromide 71.37%. By the lead salt-ether method, the fatty acids are separated into liquid acids (77.4%; n_{D}^{20} 1.4810, neutralisation value 182.1, and iodine value 247.7), and solid acids (m.p. 52.5°, neutralisation value 211.1, and iodine value 14.1). The highly unsaturated fatty acids (n_{D}^{20} 1.4958, neutralisation value 176.5, and iodine value 372.1) are obtained from the fatty acids by the lithium salt-acetone method in 41.3% yield. The methyl esters of the fatty acids on distillation under 15 mm. pressure gives fractions containing (a) palmitic acid, (b) oleic acid, (c) highly unsaturated acids. The unsaponifiable matter is an orange-yellow crystalline solid and contains vitamin-A and cholesterol (2.7% of the oil). The growth-promoting activity of vitamin-A in the oil is rather superior to that of cod-liver oil.

K. KASHIMA.

Oil from *Pinus Gerardiana*. Chilgoza oil. I. S. D. HARDIKAR (J. Indian Chem. Soc., 1928, 5, 63—67).—The kernels of this tree, indigenous to North-West India and Afghanistan, contain 33.7% of an oil which consists of glycerides of linoleic and oleic acids (over 93%) and of saturated acids (about 5%). The esters of linolenic acid are absent. The oil has d_{4}^{20} 0.9144, n_{D}^{20} 1.4709, acid value 3.87, saponif. value 192.4, acetyl value 4.07, iodine (Hubl) 121.3, unsaponifiable matter 0.50.

G. A. C. GOUGH.

Theory of oil bleaching; drying of oils by gas-coagulation. A. EIBNER and A. GRETH (Farben-Ztg., 1928, 33, 1595—1598).—Drying oils of the linseed and poppyseed oil groups were bleached by bubbling a slow

current of dry air through them for 5—10 days at ordinary temperatures in diffused daylight (and in the case of the easily-bleached pine-seed oils in the dark). Parallel experiments were carried out using moist air. During the bleaching no development of acidity or change in viscosity occurs, and slight rises in saponif. values are explicable by lactone formation. Although oxygen—in the presence or absence of light—is essential to the bleaching process, the changes are not chemical in the sense of formation of "blown oils." The bleached oils were sealed in glass tubes with very small air space, and stored in diffused light for 7 years, together with parallel tubes of the unbleached oils. Up to 3 years no changes were apparent in the bleached oils; perilla oil and then linseed and walnut oils began to darken from this time. Poppyseed and pine-seed oils remained practically colourless for 7 years, after which time all the tubes were opened. The phenomena observed on opening and the nature of the stored oils are discussed. Autoxidation has occurred with the linseed oil group, whilst poppyseed oil is virtually unaltered, the adsorbed oxygen not having led to "gas-coagulation." The significance of α -linolein content is stressed, the satisfactory drying and film-forming properties of linseed oil etc. being counterbalanced by the subsequent tendency to disintegrate, whereas the slow-drying poppyseed oil is more permanent. Similar experiments by other workers are recapitulated, and Auer's views are criticised in the light of the present work.

S. S. WOOLF.

Oil testing. SCHLÜTER.—See II.

PATENTS.

Production of washing agents. G. PETROV and P. SHESTAKOV (U.S.P. 1,661,620, 6.3.28. Appl., 30.12.25. Ger., 20.2.25).—A washing compound is prepared from the purified product obtained by sulphonating a mixture of aromatic hydrocarbons and highly unsaturated drying oils.

A. R. POWELL.

[Rotatable cauldrons for use in] soap-making. L. H. NELLES (B.P. 287,198, 16.11.26).

Extraction press (B.P. 262,072).—See I.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Terpineol content of the turpentine obtained in the preparation of terpin hydrate. B. SÜSSKIND (Trans. Sci. Chem.-pharm. Inst. [Moscow], 1923, 6, 29—30; Chem. Zentr., 1927, ii, 2629).—The terpineol content was 9.2%.

A. A. ELDRIDGE.

Removal of ink from vulcanite. DITMAR.—See XIV.

PATENTS.

Production of waterproof impregnating, finishing, and colour coatings. A. JEREMIAS (B.P. 286,396, 20.12.26).—Rubber, collodion, shellac, and other materials insoluble in water are emulsified by the use of soap, Turkey-red oil, or other emulsifying agent, and converted into a "water-soluble" form in which they can be used more readily than usual as waterproof coating materials. The coating is finally reconverted into the water-insoluble state by means of a fixing agent containing a metal salt, e.g., alum, aluminium acetate, etc.

S. S. WOOLF.

Coating and impregnating medium. C. ELLIS (U.S.P. 1,663,160, 20.3.28. Appl., 7.12.20).—A phenol-sulphur halide resin which is not readily soluble in any one of various specified solvents, *e.g.*, alcohols, benzene, chlorobenzene, etc., is dissolved to a clear solution in a composite solvent, including at least one of these solvents.

S. S. WOOLF.

Manufacture of lithopone. NEW JERSEY ZINC Co., Asses. of [A, B] W. C. HOOEY, and [C] F. G. BREYER and C. W. FARBER (B.P. 263,119, 263,120, and 265,550, [A, B] 2.12.26, [C] 9.12.26. U.S., [A, B] 15.12.25, [C] 2.2.26).—(A) In the precipitation of "crude pulp" in lithopone manufacture, the end-point of the reaction between the barium sulphide solution and the zinc sulphate solution is determined by the amounts of hydroxide and/or hydrosulphide radical present, the reaction being controlled by predetermined excess of and ratio between these radicals. (B) This excess and ratio are such as to control the properties of the finished lithopone, *e.g.*, oil absorption, alkalinity, strength, wetability, etc., and to lower the calcining temperature below that at which the light-resistance of the pigment deteriorates. (C) The crude lithopone is precipitated in the presence of a soluble chloride or other water-soluble compounds in amount equivalent to 0.75—1.0 g. of chlorine per litre of zinc sulphate solution (*d* 1.20 at 20°), the ratio of hydroxide to hydrosulphide radical being maintained at 65—80 : 35—20. The crude lithopone is dried to a water content of 4—10% before calcination. S. S. WOOLF.

Preparation of white titanium pigments. G. CARTERET (B.P. 274,072, 30.6.27. Fr., 12.7.26).—Titanium oxide is precipitated from a hydrochloric acid solution to which a small amount of sulphuric acid has been added, or from a sulphuric acid solution to which a small amount of hydrochloric acid has been added, by boiling in the presence of a suspended base, *e.g.*, silica, aluminium silicate, etc. The resulting paste is washed, filtered, dried, intimately mixed with sufficient weak alkali solution for neutralisation, again washed, dried, calcined, cooled, and crushed. The total acidity of the acid solution of titanium hydroxide is preferably about half that indicated by the theoretical equation of the hydrolysis of the normal salt. S. S. WOOLF.

Printing in greasy inks with gelatin printing surfaces. O. TREICHEL (U.S.P. 1,661,515, 6.3.28. Appl., 30.11.26. Ger., 18.12.25).—The gelatin is treated with a substance which reduces or delays its swelling prior to use. A. R. POWELL.

Coloration of lacquers. I. G. FARBENIND. A.-G. (B.P. 275,969, 2.8.27. Ger., 13.8.26).—Lacquers are coloured by incorporation therewith of basic dyestuffs which may also contain acid groups, together with complex acids, *e.g.*, phosphotungstic acid, phosphomolybdic acid, silicotungstic acid, etc., or salts of these acids capable of forming colour lakes with the dyestuffs. S. S. WOOLF.

Manufacture of cellulose ester compositions. I. G. FARBENIND. A.-G. (B.P. 257,258, 11.8.26. Ger., 21.8.25).—Halogeno-alkyl esters of mono- or poly-basic carboxylic acids (including carbonic but excluding acetic), of b.p. above 150°, are used as solvents for cellulose esters. B. FULLMAN.

Insulating layers (B.P. 287,039).—See XI.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Distribution of fillers in rubber mixing. F. S. REINER (Gummi-Ztg., 1928, 43, 1359—1360).—The ordinary operation of mixing fails to give uniform distribution of the various ingredients in rubber, and even subsequent calendaring does not effect this. Examination of the rubber insulation of a sample of commercial electric wiring also revealed irregularity of composition. Uniformity of composition was observed in rubber into which the ingredients had been introduced while the rubber was in the form of latex or of solution.

