

# BRITISH CHEMICAL ABSTRACTS

## B.—APPLIED CHEMISTRY

JUNE 21, 1929.

### I.—GENERAL; PLANT; MACHINERY.

**Modification of Hempel gas pipette.** G. H. W. LUCAS (Ind. Eng. Chem. [Anal.], 1929, 1, 79).—To prevent reagents, *e.g.*, alkaline pyrogallol, used in Hempel absorption pipettes from running up the capillary tube of the pipette and entering the measuring burette, using mercury, a small bulb is blown in the capillary tubing, thus causing bubbles to be broken.

C. A. KING.

See also A., May, 528, Determination of water by distillation (BOLLER). 533, Gauge for measurement of high vacua (STANLEY). Efficiency of fractional distillation apparatus (GRIMM). Apparatus for fractional distillation (PICHARD). Vacuum distillation (BURCH). 613, Apparatus for filtration and precipitation with subsequent filtration in nitrogen (GRABE and FREUND).

### PATENTS.

**Producer furnaces for boiler heating and like purposes.** T. R. WOLLASTON (B.P. 305,288, 8.11.27).—A gas producer for low-grade fuels is in communication with a combustion furnace by means of a side passage to which air is also admitted. The producer itself is provided with crusher-like rolls at the bottom for discharging clinker, also with suspended inclined fire-bars adapted to be joggled by the rotation of the rolls.

B. M. VENABLES.

**Manufacture of [refractory] linings of furnaces.** D. F. CAMPBELL, and ELECTRIC FURNACE CO., LTD. (B.P. 303,574, 16.4.28).—The lining is formed either of bricks or loose material round a core of electrically conducting material the m.p. of which is higher than the fritting point of the lining, the whole being raised to the latter temperature by means of alternating currents in a coil surrounding the furnace, and the core afterwards withdrawn whole. Materials mentioned as suitable for the core are graphite, tungsten, nickel-chrome, and heat-resisting steel.

B. M. VENABLES.

**Carrying out chemical reactions and furnace suitable therefore.** R. VETTERLEIN (B.P. 309,734, 11.4.28).—A multi-stage furnace built like a Herreshoff roaster is used for carrying out chemical reactions (in a continuous manner) between neutral or acid salts and liquid reagents. The uppermost hearth of the roaster is preferably charged with solid material only, forming a powder seal, the liquid reagent being added to the second hearth through the hollow shaft. Examples of reactions that may be effected are: sodium or potassium sulphate or bisulphate from the chloride and sulphuric acid; the production of soda and purely metallurgical reactions are excluded.

B. M. VENABLES.

**Carrying out of reactions at high pressures and temperatures.** J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 309,057, 2.12.27).—High-pressure reactions, *e.g.*, the destructive hydrogenation of carbonaceous materials, are carried out in a jacketed apparatus, the inner wall of which consists of a special steel highly resistant to chemical action, and the outer wall of another special steel resistant to mechanical stress.

A. B. MANNING.

**Apparatus for effecting chemical reactions under pressure.** SYNTHETIC AMMONIA & NITRATES, LTD., and A. RULE (B.P. 309,258, 12.2.28).—High-pressure reactions, in particular the hydrogenation of oils, tars, etc., are carried out in a vertical tower, of considerable height in relation to its diameter, the liquid in which is continuously agitated by the passage of the hydrogen which is admitted with the liquid at the bottom of the tower.

A. B. MANNING.

**Heating of materials.** J. S. MORGAN (B.P. 305,106, 28.7.27).—The finely-divided material to be heated (or cooled) is mixed with heated (or cold) shot, the whole of the heat being supplied (or removed) by the shot. The shot may also be used to effect grinding of the material and to form a gas-tight seal. The process may be worked intermittently, or with more than one stage of heating. The separation of the shot at the end (or between stages) of the process may be effected by screening, by magnetic means, or pneumatically.

B. M. VENABLES.

**Heat interchanger.** F. H. WILLCOX and J. C. HAYES, JUN., Assrs. to FREYN ENGINEERING Co. (U.S.P. 1,707,777, 2.4.29. Appl., 11.4.27).—A heat interchanger has vertical tubes for the gas to be heated, and is provided with inlet and outlet conduits and headers so positioned and shaped as to distribute the gas evenly. Flushing jets are also placed in the delivery header for flushing the tubes.

B. M. VENABLES.

**Heat exchanger.** J. P. RATHBUN, Assr. to WESTINGHOUSE ELECTRIC & MANUF. Co. (U.S.P. 1,708,031, 9.4.29. Appl., 28.10.27).—A baffle within a heat exchanger of the shell and nest-of-tubes type is provided with a liquid seal between it and the shell.

B. M. VENABLES.

**Heat-exchanging apparatus.** W. E. KOCHS & Co., LTD. (B.P. 309,798, 21.7.28).—Heat-transfer tubes are constructed with a section having the shape of a falling drop or pear, or other stream-line section, so that the external fluid stream will remain in contact with the whole surface of the tubes. A preferred arrangement is vertical with the gas approaching the wide end of the section. The rows of tubes may be staggered or not, as desired.

B. M. VENABLES.



**Drying apparatus.** I. G. FARBENIND A.-G. (B.P. 293,028, 19.6.28. Ger., 30.6.27).—A Huillard apparatus (in which a band of fine-mesh wire netting picks up a paste and conveys it zig-zag fashion against a stream of heated air) has its rollers mounted on springs, so that they can yield in two directions, against the pull of the band and axially. B. M. VENABLES.

**Oven for drying or baking briquettes and other moulded products.** T. NAGEL (B.P. 283,123, 3.1.28. U.S., 3.1.27).—The briquettes are allowed to slide down a succession of sloping chutes, disposed at an angle approximately equal to the angle of repose of the material; each chute terminates close to the commencement of the next, but the direction changes at each step, so that the briquettes are turned over at each transfer. They are heated by an upward current of gases, and cooled by other gases in the lower chutes. B. M. VENABLES.

**Apparatus for treating and drying coal, cereals, chemical substances, etc.** J. H. GOURLEY (B.P. 308,548, 19.9.28).—In apparatus comprising a number of rotating drums or retarders in staggered vertical relation, around which heated air or other drying agent zig-zags upwardly countercurrent to the falling material, the drums are heated internally, and balanced flaps are provided extending from the nearest side of the casing, the flaps acting both as scrapers for sticky material and as baffles preventing flow of the drying gas up that side of the casing. The inlet and outlet for the material are provided with valves. B. M. VENABLES.

**Drying and impregnating *in vacuo* particularly applicable to manufacture of insulating materials.** H. GRIFFITHS and E. PASSBURG (B.P. 308,641, 23.12.27).—The major portion of the moisture is removed under a vacuum of the same order as the vapour tension of water at ordinary condenser temperatures (*e.g.*, 24 mm. of mercury for 22°), and the drying is finished by increasing the vacuum, which may be effected by removing the moisture from the internal atmosphere either by deposition on a condensing surface maintained at about 0°, by absorption in a cooled liquid such as brine, or by dehydrating substances such as silica gel. Alternatively, the high vacuum may be obtained simply by the use of efficient vacuum pumps, *e.g.*, of the steam ejector type. In either case impregnation is afterwards effected under pressure. B. M. VENABLES.

**Heat-insulating material.** HENLEY'S TYRE & RUBBER Co., LTD., and J. TRAXLER (B.P. 309,662, 6.2.28).—Articles such as pipes and receptacles are coated before assembly with a rubber composition capable of becoming porous when heated under pressure, *e.g.*, rubber 47%, granulated cork 35%, sulphur 3%, barytes 14½%, accelerator ½%. Vulcanisation is effected preferably after the material has been applied. D. F. TWISS.

**Disintegrators.** GEBR. BÜHLER (B.P. 301,896, 12.11.28. Ger., 9.12.27).—Accumulations of material at points between the screen and the enclosing casing are prevented by providing air slots at those points through which strong currents of air are induced by the operation of the disintegrator. B. M. VENABLES.

**Crushing mill.** A. H. STEBBINS (U.S.P. 1,708,195, 9.4.29. Appl., 15.12.27).—The ground material from a mill in an air-borne system is drawn through a pipe horizontally then upwardly, and the elbow in the pipe is provided with a number of apertures which admit air and break up any lodgments of dust. B. M. VENABLES.

**Gyratory crusher.** T. C. COOKE (U.S.P. 1,706,975, 26.3.29. Appl., 27.10.27).—The driven eccentric ring is provided with anti-friction members [roller bearings] both outwardly and inwardly. B. M. VENABLES.

**Rotary [gyratory] crusher heads or the like.** J. A. HETU (B.P. 305,398, 17.3.28).—The mantle of a gyratory crusher is provided with a conical interior and fits on a conical part of the driving shaft, with or without the interposition of a conical bush. On any slip taking place the mantle is pressed more tightly down the shaft by means of a pair of cam-faced washers one of which is prevented from rotation with respect to the mantle and to the shaft, respectively. The head is thus self-tightening. B. M. VENABLES.

**Formation of agglomerates or aggregates from pulverised materials.** J. S. MORGAN (B.P. 305,051, 29.7.27).—Aggregates of solid carbonaceous or other powdered material are formed by causing it and a binder to impinge upon a solid surface. The rapid relative motion necessary may be produced mechanically (centrifugally) or pneumatically, and the solid surface preferably moves slowly to withdraw the agglomerated material. The binding agent may be produced by condensing the vapour or finely-divided spray of oil, and the vapour may also be used as the pneumatic carrying agent. In some cases addition of external binding agent is not necessary. B. M. VENABLES.

**Rotary screens or separators.** W. and R. H. REID, and W. REID, JUN. (B.P. 303,970, 23.8.28).—The apparatus is in the form of a trommel, the screening surface comprising a number of rollers parallel to the axis. The end spiders (driven by the shaft) are formed into sun-pinions, each roller being provided with a pair of planet-pinions at each end, one of each pair gearing with outer, fixed, internally-toothed rings and the other of each pair with the sun-pinions. The rollers rotate about their own axis, also about the central shaft, but at a slower speed than the end spiders; internal scoops may be provided rotating with shaft and spiders, and therefore having movement relative to the screening surface. B. M. VENABLES.

**Dry separation of masses of materials.** H. M. SUTTON, W. L. and E. G. STEELE (B.P. 307,526, 10.11.27).—A reciprocating table, having a crinkled perforated deck and perforated tapering riffles, is described, which is pervious to upward air currents. Adjustable "pneumatic skimmers" or horizontal cross-jets of air are provided above the table. B. M. VENABLES.

**Separation of solid materials of different sp. gr.** G. RAW (B.P. 305,068, 28.10.27 and 31.7.28).—A bed of materials is stratified by pulsating air pressure coming through a pervious table without substantial net movement of the air. The pressure waves are caused to grow synchronously by creating the pulsation at one



end of the wind box and having a wall at the other end accurately positioned to reflect the waves back to the pulsating device, the frequency of the applied pulsations being related by a formula to the time it takes a wave to travel the length of the box. The waves are preferably caused by the simultaneous operation of a number of valves well distributed over the end of the wind box.

B. M. VENABLES.

**Centrifugal machines.** SHARPLES SPECIALTY CO., Assees. of L. D. JONES (B.P. 299,018, 18.10.28. U.S., 19.10.27).—A small machine suitable for continuous operation, *e.g.*, purifying lubricating oil etc., is constructed with an electric motor on the same axis and below the bowl, and with only two bearings, one of which, nearest the commutator of the motor, is rigid radially and the other merely restrained radially. The bowl is easily detachable for cleaning.

B. M. VENABLES.

**Centrifugal machine.** J. J. MUNSON (U.S.P. 1,703,404, 26.2.29. Appl., 23.6.26).—A continuously-acting centrifugal machine is constructed with a number of planetary rotating baskets.

B. M. VENABLES.

**Centrifugal purifying and dehydrating apparatus.** EMPSON CENTRIFUGALS, LTD., and F. A. G. NOEL (B.P. 308,233, 19.12.27).—The heavier matter collected in a centrifugal machine is caused to flow continuously away by constructing the drum with no "abruption" on its inner surfaces, and the cover and sealing cone with smooth surfaces, thus reducing the resistance to upward flow of heavy material, while at the same time the resistance to inward flow of purified lighter liquid is increased.

B. M. VENABLES.

**Centrifugal separator drums.** F. KRUPP A.-G. (B.P. 299,454, 18.10.28. Ger., 28.10.27).—In a centrifugal separator, the fluid after passing through one or more concentric separating chambers passes inwardly through a filter medium. The filter medium is secured between conical inner and outer members, the former of which is pressed down by screwing means attached to the shaft.

B. M. VENABLES.

**Centrifugal fixture.** C. G. HAWLEY, Assr. to CENTRIFIX CORP. (U.S.P. 1,700,261, 29.1.29. Appl., 4.5.25).—In a non-rotating centrifugal separator the fluid passes from an inlet at one end of a casing to an outlet at the other, through two sets of whirling elements both operating in the same direction, one of which is longitudinally "tuyèred" and the other radially.

B. M. VENABLES.

**Filtering apparatus.** J. B. VERNAY (B.P. 297,394, 20.9.28. Ger., 20.9.27).—The filter is of the type in which a number of filter chambers are arranged in a horizontal circle around a vertical shaft. The chambers are overweighted on their radial supporting shafts so that they tip up in succession when permitted to do so and discharge their contents, aided by compressed air. The supporting shafts are hollow, and serve to withdraw filtrate under vacuum, and to supply compressed air to discharge the cakes. Charging of the chambers is done intermittently by a measuring device. To save ground space the filter may be in two stories, the thickened pulp from the upper storey discharging into the lower.

B. M. VENABLES.

**Operation and construction of filter presses.** M. WILDERMAN (B.P. 307,525, 10.11.27).—The filter plates are made double, so that in addition to the comparatively wide spaces for cake there are formed narrower spaces for filtrate. The plates may be perforated right through and used with cloths or filter paper, or may be made of porous ebonite or other porous material with impervious rim. Several variations of construction are described.

B. M. VENABLES.

**Apparatus for straining liquids.** R. A. and J. B. BLAKEBOROUGH, and J. LINDSAY (B.P. 309,814, 13.9.28).—A duplex strainer is mounted on a sliding carrier so that while one element is in use the other may be removed for cleaning.

B. M. VENABLES.

**Emulsifiers, mixers, etc.** C. S. H. SNOW (B.P. 305,711, 10.11.27).—A rotor with vertical axis comprises spokes driving upper and lower annular discs with concentric corrugations and runs with fine clearances between upper and lower fixed annuli, which are maintained the correct distance apart by a sleeve of stiff gauze or perforated metal. The whole is submerged in a container for the material which enters the centre of the rotor from above and below, passes through the sinuous spaces between the discs, and leaves through the gauze. Additional devices are provided, notably scoops for preventing excessive whirlpool action and returning the fluid to the centre. Air may be admitted through a central sleeve surrounding the driving shaft.

B. M. VENABLES.

**Concentration or drying of liquids [*e.g.*, aqueous dispersions].** DUNLOP RUBBER CO., LTD., D. F. TWISS, and E. A. MURPHY (B.P. 307,315, 3.11.27).—In a machine for producing simultaneous evaporation and mixing of difficult liquids such as rubber mixes, a comparatively small quantity of liquid is placed in a vessel which oscillates in all directions about a point within the vessel, so that both the exposed wetted surface on the interior vessel and the free surface of the liquid are continually being changed. A jacket for heating or cooling is provided, also inlet and outlet for a drying medium to and from the interior of the vessel.

B. M. VENABLES.

**Recovery of volatile liquids.** R. RILEY, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 310,141, 1.3.28).—Mixtures of dry air with, *e.g.*, acetic acid vapour are scrubbed with a countercurrent of water in quantity sufficient to saturate the air with water vapour.

L. A. COLES.

**Treating liquids with gases or vapours.** J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 309,206, 5.11.27).—Organic liquids (*e.g.*, paraffin wax) are treated with oxidising gases by blowing the mixture upwards through a reaction vessel filled with inert or catalytic fillers; the foam is drawn off at the top and returned to the bottom of the same vessel, or passed through other vessels in series. The material may be heated or cooled during the return journeys.

B. M. VENABLES.

**Absorption tower.** J. A. CAMPBELL (U.S.P. 1,703,571, 26.2.29. Appl., 27.7.26).—The lowest floor of an absorption tower is supported by a shoulder within the shell casing. The other floors are supported from the lowest by means of cylindrical spacers smaller



than the shell. There is communication from the top space of the apparatus to the annular space between the top spacer and the shell; also means for pressing the top floor, and consequently the other floors and spacers, downwards towards the supporting shoulder.

B. M. VENABLES.

**Filter [for gases].** A. JORDAHL and K. G. RUNBACK, Assrs. to MIDWEST STEEL & SUPPLY CO., INC. (U.S.P. 1,708,065, 9.4.29. Appl., 28.12.23).—A filter for air or gas has a primary filter freely exposed to the atmosphere on the inlet side and situated on one side of a quiescent air chamber; on the other side of the chamber is a secondary filter of larger area and having pockets for the collection of the dust settled out in the quiescent chamber. The larger area of the secondary filter may be obtained by zig-zagging the filter medium.

B. M. VENABLES.

**Filters for air and other gas.** (SIR) H. AUSTIN (B.P. 307,540, 10.12.27).—The air to be cleaned passes edgewise through a pile of plates that are kept moist by oil or other liquid, the plates being corrugated transversely to the flow of air so that the narrow passages between have abrupt turns at intervals. A preferred construction comprises a pile of annular plates assembled in an inner container with horizontal axis, and with axial inlet and peripheral outlet. An outer casing contains the filter and also a bath of oil which is flushed over the plates by rotating the inner container and plates slowly or intermittently.