D. F. TWISS.

Removing dried ink from vulcanite fountain pens. R. DITMAR (Chem.-Ztg., 1928, 52, 123).—The greenish-grey discoloration caused by prolonged immersion in water or aqueous solutions to remove dried ink may be avoided by using a solution of sodium hyposulphite, which effects a rapid cleaning without affecting the vulcanite.

S. I. LEVY.

Power consumption in the preparation of crêpe rubber. M. SCHRÖTER and R. RIEBL (Med. Proefstat. Rubber, Buitenzorg, 1927, [22], 397—419; Arch. Rubbercultuur, 1927, 11, [8]).

PATENTS.

Manufacture of rubber goods. G. FESSEL, and TECH. CHEMIKALIEN COMP. G.M.B.H. (B.P. 286,171, 21.9.27).—The tars and tar distillates from the carbonisation of lignite, coal, shale, or peat are extracted with a suitable organic solvent such as hot alcohol or with a solution of sodium hydroxide. The extracted oils, which may be freed from volatile constituents by distillation, when used in the proportion of 5—10 pts., constitute an excellent softener and preservative for rubber (100 pts.). For this purpose they can be further improved by heating between 135° and 150°, and are superior to coal-tar and pine-tar oil. D. F. TWISS.

Production of rubber goods directly from latex. DUNLOP RUBBER Co., and D. F. TWISS (B.P. 285,938, 22.10.26).—A mould of the desired shape, coated with a jelly containing a coagulant, is immersed in latex, of normal or higher concentration, to which compounding and vulcanising ingredients may have been added. A deposit of coagulum is formed, which is then dried and removed from the mould. D. F. TWISS.

Preservation of vulcanised rubber. H. W. FIEDLER (U.S.P. 1,661,887, 6.3.28. Appl., 3.9.24. Ger., 13.9.23).—A paste for the preservation of vulcanised rubber is produced by mixing glycerol, benzaldehyde, and talc into a solution of raw rubber in paraffin oil at about 140° and raising the temperature to about 180°. D. F. TWISS.

XV.—LEATHER; GLUE.

Batch B.14 hide powder. III. D. BURTON (J. Soc. Leather Trades Chem., 1928, 12, 20—25; cf. B., 1927, 757).—Chroming with chrome alum gives less variation in the non-tans with different batches of powder than basic chromium chloride on myrobalans, quebracho, mimosa, and blended extracts. Slightly higher results were obtained for the myrobalans extract using chrome alum instead of basic chromium chloride for chroming each batch of powder, except for B.14. Greater

differences between the non-tans given by the two methods of chroming were obtained on quebracho extracts, the powder chromed with chrome alum showing the lower result. B.14 hide powder gave a considerably greater amount of non-tars for both myrobalans and quebracho extracts with either method of chroming. Comparison of the results given by B.14 powder chromed with chrome alum and B.13 chromed with basic chromium chloride on the above extracts and crushed myrobalans shows an average difference of 0.5% (—0.6% to +0.5%). D. WOODROFFE.

PATENTS.

Preparation of depilatory substances. R. BOTSON (B.P. 285,152, 11.11.26).—An alkali sulphide, e.g., sodium sulphide, is liquefied by treatment with dry steam in a closed digester and terpinolene (1%) or similar solvent is added. The liquid is decanted, filtered, and mixed with a solution of caustic soda (*d* 1.32) in the proportion of 20—10%, filtered, concentrated, and crystallised. D. WOODROFFE.

Production of glue in flake or powder form. A. EHRENREICH (B.P. 284,593, 24.3.27. Belg., 31.1.27).—The viscous fluid prepared from the waste material of plagiostomi is evaporated *in vacuo* until it contains 70% of water only, agitated to form a frothy mass either of large cells, which are dried *in vacuo* yielding flakes, or of small cells which after being dried are powdered. D. WOODROFFE.

XVI.—AGRICULTURE.

Relations between plant growth and soil reaction as affected by fertilisers and liming. K. NEHRING (Z. Pflanz. Düng., 1928, 10A, 348—366).—The degree of exchange acidity and the p_H value of soils varies seasonally. Following much rain, acid conditions are intensified in the subsoil but reappear in the surface soil during the drier periods of the year when surface evaporation is rapid. Additions of lime in excess of the amounts calculated by the Daikuhara method do not remove all exchange acidity nor bring the p_H value of the soil to 7.0. Increased yields of barley followed the liming of acid soils, the maximum point corresponding to the complete neutralisation of the exchange acidity. Maximum yields of oats were obtained when the exchange acidity value was from 2.5 to 6.0 c.c. Decreased yields resulted from liming to a greater or less extent. On soils exhibiting exchange acidity physiologically alkaline fertilisers gave better yields of barley than acid ones, but both were equally satisfactory after adequate liming. Acid fertilisers were preferable to alkaline for oats. A. G. POLLARD.

Yield of oats as a function of the nitrogen supplied and the growth period. R. MEYER [with A. STORCK] (Z. Pflanz. Düng., 1928, 10A, 329—347).—Cropping experiments are examined from the point of view of the Mitscherlich law of growth, but with separate and detailed consideration of root, grain, and straw development, and the period of the life history of the plant. Up to the ripening stage of oats the slope of the nitrogen-growth curve does not increase with increasing phosphate treatment, but the position of the maximum point approaches that corresponding to the heavier

nitrogen treatments. The descending portion of the curve has a point of inflexion. Increasing additions of nitrogen produce growth-curve maxima first in the roots, followed by straw and grain in order. The maxima of a series of nitrogen-growth curves move towards the position of the higher nitrogen values as the growth period increases. Nitrogen-growth curves for roots reach their maxima earlier than those for the aerial portions of the plant. From a consideration of nitrogen-growth curves for varying periods a process is derived for determining final crop yields and thence fertiliser requirements. A. G. POLLARD.

Manuring of meadows with mineral nitrogen. GISEVIUS and KLITSCH (Z. Pflanz. Düng., 1928, 7B, 1—15).—Chemical examination of hay from fertilised meadows showed that potash-phosphate fertilisation produced heavier crops with higher nitrogen content than nitrogen fertilisation. Complete artificials produced the heaviest crops, but the nitrogen content was below that when potash and phosphate only were used. These results were paralleled by the proportion of grasses to clovers following the use of the various fertilisers. Where more than one cut of grass was taken in a season on plots receiving nitrogen only, the total yield and nitrogen content were higher when three cuttings were made than with two. Meadows fertilised with phosphate and potash only yielded heavier crops and higher nitrogen contents when two cuttings were made than with three. Ammonium sulphate, sodium nitrate, and urea did not exhibit very definite differences in their effects on herbage. Sodium nitrate was generally superior in dry weather. The bearing of these results on the control of pasture and meadow land is discussed. A. G. POLLARD.

Examination and manuring of acid mineral soils. H. KAPPEN (Z. Pflanz. Düng., 1928, 7B, 16—29).—Methods for measuring soil acidity are compared and discussed. To characterise soil acidity, determinations should be made of p_H value, exchange and hydrolytic acidity, and absolute neutralisation value (Kappen-Hilkowitz). The degree of saturation can be calculated from these latter values. The efficiency of liming depends on the fineness of grinding of the material, thoroughness of distribution through the soil mass, and the temperature and moisture content of the soil. The value of determinations of buffer capacity (Jensen) in the selection of general fertiliser materials is discussed. A. G. POLLARD.

Phosphate in the soil solution as affected by reaction and cation concentrations. L. J. H. TEAKLE (Soil Sci., 1928, 25, 143—162).—Experiments on the influence of various cations on the solubility of phosphates in aqueous solutions, and of various reagents on the concentration of phosphate in the soil solution indicate that a purely chemical explanation of the low phosphate concentration of the soil solution is most satisfactory. A series of reactions are proposed as indicative of the behaviour of phosphate in the soil. Iron, manganese, aluminium, and calcium are effective in turn in precipitating phosphate from the soil solution as the reaction changes from very acid to neutral and alkaline conditions. H. J. G. HINES.