B. M. VENABLES.

**Rotatable air or gas filter of the plate type.** A. SCHIRP (B.P. 307,694, 5.10.28. Ger., 15.3.28).—In a filter comprising a number of closely-spaced plates through which the gas passes edgewise, bundles of the plates are assembled in frames which are wholly or partly of chill-cast metal, and the frames are secured to a chain which passes over small sprockets at each end of its run, so that in the operative position the bundles lie close to each other (grooves and tongues are provided in the frames for sealing purposes), but on passing over the sprockets the frames open out and the plates may be flushed while passing round the lower sprocket.

B. M. VENABLES.

**Apparatus for separating solid impurities from air and gases.** H. S. POCHIN and C. H. W. CHELTNAM (B.P. 305,693, 4.11.27 and 20.1.28).—The dirty gas is blown by a fan through an outlet tube of rectangular cross-section and bent, and in which the impurities stratify; the outer layer of gas with the heavier particles are taken off by a branch to a cyclone separator, the inner layers pass on to a fabric filter, which may also receive the partially-cleaned gas from the cyclone. The proportion going to each branch may be regulated by a flap within the bent tube, and the centre about which the tube is bent is situated on the inlet side of the fan.

B. M. VENABLES.

**Air cleaner.** H. R. DAVIES, Assr. to INDUSTRIAL RES. CORP. (U.S.P. 1,708,122, 9.4.29. Appl., 29.5.29. Renewed 29.8.28).—A number of imperforated, inverted, truncated conical baffle plates are suspended from the closed top (base) of an inverted, truncated-conical casing, to which the air is admitted near the top periphery (outside the largest baffle), and exhausted through

the top centre. An upright cone extends from the bottom (small end) of the casing upwards towards the baffles.

B. M. VENABLES.

**Air filtering and like apparatus.** O. STOTT, and MATTHEWS & YATES, LTD. (B.P. 303,961, 10.11.27).—A number of cylindrical or other shaped units are mounted in pairs on either side of a dividing wall with apertures through the wall within the units. The end walls of the units are impervious, but the cylindrical walls are of filter medium, so that the air passes inwards through the cylindrical filter surfaces on one side of the wall, through the wall, and out through the filter surfaces in the other side of the wall. The units are easily detachable for cleaning.

B. M. VENABLES.

**Production of compressed gases from liquefied gases.** GES. F. INDUSTRIEGASVERWERTUNG M.B.H. (B.P. 280,568, 10.11.27. Ger., 15.12.26).—Liquefied gases are evaporated by permitting heat to enter them, a moderate pressure being thus self-generated. The gases are further compressed into storage cylinders by means of a power-driven compressor, the operation of which may be regulated by the intermediate pressure.

B. M. VENABLES.

**Insulation of vessels for storing liquefied gases. Adsorption of gases in liquid gas apparatus. Drying of gases in air-liquefying and gas-separation plant.** GES. F. INDUSTRIEGASVERWERTUNG M.B.H. (B.P. [A] 281,305, [B,\*] 305,974—5, 23.11.27. Ger., [A] 27.12.26, [B] 24.11.26, [C] 1.12.26).—(A) Highly porous, inorganic insulating material (e.g., kieselguhr) is loosely packed in the space between the pressure vessel and outer case, so loosely that it does not become compacted under its own weight, which effect may be aided by use of layers of slag wool, cellulose fibres, etc. to act as supports. The interstices of the material are filled with still air so chilled by the stored liquefied gas that it becomes a perfect insulator. (B) Attached to a storage vessel for liquefied gas (which it is intended to convert into compressed gas) is an absorption vessel containing a gel which absorbs any gas evaporated by leakage of heat during periods of rest between the periods of production of compressed gas, and during the latter periods the vaporising liquid withdrawn is passed through a pipe coil within the gel, so that it is chilled and rendered a more effective absorbent. When the storage vessel is empty, the adsorbed gas is recovered by heat. (C) In an air- or other gas-liquefying plant, the gases are dried by passing through a gel, such as silica gel, and the moisture is afterwards removed by a heated gas, e.g., nitrogen, obtained from the same plant. Two (or more) vessels may be used—one drying, the other regenerating. Gases saturated with moisture at 15° may, at the pressure commonly used for the separation of constituents of air, be dried to a dew point of -30 to -40°.

B. M. VENABLES.

**Apparatus for testing the viscosity of oils.** C. W. B. SHORTO (B.P. 307,602, 13.2.28).—A vertical tube to contain the oil is provided with a tapered internal seating at the bottom, and with a tapered plug an exact fit in the seating. The plug, which is provided with a handle in the form of a rod extending upwards within the tube and longer than the latter,



has convex upper and lower surfaces with an axial hole of exact diameter drilled through the summits of the convexities. A valve or stopper with handle is provided to fit closely to the upper convexity and close the hole. The viscosimeter is operated in the usual way, after taking suitable precautions as to temperature etc., and the time is noted for the oil to drop a certain distance in the tube.  
B. M. VENABLES.

**Apparatus for testing the effect of light and other influences.** KELVIN, BOTTOMLEY, & BAIRD, LTD., and F. A. KING (B.P. 309,726, 2.4.28).—A number of "swatch boxes" in which samples of fabrics, paints, etc. may be exposed to light and kept under definite conditions of humidity are arranged round a source of light, such as a carbon arc. They are mounted on trunnions, which are hollow, and serve for a supply of conditioned air to all the boxes in series. When any swatch box is swung down for inspection of a sample, the rotation of the trunnion causes the air stream to be by-passed across that box.  
B. M. VENABLES.

**Fire-extinguishing compound.** G. BLENIO (U.S.P. 1,707,597, 2.4.29. Appl., 22.7.22).—A mixture of an aluminium soap with a carbonate is claimed.  
H. ROYAL-DAWSON.

**Apparatus for introducing air or gaseous fluid into the charge in rotary furnaces.** G. BOJNER and A. H. PEHRSON (U.S.P. 1,709,456, 16.4.29. Appl., 21.4.27. Swed., 24.4.26).—See B.P. 269,892; B., 1928, 505.

**Heat-transferring apparatus.** F. H. BRAMWELL, ASS. TO ATMOSPHERIC NITROGEN CORP. (U.S.P. 1,708,387, 9.4.29. Appl., 23.7.26. U.K., 22.7.25).—See B.P. 248,999; B., 1926, 405.

**Calorimetric bomb.** J. DARROCH (U.S.P. 1,708,873, 9.4.29. Appl., 22.12.23. U.K., 13.8.23).—See B.P. 208,492; B., 1924, 320.

**Apparatus for [wet] separation of the constituents of pulp.** T. G. MARTYN (U.S.P. 1,709,676, 16.4.29. Appl., 24.12.26. S. Afr., 7.1.26).—See B.P. 264,129; B., 1927, 319.

**Catalytic apparatus.** SELDEN Co., Assees. of A. O. JAEGER (B.P. 283,887, 7.1.28. U.S., 19.1.27).—See U.S.P. 1,660,511; B., 1928, 320.

**Furnace walls.** F. B. BIGELOW (B.P. 310,305, 23.1.28).

**[Distribution of fuel and air to] furnaces for pulverised coal.** S. LÖFFLER (B.P. 297,835, 25.9.28. Ger., 29.9.27).

**[Water] heating apparatus.** BASTIAN-MORLEY & Co., Assees. of J. P. MORLEY (B.P. 288,594, 5.10.27. U.S., 13.4.27).

**Heat-insulating processes, devices, and materials.** E. SCHMIDT and E. DYCKERHOFF (B.P. 310,572, 2.2.28. Addn. to B.P. 266,177).

**Absorption refrigerating apparatus.** ELECTROLUX, LTD., Assees. of A. LENNING (B.P. 283,938 and 284,193, [A] 20.1.28, [B] 23.1.28. U.S., [A] 20.1.27, [B] 22.1.27).

**Absorption refrigerating systems.** ELECTROLUX, LTD., Assees. of PLATEN-MUNTERS REFRIGERATING

SYSTEM AKTIEBOLAG (B.P. 283,937, 20.1.28. Swed., 20.1.27).

**Filter material (B.P. 308,187).—See V. Separation of materials (B.P. 284,307).—See XI.**

## II.—FUEL; GAS; TAR; MINERAL OILS.

**Coking test of Chinese and Japanese coals.** T. SHIMMURA (J. Fuel Soc. Japan, 1929, 8, 48—50).—Application of the Lessing test shows that strongly coking coals give swollen, black cokes, whilst weakly coking coals give grey, unswollen cokes. When examined by methods of solvent analysis, the  $\alpha$ -compounds, carbonised in the Lessing apparatus, produced a black, compact, powdery coke,  $\beta$ -compounds mostly gave a highly swollen coke, and  $\gamma$ -compounds fused easily, forming black flakes of mushroom appearance. It is concluded that the swelling properties and general appearance of the cokes obtained in the Lessing test bear a close relationship to the coking constituents of the coal.  
C. B. MARSON.

**Heat expenditure in the coking process [for coals].** E. TERRES (Gas- u. Wasserfach, 1929, 72, 361—369).—Fuel needs for different types of carbonising units vary widely, being about 955 kg.-cal. per kg. of coal for intermittent ovens, and generally 540—580 kg.-cal., but sometimes as low as 420—480 kg.-cal. in coke ovens of the most modern type. In determining the thermal effect of coking, a calorimetric bomb is used which contains an electrically-heated quartz vessel; the total energy consumption needed to produce a given temperature rise, with and without a coal charge, is measured. The tar and gas formed are removed continuously, and if information is also required as to the heat of the reaction it is only necessary to pass the distillation products through a second calorimeter and to allow for the work done by these substances in expanding against atmospheric pressure (cf. Terres and Walter, B., 1927, 177; Terres and Meier, B., 1928, 508). Curves are constructed showing the heat consumption and the heat of reaction at temperatures from 600° to 1100° for gas coals from the Ruhr and the Saar, two coking coals from the Ruhr, and a Boldon gas coal. With the Saar coal the heat consumption rose slowly from 700° to 870°, then fell slightly until 940°, and finally rose rapidly; these fluctuations are explained by the curve showing the heat of reaction, which increases suddenly at 870°, but falls again from its maximum at about 940°. The same general form of curve is obtained with other coals, but the intensity of the effect varies considerably, and the heat of reaction may have a negative or a positive value. New coal has a smaller heat requirement than one which has been stored for some time, and the moisture content has also a large effect which does not arise simply from evaporation of water, but because the water-gas reaction comes into play during carbonisation. The relation between heat of reaction and heat consumption on carbonisation at 1000° takes the form of a smooth curve for 28 different coals, and it is found that when the heat of reaction is nil, the heat consumption is 325 kg.-cal. per kg. The nett heat requirement is made up of the total heat effect of the coking process,



the thermal result of the recuperator systems for gas and air, and the radiation and convection losses from the setting. These losses are bigger than is generally realised, and may account for 15–35% of the fuel used. The time which a charge needs for complete carbonisation will depend on these heat requirements and also on the thermal conductivity of the coal and coke. Experiments in this connexion have been carried out, using the method of Heyn and Baur (Mitt. Materialprüf., 1914, Nos. 2 and 3), with coals and cokes of different sizes, and it appears that the dimensions of the particles have an important effect. The values for coal are always very small, but coke gives appreciably larger results, and measurements can be made at higher temperatures. Curves and methods for calculating the mean heat conductivity for a range of temperatures are given for different coals, and the information which can be derived from them with relation to coking time and design of ovens is discussed.

R. H. GRIFFITH.

**Apparatus for determining the softening range and the degree of softening of coking coals.** G. AGDE and L. VON LYNCKER (Brennstoff-Chem., 1929, 10, 86–87).—The apparatus resembles a penetrometer, a weighted needle, the movement of which can be measured on a graduated dial, resting on the coal sample. The latter is contained in a metal tube, supported vertically in an electrically heated salt bath, the temperature of which is read with a thermometer or thermocouple. The tube is 10 mm. in external diameter, and contains 3 c.c. of coal (1–2 mm. size) resting on 1.5 c.c. of sand. The needle usually carries a 100 g. weight and the rate of heating is 5° per min. By reading the dial pointer for every 5° rise in temperature the softening range and the extent of softening are determined.

W. T. K. BRAUNHOLTZ.

**Fixation of sulphur in coal briquettes.** R. KADA and K. OGATA (J. Fuel Soc. Japan, 1929, 8, 52–55).—Experiments are described in which calcium oxide, calcium carbonate, magnesium oxide, sodium carbonate, barium carbonate, and ferric oxide are added to the briquettes in order to fix the sulphur and retain it in the ash. An addition of 1–2% of ferric oxide together with some slaked lime was found to be the most efficacious.

C. B. MARSON.

**Rough estimation of the content of tar coke in lump coke.** G. AGDE and L. VON LYNCKER (Brennstoff-Chem., 1929, 10, 88–89).—Tar coke comprises the solid residue formed by the coking of decomposition products of bitumen which have not been removed by distillation during carbonisation. It is derived from both the extractable and non-extractable bitumen, but the quantity obtained from coal after extraction is very small if the coal is carbonised under greatly reduced pressure. The content of tar coke may thus be roughly estimated by weighing the coke produced by carbonising the non-extracted coal under normal crucible conditions and subtracting from this the weight of coke obtained by carbonising under diminished pressure at 1020° an equivalent quantity of extracted coal. A normal coke contains about 6–8% (not more than 10%) of tar coke.

W. T. K. BRAUNHOLTZ.

**Properties of coal for gas producers.** S. UCHIDA (J. Fuel Soc. Japan, 1929, 8, 50–52).—It is suggested that in addition to the usual data from the analysis and calorific value determinations, a knowledge of the size of the coal, its caking power, the fusing temperature of the ash, and the reactivity of the coke is necessary to obtain the best working results.

C. B. MARSON.

**Apparatus and method for determining the progress of gas evolution from coking coals.** G. AGDE and L. VON LYNCKER (Brennstoff-Chem., 1929, 10, 89–90).—The coal (3 g.,  $\frac{1}{2}$ –1 mm. size), contained in an elongated silica crucible, is placed in a porcelain tube sealed at one end. The tube is heated in a vertical, electric tube furnace, and the temperature, read by a thermocouple just below the sealed end of the porcelain tube, is raised by at least 7° per min. up to the maximum of 1200°. The upper end of the porcelain tube is cooled and contains a plug of asbestos, previously heated to redness, to prevent condensed products dropping back on to the heated coal. The gas is scrubbed by passing it through a bottle containing cotton wool and passes to a 3-way tap, by means of which it is collected and measured alternately every 5 min. in two graduated burettes. Curves are drawn with temperatures as abscissæ and the gas collected in 5 min. as ordinates, an example being given for a raw coal, its oily and solid bitumens, and the extracted coal.

W. T. K. BRAUNHOLTZ.

**Petroleum wash-oil thickening in the scrubbing of coke-oven gas.** H. M. ULLMANN, D. S. CHAMBERLIN, C. W. SIMMONS, and M. A. THORPE (Ind. Eng. Chem., 1929, 21, 313–314).—Although the sulphur content of a wash oil on thickening increased from 0.182% to 0.967%, no thickening was caused by hydrogen sulphide or sulphur alone under any conditions. Addition of light petroleum to spent oil gave a precipitate containing 9.25% S and 6.17% O, and the substance appears to be derived from the gas which is being stripped, carried in a state of fine suspension. This suspended material was fully investigated by using a Cottrell precipitator, which separated 3.17 g. of a brown tarry substance, containing 12.5% S, per 100 cub. ft. of gas. No thickening occurred in wash oil which dealt with gas that had been cleaned in this way, but the addition of a coal tar, collected from sumps on the plant, produced thickening in an unused oil.

R. H. GRIFFITH.

**Blau gas and its industrial applications.** L. DAL PRATO (Zymologica, 1929, 4, 35–51).—Descriptions are given of the various processes for obtaining this gas (cf. B., 1925, 621), and of its uses in the synthesis of alcohol and other products, as a substitute for acetylene in autogenous welding, and as an automobile fuel.

T. H. POPE.

**Action of sulphuric acid on olefines etc.** W. R. ORMANDY and E. C. CRAVEN (J.S.C.I., 1928, 47, 317–320 T).—The olefines from ethylene to pentene have been treated with excess of concentrated sulphuric acid at temperatures below 25°, and the reaction products examined. Inspection of the oil which separated from the acid layer, of oily products extracted by pentane after dilution with water, and of alcohols remaining dissolved showed that high percentages of the mixtures



were colourless, mobile oils having the following mean values:  $d_{20}^{20}$  0.73—0.76,  $n_D^{20}$  1.41—1.43,  $r_L$  0.34, b.p. range 80—350°, mol. wt. 170—200, and containing 85% C and 15% H. The oils extracted by pentane were unsaturated in character: some cyclic olefines and substances of high mol. wt. obtained from cracked spirit appear to give similar results. Treatment of alcohols belonging to the same series yields substances of the same type, but no paraffin-like oils separate with a smaller molecule than that of propyl alcohol, and the cyclohexanols give rise to cyclic compounds of high b.p. and viscosity.

R. H. GRIFFITH.

**Production of alcohols from butenes and pentenes through interaction with sulphuric acid.** J. F. NORRIS and H. S. DAVIS (J.S.C.I., 1929, 48, 70—71 T).—The authors take issue with the conclusions of Ormandy and Craven (cf. preceding abstract) that alcohols cannot be made from the butenes and pentenes by sulphuric acid; *sec.*- and *tert.*-butyl and amyl alcohols are being manufactured in the United States in this way from olefines made from petroleum products. A review of the conditions necessary for their production is given.

**Methods of extraction of pyridine bases.** C. AB-DER-HALDEN (Chim. et Ind., 1929, 21, 708—710).—Modern methods of coal-tar distillation employing steam may yield a light oil containing 35—40% of tar acids and 5—7% of bases. The compounds formed by their union are not completely decomposed by sulphuric acid, and the tar acids must first be removed with soda. Pyridine is then obtained as pyridine sulphate which may be further treated: (1) by neutralisation with ammonia in presence of pure benzol followed by distillation of the latter; (2) by addition of the equivalent of caustic soda followed by distillation with live steam. Light pyridine comes over at 93—96° as soluble hydrate. The heavy bases which commence to distil at 96° are insoluble in water. The light pyridine is dehydrated with 50% caustic soda solution; (3) by neutralisation with sodium carbonate. Two layers are formed, the lower one containing sodium sulphate and light pyridine. This is distilled without fractionation. The upper layer is fractionated and gives in succession aqueous pyridine, anhydrous light pyridine, and heavy bases. The aqueous fractions are used for the dissolution of further sodium carbonate. This method is cheaper than (2) in reagents, but consumes more heat.

C. IRWIN.

**Volumetric determination of phenols by means of glycerin in distillation tars of brown coals.** B. P. LUGOVKIN (J. Chem. Ind. Moscow, 1928 5, 798—799).—The tar is shaken with an equal volume of glycerin; after 2—3 min. (or immersion in hot water) two layers are formed, the lower consisting of a solution of phenols in glycerin, from which the phenols may be recovered by dilution with water. The decrease in volume of the tar layer is measured. Paraffins or much (60—70%) water interfere. For viscous distillates the glycerin is diluted with kerosene.

CHEMICAL ABSTRACTS.

**Carbonisation of lubricating oils and fuel oils.** N. I. TSCHERNOSHUKOV (Ind. Eng. Chem., 1929, 21, 315—316).—Sludge formation in lubricating and other oils during use is due to oxidation reactions of various types,

and three crude oils have been treated with oxygen at 150° and 15 atm., while the formation of asphaltenes was measured at intervals. Similar experiments with floridin tars from the crude oils showed that no relation existed between the behaviour on oxidation and the results provided by the Conradson coking tests. Satisfactory information as to the value of an oil can only be obtained, therefore, by oxidation tests, especially when conditions of high pressure actually exist under working conditions.

R. H. GRIFFITH.

**Determination of olefines.** P. S. SMIRNOV (Neft. Choz., 1928, 15, 217—221).—Cracked gasoline is added drop by drop to liquid nitric oxide at —15° to —20°; the liquid is then made alkaline with sodium hydroxide and distilled with steam. The distillate, after separation, is dried with sodium sulphate and filtered through silica gel, which is washed with ether. After centrifuging, the ether is removed by distillation, and the top layer (gasoline) is added to that left after treatment with sodium sulphate. The difference between the total volume of gasoline left after treatment and the original volume represents the unsaturated compounds.

CHEMICAL ABSTRACTS.

**Characteristics of amorphous wax.** L. D. JONES and F. E. BLACHLY (Ind. Eng. Chem., 1929, 21, 318—320).—When amorphous wax is to be precipitated by centrifuging from lubricating stock it must be present in sufficiently coarse form to make rapid separation possible; this can largely be achieved by choice of a suitable diluent. The properties of the wax depend primarily on its origin, but may be modified by the solvent, and a crystalline wax may be obtained from one that is amorphous by removal of associated impurities. An oil solution containing amorphous wax may be cooled to —45.6° without coating the chilling coils, even when the mixture becomes quite viscous, but crystalline wax is always deposited on the cold surface. This is due to the higher surface tension of the amorphous form caused by the presence of some substance of higher b.p., which can, however, be distilled without appreciable change. It is suggested that this substance is of an asphaltic nature, and can be adsorbed by fuller's earth, but is frequently adsorbed by crystalline wax, especially at low temperatures.

R. H. GRIFFITH.

**Acids of montan wax.** III. H. TROPSCH and H. KOCH (Brennstoff-Chem., 1929, 10, 82—86; cf. B., 1922, 208 A, 659 A).—The fatty acids present in montan wax obtained from mid-German lignite are purified by fractionally distilling their methyl esters under diminished pressure, and are separated from the distillates by fractional precipitation of their magnesium salts. They are identified from their m.p. and by determining their equivalent by titration with alcoholic potassium hydroxide. The presence in the wax of an acid,  $C_{31}H_{62}O_2$ , and the absence of the acid,  $C_{30}H_{60}O_2$ , are established. The former, which constitutes 4.7% of the fatty acids present in the wax, has m.p. 88.5—89.0° and appears to be identical with melissic acid occurring in beeswax.

W. T. K. BRAUNHOLTZ.

**Treatment of montan wax without acid.** V. TOKMANOV (Neft. Choz., 1928, 15, 224—225).—Treatment with sulphuric acid (6% free monohydrate) is preferred



to that with adsorbents in the production of ceresin; adsorbents give a higher yield, but the product contains unsaturated compounds and naphthenes.

## CHEMICAL ABSTRACTS.

See also A., May, 534, **Measurement of flame temperature** (GRIFFITHS and AUBREY). 551, **Thermal behaviour of phenols** (HAGEMANN).

## PATENTS.

**Coke ovens.** L. WILPUTTE (B.P. 309,774, 30.5.28. Addn. to B.P. 308,120; B., 1929, 422).—The heating arrangements of the oven described in the main patent are modified, and undesirably intense combustion in the lower part of the flues is avoided, by supplying gas at alternate intervals to the ports opening at different levels within each flue. A. B. MANNING.

**Coke ovens and chamber ovens.** J. Y. JOHNSON. From A. WEINDEL (B.P. 309,760, 15.5.28).—Coking chambers which are heated on one side only have sloping passages connecting the opposite side to the discharge chamber for the distillation products. These passages are also inclined to the longitudinal direction of the chamber, and are preferably narrowed conically from the coking chamber to the discharge chamber. Longitudinal grooves extend along the unheated wall and form the starting point of the off-take passages. The lower edges of the grooves are rounded off and the bricks above may be provided with bulbous projections into the chamber. The offtake passages may be arranged just above the level of the charge only or may be distributed over the wall below the surface of the charge. The discharge chambers are provided with drainage gulleys, and may be heated in such a way that only the heavy tar or pitch is run off through the gulleys, whilst the lighter products are led away to the condensing system. A. B. MANNING.

**Coking retort oven.** J. VAN ACKEREN, Assr. to KOPPERS Co. (U.S.P. 1,707,419, 2.4.29. Appl., 22.4.22).—A regenerative coking oven is provided with steam-superheating channels below the respective coking chambers and extending from side to side of the battery. Steam is introduced into these channels and passes through suitably arranged distributing channels to the coking chambers. A. B. MANNING.

**Coking retort oven.** J. BECKER, Assr. to KOPPERS Co. (U.S.P. 1,706,476, 26.3.29. Appl., 13.10.22).—A special flue system communicates with vertical combustion flues which constitute the heating walls.

J. A. SUGDEN.

**Regenerative coke ovens.** W. MUELLER (B.P. 308,994, 24.11.27).—The regenerators arranged below the oven chambers are each divided into a number of separate sections, alternate sections being traversed by gas and air, respectively, simultaneously flowing in the same direction. The gas and air, thus separately preheated, are supplied in a uniform manner to the heating flues over the whole length of the oven. The waste heat gases are withdrawn through the corresponding regenerator sections below the adjacent oven chamber, also in a uniformly distributed manner throughout the length of the oven. In examples, the flames ascending in one heating flue pass over at the top and down the adjacent

flue, a portion of the gas and air being led up through partition flues to the turning point between the adjacent heating flues; or the vertical flues are connected at the top to a horizontal flue and the vertical passages in the partition wall serve as exit flues for the waste gases and as inlet flues for gas and air, the direction of the flames in the heating flues reversing with each reversal of the gas and air supply. Provision is made for heating with rich gases, and some other possible modifications in the mode of heating are described.

A. B. MANNING.

**Regenerative coke oven.** C. OTTO (U.S.P. 1,707,537, 2.4.29. Appl., 25.4.25. Ger., 26.6.24).—The heating walls of the oven have vertical flues with cross-over conduits connecting together into independent flue systems the tops of flues of alternate heating walls only. Regenerators for preheating weak gas and air extend longitudinally below the ovens. Provision is made also for heating with strong gas. A. B. MANNING.

**Coking of coal in a retorting space.** J. BECKER, Assr. to KOPPERS Co. (U.S.P. 1,707,427, 2.4.29. Appl., 24.7.22).—The area of the coking chamber is smaller at the bottom than at the top. External heat is applied to the sides of the chamber so that coking is first completed at the bottom. Steam is then passed through the lower portion until the remainder of the charge is coked. The gas production is increased and over-coking of the lower portion of the charge is avoided. J. A. SUGDEN.

**Vertical continuous distillation furnace.** J. PIETERS (B.P. 287,934, 29.3.28. Fr., 30.3.27).—A bench of vertical retorts of the type which are heated from flues constructed in the longitudinal walls of the retorts has the combustion zones of the vertical flues bridged and partly obstructed by a number of bricks parallel to the horizontal long axis of the retorts, but occupying only a small proportion of the vertical depth of the flues, so that the heating gases become thoroughly mixed. For a certain distance below the combustion zone the gas and air are kept separate and are preheated by the cooling coke or residue. The gases after combustion are exhausted through a number of ports in the short unheated wall of the bench, which lead into a collecting passage, one for each retort with a valve to each passage. B. M. VENABLES.

**Apparatus for low-temperature carbonisation.** P. C. POPE (B.P. 309,387, 9.12.27).—An annular retort is formed by an externally heated, vertical, cylindrical chamber within which is suspended an axially movable, internal stem, which is enlarged at the bottom to be a loose fit to the outer container. After carbonisation is complete the stem with the coke is lowered into a cooling chamber. A pair of hinged scrapers arranged below the container remove any adherent coke from the stem as it is again raised into position. The retort is charged from a hopper through a heat-insulated, conical valve, which slides upon the rod from which the stem is suspended. During carbonisation low-pressure steam is admitted to the coke-cooling chamber, whence it passes up through the narrow passage between the enlarged part of the stem and the container and assists in carrying away from the retort the volatile products of carbonisation. A. B. MANNING.



**Low-temperature carbonisation of fuels.** J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 309,253, 26.10.28. Addn. to B.P. 301,975; B., 1929, 119).—Before submitting the fuel to the process described in the main patent it is dried at 250–350° by blowing hot scavenging gases through it at such a rate that the fuel is maintained in a state of active movement on its bed; it is then introduced directly, in its preheated state, into the carbonising chamber.

A. B. MANNING.

**Destructive hydrogenation of carbonaceous materials.** H. A. HUMPHREY, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 308,995, 30.11.27).—Solid carbonaceous material is treated with hydrogen, under at least 100 atm. pressure, and at 300–550°, while held in suspension in a liquid medium of high b.p., contained in a vertical tower.

A. B. MANNING.

**Destructive hydrogenation of carbonaceous materials.** J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 309,228, 3.10.27. Cf. B.P. 302,941; B., 1929, 232).—The hydrogenation is carried out in the presence of small quantities of substances, *e.g.*, sodium isopropyl-naphthalenesulphonate, which contain the radical of a mineral acid in the molecule, and which lower the surface tension of water.

A. B. MANNING.

**Hydrogenation of coal, tars, mineral oils, and other carbonaceous materials.** IMPERIAL CHEM. INDUSTRIES, LTD., and K. GORDON (B.P. 309,095 and 309,239, [A] 2.12.27, [B] 14.1.28).—The material is subjected to the action of hydrogen at temperatures of 400–500° under pressures of (A) 300–1000 atm. or (B) 1000–5000 atm. or higher. The process may be carried out in stages, and with or without the use of catalysts. The preliminary hydrogenation may be effected with circulation of the hydrogen, but the hyper-pressure treatment is preferably effected without such circulation.

A. B. MANNING.

**Manufacture of valuable liquid products from varieties of coal, tars, mineral oils, etc.** I. G. FARBENIND. A.-G. (B.P. 282,384, 9.12.27. Ger., 20.12.26).—In the hydrogenation of coal etc. under high pressures and at elevated temperatures, and in similar processes, in which, however, there should be no appreciable amount of carbon monoxide present, the presence of iron and nickel is excluded in such forms only as are not physically or chemically resistant or which initiate injurious chemical reactions, *e.g.*, the formation of methane or coke. Copper is excluded if sulphur is present. The apparatus, therefore, is constructed of, or coated with, aluminium or iron and nickel alloys having a high content of chromium, molybdenum, tungsten, vanadium, etc. The metals and alloys used are preferably freed from such impurities as oxygen, sulphur, and carbon by treatment with moist hydrogen at high temperatures. When sulphur is absent silver or its alloys may be used.

A. B. MANNING.

**Manufacture of activated carbon.** E. BERL (B.P. 283,968, 20.1.28. Ger., 21.1.27).—Acid tars, *e.g.*, such as are produced in the sulphuric acid refining of oils and tars, are neutralised with potassium carbonate, hydroxide, or sulphide, and heated to activating temperatures in the presence of air, carbon dioxide, steam,

or mixtures of these. After cooling and extracting the soluble inorganic constituents the material is preferably again heated in an atmosphere free from or poor in oxygen.

A. B. MANNING.

**Production of gas.** C. W. ANDREWS and H. A. BRASSERT (U.S.P. 1,707,651, 2.4.29. Appl., 20.5.22).—A unit containing carbonaceous residue is alternately air-blasted and steamed. The generated water-gas, further heated by passing through another unit containing heated carbonaceous residue, serves to carbonise a bed of fresh coal contained in the same unit, thereby producing a mixture of coal gas and water-gas.

J. A. SUGDEN.

**Recovery of ammonia [from gas].** F. OSBORNE Assr. to SEMET-SOLVAY Co. (U.S.P. 1,703,405, 26.2.29. Appl., 12.4.27).—Ammonia gas, *e.g.*, from coke ovens, at 120–130° is cooled successively to 100° and to 80° in a heat interchanger and an electrical precipitator. Condensate is removed, and the issuing gas is raised to 90–100° by heat exchange with fresh gas in the interchanger and passed into a saturator containing sulphuric acid. Ammonium sulphate crystallises out, and is ejected and centrifuged, the mother-liquors being returned with sulphuric acid to the saturator. Vapours from the saturator are cooled to 30°, the condensate of water and light oils being separated, passed through a second precipitator, and thence to an exhaustor and holder.

R. BRIGHTMAN.

**Thermal decomposition of hydrocarbons.** S. M. NORWOOD, Assr. to ELECTRO METALLURGICAL Co. (U.S.P. 1,703,949, 5.3.29. Appl., 11.10.27).—An iron catalyst, containing 15–40% Cr, 2–15% Ni, 0.7–3.0% Si, 0.7–3.0% Mn, and not more than 1% C, is used.

C. HOLLINS.

**Cracking of [hydrocarbon] oil.** G. EGLOFF, Assr. to UNIVERSAL OIL PRODUCTS Co. (U.S.P. 1,703,617, 26.2.29. Appl., 15.12.20. Renewed 24.3.27).—Oil, *e.g.*, Kansas fuel oil, is cracked at, *e.g.*, 135 lb./in.<sup>2</sup> and 400° in a series of stills and expansion chambers. Reflux condensate from the dephlegmators is returned to the heating tubes, and the uncondensed gas from the final condenser and receivers passes through a common header to the compression pump and reservoir, a check valve in the leads to the header preventing back-pressure on the receivers.

R. BRIGHTMAN.

**Cracking of heavier hydrocarbon oils.** E. C. HERTHEL and H. L. PELZER, Assrs. to SINCLAIR REFINING Co. (U.S.P. 1,703,529, 26.2.29. Appl., 28.5.25).—The oil is circulated through heating tubes from a supply tank containing a bed of 10–18 in. of fuller's earth, the return pipe to the tank delivering to the further end below the oil level and above the bed of earth. Vapours escape to a dephlegmator and thence to condenser and receiver, the phlegms being returned to the circulation pipe below the bed of earth. Fresh oil may be fed in at the top of the dephlegmator or through the circulating pump.

R. BRIGHTMAN.

**Cracking of emulsified petroleum oil.** G. EGLOFF and H. P. BENNER, Assrs. to UNIVERSAL OIL PRODUCTS Co. (U.S.P. 1,703,103, 26.2.29. Appl., 1.9.20. Renewed 2.7.28).—The oil is heated to cracking temperature and the condensate and vapours from the dephlegmator are



passed through separate coils at above 100°, *e.g.*, 190°. Uncondensed vapours from either coil are passed through a water condenser at, *e.g.*, 20°, and the water and light oil are separated in the receiver. The condensate is discharged through separate water condensers to receivers for distillate and reflux condensate, the latter being retreated if desired.

R. BRIGHTMAN.

**Refining of petroleum oils.** O. DIECKMANN (U.S.P. 1,703,615, 26.2.29. Appl., 1.9.21).—The crude oil, after separating any water, is topped to remove benzine and gasoline and is agitated with concentrated sulphuric acid, the acid sludge being drawn off, partly decomposed with live steam, and extracted with refined petroleum oil. The recovered oil is returned to the acid oil and the residue affords, on extraction with tar oil and neutralisation, cylinder oil and a hard pitch free from coke. The acid oil and extract, after further acid washing, are agitated successively with 10–15% of sodium carbonate at 80–90° and with 20–25% of water and fractionated.