Sodium salts, used in conjunction with potash, as a plant food. V. PEAS. H. HEINRICH (Z. Pflanz. Düng., 1928, 10A, 299—328).—Heavy dressings of potash manures fail to bring about corresponding crop increases in peas. The further addition of sodium salts, however, increases the yield of both grain and straw in amounts depending on the amount of salt added. A fairly large proportion of the commonly used potash fertilisers for peas may, with advantage, be replaced by sodium salts. Definite relationships between the extent of the replacement and the crop yields exist. Relatively large doses of sodium salts are without injurious effects on the crop, and in moderate amounts sodium sulphate alone produces considerable crop increases. Explanations of these phenomena are discussed. A. G. POLLARD.

Action of sodium chloride in irrigation water on certain plants. N. PASSERINI and P. GALLI (Atti R. Accad. Lincei, 1927, [vi], 6, 618—619).—The results of pot experiments indicate the inadvisability of using water containing more than 1 pt. of combined chlorine per 1000 for the irrigation of crops in open ground. This limit may be increased to 2 or even 3 pts. per 1000 in the case of the spontaneous growths of established meadowland or arable land with permeable subsoil.

T. H. POPE.

Absorption of rain water during vegetation by the soil and its utilisation by plants. N. TULAIKOV and A. KOZHEVNIKOV (Soil Sci., 1928, 25, 213—224).—Moisture determinations at intervals of 5 cm. were made to a depth of 100 cm. during spring and summer on soils bearing winter rye, spring wheat, and sunflower, and the results are discussed in relation to the rainfall and the habits of these plants.

H. J. G. HINES.

Significance of soil respiration in the carbon dioxide-feeding of plants. P. HASSE and F. KIRCHMEYER (Z. Pflanz. Düng., 1928, 10A, 257—298).—Methods are described for the determination of carbon dioxide in the free atmosphere and the extent of the daily "respiratory" changes in the soil mass. The average carbon dioxide content of the atmosphere near to the soil surface was 2.2% higher at night than during the day. The carbon dioxide concentration during soil respiration depended to a large extent on temperature and moisture conditions of the soil, and was greater at night than during the day. Exhalations of carbon dioxide from cropped soils varied with the crop, being much larger under lucerne than under potatoes or rye. 80% of the respired carbon dioxide in the case of lucerne came from the plant roots. The concentration of carbon dioxide in the free air at the zone of the middle leaves of the plants was smaller than that of the upper air during the day and greater during the night. The range of concentrations differed with the crop, being greatest with lucerne. The near presence of factory exhaust gases did not affect the carbon dioxide concentration of the atmosphere immediately surrounding the plants. The effects of air currents and local temperature changes are discussed. Changes in the carbon dioxide of the air, sufficient to produce significant crop increases, are not considered to be producible by manual treatment. Systematic "gassing" of crops by carbon dioxide is not a commercial possibility unless waste gas can be utilised.

A. G. POLLARD.

Fixation of [atmospheric] nitrogen by *Bacterium aerogenes* and related species. C. E. SKINNER (Soil Sci., 1928, 25, 195—205).—Of twenty-three strains of *B. aerogenes* isolated from soil, flour, and water, two, possibly three, strains were found to fix atmospheric nitrogen when grown in routine nitrogen-free media. Of the strains of *B. radiobacter* examined some were unable to fix nitrogen, and no strains of *B. cloacae* were found capable of so doing.

H. J. G. HINES.

***Actinomyces acidophilus*, N.Sp.—a group of *acidophilus actinomycetes* isolated from the soil.** H. L. JENSEN (Soil Sci., 1928, 25, 225—234).—This new species-group was isolated from three acid humus soils (p_{H} 3.4—4.1). They are able to live only in acid media. Their biochemical activities are briefly described.

H. J. G. HINES.

Constitution and properties of certain common anti-speronspore preparations. U. PRATOLONGO and M. P. ALLAN (Giorn. Chim. Ind. Appl., 1928, 10, 3—7).—The efficacy of Bordeaux mixtures as anti-cryptogams is due to basic copper sulphates, such as the compounds, $\text{CuSO}_4 \cdot 3\text{CuO} \cdot 3\text{H}_2\text{O}$ and $\text{CuSO}_4 \cdot 4\text{CuO} \cdot 4\text{H}_2\text{O}$; that of Caffaro paste to the compound, $3\text{CuO} \cdot \text{CuCl}_2$, that of Caffaro powder to $3\text{CuO} \cdot \text{CaCl}_2$, and that of copper protector (Protector ramato) to $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$. The most soluble of these is the calcium copper oxychloride, and the least soluble the copper oxychloride and basic carbonate, the resistance to washing-off being the reverse of the solubility. Poisoning of cattle by fodder (beet-tops) which has been treated with these preparations is unlikely, in view of the low solubility of the basic copper compounds in the slightly acid gastric contents.

T. H. POPE.

p_{H} value of some Texas soils and its relation to the incidence of certain woody plant species. A. H. BERKMAN (Soil Sci., 1928, 25, 133—142).—Colorimetric determinations of soil reaction in conjunction with ecological observations afford some evidence that soil reaction exerts a selective influence on woody plant species. This evidence is as yet regarded as inconclusive.

H. J. G. HINES.

Chemical characteristics of tobaccos of various districts (1925 season). A. SCHMUCK and BALABUCHA-POPZOWA (State Inst. Tobacco Invest., U.S.S.R., Bull. 40, 1927, 41 pp.).—Results are given of chemical analyses of tobaccos grown in 1925 in Abkhasia, Armenia, Black Sea region, Tuapsinski, Crimea, etc. In general, the proportions of carbohydrates and of polyphenolic compounds are greater, and those of proteins and total nitrogen less in the better than in the inferior tobaccos. The latter contain also the higher percentages of nicotine and ash. An indication of the quality of a tobacco is furnished by the ratio of the percentage of total carbohydrates to that of proteins, this ratio increasing as the quality improves. Of Crimean tobaccos, the paler ones are superior to the darker varieties.

T. H. POPE.

Effect of different fertilisers on the amount and quality of tobacco crops. A. V. OTRYGANIEV and D. V. BALANDA (State Inst. Tobacco Invest., U.S.S.R., Bull. 43, 1928, 33 pp.).—The results of field experiments during 1926 and 1927 on tobacco of the

Oriental cigarette type show that heavy reddish-brown silt loam soil gives a tobacco of continually improving quality and increasing yield as the amount of P_2O_5 applied to the soil as superphosphate is increased from 22 to 65 kg. per hectare. Thomas meal produces better results than superphosphate, but addition of lime with the meal lowers the yield. The use of potash and nitrogenous fertilisers alone, or of lime alone, results in no marked increase in the yield. On sandy loam soil the greatest need is phosphatic fertiliser, but the crop is increased also by nitrogen and potash, but not by lime; less pronounced improvement in yield follows the use of stable manure. The effects of ammonium sulphate and sodium nitrate are practically identical as regards the magnitude of the crop, but tobacco of better quality is obtained when ammonium sulphate is used. Organic fertilisers, especially green manure (lupin and hairy vetch), improve the quality more than the inorganic fertilisers. Only when lime was applied, either alone or with other manures, was any appreciable change in the soil reaction produced.

T. H. POPE.

Fertiliser from fermentation waste. BAUER.—See XVIII. **Ripening of Grimes apples.** PLAGGE and others.—See XIX.

PATENT.

Sulphur fungicide and insecticide. C. D. VREELAND (U.S.P. 1,662,550, 13.3.28. Appl., 24.11.25).—An intimate dry mixture of flowers of sulphur and crude pyroligneous acetate is claimed.

A. R. POWELL.

XVII.—SUGARS; STARCHES; GUMS.

Objective measurement of colour in sugar manufacture. K. ŠANDERA (Z. Zuckerind. Czechoslov., 1928, 52, 261—269).—The author has designed an instrument for measuring intensities of light by means of the photo-electric current produced at a surface of metallic potassium in a photo-electric cell. It consists of a 100-watt lamp with light filters and stops, from which the light passes through a glass cell containing the liquid under examination to a photo-electric bulb or cell containing a film of potassium and a grid anode. The current which passes between the film and the anode on illumination is amplified by a three-electrode thermionic valve and measured by means of a millivoltmeter. For light of given quality the photo-electric current is, within wide limits, proportional to the intensity of illumination. Measurements made on sugar juices at various stages of manufacture show agreement of duplicate readings to within 1 in 150. The instrument can be used to measure not only colour intensities, but also turbidities.