R. BRIGHTMAN.

**Means for treating oils.** C. B. BELKNAP (U.S.P. 1,704,277, 5.3.29. Appl., 7.5.25. Renewed 25.7.28).—Oil is heated in the liquid state under a predetermined pressure, and the vapours are received in a vapour space adjacent the liquid oil.

H. S. GARLICK.

**Combining natural gas and hydrocarbon oil for production of gasoline.** L. S. WORTHINGTON, Assr. to C. L. THOMPSON (U.S.P. 1,705,348, 12.3.29. Appl., 6.5.24).—The oil is fed into a chamber in which it is maintained at a constant level. It is passed from this chamber through a heater, is then atomised and mixed with a hydrocarbon gas, and re-introduced into the vapour space of the chamber. The mixture of gas and vapour discharged from the upper part of the chamber passes to a condensing system.

A. B. MANNING.

**Recovering oil.** B. M. CLOUD (U.S.P. 1,697,260, 1.1.29. Appl., 7.3.27).—Hydrocarbon oil is recovered from oil-containing sand and rock, *e.g.*, "exhausted" wells, by injecting carbon monoxide and hydrogen (water-gas), preferably admixed with 15–30% of acetylene.

R. BRIGHTMAN.

**Treatment of distillates from cracking of petroleum oils.** R. A. HALLORAN, Assr. to UNIVERSAL OIL PRODUCTS Co. (U.S.P. 1,704,246, 5.3.29. Appl., 4.10.23).—The pressure of the distillate, which contains more than 0.2% S, is reduced only sufficiently to release water vapour prior to washing with alkali.

F. G. CLARKE.

**Acid treatment of lubricating oils.** G. F. OLSEN, Assr. to GEN. PETROLEUM CORP. OF CALIFORNIA (U.S.P. 1,704,206, 5.3.29. Appl., 11.10.26).—A confined stream of oil is treated with an enveloping annular stream of acid. The two liquids are then mixed by being passed into a conduit of reduced diameter.

F. G. CLARKE.

**Normal-pressure hydrolysis of acid sludge.** E. W. ROTH (U.S.P. 1,682,713, 28.8.28. Appl., 13.4.27).—A supernatant layer of acid sludge, or a mixture of acid sludge and solvent oil, *e.g.*, gas oil, of *d* 0.875–0.886, in contact with sulphuric acid of *d* 1.16–1.53, is heated by means of a steam coil immersed in the acid, which keeps the acid layer at simmering temperature

(about 125°). The disappearance of the sludge coincides with cessation of evolution of sulphur dioxide, and the layer of tar is run off, a portion being left until sufficient free carbon has accumulated from successive charges to interfere with the operations when this residue is run to waste. The requisite concentration of acid is maintained by the addition of small amounts of water as required.

R. BRIGHTMAN.

**Recovery of oxidation products of solid hydrocarbons, waxes, etc.** J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 309,875, 7.11.27).—Mixtures obtained by the incomplete oxidation of waxes etc. are subjected to mechanical pressure at a temperature below the m.p. of the initial material, whereby the oxidation products are expressed as oils. Alternatively, fatty acids are first recovered by conversion into soaps and extraction of these with water, and residual higher alcohols etc. are then recovered by expression.

L. A. COLES.

**Lubricating mixture.** P. C. GOSS (U.S.P. 1,708,058, 9.4.29. Appl., 7.2.27).—A mineral lubricating oil of a petroleum base is emulsified with an aqueous extract of the inner bark of slippery elm.

H. ROYAL-DAWSON.

**[Production of] decolorising carbon.** E. URBAIN (U.S.P. 1,709,503, 16.4.29. Appl., 29.3.26. Fr., 12.3.25).—See B.P. 249,138; B., 1926, 1003.

**Purification of coal or other gases.** J. N. REESON and W. L. MOSS (U.S.P. 1,708,590, 9.4.29. Appl., 13.3.25. Austral., 30.4.24).—See B.P. 249,312; B., 1926, 430.

**Separation of low-temperature tar into phenols and hydrocarbons.** A. CORRELL, Assr. to ZECHE M. STINNES (U.S.P. 1,709,309, 16.4.29. Appl., 7.11.25. Ger., 10.12.24).—See B.P. 245,633; B., 1926, 184.

**Distillation of [mineral] oil.** A. E. HARNBERGER (B.P. 310,393, 23.1.28).—See U.S.P. 1,666,597; B., 1928, 396.

**Atomisable motor fuel product.** ALOX CHEM. CORP. (B.P. 286,260, 10.10.27. U.S., 2.3.27).—See U.S.P. 1,684,125; B., 1929, 10.

**Manufacture of agents for emulsifying, purifying, wetting, etc. by sulphonation.** K. MARX, K. BRODERSON, and K. BITTNER, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,708,103, 9.4.29. Appl., 18.5.27. Ger., 19.5.26).—See B.P. 271,474; B., 1928, 326.

**Burners for pulverulent fuel and/or liquid fuel.** L. GROTE (B.P. 310,555, 26.1.28.)

**Producer furnaces (B.P. 305,288).** Apparatus for chemical reactions (B.P. 309,057 and 309,258). Drying of coal etc. (B.P. 308,548). Agglomerates from pulverised materials (B.P. 305,051). Centrifugal machine (B.P. 299,018). Treating liquids with gases or vapours (B.P. 309,206). Viscosity of oils (B.P. 307,602).—See I. Ammonium sulphate (B.P. 307,037).—See VII. Castor oil-mineral oil mixtures (B.P. 308,502).—See XII.

### III.—ORGANIC INTERMEDIATES.

See A., May, 521, Anodic behaviour of diphenylacetic acid (KATAGISHI and others). Electrolytic



reduction of aldehydes (SHIMA). 548, Hydrogenation of phenanthrene (SCHROETER and others). 550, Perylene and its derivatives (FUNKE and others). 555, Di- and tetra-hydro- $\beta$ -naphthoic acids (LÉON and CHARRO). 579, Acenaphthiminazoles and acenaphthoxazoles (SIRCAR and GUHA-RAY).

Blau gas. DAL PRATO. Action of sulphuric acid on olefines (ORMANDY and CRAVEN; NORRIS and DAVIS). Extraction of pyridine bases. AB-DER-HALDEN. Determination of phenols. LUGOVKIN.—See II. Methyl and ethyl alcohols in sugar beet pulp. JEDLIČKA.—See XVII. Anhydrous alcohol. VON KEUSSLER.—See XVIII.

## PATENTS.

Manufacture of organic compounds containing oxygen. I. G. FARBENIND. A.-G. (B.P. 280,522, 28.10.27. Ger., 15.11.26).—In the hydrogenation of oxides of carbon, the use of an iron oxide catalyst containing small amounts of oxides or hydroxides of alkali or alkaline-earth metals below 300° leads to oxygenated products. Copper oxide (*e.g.*, 33%) may be added. C. HOLLINS.

Recovery of acetone from gases containing it. W. R. ORMANDY (B.P. 308,885, 14.3.28).—The gases are scrubbed with moderately concentrated sulphuric or phosphoric acid, which is diluted before distilling off the absorbed acetone. C. HOLLINS.

Manufacture of condensation product from *m*-cresol and acetone. SCHERING-KAHLBAUM A.-G., and H. JORDAN (B.P. 308,741, 28.10.27. Addn. to B.P. 273,684; B., 1929, 236).—When the process of the prior patent is carried out under milder conditions (lower temperature, lower concentration of acid, or with a diluent) the product is 2:2'-*dihydroxy*-4:4'-*dimethyl*- $\beta\beta$ -*diphenylpropane*, m.p. 131—132° (*diacetate*, m.p. 84—85°). C. HOLLINS.

Production of purified styrene. I. OSTROMISLENSKY, Assr. to NAUGATUCK CHEM. CO. (U.S.P. 1,703,950, 5.3.29. Appl., 7.5.24).—Styrene is separated from ethylbenzene by polymerising for 16—48 hrs. at 130—140°, distilling off the ethylbenzene, and depolymerising the styrol at 350—500°. C. HOLLINS.

Manufacture of benzonitrile and other aryl cyanides [nitriles]. R. B. TRUSLER, Assr. to ROESSLER & HASSLACHER CHEM. CO. (U.S.P. 1,702,711, 19.2.29. Appl., 20.6.27).—Aryl halides which do not contain substituents, *e.g.*, amino-, carboxylic, or hydroxyl groups, which are reactive under the conditions of reaction, are heated at 300° with zinc cyanide or other metallic cyanide in presence of copper, nickel, or cobalt bromide as catalyst. R. BRIGHTMAN.

Manufacture of 2-aminonaphthalene-3-carboxylic [2-amino-3-naphthoic] acid. O. Y. IMRAY. From I. G. FARBENIND. A.-G. (B.P. 282,450, 19.12.27).—2:3-Hydroxynaphthoic acid (or a salt) is heated with ferrous sulphate and 25% ammonia solution at 200—210° (pressure 40 atm.) to give an iron compound  $C_{10}H_6 \begin{matrix} \text{NH} \cdot \text{Fe} \\ \text{CO} \cdot \text{O} \end{matrix}$ , which on decomposition with hot caustic alkali yields 2-amino-3-naphthoic acid. C. HOLLINS.

Oxidation of hydrocarbons. E. C. R. MARKS. From ALOX CHEM. CORP. (B.P. 309,382, 6.10.27).—See U.S.P. 1,690,768—9; B., 1929, 199.

Catalytic oxidation of organic compounds. A. O. JAEGER, Assr. to SELDEN CO. (U.S.P. 1,709,853, 23.4.29. Appl., 3.6.27).—See B.P. 291,419; B., 1929, 275.

Preparation of maleic and succinic acids from furfuraldehyde by electrolysis. T. YABUTA, Assr. to ZAIDAN HOJIN RIKAGAKU KENKYUJO (U.S.P. 1,709,207, 16.4.29. Appl., 31.3.26. Japan, 22.6.25).—See B.P. 253,877; B., 1927, 268.

Manufacture of aniline and other arylamines. W. J. HALE and J. W. BRITTON, Assrs. to DOW CHEM. CO. (Re-issue 17,280, 23.4.29, of U.S.P. 1,607,824, 23.11.26).—See B., 1927, 101.

Preparation of dinitrohalogenaryls [halogeno-dinitro-benzenesulphonamides and -benzamides]. E. FISCHER, Assr. to GRASELLI DYESTUFF CORP. (U.S.P. 1,709,256, 16.4.29. Appl., 12.10.27. Ger., 18.10.26).—See B.P. 279,134; B., 1928, 440.

Manufacture of mononitrated diphthaloyl-acridones. W. MIEG and A. JOB, Assrs. to GRASELLI DYESTUFF CORP. (U.S.P. 1,709,945, 23.4.29. Appl., 23.5.27. Ger., 27.5.26).—See B.P. 295,645; B., 1928, 781.

Manufacture of naphthaquinone derivatives. A. WAHL and R. LANTZ, Assrs. to SOC. ANON. DES MAT. COL. & PROD. CHIM. DE ST-DENIS (U.S.P. 1,708,001, 9.4.29. Appl., 22.10.23. Fr., 30.10.22).—See B.P. 206,142; B., 1924, 902.

Manufacture of 1:8-naphthoxyphenanthrophen [perinaphththioindoxyl] compounds. J. MÜLLER and M. SCHUBERT, Assrs. to GRASELLI DYESTUFF CORP. (U.S.P. 1,709,277, 16.4.29. Appl., 5.10.27. Ger., 12.10.26).—See B.P. 300,771; B., 1929, 200.

## IV.—DYESTUFFS.

See A., May, 554, Synthesis of *m*-hydroxyazo-dyes (BUCHERER and HOFFMANN). 567, Differently coloured conditions of anthraquinonylcarboxylic acids and anthraquinol- $\alpha$ -carboxylactones (SCHOLL and others). Derivatives of 3:4-phenanthraquinone (FIESER). 568, Perylene and its derivatives (ZINKE and others). 569 and 574, Plant colouring matters (KARRER and BACHMANN; KARRER and WIDMER). 579, Dyes from acenaphthenequinone (SIRCAR and GUHA-RAY). 580, Pyocyanine (WREDE and STRACK).

## PATENTS.

Triarylmethane dyes. IMPERIAL CHEM. INDUSTRIES, LTD., E. H. RODD, and F. L. SHARP (B.P. 308,906, 18.4.28).—Pararosaniline, rosaniline, or a homologue is condensed with an anisidine or phenetidine and sulphated to give new acid blues. Good yields are obtained even with New Magenta. C. HOLLINS.

Manufacture of substantive dyes of the stilbene series. A. RHEINER, Assr. to CHEM. WORKS FORMERLY SANDOZ (U.S.P. 1,708,897, 9.4.29. Appl., 13.12.26. Ger., 19.12.25).—See B.P. 263,192; B., 1928, 46.

Manufacture of vat dyes of the anthracene series. H. SCHEYER, Assr. to GRASELLI DYESTUFF CORP.



(U.S.P. 1,709,956, 23.4.29. Appl., 26.9.27. Ger., 30.9.26).—See B.P. 299,972; B., 1929, 12.

**Manufacture of dihydro-*p*-thioazines of the anthraquinone series.** G. KRÄNZLEIN and M. CORELL, Assrs. to GRASSELLI DYESTUFF CORP. (U.S.P. 1,709,986, 23.4.29. Appl., 15.12.26. Ger., 17.12.25).—See B.P. 263,178; B., 1928, 398.

**Manufacture of azo dyes.** L. OSWALD, Assr. to J. R. GEIGY SOC. ANON. (U.S.P. 1,709,734, 16.4.29. Appl., 14.7.27. Ger., 29.7.26).—See B.P. 275,220; B., 1928, 399.

## V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

**Electrical conduction in textiles. III. Anomalous properties.** E. J. MURPHY (J. Physical Chem., 1929, 33, 509—532; cf. B., 1929, 318).—The insulation resistance of cotton samples of different types has been measured as a function of applied *P.D.* and humidity, together with the residual *E.M.F.* in cotton at various humidities, and the distribution of resistance in cotton threads. The insulation resistance decreases with an increase in applied *P.D.* under all conditions, and in the range 20—80% R.H. can be represented by the equation  $\log_{10} R = -8.5 \times 10^{-2} H + k$ , where *H* is % R.H. and *k* is a constant. The passage of an electric current through cotton tends, in general, to increase its resistance and above 70—80% R.H. the rate of change is rapid but below 70—20% it is slow. The increase in resistance is shown to take place in the textile itself and not at the contacts with the electrodes, and the current tends to cause a non-uniform distribution of the resistance of the textile, which depends on the nature of the electrode; with brass it becomes concentrated in the anodic region, whilst with platinum electrodes the greatest resistance occurs in the middle of the textile thread. This non-uniform distribution may remain for hours after the removal of the applied *P.D.* These facts are explained by the effects of the products of electrolysis on the conductivity of the aqueous solutions through which conduction takes place, and their bearing on the measurement of resistance in textiles and other moisture-absorbing materials is discussed. Views similar to those previously advanced to account for *D-C* resistivity and *A-C* capacity and conductivity (*loc. cit.*) are now used to explain the anomalous properties of conduction in textiles. L. S. THEOBALD.

**Relation of moisture content of wool to that of air.** V. LÖHRMANN (Kisérlet Köz., 1927, 30, 472—482). The moisture content of wool depends on that of the air, and not on the quality of the wool.

### CHEMICAL ABSTRACTS.

**Enzymic degradation of cellulose and cotton.** O. FAUST and P. KARRER (Helv. Chim. Acta, 1929, 12, 414—417).—Enzymic decomposition of an artificial-silk cellulose with snail cellulase proceeds to a somewhat greater extent when mercerised, provided maturing is of the order of one day. With various forms of cotton at 36° and *pH* 5.28, increased degradation again occurs with the mercerised material, and proceeds to a greater extent when mercerisation is carried out without stretching the fibre. H. BURTON.

## Properties of acetone-soluble acetylcellulose.

K. WERNER and H. ENGELMANN (Z. angew. Chem., 1929, 42, 438—444).—The variation in the viscosity, tensile strength, solubility, and other properties of acetylcellulose of varying acetyl content (50—60% OAc) has been investigated in dried films 0.1 mm. thick prepared from a 13% acetone solution of acetylcellulose. The main results are as follows. The absorption of water in 24 hrs. at the ordinary temperature is inversely proportional to the acetyl content (varying from 1.2% with a specimen containing 60.9% OAc to 25.4% with one containing 42.4%), but with alcohol (containing 10% of ether) a maximum absorption occurs with a 50% acetyl content. Simultaneous determinations of the viscosity of various samples in 2% formic acid and 10% acetone solutions and of the tensile strength of the films have been made. In the former solvent the tensile strength is directly proportional to the viscosity. Samples of low acetyl content, and which, therefore, absorb much water, show a very large decrease in tensile strength on wetting, the latter varying from a 57% decrease with a specimen containing 51.3% OAc to 17% with one containing 60.9%, *i.e.*, one in which very little hydrolysis has occurred. A similar behaviour is shown by nitrocellulose films, the tensile strength increasing with the viscosity, but both the decrease in tensile strength on wetting and the quantity of water absorbed (both of which depend on the nitrogen content of the sample) are much smaller in magnitude than in the case of acetylcellulose, the values for a highly viscous sample containing 12% N (8% and 1%, respectively) scarcely equalling those of an acetylcellulose containing 61% OAc (17% and 1.2%, respectively). Both cellophane and completely hydrolysed acetylcellulose (transparite) have a very high tensile strength (14 kg./mm.<sup>2</sup>) and show only a very low absorption of alcohol (0.6%), but absorb a large quantity of water and hence exhibit a very large decrease in tensile strength (90—100%) on wetting. On the basis of these results the nature of solutions of acetylcellulose in acetone and other solvents is discussed, and it is concluded that the colloidal character of the solution depends very closely on the acetyl content, which in turn depends on the degree of hydrolysis, and hence on the presence of free hydroxyl groups, in the surface of the triacetylcellulose micelle in a similar manner to that postulated by Highfield (B., 1926, 188) for nitrocellulose solutions, the solvent power depending on the presence of polar and non-polar groups in both the solute and the surface of the micelle. A minimum viscosity is thus a criterion for a homogeneous sol. Hence the minimum viscosity and maximum solubility in acetone occur with a sample containing 58.9% OAc, in which only one of the acetyl groups in the surface of the micelle is hydrolysed, giving an apparent composition  $3C_6H_7O_2Ac_2.C_6H_7O_2(OH)Ac_2$  (acetyl 59.5%), but the acetyl value has purely a statistical significance. The technical importance of the results in the preparation of good acetylcellulose products is indicated. J. W. BAKER.

**Structural matter of varieties of cabbage. II.** H. PRINGSHEIM and C. R. FORDYCE (Ber., 1929, 62, [B], 831—832; cf. A., 1928, 1227).—The polysaccharide obtained previously from the leaves and stalks of the



white cabbage has been isolated from the leaves and stalks of the red cabbage and from cauliflower. The swollen polysaccharide is readily soluble in Schweizer's solution, and does not appear separable into components by fractional treatment with the reagent in presence of sodium hydroxide. The Röntgen diagram of the polysaccharide is nearly identical with that of cellulose. H. WREN.

—See also A., May, 544, **Hydrolysis of cellulose** (WILLSTÄTTER and ZECHMEISTER).

**Fibre plants.** TOBLER.—See XVI.

#### PATENTS.

**Preparation from flax or other plants of fibre suitable for spinning by machinery of the kind used in cotton mills.** VICKERS, LTD., and O. D. LUCAS (B.P. 309,213, 8.12.27).—Plant fibres, e.g., flax, preferably unretted, are subjected to a chemical treatment of such a nature that the cellulose of the fibre remains substantially unaffected whilst the cementing agent at the nodal points is attacked sufficiently to permit the ultimate fibres to be separated in an unbroken condition by a subsequent mechanical treatment. A suitable treatment consists in digesting the raw material at 150–170° for 1–4 hrs. with 3–5% caustic soda solution containing 1½% of Turkey-red oil and ½% of linseed oil (on the weight of fibre), and finally treating the washed fibre with cold dilute acid, e.g., ½–2% hydrochloric acid. With flax straw the raw material, without previous scutching, is first digested for about ½ hr. in water at 182° to produce furfuraldehyde, which is recovered by distillation. D. J. NORMAN.

**Washing or cleaning of wool.** E. C. DUHAMEL, and COMP. GÉN. DES IND. TEXT. (B.P. 307,199, 20.2.28. Addn. to B.P. 251,669; B., 1928, 187).—In the process of the prior patent a quantity of weak suint liquor exceeding 1 litre per kg. of wool treated is intermittently introduced into the bath, while any excess of liquor is withdrawn therefrom, these two operations being so conducted that the concentration of suint in the bath always corresponds with *d* 1.02 or above.

D. J. NORMAN.

**Treatment of wool.** V. G. WALSH and E. V. HAYES-GRATZE (B.P. 306,916, 28.9.27).—Wool is cleaned and scoured by treatment with a water-miscible, sulphonated vegetable oil containing no free alkali. [Stat. ref.]

D. J. NORMAN.

**Filter material for hot, or acid, or alkaline gases and liquids.** M. LEHMANN (B.P. 308,187, 19.12.27).—The filter material has as its base wild silk, which covers all classes of silk not produced by the silkworm. It is stated that dry distillation does not commence until 180° is reached, and that the silk is resistant to acids and alkalis of moderate concentration; dilute acid even improves it. B. M. VENABLES.

**Manufacture of cellulose esters.** J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 309,203, 3.10.27).—The preparation of organic esters of cellulose is facilitated if the esterification is conducted in the presence of an alkylated naphthalenesulphonic acid or a salt thereof, e.g., 0.7 pt. of isopropyl-naphthalenesulphonic acid per 100 pts. of cellulose. As protective colloids such

compounds as the addition products of sulphuric acid and oleic acid may be used. D. J. NORMAN.

**Spinning of artificial silk and the like.** J. HUERNER, R. J. H. GAEBEL, and NUERA ART-SILK Co., LTD. (B.P. 309,204, 6.10.27).—In the process of B.P. 303,421 (B., 1929, 203) some of the filaments stretch to a greater extent than others, and tend to separate from the main thread. This tendency is counteracted by causing the liquid set in motion by the travel of the thread to flow towards the bundle of filaments at one or more points, and preferably at or immediately before the point where the thread leaves the bath.

D. J. NORMAN.

**Manufacture of hollow artificial textile threads.** H. KARPLUS (U.S.P. 1,707,164, 26.3.29. Appl., 27.8.26. Czechoslov., 17.9.25).—Liquid or solid organic, non-crystalline substances, e.g., oils, waxes, soaps, which cannot form bubble-forming vapours, are incorporated as emulsions or suspensions with the spinning solution, and are subsequently removed from the textile threads by suitable solvents. F. R. ENNOS.

**Production of fine-fibre artificial silk.** A. WAGNER, Assr. to F. KUTTNER (U.S.P. 1,706,717, 26.3.29. Appl., 25.3.27. Ger., 11.6.26).—Threads of cuprammonium silk after being treated with aluminium sulphate solution are wound on to spools, washed with water to remove soluble salts, treated with sulphuric acid to free it from copper, and finally again washed with water, soaped, and dried. F. R. ENNOS.

**Reeling of artificial threads.** I. G. FARBENIND. A.-G. (B.P. 297,112, 30.8.28. Ger., 15.9.27).—The centrifugal cake of artificial silk is supported during the reeling operation by inserting an elastic bag mounted on a base plate into the centre of the cake and then inflating the bag so that it presses uniformly against the inner surface of the cake. D. J. NORMAN.

**Manufacture of [non-curling] adhesive paper.** G. H. WILKINSON and J. MUIR (B.P. 308,444, 2.3.28).—As an adhesive for the paper a mixture comprising 25–40 pts. of glue, 50–70 pts. of water, and 30–50 pts. of clay, chalk, terra alba, French white, plumbago, or any mixture of these is used. D. J. NORMAN.

**Waterproof paper. Greaseproof and waterproof paper.** A. L. CLAPP, Assr. to BENNETT, INC. (U.S.P. 1,706,840—1, 26.3.29. Appl., 27.2.26).—Paper pulp is mixed with (A) a soluble, straight-chain fatty acid soap, e.g., sodium stearate, and sodium silicate, or (B) glue, an aqueous dispersion of a waterproofing material, e.g., paraffin wax, rosin, etc., and sodium silicate. Alum or aluminium sulphate is then added in sufficient quantity to precipitate the soap and/or sodium silicate, and to fix the glue and waterproofing material in the pulp, which is then run off on a paper machine.

F. R. ENNOS.

**Saturating paper.** R. P. ROSE and H. E. CUDE, Assrs. to GEN. RUBBER Co. (U.S.P. 1,705,537, 19.3.29. Appl., 11.12.25).—Cotton fibre is mildly cooked to remove fats, waxes, and other non-cellulosic material without impairing the strength of the fibre, and the paper made from this pulp is used for absorbing a plastic substance from a dispersion thereof. D. J. NORMAN.



**Carbon paper.** M. BANDLI (B.P. 307,714, 11.10.27).—Solutions of cellulose derivatives, *e.g.*, an acetone solution of cellulose acetate, in admixture with suitable softening agents and optionally containing undissolved cellulose in a fine state of division, are used for applying the colouring medium in the manufacture of carbon paper.

D. J. NORMAN.

**De-inking of paper.** H. C. FISHER, Assr. to RICHARDSON Co. (U.S.P. 1,707,604, 2.4.29. Appl., 28.9.27).—After soaking the pulp in a solution of alkali and of the sodium salt of a sulphonic acid to loosen the inky material, the whole is agitated with a volatile liquid immiscible with water, *e.g.*, benzene, to form an emulsion. It is then deposited on the surface of water maintained at a temperature sufficient to vaporise the volatile liquid, when the inky matter floats on the surface and is skimmed off, and the pulp sinks to the bottom.

F. R. ENNOS.

**De-inking of fibrous material.** J. DE WITT (U.S.P. 1,705,907, 19.3.29. Appl., 14.7.27).—The paper is soaked in soap solution for approximately 2 hrs., shredded for 15 min., allowed to remain for 1 hr., and shredded for a further 30 min. The pulp is then shredded and washed for 15 min. and allowed to drain. Suitable apparatus is described.

D. J. NORMAN.

**Vegetable parchment.** W. HARRISON, and BRIT. VEGETABLE PARCHMENT MILLS, LTD. (B.P. 307,108, 3.12.27 and 16.8.28).—Thin vegetable parchment, which is supple, free from minute pinholes, and superior in mechanical strength and equal in appearance to paper of the same weight made from rag pulp, is obtained by using as the base a paper containing a proportion, *e.g.*, 70—75%, of boiled and bleached graminaceous fibres such as esparto.

D. J. NORMAN.

**Treating or retting fibre-bearing plants.** M. WADDELL and H. C. WATSON, Assrs. to WATSON-WADDELL, LTD. (U.S.P. 1,708,812, 9.4.29. Appl., 31.10.27. U.K., 14.9.27).—See B.P. 302,300; B., 1929, 167.

**Degumming [of natural silk].** G. H. ELLIS, Assr. to CELANESE CORP. OF AMERICA (U.S.P. 1,709,662, 16.4.29. Appl., 30.11.25. U.K., 30.10.25).—See B.P. 264,936; B., 1927, 247.

**Manufacture of cellulose.** H. WALKER, Assr. to G. H. WALKER, M. H. EPSTEIN, and E. MARKS (U.S.P. 1,709,824, 16.4.29. Appl., 12.8.26).—See B.P. 267,226; B., 1927, 361.

**Manufacture of fatty acid [acetic] esters of cellulose of high viscosity.** H. DREYFUS (U.S.P. 1,708,787, 9.4.29. Appl., 18.4.23. U.K., 24.5.22).—See B.P. 207,562; B., 1924, 129.

**Manufacture of paper.** G. A. MOURLAQUE (U.S.P. 1,710,375, 23.4.29. Appl., 4.10.27. Fr., 22.8.27).—See B.P. 299,965; B., 1929, 14.

**Stencil sheet.** S. HORII (Re-issue 17,267, 9.4.29, of U.S.P. 1,587,954, 8.6.26).—See B., 1926, 627.

**Rotary drying cylinders [for fabrics, paper, etc.].** J. B. NORTON, and LANG BRIDGE, LTD. (B.P. 309,732, 10.4.28).

**[Conveying] means for waterproofing sacks, bags, etc.** L. MOTLEY (B.P. 309,636, 7.1.28).

**[Pumping] apparatus for use in manufacture of artificial silk or other operations in which liquids are supplied under pressure.** BRIT. CELANESE, LTD., and E. KINSELLA (B.P. 310,384, 21.12.27).

**Nozzles for spinning artificial silk.** RUTH-ALDO Co., INC., Asses. of E. ORIOLI (B.P. 303,782, 3.8.28. Fr., 9.1.28).

**Recovery of acetone from gases** (B.P. 308,885).—See III. **Bleaching of pulp** (U.S.P. 1,705,897).—See VI. **Coated fabrics etc.** (B.P. 309,391).—See XIV.

## VI.—BLEACHING; DYEING; PRINTING; FINISHING.

**[Colour-]lake formation and cotton dyeing.** E. BAUR and H. SCHNYDER (Z. Elektrochem., 1929, 35, 254—263).—Numerous curves are given showing the amounts of various dyes taken up from dye solutions of widely differing concentrations by (i) aluminium hydroxide; (ii) tannin complexes, formed by the interaction of tannin with the hydroxides of either aluminium, chromium, or copper; and (iii) various types of yarns, including cotton and mercerised cotton.

H. T. S. BRITTON.

**Coal-tar dyes in wine.** MAROTTA.—See XVIII.

### PATENTS.

**Bleaching of pulp.** L. BRADLEY and E. P. McKEEFE (U.S.P. 1,705,897, 19.3.29. Appl., 16.3.22).—Chemical wood pulp resulting from the digestion of wood with cooking liquors containing sodium compounds is treated first with dilute acid and then with an alkaline hypochlorite solution.

D. J. NORMAN.

**Mercerisation of cotton.** E. C. R. MARKS. From CHEM. FABR. STOCKHAUSEN & Co. (B.P. 308,116, 24.5.28).—The wetting capacity of mercerising liquors is considerably increased, resulting in a more uniform mercerisation and permitting of the use of less concentrated liquors, *e.g.*, of *d* 1·2—1·22, if the sulphuric compounds of oils, fats, or fatty acids described in B.P. 293,480 and 293,717 (B., 1928, 678, 718), either alone or in admixture with aromatic or hydroaromatic sulphonic acids (*e.g.*, alkylated naphthalenesulphonic acids) or hydrocarbons, chlorinated hydrocarbons, hydrogenated naphthalenes or phenols, etc. are added to the mercerising bath (0·5—2 g. per litre) or used for pretreating the fabric.

D. J. NORMAN.

**Carroting animal hair and wool.** E. BÖHM (U.S.P. 1,710,565, 23.4.29. Appl., 6.1.28. Austr., 9.2.27).—See B.P. 285,028; B., 1928, 520.

**Printing with vat dyes mixed with cellulose esters or ethers.** E. PFEFFER, Assr. to GRASSELLI DYESTUFF CORP. (U.S.P. 1,710,007, 23.4.29. Appl., 15.10.27. Ger., 26.10.26).—See B.P. 279,864; B., 1929, 15.

**Treatment of cellulose acetate artificial silk.** A. J. HALL, Assr. to CELANESE CORP. OF AMERICA (U.S.P. 1,709,470, 16.4.29. Appl., 8.6.28. U.K., 8.6.26).—See B.P. 277,089; B., 1927, 964.

**Machines for dyeing, impregnating, or like treatment of fabrics.** L. MELLERSH-JACKSON. From



MASCHINENFABR. BENNINGER A.-G. (B.P. 309,702, 17.3.28).

Testing the effect of light etc. (B.P. 309,726).—See I.

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

**Manufacture of synthetic nitric acid.** M. KALTENBACH (Chim. et Ind., 1929, 21, 701—707).—Liquid ammonia for nitric acid manufacture can be transported, at any rate over private railways, in ordinary tank-wagons if these are insulated and the ammonia is cooled to  $-30^{\circ}$  before filling. These tank-wagons are charged from high-pressure reservoirs by a valve which automatically maintains a given pressure difference, and the necessary cooling is obtained by partial evaporation of the ammonia. The ammonia is stored at the nitric acid plant in insulated tanks connected by safety valves to a gasholder. When the pressure in this rises a liquefaction plant is automatically started. Tank-wagons are discharged into these through a constant-pressure-difference valve proportional to the capacity of the liquefaction set. With this system of working no difficulty arises in keeping joints tight. An automatic arrangement is described for maintaining a constant composition of the air-ammonia mixture, based on the difference in thermal conductivities of air and the mixture. The Parsons cylindrical catalyser is described. It has greater mechanical strength than the flat gauge. A temperature of  $825^{\circ}$  can thus be maintained or, with a heat exchanger,  $925-950^{\circ}$ . At this temperature the capacity is double that at  $725^{\circ}$ , and the conversion efficiency is 95—96% against 88—90%. A device for controlling the volume of nitric acid withdrawn from the absorption towers to correspond with their production is described, together with a spraying arrangement for the tower tops. C. IRWIN.

**Analysis of fluorspar.** G. E. F. LUNDELL and J. T. HOFFMAN (U.S. Bur. Stand. J. Res., 1929, 2, 671—683; Res. Paper No. 51).—Descriptions are given of methods suitable for the determination of carbonates, silica, sulphur, barium, lead, zinc, and calcium fluoride.

F. J. WILKINS.

**Metal carbonyls.** R. L. MOND (Chim. et Ind., 1929, 21, 681—700, 937—940).—The history of the discovery of nickel carbonyl and the measurement of its thermal and physical properties is recounted. The nickel should be prepared by reduction at  $350^{\circ}$  and cooled to  $50^{\circ}$  in a reducing atmosphere. There is no definite evidence of any compound containing nickel carbonyl as such. The blue substance formed by reaction with nitrogen peroxide is probably  $\text{Ni}(\text{NO}_2)_2$ . An account of the preparation of other carbonyls is also given. To nickel and iron tetracarbonyls and cobalt tricarbonyl cyclic structures are assigned. Such compounds as cobalt tetracarbonyl are dicyclic. It is shown that this view accords well with the chemical properties of the compounds. The comparatively easy formation of nickel carbonyl at the ordinary temperature and its decomposition at  $180^{\circ}$  is the groundwork of the Mond nickel process. This is described and illustrated. The operations performed in Canada are magnetic concentration, sintering with

coke and lime whereby part of the iron present combines with the silica as a slag, and treatment in a Bessemer converter whereby the remaining iron is removed as oxide. The greater part of the sulphur is driven off and converted into sulphuric acid, using a vanadium catalyst. The matte contains 80% (Ni+Cu). This matte is shipped to Wales, powdered to 60-mesh, and calcined at  $700-800^{\circ}$  in excess of air. The oxides so produced are extracted with dilute sulphuric acid and the undissolved nickel oxide is filtered on rotary vacuum filters. Copper sulphate is crystallised and when nickel has accumulated in the mother-liquor it is extracted as nickel ammonium sulphate. The dried powder is reduced with water-gas, cooled, and passed without contact with air to the "volatilisers." Here it is treated with carbon monoxide. Several operations are necessary to remove the nickel completely. The gas passes through dust filters to the decomposing towers. The only other commercial use for the carbonyls actually developed is as an anti-knock addition to petrol. Other suggestions have included use in nickel plating, for mirrors on the internal walls of Dewar flasks, for making pure metal for transformer cores, etc.