J. H. LANE.

Rate of dissolution of sugar. K. ŠANDERA (Z. Zuckerind. Czechoslov., 1927, 52, 153—160).—The rate at which commercial sugars dissolve in water is important to the refiner, since it is the controlling factor in affination. Experiments were made on single large crystals, and on regularly-shaped pellets of amorphous sugar, to determine the time taken for the object to dissolve completely when supported in a wire-gauze cage immersed just below the surface of water in a relatively deep vessel. The rate of dissolution (weight of crystal or pellet

divided by time required for dissolution and by original surface area) at 20° was of the order of 1.6×10^{-4} g./cm.²/sec., irrespective of the origin and shape of the sugar. Corresponding values for some inorganic compounds are: potassium hydroxide 18×10^{-4} , potassium iodide 15.3×10^{-4} , copper sulphate 0.6×10^{-4} , and potassium permanganate 0.0097×10^{-4} . Comparative experiments on the initial rate of dissolution of raw beet sugars when washed with water were made by placing 10 g. of the sugar in a receptacle with glass bottom and wire-gauze sides, and allowing a stream of water to flow on it from a certain height at such a rate that 100 c.c. of washings passed through the receptacle in 1 min. The proportion of the total sugar dissolved in the 100 c.c. of washings ranged from 35% to 74% for different raw sugars, whilst the proportion of mineral matter dissolved ranged from 68% to 86%.

J. H. LANE.

Rate of dissolution of sucrose under various physical and chemical conditions. V. NETUKA (Z. Zuckerind. Czechoslov., 1928, 52, 289—293).—Using similar apparatus to that of Šandera (cf. preceding abstract), the author investigated the rate of dissolution of pellets of amorphous sugar prepared by allowing drops of molten sugar (containing 2—3% of moisture) to fall into cold mercury. The relative rates of dissolution of these pellets in pure water at 20°, 40°, and 70° were approximately in the proportions 1:4:13. At a constant temperature of 20° the rate of dissolution in pure water was twice that in 18% sucrose solution, and about 10 times as great as the rate in 50% sucrose solutions. In lime water, 1% solutions of potassium sulphate and oxalic acid, and 5% solution of sodium carbonate, the pellets dissolved rather less rapidly than in pure water, but the maximum observed reduction in rate was only about 5%. In molasses solutions also the rate of dissolution was less than in pure water, owing mainly to the sugar and only to a slight extent to the salts present. The rate of dissolution of sugar crystals in pure water at 20° showed occasional differences beyond the limits of experimental error. It is suggested that crystals formed slowly in the cold may dissolve more slowly than those formed under the usual technical conditions.

J. H. LANE.

Determination of the polarisation of beets by aqueous digestion, and the errors due to the volume of the marc. V. STANĚK and J. VONDRÁK (Z. Zuckerind. Czechoslov., 1927, 52, 165—174).—After the polarisation of beets had been effected by the method of hot aqueous digestion, the undissolved matter was treated with successive cold water washings, each removed by centrifuging, until all the sugar was extracted. The combined liquors were then concentrated, *in vacuo*, and polarised. This check on the usual procedure confirmed previous conclusions (B., 1927, 395) that the generally accepted values for the volumes of the marc and the juice are incorrect, a conclusion which has also been confirmed by Spengler and Brendel (B., 1927, 234), and by Fremel. From the whole of their data the authors calculate that the average volume of the marc in the normal weight (26 g.) of beet is 1.54 c.c. instead of 0.6 c.c., and the average volume of the juice is 21.78 c.c. instead of 23.0 c.c., as generally accepted

at present. They recommend, therefore, that in analysing beets by aqueous digestion by the graduated flask method the flask should be marked at 403 c.c., instead of 401.2 c.c. for 52 g., and if the pipette method is used the volume to be added to 52 g. of sample should be 356.4 c.c. instead of 354 c.c.

J. H. LANE.

Preparation of syrups. I. II. E. E. PETERSON, M. LEVINE, and J. H. BUCHANAN (Iowa State Coll. J. Sci., 1927, 2, 31—41, 43—55).—83.3% of 734 samples of spoiled carbonated beverages and 47% of 132 samples of commercial sugar contained yeast. The addition of sodium carbonate to sodium hydroxide wash-waters is not so effective for killing yeasts as the addition of an equivalent amount of hydroxide. Simultaneous inversion and sterilisation of sucrose syrups (40—90 g. in 100 c.c.) may be effected by adding to 100 c.c. 1 c.c. of 7.074*N*-citric or 6.553*N*-tartaric acid, and boiling for 5 min. In concentrated syrups, equilibrium is reached at 97.5% inversion. The velocity of the reaction (considered as unimolecular) increases as hydrolysis progresses, and increases slightly with increasing concentration up to 600 g. per litre.

CHEMICAL ABSTRACTS.

Bone charcoal and active vegetable carbons [in sugar refining]. C. MRASEK (Z. Zuckerind. Czechoslov., 1927, 52, 174—176).—Bone charcoal is considered to give more regular and surer working, and, contrary to Wiesner's views, it is more economical than vegetable carbons.

J. H. LANE.

Decolorisation of [sugar] juices by active carbons. F. NOSEK (Z. Zuckerind. Czechoslov., 1928, 52, 269—272).—A commentary on recent papers by Wiesner (B., 1928, 103) and Mrasek (cf. preceding abstract) on the use of active carbons in refinery and factory working.

J. H. LANE.

Reducing power of carbons. VAŠÁTKO.—See II.

Fertiliser from molasses waste.—BAUER.—See XVIII.

PATENTS.

Continuous defecation of sugar juices. DORR Co., Assees. of E. R. RAMSEY and A. W. BULL (B.P. 270,757, 9.5.27. U.S., 8.5.26).—The juice is treated with milk of lime followed by the regulated addition of carbon dioxide, so that the liquid is maintained at a predetermined alkalinity, which is controlled by the measurement of the electrical resistance of a portion of the solution in which the reaction is complete.

F. R. ENNOS.

Refining of massecuite or other crystalline materials. RAFFINERIE TIRLEMontoise Soc. ANON. (B.P. 280,152, 29.11.26. Ger., 4.11.26).—The massecuite is centrifuged in an apparatus of the usual single-drum type, which rotates at a greatly increased speed, so that the mother-liquor is completely separated from the crystals, thereby obviating the necessity of washing and drying the crystals.

F. R. ENNOS.

Manufacture of starch compositions particularly suitable for use as adhesives. O. MEYER (B.P. 286,377, 6.12.26).—Starch is mixed with 2—3% of cyclohexanone or methylcyclohexanone and is then treated with a solution of sodium hydroxide. After

neutralising with an organic acid the product is dried at 50—70° and pulverised.

F. R. ENNOS.

Carbohydrate derivatives (B.P. 286,331—2).—See V. **Nitrogen and acetone from molasses (B.P. 277,932).**—See XVIII.

XVIII.—FERMENTATION INDUSTRIES.

Composition of wines of the Malaga type. E. ŠVAGR, J. LUKAS, and A. JILEK (Chem. Listy, 1928, 22, 29—34).—Malaga wines manufactured in Czechoslovakia differ little in chemical composition and alimentary value from the original products. The calorific value of the above wines is very nearly the same as that of malt wines of the Malaga type, both ordinary and medicinal. In composition, however, the malt Malaga types differ from the true Malaga wines in their high content of lactic acid and dextrin, and in the absence of tartaric acid. Whilst unmaturing malt Malaga wines contain sucrose, this is not a specific constituent. The mineral content of the latter wines is only half as great as for true Malagas, and is remarkable for its low potassium and high phosphoric acid content.

R. TRUSZKOWSKI.

Preparation of fertiliser from fermentation waste. E. BAUER (Oesterr. Chem.-Ztg., 1928, 31, 39).—The waste materials from the production of industrial alcohol from molasses contain potassium salts and most of the nitrogen from the sugar beet. Recovery of the nitrogen by burning is uneconomical as nitrogen is lost, and the preparation of a suitable fertiliser is made difficult on account of the presence of glycerin. Good results can, however, be obtained by mixing the materials with "saturation lime." The product contains 2—2.3% N, 5—5.4% K₂O, 0.6—1% P₂O₅, 28—30% CaO (as carbonate), and 26—28% of organic matter.