C. IRWIN.

See also A., May, 489, Phosphorescence of zinc sulphides (PREVET). 503, Adsorption of carbon dioxide and ammonia by silica gel (MAGNUS and KIEFFER). 523, Pure hydrogen peroxide (MATHESON). 524, Preparation of phosphorescent zinc sulphide (COUSTAL and PREVET). 525, Preparation of hypophosphoric acid (VOGEL; PROBST). 528, Determination of sulphate in fluorides (GINSBERG and HOLDER). 529, Determination of fluosilicate and fluorine ions (BAYLE and AMY). Determination of phosphoric acid (ISHIBASHI). 531, Analysis by electrolysis with mercury cathode (MOLDENHAUER and others). 600, Basic titanium salicylate (PICHON). 614, Microdetermination of carbon dioxide in air (KROGH and REHBERG).

Alkalis as germicides. LEVINE and BUCHANAN.—See XXIII.

PATENTS.

**Gaseous oxidation of ammonia and gases containing ammonia.** F. JOST (B.P. 300,562, 14.11.28, Ger., 15.11.27).—The excess heat of reaction produced when using a high concentration of ammonia and oxidising gases at optimum yield temperature is removed by employing hollow bodies as contact catalysts, the reaction taking place on the external surfaces while the inner surfaces are cooled. W. G. CAREY.

**Production of alkali nitrates from alkali chlorides.** J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 310,230, 25.6.28).—An alkali chloride is kept in continuous intimate contact (e.g., by counterflow) with liquid nitrogen tetroxide, preferably containing a small amount of moisture. W. G. CAREY.

**Producing a mixture of calcium nitrate and ammonium nitrate.** KUNSTDÜNGER-PATENT-VERWER-TUNGS A.-G., Assees. of F. G. LILJENROTH (B.P. 310,276, 30.10.28, Swed., 5.6.28, Addn. to B.P. 301,486; B., 1929, 171).—Removal of the calcium sulphate formed in the reaction is facilitated by obtaining the hemihydrate



at suitable temperature and concentration, cooling and diluting the solution to produce gypsum, and assisting crystallisation by the addition of small crystals of gypsum from a former operation. W. G. CAREY.

**Production of ammonium sulphate by the treatment with gypsum of an ammoniacal solution used for the scrubbing of gases.** UNION CHIM. BELGE, SOC. ANON. (B.P. 307,037, 24.3.28. Belg., 2.3.28).—A solution nearly saturated with ammonium sulphate is treated in a gas scrubber with ammonia and with gases obtained by the carbonisation, the gasification, or the combustion of fuel, and, after removal of the crystalline ammonium sulphate which settles out, the liquor is successively treated with calcium sulphate, filtered, distilled to recover ammonia and volatile acids, concentrated to remove water added with the gypsum and during the washing of the calcium carbonate, and returned to the scrubber. L. A. COLES.

**Manufacture of ammonium benzoate.** J. A. SPINA, ASSR. to HOOPER ELECTROCHEM. CO. (U.S.P. 1,704,636, 5.3.29. Appl., 1.3.27).—Dry ammonia is combined with dry benzoic acid. C. HOLLINS.

**Bleaching of raw heavy spar.** K. EBERS (U.S.P. 1,709,612, 16.4.29. Appl., 13.7.25. Ger., 17.7.24).—See B.P. 237,268; B., 1925, 847.

**Furnace for chemical reactions (B.P. 309,734). Insulation of vessels for liquefied gases etc. (B.P. 281,305, 305,974—5).**—See I. **Ammonia from gas (U.S.P. 1,703,405).**—See II. **Crystalline cuprous oxide on copper (B.P. 309,966).**—See X.

### VIII.—GLASS; CERAMICS.

**Reports to the Special Committee on glass-house pots.** I. J. F. HYSLOP. II. P. MARSON. III. W. E. S. TURNER (J. Soc. Glass Tech., 1929, 13, 11—20 p).—Three reports on the subject of pot manufacture are presented. I.—Methods of improving the performance of pots are considered, for which the most important factors in the case of pots made from usual clay mixtures are: (a) finely grinding the raw clay and thoroughly mixing clay and grog, and (b) well soaking the finished pot at high temperatures before using. Better pots would be secured by improving pot-making technique to allow of the use of mixtures containing much sillimanite or of highly aluminous grog.

II.—Defects found in pot clay, grog, and grog-clay mixtures, in the process of pot-making, in pot-arching, and in pot-using are summarised.

III.—Sources of clay suitable for pot-making, the osmotic purification of clay, the heat treatment of pots, and the uses of sillimanite are dealt with.

A. COUSEN.

**Influence of cullet on rate of melting and other properties of soda-lime-silica glass.** F. W. HODKIN, H. W. HOWES, and W. E. S. TURNER (J. Soc. Glass Tech., 1929, 13, 25—37 p).—Variable results were obtained for the rates of melting of series of colourless and greenish-amber soda-lime glasses as the proportion of cullet employed was increased. The colourless glasses were less rapidly "fined" when the cullet exceeded 60%,

but no such effect was found with the coloured glasses. Working-out tests indicated an increase of viscosity and shortening of the working range when more than 40% of cullet had been used, particularly when this was in the form of large-sized lumps. The silica content of remelted glass was slightly less than that of the cullet used, but this could not be ascribed to volatilisation of soda. A. COUSEN.

**Influence of addition of small quantities of alkaline salts on ease of melting and on working properties of soda-lime-silica glasses prepared from cullet.** F. W. HODKIN, W. E. S. TURNER, and F. WINKS (J. Soc. Glass Tech., 1929, 13, 47—56 p).—The salt which was the most effective, when added to cullet, in producing easy melting and fining, with least extensive corrosion of refractory materials, while resulting in a product having good working properties, was sodium carbonate; the next best was borax. Both salts increased the melting rate, as compared with cullet alone or cullet-batch mixtures, a similar result being obtained also with salteake with some carbon. The softest glass was made by the use of sodium nitrate with the cullet. A. COUSEN.

**Effect of cullet on the melting and working properties of potash-lead oxide-silica glasses.** S. ENGLISH, (MRS.) G. A. GREEN, F. W. HODKIN, and W. E. S. TURNER (J. Soc. Glass Tech., 1929, 13, 37—47 p).—Increase of cullet beyond 50% retarded the melting rate, though less markedly than with soda-lime glass, whilst the working viscosity and setting rate were increased. A. COUSEN.

**Influence of grain size of batch materials on rate of melting [of glass].** (MRS.) G. A. GREEN, F. W. HODKIN, M. PARKIN, and W. E. S. TURNER (J. Soc. Glass Tech., 1929, 13, 57—63 p).—Diminution of the size of sand grains increases the melting rate, and similar results are found by decreasing the size of soda ash and of limestone particles in the batch. A. COUSEN.

**Velocity of crystallisation of soda-lime-silica glasses.** E. ZSCHIMMER (J. Soc. Glass Tech., 1929, 13, 76—84 p).—The apparatus of Zschimmer and Dietzel (B., 1926, 877) for measuring microscopically the rate of growth of crystals in glass at varying temperatures has been used to draw up a series of charts showing temperature-devitification velocity relationships for soda-lime glasses containing 12—18% Na<sub>2</sub>O and 6—16% CaO. A. COUSEN.

**Remelting of glasses of abnormal working properties.** (MRS.) G. A. GREEN, F. W. HODKIN, and W. E. S. TURNER (J. Soc. Glass Tech., 1929, 13, 64—70 p).—Soda-lime glasses made from batches containing 10—15% of moisture, and which had abnormal melting and working properties, formed satisfactory, homogeneous glasses when broken up and remelted, but these had a still greater viscosity and setting rate. Addition of salteake up to 2% (with a small proportion of carbon for reducing purposes) to the cullet gave a glass having normal properties on remelting. Similar results were found with cullet made from batch containing coarse limestone. A. COUSEN.

**Manganese equilibrium in glasses.** W. D. BANCROFT and R. L. NUGENT (J. Physical Chem., 1929,



33, 481—497).—Investigation of the system sodium oxide-boric oxide-manganese dioxide has shown that the pink-violet colour of the manganese borax bead under oxidising conditions is due to tervalent manganese, probably in the form of free manganic oxide; under reducing conditions the manganese in the colourless bead is bivalent, and is probably present as manganous borate. Under ordinary oxidising conditions equilibrium is attained at approx. 40% Mn<sup>+++</sup>, and is shifted towards the manganic side by an increase in oxygen pressure and alkali content and by a fall in temperature. Similar behaviour has been demonstrated quantitatively for the system litharge-boric oxide, and qualitatively for the system sodium oxide-phosphorus pentoxide. Assuming that a similar equilibrium obtains in silicate systems, various applications to the problems of glass-making are discussed. The loss of colour of rose quartz on heating to 575° is also attributed to a shift in a manganous-manganic equilibrium. Under conditions in which there is 40% Mn<sup>+++</sup> in borax melts, 100% Fe<sup>++</sup> is practically obtained, and this difference is discussed together with other points of theoretical interest. L. S. THEOBALD.

**Gases in glass. II. Gas and moisture content of glasses.** A. BECKER and H. SALMANG (J. Soc. Glass Tech., 1929, 13, 98—111 *r*).—Small bubbles appeared during fining or remelting of glass, due to several causes, viz., (1) secondary decomposition of unchanged batch materials present; (2) decomposition of dissolved sulphates by reducing gases; (3) penetration of air from pores in the refractory materials; (4) liberation of hydrogen sulphide from sulphide constituents; (5) reaction between the glass and oxides, carbides, etc. present in any commercial iron in contact with it. Water was only retained in the glass when relatively large quantities of steam had to pass through the molten material, or by transference from the furnace atmosphere to the glass. At high temperatures water vapour was a stronger acid than silicic acid, and acted on glass chemically. A. COUSEN.

**Reduction of glasses in hydrogen.** J. T. RANDALL and R. E. LEEDS (J. Soc. Glass Tech., 1929, 13, 16—19 *r*).—Pure soda-lime glass was unaffected in a hydrogen furnace at 1200°, but glasses containing arsenious, lead, or ferric oxides show reduction of these oxides at temperatures between 500° and 1000°. Glass coloured amber by selenium was unaffected by hydrogen at 1000°. The process is suggested as a method of testing for the presence of the above-named oxides in glass. A. COUSEN.

**Le Chatelier's equation for viscosity of glass.** F. W. PRESTON (J. Soc. Glass Tech., 1929, 13, 19—24 *r*).—A criticism of the proposed double-logarithmic formula for the temperature-viscosity relationships of glass (cf. B., 1925, 242). A. COUSEN.

**Viscosity of some glasses of abnormal working properties.** S. ENGLISH and W. E. S. TURNER (J. Soc. Glass Tech., 1929, 13, 70—76 *r*). Viscosity determinations in the case of abnormal glasses obtained by the melting of batches containing large proportions of moisture or coarse-grained limestone, over the lower ranges down to within 15° of the annealing temperature,

failed to confirm the effects indicated by hand-working of the glass, and no explanation of the apparent divergence could be found. A. COUSEN.

**Detection of iron oxides in glass sands.** J. T. RANDALL and R. E. LEEDS (J. Soc. Glass Tech., 1929, 13, 15—16 *r*).—The iron oxide is reduced by heating the sand in an atmosphere of dry hydrogen at 1000° for ½ hr., and the proportion present is judged from the change of colour. A. COUSEN.

**Manufacture of fused bifocal spectacle lenses.** R. J. MONTGOMERY (J. Amer. Ceram. Soc., 1929, 12, 274—303).—The conditions necessary to unite satisfactorily a segment of flint glass to a worked surface of crown glass are very exacting. Besides being of high quality in respect to colour and striæ, and of correct optical properties, the softening points and coefficients of expansion must be adjusted to avoid distortions and strain. An account is given of a partial solution of the problem. In testing for strain it was found necessary to make observations through both the edge and the flats of the lense. "Fogging" at the surface of fusion was troublesome, and the use of a barium glass was necessary. Modifications must be made to improve the quality of a normal barium glass and to prevent tarnishing. J. A. SUGDEN.

**Organic agents as aids to adhesion and suspension of glazes.** E. S. FOSTER (J. Amer. Ceram. Soc., 1929, 12, 264—269).—The uses and properties of gums tragacanth, arabic, karaya, and dextrin, and "bindex" are described. Some measurements of the effect of the gums on the transverse strength of a ball clay-silica mixture show that gum arabic is the best adhesive. Some points of terra cotta glaze shop practice are described. J. A. SUGDEN.

**Some properties of glaze slips.** E. SCHRAMM and R. F. SHERWOOD (J. Amer. Ceram. Soc., 1929, 12, 270—273).—Data are given for the relationship between viscosity and sp. gr. and  $p_H$  of a fritted glaze and a raw porcelain glaze. As regards the action of acids and alkalis on the viscosity it was found that the normal working condition of the slips is near that of minimum viscosity. Finer grinding decreases the viscosity of a slip and gives improved appearance at the same glost fire. J. A. SUGDEN.

**Plasticity and water absorption of clays.** H. B. OAKLEY (Nature, 1929, 113, 714—715).—The water absorption of clays, as determined by the increase in concentration of chlorine ions remaining in an aqueous solution of chloride after removal of the clay, is correlated with the plasticity, relative hardness, and bulk density for a clay with different bases, and with the plasticity for different clays with the same base. The water absorption is greatly influenced by the concentration of the reference salt. A. A. ELDRIDGE.

**Effect of typical slags on firebrick with a method of determination correlated to service.** C. E. GRIGSBY (J. Amer. Ceram. Soc., 1929, 12, 241—263).—A large number of fireclay and diaspore materials were tested in the laboratory for resistance to typical slags met with in malleable cast-iron, reverberatory furnace, grey-iron cupola, and "bull-ladle" practice. The



results showed excellent correlation with actual service tests in all cases where high-temperature abrasion was not severe. Abrasion is the chief cause of failure in some cases, and the need for such a test is stressed. The laboratory tests were carried out in a small, rotating, oil-fired furnace. The hearth of the furnace held a small amount of metal on the top of which the slag was violently agitated by the blast from the burner entering through a hole in the lid. The wall of the furnace was built up of the twelve bricks to be tested. A tapping hole was provided so that fresh slag could be added every 4 hrs. The test was run until the bricks were eroded to about half their size (*e.g.*, for 24 hrs.) and the results are reported as volume eroded per unit area. Service tests were carried out in several types of furnaces. It was found that for resistance to slag high in iron oxide (reverberatory furnace) bricks of 50%  $\text{Al}_2\text{O}_3$  or over are superior to flint-fireclay-grog bricks of low (12—20%) porosity. For slags high in lime (cupola) and in soda ("bull-ladle") the flint-fireclay bricks were superior. Where slagging and abrasion are combined, high-alumina bricks are inferior owing to high porosity. Excessive spalling takes place if the porosity is reduced to the point which will give good resistance to attack. Increase in plastic clay or grog content decreases resistance to both types of attack. In general, it seems that if a brick does not exceed 20—22% porosity and withstands slag attack, it will resist high-temperature abrasion satisfactorily. Composition is more important than physical properties in determining resistance to slag, whilst the reverse seems to be true with abrasion.

J. A. SUGDEN.

**Ceramics of highly refractory materials. I. Forms of zirconium dioxide.** O. RUFF and F. EBERT (*Z. anorg. Chem.*, 1929, 180, 19—41).—X-Ray investigation shows that the ordinary monoclinic form of zirconium dioxide has the lattice constants  $a=5.17$ ,  $b=5.27$ ,  $c=5.31$  Å., and  $\beta=80.8^\circ$ , and has  $d$  5.68, but at about  $1000^\circ$  undergoes a reversible transformation into a tetragonal form, having  $d$  6.10, and  $a=5.07$  and  $c=5.16$  Å., to which change the destruction of vessels made from the pure oxide when heated at high temperatures must be attributed. The oxide prepared by heating the nitrate, oxalate, or basic chloride below about  $600^\circ$  is tetragonal, but metastable, becoming monoclinic above  $600^\circ$ . If, however, the salt is heated with at least 10 g.-mol.% of magnesium oxide at about  $1400^\circ$  there is formed an oxide with a cubic lattice, which, as it does not change on cooling, is a suitable ceramic mass for the production of articles required to undergo very wide variations in temperature without fracture or deformation. A similar result is obtained by heating the monoclinic oxide at  $1700^\circ$  with as little as 4 g.-mol.% of magnesium oxide. The maximum amount of magnesium oxide which the zirconium oxide lattice will take up corresponds with the formation of a compound  $\text{Mg}_2\text{Zr}_3\text{O}_8$ . The oxides of scandium, yttrium, and calcium, and cerium dioxide have the same effect as magnesium oxide.

R. CUTHILL.

**Effect of water vapour and sulphur dioxide on firing of clays.** J. KONARZEWSKI and B. KRYNSKI (*Trans. Ceram. Soc.*, 1929, 28, 18—25).—See B., 1928, 671.

See also A., May, 534, **Platinising glass** (TAYLOR).

## PATENTS.

**Enamelling composition.** R. WEIMER (U.S.P. 1,706,866, 26.3.29. Appl., 24.7.25).—A composition suitable for application in a cold condition consists of ground silica, clay, lime, soda, boric acid, broken pieces of glass and porcelain, and water, the whole being cold-ground.

H. ROYAL-DAWSON.

**[Readily fusible] vitreous [enamel] composition.** F. SKAUPY, H. NACHOD, and G. GAIDIES, Asssts. to GEN. ELECTRIC CO. (U.S.P. 1,708,743, 9.4.29. Appl., 1.12.26. Ger., 11.5.26).—See B.P. 267,815; B., 1927, 365.

**Apparatus [lehers] for annealing glassware.** AMSLER-MORTON Co., W. A. MORTON, and P. L. GEER (B.P. 309,511 and 309,528, 10.10.27).

**Manufacture of plate glass.** COMP. RÉUNIES DES GLACES & VERRES SPÉCIAUX DU NORD DE LA FRANCE (B.P. 299,034, 14.8.28. Fr., 21.10.27).

**Crucible process for manufacture of plate glass.** COMP. RÉUNIES DES GLACES ET VERRES SPÉCIAUX DU NORD DE LA FRANCE, and A. HERMANSEN (B.P. 309,974, 19.1.28).

**Manufacture of sheets of glass.** J. H. LEMAIRE (B.P. 301,083, 20.11.28. Fr., 25.11.27).

**Apparatus for manufacture [sealing edges] of reinforced glass.** G. B. RILEY (B.P. 310,065, 21.10.27).

**Linings for furnaces** (B.P. 303,574).—See I.

## IX.—BUILDING MATERIALS.

**Source of error in determination of plasticity of hydrated lime.** F. C. MATHERS and E. C. GOSNELL (*Ind. Eng. Chem. [Anal.]*, 1929, 1, 59—61).—The lack of uniformity of results from determinations of plasticity is due not so much to the variation in the quantity of water or the manner in which it is added as to the amount of stirring at the time of the final test. It is recommended that the proper proportion of water, determined previously, should be added at the beginning, and that the samples should be stirred vigorously for 2 min. with a steel spatula before using the Vicat needle.

C. A. KING.

**Effect of sugar on concrete in large-scale trial.** M. N. CLAIR (*Eng. News-Rec.*, 1929, 102, 473).—In the construction of a large floor of 1 in. stone concrete with 1 in. topping, sugar was added to the mix for the latter in proportions from 1% to 0.12% with the intention of retarding the setting overnight. Portions with 0.5% and over, however, failed to set satisfactorily in 25 days, and the 2 in. concrete beneath was affected. Laboratory experiments did not indicate any practical treatment likely to yield a satisfactory result, and these parts of the floor were replaced. Parts with 0.25% of sugar were slightly affected.

C. IRWIN.

**Fibre saturation point of wood as obtained from electrical conductivity measurement.** A. J. STAMM (*Ind. Eng. Chem. [Anal.]*, 1929, 1, 94—97).—The strength of wood is greatly affected by absorbed water up to the fibre-saturation point, and with changes in the moisture content from zero to this point the electrical conductivity increases a million-fold, a linear relation existing between the logarithm of the conductivity and the moisture content. The usefulness of



the conductivity method depends on a uniform distribution of moisture in the fibres, and small specimens less than a fibre length in thickness were used. The same linear relationship exists at the lower moisture content values for all the species studied, a slight deviation occurring above a moisture content of 30%. Results showed that the extractives from redwood were less hygroscopic than was the wood substance itself. The fibre-saturation point indicated by this method corresponds closely with that determined by other methods.

C. A. KING.

**Laboratory methods of testing the toxicity of wood preservatives.** H. SCHMITZ (Ind. Eng. Chem. [Anal.], 1929, 1, 76—79).—No single method of determining toxicity is entirely satisfactory. Observation of the period of fungoid growth on impregnated wood is too slow to be of any value, whilst the addition of toxic material to nutrient agar does not always represent conditions parallel to practical considerations, though the trend is towards the latter method. It is now customary to sterilise the culture medium and the preservative separately, to shake the mixture vigorously until it is about to gel, and to pour it quickly into cold Petri dishes. Measurement of the toxicity of these mixtures to *Fomes annosus* is now standard practice in the U.S. Forest Products laboratory. To overcome loss of volatile preservatives during sterilisation it is suggested that a weighed quantity of the preservative be placed in a sealed ampoule which is sterilised in the nutrient, and the ampoule fractured to provide the sterile emulsion.

C. A. KING.

## PATENTS.

**Rotary [cement] kiln.** J. S. FASTING, Assr. to F. L. SMIDTH & Co. (U.S.P. 1,708,693, 9.4.29. Appl., 6.1.26. U.K., 7.1.25).—See B.P. 240,049; B., 1925, 923.

**Feeding cement slurry to rotary kilns.** N. NIELSEN, Assr. to F. L. SMIDTH & Co. (U.S.P. 1,708,705, 9.4.29. Appl., 17.9.26. U.K., 4.5.26).—See B.P. 258,199; B., 1926, 981.

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

**Thermal conductivities of grey cast irons.** J. W. DONALDSON (Proc. Inst. Mech. Eng., 1928, 953—983).—The thermal conductivity of grey cast iron varies from 0.11 to 0.137 g.-cal./cm.<sup>2</sup>/sec. and decreases as the temperature increases; e.g., iron with 0.65% Si had a conductivity of 0.135 at 100°, falling to 0.114 at 400°. With silicon increased to 1.24% corresponding values were 0.127 and 0.109, and, generally, the influence of silicon, nickel, and to a smaller extent manganese and vanadium is to lower the conductivity. Chromium and tungsten act in the opposite direction, and phosphorus has a negligible influence. Structure is of less importance than composition, though ferrite was a better conductor than eutectoid pearlite, as was noticed by the decomposition of pearlite at 550° raising the conductivity, which decreased later by reason of oxidation of ferrite adjacent to the graphite flakes.

C. A. KING.

**Change of sp. gr. of cold-worked iron and steel by tempering.** K. TAMARU (Bull. Inst. Phys. Chem. Res., Japan, 1929, 8, 187—196).—The temperature at which strain is relieved in iron and steel, as determined by change in sp. gr., was found to be 400° for all samples examined. Armco iron showed a maximum density after tempering at 150°, and a minimum after tempering at 400°. In steels the values of the maxima and minima decrease with decreasing carbon content and disappear at 0.2% C. The results are explained on the assumption of minute changes in grain size and cleavage within the grains, an increase in the total grain boundary surface causing a reduction in density.

C. J. SMITHELLS.

**Physical chemistry of steel making; deoxidation with silicon and the formation of ferrous silicate inclusions in steel.** C. H. HERTY, JUN., and G. R. FITTERER (Carnegie Inst. Tech. Min. Met. Invest. Bull. 36, 1928, 1—92).—A phase-equilibrium diagram of the system ferrous oxide-silica has been constructed. Ferrous oxide has m.p. not far above 1355°. Two eutectics contain 22% (1240°) and 35% (1260°) SiO<sub>2</sub>, respectively. Deoxidation with silicon consists of the formation of silica particles ( $\text{Si} + 2\text{FeO} \rightleftharpoons \text{SiO}_2 + 2\text{Fe}$ ) and subsequent fluxing of dissolved ferrous oxide by the silica formed, the extent of deoxidation for steel of a particular ferrous oxide content depending on the amount of silicon added and the type of silicate formed. When the metal is saturated with silica,  $K = [\text{Si}][\text{FeO}]^2 = 1.49 \times 10^{-4}$ . As the concentration of dissolved silica decreases, the amount of deoxidation increases. Steels containing ferrous silicates rich in ferrous oxide forge readily and do not show red-shortness; when inclusions rich in silica are present the steel is red-short.

CHEMICAL ABSTRACTS.

**Physical chemistry of steel making. Dickenson's method for the determination of non-metallic inclusions in steel.** C. H. HERTY, JUN., G. R. FITTERER, and J. F. ECKEL (Carnegie Inst. Tech. Min. Met. Invest. Bull. 37, 1928, 1—37).—Dickenson's method (B., 1926, 491) is satisfactory for steel "killed" with sulphur or aluminium, but not for rimming steel or steels in which the predominant inclusions are manganous or ferrous oxide. In the system ferrous oxide-silica good results are obtained if the inclusions contain more than 60—65% SiO<sub>2</sub>; the compound 2FeO.SiO<sub>2</sub> is completely dissolved by the treatment with nitric acid. Ferrous or manganous oxide, alone or combined, is not recovered; alumina is completely recovered, and good results are obtained with manganous oxide-silica inclusions containing more than 30—40% SiO<sub>2</sub>. The compound 2FeO.Al<sub>2</sub>O<sub>3</sub> is recoverable. A decrease in the concentration of acid does not affect the results for the more soluble oxides. A modified method is described.

CHEMICAL ABSTRACTS.

**Properties of materials at high temperatures. The "creep" strength of a "high nickel-high chromium steel" between 600° and 800°.** H. J. TAPSELL and J. REMFRY (Dept. Sci. Ind. Res. Eng. Res., Spec. Rep. No. 15, 1929, 7 pp.).—Steel containing 26.5% Ni, 14% Cr, and 3.59% W, being within the Air Ministry Specification D.T.D. 49, has been subjected



to prolonged tensile stresses at 600°, 700°, and 800° to determine the limiting creep stresses, the estimated values of which were 11 (at 600°), 6 (at 700°), and 2 (at 800°) tons/in.<sup>2</sup> Intercrystalline cracks could not be detected at 600°, but were noted at the higher temperatures.

C. A. KING.

**Magnetostriction of various steels.** J. S. RANKIN (J. Roy. Tech. Coll. Glasgow, 1929, 2, [1], 12—19).—The change in length of steels containing 0.17—0.8% C, due to magnetostriction, increases with the magnetising force to a maximum, and then decreases; this maximum occurs at  $H = 350$  c.g.s. units with steels containing 0.17—0.4% C, and at  $H = 600$  c.g.s. units, with steels containing 0.6—0.8% C. The increase of length is greater the lower the carbon content in plain carbon steels and the lower the nickel content in nickel steels.

A. R. POWELL.

**Rapid determination of the endurance limit [of steel] by measuring the electrical resistance.** S. IKEDA (Tech. Rep. Tôhoku Imp. Univ., 1929, 8, [2], 41—70).—Bending tests are carried out in Ono's machine under slowly increasing stresses until the electrical resistance begins to increase. This occurs at a definite stress value which is far below the proportionality limit in statical tension tests. Specimens stressed just below the endurance limit so found withstand 10<sup>7</sup> reversals without fracture. In hypoeutectoidal steels the endurance limit increases linearly with the carbon content, other conditions remaining constant; it also bears a linear relation to the hardness number (by scleroscope or Brinell machine), and the graph passes through the origin, thus suggesting that a material of zero hardness has no endurance limit. The angle of inclination of the graph to the abscissa is a characteristic of the metal tested.

A. R. POWELL.

**Tensile tests on rods and wires of the same iron.** J. MUIR (J. Roy. Tech. Coll. Glasgow, 1929, 2, [1], 5—11).—The yield point of iron wire increases by about 20% when the wire is strained at the primary yield point and allowed to recover from overstrain by boiling in water. Further increases in the yield point may be obtained by repeating the procedure two or three times, but finally the wire breaks without yielding. The extension at the primary yield point is considerably increased by annealing at 400—700°, but otherwise the annealing has no effect on the stress values at the yield point.

A. R. POWELL.

**Thermal expansion of iron alloys.** A. SCHULZE (Z. tech. Physik, 1928, 9, 338—343; Chem. Zentr., 1928, ii, 2056).—The thermal expansion of iron-silicon (0—8.37%), -aluminium (0—10.52%), and -manganese (0—14.41%) alloys up to 500° was determined. In the first two cases the presence of mixed crystals is indicated.

A. A. ELDRIDGE.

**Rapid method for dissolving high-chromium steels for determination of sulphur.** B. S. EVANS (Analyst, 1929, 54, 286—287).—In order that the sample of steel may be dissolved in hydrochloric acid alone and afterwards oxidised with nitric acid, a flask is used with ground-in hollow stopper carrying a tapped funnel with a stem which reaches to the bottom

of the flask, and a leading tube the short arm of which ends just below the stopper and having the end of the long arm just above the level of the bottom of the flask. 25 c.c. of water are run into the flask containing 5 g. of sample; the outer end of the leading tube is dipped to the bottom of a cylinder containing 35 c.c. of concentrated nitric acid, and 25 c.c. of concentrated hydrochloric acid are run into the flask. When evolution of gas slackens the flask is warmed slightly, and when action again slackens the tap is opened and, finally, the apparatus is cooled. The tap is then closed and the top of the flask held for a few seconds under a stream of hot water, immediately followed by cold, so that the nitric acid is drawn back so quickly that it has not time to react with the ferrous salts before the cylinder is empty. When the reaction ceases the cylinder and tube are rinsed into the flask, 5 c.c. of 20% potassium nitrate solution are added to the liquid, the solution is evaporated to dryness, and the sulphur determined.

D. G. HEWER.

#### Mechanism of oxidative processes. XVI.

**Rusting of iron.** H. WIELAND and W. FRANKE (Annalen, 1929, 469, 257—308; cf. A., 1928, 965).—Schönbein's observation (cf. Traube, A., 1882, 795) that hydrogen peroxide is formed when iron amalgam is shaken with water and air is confirmed; the maximum amount is found after about 1 min. In acid solution no hydrogen peroxide results, but in alkaline solution the amount formed increases with increased concentration of hydroxyl ions. The production of peroxide does not depend on occluded hydrogen in the amalgam, and the amalgam has only a slight decomposing action on the peroxide. The autoxidation of iron amalgam in presence of water, 0.01*N*- and *N*-potassium hydroxide solutions at 37.5° has been studied. In the initial stage the absorption of oxygen is more rapid in alkaline solution, but after 4 hrs. a larger amount is taken up in neutral solution. Ferrous oxide (or hydroxide) is first produced, and this is further oxidised more slowly than the metal. Autoxidation is accelerated slightly by hydrocyanic acid. The autoxidation of iron amalgam with 0.01*N*-hydrogen peroxide at 37.5° in absence of oxygen shows that 63% of the peroxide is used for oxidation; the presence of hydrocyanic acid increases this to 95%. In presence of oxygen the consumption of the hydrogen peroxide is more rapid in the initial stages, but at the same time catalytic decomposition of the peroxide is considerably greater. The function of the peroxide appears to consist of directly oxidising the iron and resultant ferrous hydroxide, at the same time undergoing decomposition (by the iron or hydroxide) into oxygen and water. The formation of hydrogen peroxide from iron powder (*ferrum reductum*) and oxygen occurs only in presence of alkali. The amount formed is only one tenth of that using iron amalgam, and a maximum value is reached after 0.5 min. Decomposition of hydrogen peroxide by iron powder is much more rapid in presence of water than in potassium hydroxide solution, thereby explaining the non-detection of the peroxide by autoxidation of iron in pure water. The authors believe that the peroxide is actually produced in this case and in the rusting of the metal.



Iron powder is oxidised much more rapidly than the amalgam by 0.01*N*-hydrogen peroxide at 37.5°; in 0.01*N*-potassium hydroxide solution the major part of the peroxide is decomposed. This difference in neutral and alkaline solution is not shown by the amalgam. Autoxidation of iron powder by oxygen is accelerated by hydrocyanic acid. This acceleration appears to be specific, and is not due to changes in  $p_H$  (limits 6.8 and 6.4). The effect of various acids and acid mixtures on the change shows that the autoxidation of iron is directly opposite to that of ferrous salts (A., 1928, 965), indicating that conversion of ferrous into ferric ions is brought about by hydrogen peroxide, and not by oxygen. Oxidation of leucine by oxygen in presence of iron powder proceeds to the extent of about 0.5% (cf. Handovsky, A., 1928, 718). The activity of the iron depends on the temperature at which the iron oxide is reduced, but cooling in hydrogen or nitrogen has no effect (cf. Handovsky, *loc. cit.*). The velocity of autoxidation of iron in presence of leucine is about ten times as great as in water, but this acceleration depends considerably on the amino-acid concentration. Glycine, alanine, and asparagine have a similar effect. Small amounts of neutral salts (*e.g.*, sodium sulphate) have an accelerating influence, increasing with increased concentration of the salt. A similar effect is shown by copper sulphate. Iron amalgam is practically unaffected by neutral salts, and increasing acidity of the solution causes a retardation in the rate of autoxidation (cf. A., 1928, 965). With added leucine acceleration occurs in each solvent used, and is in the following order: 0.01*N*-sulphuric acid, 0.01*N*-potassium hydroxide, water. The increase with water is, however, not so great as with iron powder. A considerable inhibition of the autoxidation of iron occurs when the metal is rendered passive by treatment with potassium hydroxide, ferricyanide, chromate, or permanganate. The recovered iron from these experiments shows varying but increased oxygen absorption in all cases. Potassium ferricyanide or chromate does not affect iron amalgam, but permanganate has the same action as with the powder. Whilst the oxygen absorption of the powder, in presence of water, is retarded by increasing oxygen concentration, the amalgam shows a reversed effect. When iron powder is oxidised with more concentrated hydrogen peroxide, a smaller amount of oxidation occurs than with a 0.01*N*-solution. Replacement of oxygen by other hydrogen acceptors, namely quinone, methylene-blue, ethyl peroxide, and dithiodiglycollic acid, and working in an atmosphere of nitrogen causes "rusting" of iron in presence of pure water. In the first case added copper or sodium sulphate accelerates the disappearance of the quinone. The above results agree with the prevailing theory that the process of rusting is essentially electrochemical.