R. H. GRIFFITH.

PATENTS.

Production of acetone and butyl alcohol by fermentation. COMMERCIAL SOLVENTS CORP., Assees. of W. J. EDMONDS (B.P. 268,749, 14.3.27. U.S., 3.4.26).—Acetone and butyl alcohol are produced by fermentation of a carbohydrate mash in the absence of air. The entire series of operations of charging, fermenting, and removal of a suitable mash into and from the fermentation vessel are carried out in an atmosphere of "fermenter gas" which has been obtained from a previous fermentation. This gas, which consists of a mixture of carbon dioxide and hydrogen, is, prior to using, sterilised and freed from air, nitrogen, or oxygen.

C. RANKEN.

Manufacture of dihydroxyacetone. I. G. FARBEN-IND. A.-G. (B.P. 282,347, 21.9.27. Ger., 18.12.26. Addn. to B.P. 269,950; B., 1928, 313).—The prior process is modified by using a nutrient medium containing extractive substances from the waste products of malt, e.g., brewers' grains.

C. RANKEN.

Recovery of nitrogen and acetone from vinasses and/or molasses. NOUVELLES INDUSTRIES CHIMIQUES Soc. ANON. (B.P. 277,932, 13.6.27. Belg., 21.9.26).—The vinasses and/or molasses are mixed at 100° with an excess of lime or other alkaline-earth base (over 50% by wt.) and destructively distilled below 600° and under 1 atm. in a current of inert or reducing gases,

e.g., nitrogen, carbon dioxide, hydrogen, or methane. Use is preferably made of the gases obtained from the destructive distillation after recovery of the useful by-products. The carbonaceous residues are used as decolorising agents.

B. FULLMAN.

Boiling and evaporating apparatus for boilers, particularly for boilers for brewing. H. KOCK and R. QUITT (B.P. 286,955, 15.7.27).

XIX.—FOODS.

Refraction of milks with less than 8.5% of solids-not-fat. G. D. ELDON and J. R. STUBBS (Analyst, 1928, 53, 150—151; cf. B., 1927, 375).—Continued application of the refractometric method to milks having a percentage of solids-not-fat less than 8.5 has confirmed the opinion that the determination of the refraction of the serum offers no advantage over that of solids-not-fat of the milk, and may even be less valuable. The values given, covering a year's samples, support the contention that the mixed milk of a herd seldom gives a refraction less than 37.0 with copper sulphate serum at 20°.

D. G. HEWER.

"Alkalinity" of milk and its electrolytic determination. Z. VON MARIKOVSKY and E. LINDNER (Chem.-Ztg., 1928, 52, 283).—By "alkalinity" of milk is understood the total alkalinity of the cations present in the milk; it may be calculated from the analysis of the ash, or determined directly by electrolysis, using a mercury cathode and dissolving in standard acid the metals deposited in the amalgam. The cathode is prepared by cutting off the closed end of a small pyrex test-tube and covering the other end with a filter paper and a piece of clean linen held in place with a rubber band; 2 c.c. of pure mercury are placed inside the tube so as to rest on the filter paper, and a platinum wire dipping into this connects with a source of current at 30—40 volts. The cathode is placed in a small beaker containing 5 c.c. of milk diluted with about 50 c.c. of water, and a small platinum strip is used as anode. Electrolysis is continued for about 40 min., 10 c.c. of 0.1*N*-sulphuric acid being poured in the cathode tube above the mercury before switching on the current. Titration of this acid at the end of the operation yields a value for the alkalinity of the milk; the c.c. of acid used are divided by the c.c. of milk taken. For normal milks this value is approximately a constant, 1.12—1.14; higher values indicate that the milk has been neutralised.

A. R. POWELL.

Pimento for colouring egg-yolks. W. A. MORGAN and J. G. WOODRUFF (Ga. Exp. Stat. Bull., 1927, 147, 210—215).—Waste pimento fed to hens (0.4 g. per day) greatly intensifies the colour of the egg yolk.

CHEMICAL ABSTRACTS.

Physical and chemical changes of Grimes apples during ripening and storage. H. H. PLAGGE, A. J. MANEY, and F. GERHARDT (Iowa Agric. Exp. Sta. Res. Bull., 1926, 91, 1—72).—A discussion of indications of the optimal harvesting time. The ripening processes of fruit on the tree and in storage are associated with loss of moisture, acidity, dextrin, starch, and material hydrolysable by acid, and an increase in density, sugars, and soluble pectin.

CHEMICAL ABSTRACTS.

Report of the Preservatives Determination Committee of the Chemists of the Manufacturing Confectioners' Alliance and of the Food Manufacturers' Federation. Determination of sulphur dioxide [in foods] (Analyst, 1928, 53, 118—129).—The finely-divided sample (25—100 g.) is introduced with 200 c.c. of de-aerated water into a 500 c.c. round-bottomed flask holding a tap-funnel, still-head, and, where necessary, inlet tube for steam. The special "B.A.R." still-head recommended is described. The upper end is connected to a vertical condenser, which is fitted with an adapter of the scrubber type. The receiving beaker contains water to which has been added 0.2—0.3 c.c. of a filtered 1% starch solution and a few drops of 0.05*N*-iodine solution, or 1—5 c.c. if large quantities of sulphur dioxide are anticipated. Phosphoric acid (25 c.c. of 20% acid) is run into the distilling flask, and the liquid brought to the boil within 2½ min. If more than 10 mins.' distillation is required steam should be used. At least 90% of the sulphur dioxide comes over in the first rush of gas. The end-point may usually be taken as that at which more than 1 min. is required to decolorise 0.1 c.c. of 0.05*N*-iodine. As distillation proceeds 0.05*N*-iodine is added from a burette so that the colour remains. If a gravimetric determination is desired the distillate is filtered, made up to volume, 10 c.c. of 0.1*N*-hydrochloric acid are added, the liquid is boiled for 5 min., 2.5 c.c. of 10% barium chloride are added drop by drop, the solution is again boiled for 5 min., 2.5 c.c. more barium chloride are added, and the liquid is left to simmer for 1 hr. before cooling. It should then be kept for at least 2 hrs. before filtering. For starch a 1-litre flask should be used, 100 g. of sample taken, and hydrochloric acid used instead of phosphoric acid. Gelatin, meats, and dried fruits require steam-distillation, and every endeavour should be made to complete distillation in 10 min. for gelatin and 20—30 min. for hard fruits. If decomposed protein is likely to be present sulphur dioxide and hydrogen sulphide must be differentiated.

D. G. HEWER.

Effect of other reducing substances on the determination of sulphur dioxide [in foods]. J. W. BLACK and B. J. W. WARREN (Analyst, 1928, 53, 130—132).—In determining sulphur dioxide by distillation it was found that the bulk of the gas comes over in the first few minutes after distillation has started. By rapid titration during the evolution of gas, curves may be constructed which, in the case of all substances tried in which sulphur dioxide was present, show a steep upward curve to a certain point corresponding approximately to the point where added sulphur dioxide ceases to be evolved, followed after 8—10 min. from the beginning of distillation by a change of direction. In the case of glucose syrup, gelatin, and sausage the curve is then more or less horizontal, but where iodine-reducing substances are present, as in spices, the angle is more obtuse. The angle formed between the two portions of the curve is thus an indication of the proportion of interfering substances, and where these are present (nutmeg, mustard, ginger, etc.) a time limit should be set for distillation when determining sulphur dioxide.

D. G. HEWER.

Determination of sulphur dioxide in sausages and in foods by distillation in a vacuum. H. O. JONES (Analyst, 1928, 53, 138—141).—When sulphite is added to sausage there is an almost immediate loss of sulphur dioxide; e.g., on addition of 450 pts. per million there is a very approximate loss of 150 pts. Sulphur dioxide determinations in sausages 3, 24, and 48 hrs. after making gave values showing a total diminution of about a third, and in each case the Preservatives Determination Committee's method gave higher values than Leach's method. The determination of sulphur dioxide by vacuum distillation (and, in the presence of phosphoric acid, in carbon dioxide) into iodine solution gave results which agreed closely with the Committee's method in the case of sodium metabisulphite, gelatin, and sausage, and were higher than by Leach's or Monier-Williams' method, but the method is more complicated and slower than that of the Committee. D. G. HEWER.

Rapid determination of sulphites [in foods] by alkaline liberation or extraction, and titration. H. R. JENSEN (Analyst, 1928, 53, 133—135).—Direct titration with iodine after formation of fully hydrolysed sulphite by cold digestion for 15 min. with sodium or potassium hydroxide, followed by strong acidification, is recommended. *Glucose*.—The syrup (50 g.) is dissolved in 50 c.c. of water at 50°, cooled to 15°, and 20 c.c. of 5% sodium hydroxide solution are added. After 15 min. 30 c.c. of 20% sulphuric acid and 100 c.c. of water are added, and the liberated sulphur dioxide is titrated with 0.05*N*-iodine. Results, which indicate the absence of other iodine-absorbing substances for combined sulphite, vary between 22 and 90%, usually about 60%. *Sucrose*.—Commercial sugar may contain invert sugar, and the maximum value obtained by alkalisation methods may often be used as a sorting test. *Cornflour*.—A quick indication of the maximum amount of sulphur dioxide present may be obtained by adding 100 g. of starch powder to a cold mixture of 303.5 c.c. of water with 40 c.c. of 5% sodium hydroxide. After occasional rotation for 15 min., followed by filtration, a mixture of 30 c.c. of 10% hydrochloric acid with 20 c.c. of water is added to 200 c.c. of the filtrate. After again filtering at once, 200 c.c. are titrated with 0.05*N*-iodine solution. A total displacement value of 69.2 c.c. was found for 100 g. of starch, and an insoluble volume of 12.7 c.c. by double dilution. D. G. HEWER.

Sulphur dioxide in fatty substances. KNAPP and PHILLIPS.—See XII.

PATENTS.

Treatment of lactic fluids. J. M. W. KITCHEN (U.S.P. 1,658,168, 7.2.28. Appl., 19.3.23).—Before losing its self-preservative power, the clarified milk is cooled below 5°, aerated, pasteurised by heat, and again cooled to —2° to +5°, each process being performed in an atmosphere free from dust and bacteria, prior to being distributed. F. R. ENNOS.

Production of artificial coffee oil. INTERNAT. NAHRUNGS- U. GENUSSMITTEL-A.-G. (B.P. 260,960, 22.9.26. Ger., 4.11.25).—Coffee oil (cf. B.P. 246,454; B., 1926, 1028) contains hydrogen sulphide, methyl mercaptan, furfuryl mercaptan, dimethyl sulphide, acetaldehyde,

α -methyl-*n*-butaldehyde, furfuraldehyde, methylfurfuraldehyde, acetone, furyl ketone, diacetyl, pentane- $\alpha\beta$ -dione, methyl and higher alcohols, furfuryl alcohol, acetic acid, isovaleric acid and esters, palmitic acid, phenol, pyrocatechol, guaiacol, vinylguaiacol, 2:3-dihydroxyacetophenone, pyridine, pyrazine, methylpyrazine, 1-methylpyrrole, 1-furfurylpyrrole, and naphthalene. The synthesised oil can be used as flavouring.

C. HOLLINS.

Manufacture of oleomargarine. H. LEROUJER (U.S.P. 1,663,913, 27.3.28. Appl., 7.5.26. Fr., 20.5.25).—See B.P. 252,369; B., 1927, 503.

Production of white and purified pectin. R. PAUL and R. H. GRANDSEIGNE (B.P. 286,914, 29.4.27).—See F.P. 614,882; B., 1928, 34.

Conservation of foodstuffs for lengthy periods under chilled conditions. FOOD CHILLERS, LTD., ASSEES. OF A. R. MCLEOD (B.P. 275,184, 24.6.27. Austral., 30.7.26).

XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

p_H determinations in alcoholic solutions. R. B. SMITH (J. Amer. Pharm. Assoc., 1928, 17, 241—243).—The p_H values of a number of alcoholic tinctures have been determined by means of an apparatus constructed from readily available materials. Stable and reproducible values are obtained, and the following U.S.P. tinctures have been measured: digitalis 5.12—5.77, aconite 5.20—5.51, strophanthus 5.43, and ergot 4.97.

E. H. SHARPLES.

Chilgoza oil. HARDIKAR.—See XII.

PATENTS.

Manufacture of new polyamino-compounds. W. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 286,087, 19.11.26. Addn. to B.P. 267,169; B., 1927, 379).—The aminoalkyl side-chains of the prior patent are modified by the introduction of ether or thioether linkings. E.g., β -(6-methoxy-8-quinolylamino)ethyl β -diethylaminoethyl ether [8- β -(β -diethylaminoethoxy)ethyl-amino-6-methoxyquinoline], b.p. 213—215°/0.5 mm., is prepared by heating 8-amino-6-methoxyquinoline with the β' -chloro- β -diethylaminodiethyl ether, b.p. 72—73°/5 mm., obtained from β -diethylamino- β' -hydroxydiethyl ether [glycol mono- β -diethylaminoethyl ether] and thionyl chloride. The sodium compound of the last-named ether reacts with ethylene chlorohydrin to give β -(β -hydroxyethoxy)ethyl β -diethylaminoethyl ether [glycol β -diethylaminoethyl β -hydroxyethyl ether], $\text{CH}_2(\text{OH})\cdot\text{CH}_2\cdot\text{O}\cdot\text{CH}_2\cdot\text{CH}_2\cdot\text{O}\cdot\text{CH}_2\cdot\text{CH}_2\cdot\text{NEt}_2$, b.p. 132—136°/7 mm., from which by the action of thionyl chloride β -(β -chloroethoxy)ethyl β -diethylaminoethyl ether [glycol β -chloroethyl β -diethylaminoethyl ether] is obtained; this reacts with 8-amino-6-methoxyquinoline to form glycol β -(6-methoxy-8-quinolylamino)ethyl β -diethylaminoethyl ether [8- β -(β -diethylaminoethoxy)ethoxyethylamino-6-methoxyquinoline], b.p. 238—240°/2 mm. *Mono-thioglycol*, b.p. 67°/18 mm., obtained from ethylene chlorohydrin and sodium hydrosulphide, is condensed with β -chlorotriethylamine to form β -diethylamino- β' -hydroxydiethyl sulphide, b.p. 122°/6 mm.; the corre-

sponding β' -chloro-compound resulting from the action of thionyl chloride reacts with 8-amino-6-methoxyquinoline to give β -(6-methoxy-8-quinolylamino)- β' -diethylamino-diethyl sulphide, b.p. $240^{\circ}/2$ mm. C. HOLLINS.

Manufacture of new alkaloid salts of camphoric acid. CHEM. FABR. AUF ACTIEN (VORM. E. SCHERING) (B.P. 269,498, 10.3.27. Ger., 15.4.26).—Alkaloids of the *Solanaceae* group, particularly scopolamine, hyoscyamine, and atropine, are combined with equimolecular proportions of camphoric acid. The presence of excess of alkaloid does not affect the formation of the salts, which are useful therapeutically. C. HOLLINS.

Manufacture of new therapeutic compounds [pure ergotoxine]. WELLCOME FOUNDATION, LTD., and G. M. TIMMIS (B.P. 286,400, 23.12.26).—For the liberation of ergotoxine from the sulphate or phosphate, obtainable by the methods of Kraft (A., 1906, i, 979) and Barger and Carr (B., 1907, 483), weak alkalis, such as sodium bicarbonate or borax, are used, giving a purer alkaloid, which after crystallisation from benzene has $[\alpha]_{D}^{20} -195^{\circ}$, or -156° ($+2C_6H_6$). C. HOLLINS.

Preparation of soluble salts of ergotoxine. WELLCOME FOUNDATION, LTD., and G. M. TIMMIS (B.P. 286,582, 23.12.26).—*Ergotoxine methanesulphonate*, m.p. 214° (corr.), and *ethanesulphonate*, m.p. 209° (corr.), made from the alkaloid and the corresponding acids in alcohol, are stable and readily soluble in water. C. HOLLINS.

Manufacture of arseno-bismuth compounds. E. C. R. MARKS. FROM ABBOTT LABORATORIES (B.P. 286,115, 26.8.26).—3 : 3'-Diamino-4 : 4'-dihydroxyarsenobenzene, in the form of hydrochloride or formaldehyde-bisulphite compound, is stirred with an aqueous solution of potassium tribismuthyl tartrate, $C_4H_2O_9Bi_3K_4H_2O$, at 15° , to form a compound of the type, $AsAr(Bi : AsAr)_2$, which is precipitated by pouring the reaction mixture into methyl alcohol and ether. C. HOLLINS.

Preparation of 2-chloropyridine. DEUTS. GOLD- U. SILBER-SCHNEIDANSTALT VORM. ROESSLER (B.P. 281,650, 28.11.27. Ger., 3.12.26).—2-Chloropyridine is obtained when an *N*-alkyl-2-pyridone, e.g., *N*-methyl-2-pyridone, is treated at 120° under reflux with (gaseous) phosgene. The yield is 93–94%. C. HOLLINS.

Preparation of camphene. W. SCHULENBURG, Assr. to ROESSLER & HASSLACHER CHEM. CO. (U.S.P. 1,663,569, 27.3.28. Appl., 26.2.27. Ger., 27.2.26).—Pinene hydrochloride is converted into camphene by elimination of hydrogen chloride by means of an alkali monoxide. B. FULLMAN.

Manufacture of hormone from the sexual organs. CHEM. FABR. AUF ACTIEN (VORM. E. SCHERING) (B.P. 265,166, 6.1.27. Ger., 26.1.26).—Fresh, comminuted sexual organs (ovaries, placenta, etc.) are extracted with methyl alcohol at an elevated temperature below its b.p. The extract is evaporated, and the dry, water-soluble residue repeatedly extracted with methyl alcohol, evaporation of which yields a highly active oil. B. FULLMAN.

Preparation of active germinal gland substances in a water-soluble form. CHEM. FABR. AUF ACTIEN (VORM. E. SCHERING) (B.P. 276,994, 29.8.27. Ger.,

4.9.26).—Hormone extracts, obtained from the germinal glands by, e.g., the process described in B.P. 261,356 (B., 1927, 619), are brought into aqueous solution free from salts by treatment in the presence of water with alkaline-earth hydroxides and removing the latter, after heating, with carbon dioxide. B. FULLMAN.

Preparation of a toxin specific to the pneumococcus, and of a pneumococcus antitoxin. F. B. DEHN. FROM E. LILLY & CO. (B.P. 286,744, 11.5.27).—Pneumococcus toxin is prepared by incubating a pure culture of pneumococci for 20–40 hrs. in a fresh broth which is made from fresh beef, sterilised under pressure, and free from added carbohydrate. The toxin is obtained organism-free by Berkefelding. It produces the symptoms of pneumonia on injection into animals, from the blood of which the corresponding antitoxin (effective in treating pneumococcal infections of man or animals) may be obtained. B. FULLMAN.

Pharmaceutical product. W. SCHOELLER, A. FELDT, M. GEHRKE, and E. BORGWARDT, Assrs. to CHEM. FABR. AUF ACTIEN (VORM. E. SCHERING) (U.S.P. 1,663,390, 20.3.28. Appl., 1.6.26. Ger., 2.6.24).—See B.P. 234,806; B., 1925, 692.

Extraction presses (B.P. 262,072).—See I. **Mercaptans** (B.P. 286,152).—See III. **Coffee oil** (B.P. 260,960).—See XIX.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Metallic silver content of photographic films. F. WEIGERT and F. LÜHR (Naturwiss., 1927, 15, 788; Chem. Zentr., 1927, ii, 2638).—By a modification of Cox's method of differential titration, 0.001 mg. of silver ions in 20 c.c. of solution could be determined with 0.001*N*-potassium iodide solution. The films were attacked by a simple method employing nitric acid. The silver content of commercial films was 1.82 – 2.80×10^{-4} mg./cm.² That this is ripening silver was shown by the determination of silver in freshly prepared and in ripened silver halide emulsions. With silver chloride the quantity of silver increased rapidly, with silver bromide more slowly, and with silver iodide not at all. Treatment of a plate with persulphate reduces the amount of silver and reduces the sensitiveness. Since silver sulphide is not dissolved by persulphate, it appears that the sensitive nuclei are not composed of silver sulphide. A. A. ELDRIDGE.

Rate of desilverisation of the wet collodion silver bath. B. P. O'SHAUGHNESSY (Phot. J., 1928, 68, 123–127).—The use of the argentometer does not give an accurate indication of the absolute amount of silver nitrate in a sensitising bath in use. A chemical method of determination must be used. The amount of silver nitrate used per unit area of plate during sensitising is dependent to some degree on the personal equation of the worker. The discrepancy between the argentometer reading and the actual amount of silver nitrate present at any given stage is greater in the dipping bath, where evaporation is at a minimum, than in the open bath. The greatest disturbance of the argentometer readings is caused by the introduction into the bath of ether and alcohol from the collodion. W. CLARK.

Colour of developed silver images. A. and L. LUMIÈRE and A. SEYEWETZ (Brit. J. Phot., 1928, 75, 172—173).—The colours of images developed with developers which insolubilise the gelatin are due to the formation of a secondary image superimposed on the reduced silver image and modifying its colour. The secondary images are probably formed of quinone compounds arising from oxidation of the developer. The colour varies with the nature of the developer and occasionally with that of the alkali used. Its intensity is determined essentially by the sulphite content of the developer, but depends also to a certain degree on the nature of the developing agent. The intensity diminishes as the proportion of sulphite is increased. With pyrogallol the secondary images fail to appear with a sulphite content of 10%; with other developers it is 2%. Glycin is the only developer not giving the oxidised image, whatever the sulphite content. The gelatin in which the oxidised product is formed is insolubilised to a degree corresponding with the intensity of the secondary image. This image is a mordant for basic dyes, and may be intensified by fixation of these dyes to such an extent as to become equal, or even superior, in density to the original silver image.
W. CLARK.

Chemical effects of radiation. P. VILLARD (Phot. J., 1928, 68, 118—121).—A *résumé* of the author's recent views on the antagonistic actions of radiations, and the method of latent image formation (cf. A., 1927, 218, 323).
W. CLARK.

PATENTS.

Manufacture of photographic sensitive layers. F. VAN DER GRINTEN (CHEM. FABR. L. VAN DER GRINTEN) (B.P. 281,604, 23.3.27. Holl., 11.12.26).—The sensitive layer consists of the diazo compound of an *NN*-asymmetrically disubstituted *p*-phenylenediamine or a derivative thereof (excluding such as form diazo-anhydrides), with or without a suitable alkaline-coupling component and sufficient non-volatile acid to prevent premature coupling. Diazosulphonic acids or their salts may be used, and the sensitive layer may be mixed with a suitable lake-forming material such as barium chloride. Examples are: *p*-dimethylaminodiazobenzene, with tartaric acid and barium chloride, for development with Naphthol AS (black); *p*-diethylaminodiazobenzene, with potassium dihydrogen citrate and barium chloride, for development with β -naphthol (brown-black); 2-diisomylylamino-*m*-xylene-5-diazonium chlorostannate, with citric acid and 2:7-dihydroxynaphthalene, for development with alkali (dark violet).
C. HOLLINS.

Production of printed transparent images. SANDOR G.M.B.H. (B.P. 265,924, 10.12.26. Ger., 11.2.26).—An absorptive, opaque layer of cellulose derivatives is coated on a smooth surface, printed, and then clarified to the required extent by a fresh application of a solvent or gelatinising agent which acts on the cellulose particles, or of a solution of a cellulose derivative or resin containing the constituents which act on the cellulose particles. If the images are required for projection, they may be detached from the support and then clarified, or else prepared on a translucent or transparent base material.
W. CLARK.

Colour-screen films. R. RUTH, and AKTIEBOLAGET SVERIGES LITOGRAFISKA TRYCKERIER (B.P. 285,977, 23.11.26).—The screen elements consist of a colloid laid directly on a colloid support having the same physical and optical properties as the screen elements. They are fixed to the support by pressure and heat, the support being superficially softened on the surface receiving the screen particles which are applied in a single layer. The film is then fed between pressure rollers, the roller acting on the screen grains being heated.
W. CLARK.

Colour screens for photographic purposes. J. R. ROBERTSON (B.P. 286,052, 22.1.27).—The screens consist of vacuum chambers in conjunction with optical lenses. The chambers each contain a different gas, and means are provided for producing an electric discharge in the gas in any particular chamber, or in a number of chambers in succession in the case of colour cinematography. The different gases assume different colours when the tubes are excited.
W. CLARK.

Preparation of photographic developers. P. SCHESTAKOFF (U.S.P. 1,663,959, 27.3.28. Appl., 29.4.25. Ger., 12.5.24).—See F.P. 600,532; B., 1926, 566.

[Multicolour screens for] colour photography. W. CARPMAEL. From J. H. POWRIE (B.P. 276,188 and 287,388, 11.10.26).

XXII.—EXPLOSIVES; MATCHES.

PATENT.

Preparation of progressive burning smokeless powder. B. TROXLER, ASST. to HERCULES POWDER CO. (U.S.P. 1,661,278, 6.3.28. Appl., 16.11.26).—Grains of smokeless powder are coated with a deterrent substance by mixing the two together with just sufficient water to moisten the surfaces of the powder grains and heating the mixture in air to a temperature only just above the m.p. of the deterrent substance with agitation.
A. R. POWELL.

XXIII.—SANITATION; WATER PURIFICATION.

Industrial hygiene in relation to the manufacture of artificial silk in Italy. U. POMILIO (Giorn. Chim. Ind. Appl., 1928, 10, 7—11).—The growth of the artificial silk industry, particularly in Italy, hygienic measures for dealing with the noxious gases emitted during the manufacture of viscose silk, and the composition and evaluation of the aqueous residues from such manufacture are considered. In one of the large Italian factories it is found that of 340 g. of carbon disulphide combined as xanthate per kg. of viscose yarn about 90 g. undergo decomposition, giving rise to 55 g. at most of hydrogen sulphide. With a daily output of 6000 kg. of the silk, the ventilators have a total capacity of 12,000 m.³/min., and the concentration of the hydrogen sulphide should be reduced to 0.02 g./m.³ Examination of the air inside and immediately outside the building at different times of the day and under different meteorological conditions showed sometimes absence of hydrogen sulphide and in other cases a minimum concentration of 0.000493 g. and a maximum of 0.008547 g. of hydrogen sulphide per m.³, the mean being 0.0035 g. At none of the various factories examined is injury to the health

of the workpeople experienced, and experiments on guinea-pigs exposed for months to the action of air containing 0.022 g. of hydrogen sulphide per m.³ fail to reveal any harmful effects on the health of the animals. The aqueous effluent, the composition of which varies considerably, contains per litre: hydrogen and other sulphides 0.9–4.9 mg., organic matter 0.0122–0.0796 g., total SO₄ 0.1311–1.7359 g., residue at 90° 0.7845–2.1765 g., and acidity (as SO₄) 0–0.2982 g. As the effluent is diluted at least 5 to 10 times in the stream into which it flows, injury to the aquatic fauna or flora is considered impossible. In a report published in May, 1925, Loriga considers no system of ventilation to be sufficient for viscose silk factories, and recommends the destruction of the deleterious products by combustion or other method of oxidation.

T. H. POPE.

Comparative results from the testing of various germicidal agents. G. F. LEONARD and E. HEACOCK (Amer. J. Pharm., 1928, 100, 103–111).—The phenol coefficients of more than a thousand samples of various germicidal agents have been tested by the Hygienic Laboratory method (Hygienic Laboratory Bulletin, 1912, No. 82) using specific cultures of *B. typhosus* (Hopkins) and *Staphylococcus aureus* (No. 73). The cultures, taken from stock, were transplanted monthly, incubated for 24 hrs., and stored in the refrigerator. Three days before making a test they were transferred to beef extract broth and daily transplants made on to bouillon. A 24-hr. broth culture was used for the test, the medium consisting of beef extract, peptone, and sodium chloride in water adjusted to p_H 7; 0.1 c.c. of bouillon culture was added to 5 c.c. of germicide or phenol solution at 20° and samples were transplanted to bouillon tubes at intervals of 1, 5, 10 and 15 min. in the staphylococcus test and 5, 7½, 10, 12½, and 15 min. in the typhoid test, and the tubes incubated for 48 hrs. The phenol coefficient is the arithmetic mean of the three ratios (highest killing dilution of germicide: that of phenol) for the 5, 10, and 15 min. intervals. The cultures did not alter in their resistance to phenol during 8 years. This method of procedure gives uniform and consistent coefficients with the two organisms.

S. COFFEY.

Danger of mercury vapour. W. KRÖNER (Chem.-Ztg., 1928, 52, 121–122).—A résumé of recent publications from the Verein für Innere Medizin of Berlin, which have confirmed the great danger of poisoning to workers and others handling mercury, or even to those frequenting premises on which the metal is allowed to remain exposed.

S. I. LEVY.

Sedimentation studies of turbid American river waters. A. W. BULL and G. M. DARBY (J. Amer. Water Works' Assoc., 1928, 19, 284–305).—The comparative clarification rates of various rivers have been measured by determining the percentage reduction in suspended solids after varying periods of settlement in litre cylinders. The results obtained were found to agree fairly well with those from practical-scale operation. When deeper cylinders with a continuous or intermittent feed were used, the results for short detention periods were too low owing to a high upward velocity in the cylinder and the excessive depth of the feed tube.

The advantage of a slow stirring arrangement in densifying sludge is demonstrated, and settlement of the water prior to the addition of flocculating or softening reagents is shown to result in lower running costs. C. JEPSON.

Turbidity and coagulant dosage [of river water]. K. C. ARMSTRONG (J. Amer. Water Works' Assoc., 1928, 19, 306–312).—The proportion of coagulant required to produce a satisfactory water may be regulated by determining the turbidity after 3 hrs.' settlement. If the water is very turbid after settlement in grit chambers, the coagulant may be applied with advantage in successive doses. The turbidity after 24 hrs.' settlement indicates the amount of very finely-divided material, and must also be taken into account when fixing the amount of alum required. C. JEPSON.

Effect of slightly alkaline tap water on spawn and eggs of trout and perch. E. S. HOPKINS (J. Amer. Water Works' Assoc., 1928, 19, 313–322).—Experimental studies indicate that free carbon dioxide is necessary for the sustenance of fish life, and that a high oxygen content, even in very cold water, is not detrimental. C. JEPSON.

Testing for iodine in potable waters. P. DRAWE (Chem.-Ztg., 1928, 52, 122–123).—The total halides in 50 litres of the water are precipitated as the silver compounds in the usual way; these are collected on a filter, the silver chloride is removed by washing with ammonia, the insoluble residue treated with sulphuric acid and metallic zinc, and the iodide determined in the solution in the usual way after filtering. S. I. LEVY.

PATENTS.

Fumigant material. H. W. HOUGHTON, Assr. to SAFETY FUMIGANT Co. (U.S.P. 1,663,082, 20.3.28. Appl. 25.6.25).—Material for producing a mixture of hydrogen cyanide and cyanogen chloride in lachrymatory proportions on treatment with hydrochloric acid comprises a cyanide and an alkali chlorate worked up to a plastic mass with slaked lime, sand, and sodium chloride, and then allowed to harden. L. A. COLES.

Bactericidal preparation. P. LALAND, Assr. to NYEGAARD & Co., A/S. (U.S.P. 1,662,930, 20.3.28. Appl. 19.5.26. Norw., 15.3.26).—A bactericidal colloidal preparation comprises a combination of silver with a boroglucoside obtained from *Rhizoma Rhei*.

A. R. POWELL.

Removal of germs from water. O. & R. ADLER (B.P. 286,338, 4.11.26).—The residual chlorine, left after sterilisation and filtration through a fine porous medium such as sand, quartz powder, etc., is removed by passing the water over coarse pieces of carbon which converts the free chlorine into chlorine ions. The carbon is prepared by mixing it in a pulverised form with a binding material (e.g., clay), moulding to shape, and baking. C. JEPSON.

[Automatic] apparatus for softening or purifying water or for carrying out processes based on exchange reactions. UNITED WATER SOFTENERS, LTD., R. H. THOMSON, and H. S. LAWRENCE (B.P. 288,018, 11.3.27).

Bactericidal agents (U.S.P. 1,661,568).—See IV.