H. BURTON.

**Nickel-copper alloys.** A. KRUPKOWSKI (Rev. Mét., 1929, 26, 131—153, 193—208).—The physical properties of the nickel-copper system have been determined using alloys which have been thoroughly homogenised by annealing for several days. The magnetic transformation point lies on a straight line which cuts the axis of temperature at absolute zero at a composition of 41.5% Ni. The electrical conductivity at 0° falls

rapidly with addition of nickel to copper and with addition of copper to nickel, the curve being almost parallel to the axis of composition for alloys with 30—70% Ni. The temperature coefficient of resistance falls sharply with up to 3% Ni, then more slowly to zero at 40—50% Ni, rises sharply to 75% Ni, where there is a sharp deflexion in the curve, and finally rises rapidly to the value for pure nickel. Temperature-electrical resistance curves for alloys containing 2.1—38.8% Ni show a distinct deflexion corresponding with the change  $\alpha\text{Cu} \rightarrow \beta\text{Cu}$  at  $-110^\circ$  to  $-150^\circ$ . Using the shape of the transformation-composition curves as a basis, the author divides copper-nickel alloys into two classes: those containing up to 41.5% Ni, in which copper plays the part of the solvent, and those containing more than 41.5% Ni, in which nickel is the solvent. The alloys of the first class are non-magnetic at all temperatures, whereas those of the second class can be either magnetic or non-magnetic, according to the temperature. The curves showing the maximum of the temperature coefficient of resistance as a function of the composition indicate that the allotropic transformation from the magnetic to the non-magnetic form begins at a temperature a little below the Curie point. Micrographic examination, dilatometric analysis, and measurements of electrical resistance afforded no indication whatever of the presence of a compound in the system which consists solely of a continuous series of solid solutions.

A. R. POWELL.

**Methods of testing the corrosion of light metals and alloys.** X. WACHÉ and G. CHAUDRON (Rev. Mét., 1929, 26, 209—213).—As a standard method for determining the rate of corrosion of aluminium and its light alloys a modification of the Mylius oxidising salt solution is recommended. The solution should contain 1% of hydrogen peroxide and 1% of sodium chloride; more concentrated solutions exhibit no greater activity. After immersion of the specimen for a predetermined time it is washed, dried, and weighed, the oxidation products are collected from the solution, washed, dried for 36 hrs. at 50°, and weighed, and from these figures the amount of aluminium oxidised per unit area of surface is calculated. In hydrogen peroxide solutions alone corrosion is very slow, but addition of very little sodium chloride induces rapid corrosion, especially of aluminium alloys; in fact, the rate of corrosion in the above solution affords a useful guide in differentiating between aluminium and duralumin, the latter dissolving much more rapidly.

A. R. POWELL.

**Application of the *E.M.F.* of dissolution to the study of light alloys.** AUBERT and PROT (Rev. Mét., 1929, 26, 214—217).—The *E.M.F.* of aluminium and the usual constituents of aluminium alloys against pure nickel in sea water have been determined, as well as those of couples in which one element is copper, iron, nickel, cadmium, or zinc and the other aluminium or its light alloys. The bearing of the results on the rate of corrosion of the alloys in sea water is briefly discussed.

A. R. POWELL.

**Corrosion of aluminium alloys.** QUILLARD and BASCOU (Rev. Mét., 1929, 26, 217—220).—The rates of corrosion of aluminium and its light alloys may be



compared by measuring the *E.M.F.* of dissolution before and after immersion of the specimens in mercuric chloride solution. In this way it is shown that the rate of corrosion of aluminium is decreased by the addition of increasing quantities of manganese.

A. R. POWELL.

**Properties of cold-drawn wires, with particular reference to repeated torsional stresses.** F. C. LEA and R. A. BATEY (Proc. Inst. Mech. Eng., 1928, 865—899).—The resistance of cold-drawn wires to repeated shear stresses is much less than the static properties would indicate. Heavy cold-work producing high static resistance damages and cracks the surface of the material, which fails under bending or torsional tests, of which the Wöhler test is regarded as the most satisfactory. The behaviour of wire under torsional stresses can be improved greatly by low-temperature heat-treatment.

C. A. KING.

**Cyanide extraction of gold and silver in arsenical and antimonial ores.** E. S. LEAVER and J. A. WOOLF (Chem. Eng. Min. Rev., 1929, 21, 221—223).—To obtain a high extraction of gold and silver by cyaniding, arsenical and antimonial ores must be roasted at 450—500° for a time sufficient to convert the arsenic and antimony into volatile compounds or into insoluble arsenates and antimonates. Addition of coal or pyrites favours volatilisation, and addition of lime favours the formation of insoluble quinquevalent compounds. Too high a roasting temperature leads to incomplete extraction of the values by cyanide owing to the "locking up" of the gold and silver in ferric and lead arsenates and antimonates and to the formation of the silver-silica complex.

A. R. POWELL.

**Analysis of chrome ores.** T. R. CUNNINGHAM and T. R. MCNEILL (Ind. Eng. Chem. [Anal.], 1929, 1, 70—72).—For general analysis, chromite is decomposed by digesting it with a mixture of sulphuric and perchloric acids or, alternatively, by fusion with a mixture of sodium carbonate and borax. In the latter case erratic results due to the presence of boron are prevented by concentrating the solution in the presence of methyl alcohol. After reduction of chromium with sulphurous acid and separation of silica the solution is oxidised with nitric acid and precipitated twice with ammonia, iron being separated from the mixed hydroxide precipitate by the cupferron method, and titanium determined colorimetrically. The filtrate from the cupferron precipitate after concentration and oxidation with nitric acid and potassium chlorate is precipitated with ammonia, the alumina after reprecipitation being weighed. Chromium is best determined by fusing a fresh sample with sodium peroxide, and oxidising the solution completely with ammonium persulphate and potassium permanganate. Phosphoric acid is then added to the cooled solution, and an excess of standardised ferrous ammonium sulphate is titrated back with permanganate solution. Lime and magnesia together with manganese are precipitated with ammonium monohydrogen phosphate, lime being later separated from alcoholic solution as calcium sulphate, followed by precipitation as the oxalate; manganese can be determined by the bismuthate method after the destruction of all organic matter in the solution.

C. A. KING.

**Colloids in the electroplating of metals.** W. BLUM (5th Coll. Symp. Mon., 1928, 301—312).—Colloids tend to decrease the growth of existing crystals and increase the formation of new crystals, thus producing a fine-grained deposit; the action is often specific. They may alter the proportions of metals deposited, and tend to produce a uniform deposit on a cathode of irregular shape. In acid copper or zinc solutions they increase the cathode polarisation. The effects produced by colloids in electrodeposition of metals are discussed in general.

CHEMICAL ABSTRACTS.

**Rapid copper-plating of steel with a thin intermediate nickel deposit.** M. BALLY (Rev. Mét., 1929, 26, 221—223).—Steel can be plated directly with copper only from cyanide baths from which deposition is slow. By plating it for 1 min. at 35—55° at 15 amp./dm.<sup>2</sup> in a bath containing 400 g. of nickel sulphate, 22 g. of the chloride, and 22 g. of boric acid per litre, a thin coating of nickel is produced which can be plated directly with copper in an acid sulphate bath at 45° using 10 amp./dm.<sup>2</sup> In both operations the electrolyte is agitated by means of a current of air. The coatings obtained in 3 min. from this bath surpass those produced in 45 min. from a cyanide bath.

A. R. POWELL.

**Chromium plating.** R. SCHNEIDEWIND (Univ. Mich. Eng. Res. Bull., 1928, No. 10, 141 pp.).—A survey, whence the optimum conditions for the production of a smooth, bright deposit are defined.

CHEMICAL ABSTRACTS.

**Stepped lowering of the Al transformation in steels.** T. MURAKAMI (Tech. Rep. Tôhoku, 1929, 8, 119—127).—See B., 1928, 300.

See also A., May, 510, **Transformations of  $\beta$ -phase in zinc-copper alloys** (SALDAU). 530, **Determination of molybdenum in steel** (THURNWALD). 534, **Tellurium-bismuth thermo-element** (LEWITSKY and LUKOMSKY). **Platinising glass etc.** (TAYLOR).

**Blau gas.** DAL PRATO.—See II. **Effect of slags on firebrick.** GRIGSBY.—See VIII. **Chromium plating baths.** PINNER and BAKER.—See XI.

PATENTS.

[**Tilting**] **furnaces for metals.** T. HILL, and BRIT. COPPER MANUFRS., LTD. (B.P. 308,637, 23.12.27).—A furnace body which is charged from the top is mounted on trunnions for side-pouring. The top of the furnace is provided with a fume-collecting casing with fume exhaust which may be common to a series of such furnaces.

C. A. KING.

**Metallurgical apparatus and process [for reducing iron ore].** F. D. S. ROBERTSON, Assr. to F. G. CLARK (U.S.P. 1,702,575, 19.2.29. Appl., 21.4.21).—Iron ore is allowed to fall through a vertical cylindrical furnace in which are suspended a number of vertical electric resistors and which is provided with a conical discharge outlet into an air-tight receiver through which the reducing gas (hydrogen or carbon monoxide) passes in countercurrent to the ore stream.

**Annealing furnace.** A.-G. BROWN, BOVERI & Co. (B.P. 282,799, 28.12.27. Ger., 27.12.26).—In a continuous furnace for bright annealing, the charging chamber communicates with the annealing chamber through a



gas drum, both chambers having bottom openings in the same plane. The action of charging or discharging by means of a charging table pumps protective gas into the drum. C. A. KING.

**Annealing furnace.** W. J. DIEDERICH, Assr. to WESTINGHOUSE ELECTRIC & MANUF. Co. (U.S.P. 1,707,300, 2.4.29. Appl., 7.11.27).—Means are provided for stacking material to be annealed, of substantially annular form, around an electrical resistor in a gas-tight container, so that the inner parts of the material are heated by direct radiation and the outer parts by convection. J. S. G. THOMAS.

**Heat-treating furnaces.** SURFACE COMBUSTION Co., Asses. of R. M. HEAMES, H. STARK, and B. W. LINDQUIST (B.P. 291,446, 22.5.28. U.S., 2.6.27).—Small metal articles are heat-treated in a furnace heated by liquid fuel burning below the hearth. The articles are carried through the furnace on a chromium-steel ribbon conveyor, a travelling hood confining the objects in a more or less closed channel. C. A. KING.

**Heat-resisting metallic material.** W. E. RUDER, Assr. to GEN. ELECTRIC Co. (U.S.P. 1,706,130, 19.3.29. Appl., 14.9.25).—The surface layer of a metallic article consisting principally of iron is alloyed with aluminium to form a heat-resisting coating, whilst the interior portion, which is free from aluminium, contains a material preventing the penetration of aluminium thereinto at high temperatures. A. B. MANNING.

**Heat treatment of articles.** A. LE BOUTILLIER, Assr. to WESTERN ELECTRIC Co. (U.S.P. 1,706,725, 26.3.29. Appl., 19.2.27).—Metallic sheets to be annealed at a high temperature are prevented from becoming welded together by being interleaved with metal plates having an oxide scale before being subjected to heat treatment. H. ROYAL-DAWSON.

**Imparting a shearing-resistant hardness to rust-proof knives and scissors.** G. HAMMESFAHR (B.P. 294,573, 12.7.28. Ger., 26.7.27).—The articles are finished from the forged state by grinding and then hardened by heating in a salt-bath furnace; they are subsequently polished. M. E. NOTTAGE.

**Reduction of ores and manufacture of metals [iron] and alloys.** W. A. LOKE (B.P. 309,458, 28.12.27).—Iron sands are cleaned by magnetic separation, mixed with a carbonaceous reducing agent, and passed downwards through a rotating kiln provided with internal vanes to keep the charge thoroughly mixed during its reduction by means of a countercurrent of reducing gases. The discharge from the kiln passes directly into an arc furnace through the arc itself to obtain molten iron ready for refining and carburising to steel. A. R. POWELL.

**Manufacture of steel in electric furnaces.** FONDERIA MILANESE DI ACCIAIO (B.P. 283,489, 10.1.28. Italy, 10.1.27).—Steel scrap is melted and carburised in a cupola, from which it is tapped into one of two electric refining furnaces which are used alternately to make the process continuous and to ensure a constant load on the electric supply. A. R. POWELL.

**Manufacture of steels and castings.** E. H. DOPPÉE (B.P. 293,764, 10.7.28. Fr., 11.7.27).—Metals and/or

metalloids are introduced into baths of steel and cast iron in the form of alloys with aluminium, such alloys containing more than 9% Al and being free from carbide, iron, carbon, sulphur, and phosphorus. M. E. NOTTAGE.

**Manufacture of steel and alloy steels.** F. C. LANGENBERG and M. A. GROSSMANN (B.P. 309,971, 18.1.28).—Iron containing less than 0.05% C is treated with 0.15–1% of manganese to reduce the oxygen content below 0.03%. Addition of 0.15–0.6% of copper and 0.03–0.25% of molybdenum produces a steel free from red-shortness and suitable for the manufacture of boiler tubes. A. R. POWELL.

**Manufacture of [high-speed] steel.** STAHLWERK BECKER A.-G. (B.P. 282,744 and 305,105, 15.12.27. Ger., 30.12.26).—In steels containing (A) vanadium and/or cobalt, the carbon content is increased above 0.6% by 0.16% for each 1% V and by 0.04% for each 1% Co, or (B) cobalt, addition of 0.4% C is similarly made for each 1% Co. F. G. CROSSE.

**[Manganese-chromium steel] alloys.** H. ETCHELLE, A. POPPLEWELL, and L. CAMERON & SON, LTD. (B.P. 309,841, 15.10.27).—The steel contains 12–40% (Mn + Cr), of which the manganese is 5–10%. The preferred composition is 9.8% Mn, 18.88% Cr, 0.7% C, and the remainder iron, silicon, and up to 1% of one or more of the following: nickel, cobalt, vanadium, titanium, molybdenum, aluminium, copper, or tungsten. A. R. POWELL.

**Treatment of complex copper ores.** W. G. PERKINS (B.P. 309,940, 18.1.28).—Copper ores containing the metal in the oxidised and in the sulphide form are leached, with or without a preliminary low-temperature roast, with a solvent which dissolves the copper not present as sulphide, and the residue is subjected to froth flotation to recover the sulphide. A. R. POWELL.

**Melting and refining of copper.** H. H. ALEXANDER (B.P. 309,848, 16.1.28).—Crude copper is melted on a sloping hearth in a reverberatory furnace so that the molten metal runs down into a bath in front of the hearth; melting is effected by means of hot combustion gases of such composition that the impurities in the copper are oxidised as it melts without at the same time oxidising the copper. A. R. POWELL.

**Production of crystalline cuprous oxide upon copper surfaces.** A. K. CROAD. From HANOVIA CHEM. & MANUF. Co. (B.P. 309,966, 14.12.27).—Clean polished copper is heated slowly up to 1025° in an atmosphere in which the partial pressure of oxygen does not exceed 15 mm.; the oxygen pressure is then increased to 200 mm. for 5–15 min. until a predetermined thickness of the cuprous oxide coating is produced, and finally the article is cooled in an atmosphere in which the partial pressure of oxygen does not exceed 15 mm. A. R. POWELL.

**Smelting of zinc ores.** R. L. LLOYD, Assr. to DWIGHT & LLOYD METALLURG. Co. (U.S.P. 1,709,135, 16.4.29. Appl., 2.11.26).—A receptacle chiefly composed of zinc oxide bonded with zinc sulphate is suitable for the process. H. ROYAL-DAWSON.



**Manufacture of [antimonial] lead alloys [containing manganese].** J. STONE & CO., LTD., and W. LAMBERT (B.P. 309,399, 9.1.28).—An alloy containing 82.9—71% Pb, 12—18% Sb, 5—10% Sn, and 0.1—1% Mn is made by adding the requisite amounts of 5% manganese-tin and 50 : 50 antimony-lead alloy to molten lead. A. R. POWELL.

**Manufacture of [antimonial lead] alloys.** W. E. BEATTY. From WESTERN ELECTRIC CO., INC. (B.P. 309,629, 14.1.28).—Antimonial lead alloys containing up to 4% Sb are melted with up to 1% of arsenic, cadmium, sulphur, tellurium, thallium, or bismuth, the alloy is cast, annealed at 240°, quenched, and aged at 20—100° until maximum hardness is obtained. A. R. POWELL.

**Production of amalgams to be used in dentistry.** E. W. FISCHER and E. W. J. VIRGIN (B.P. 283,488, 10.1.28. Ger., 10.1.27).—Powdered silver-tin alloy is coated with mercury by heating it with acid mercuric chloride or with finely-divided mercury, from mercuric formate, and dilute hydrochloric acid. A. R. POWELL.

**Refining and mixing of metals and alloys.** T. D. KELLY (B.P. 310,119, 13.2.28).—The metal or alloy is melted by means of a direct-current arc between a graphite anode and the metal as cathode, the molten metal being stirred by eddy currents induced by an alternating current passing through a conductor encircling the bath. The impurities tend to migrate below the anode, whence they rapidly oxidise or volatilise. The process is useful in purifying iron-nickel-aluminium alloys, ferrochromium, and copper-tungsten alloys from carbon, sulphur, and other deleterious impurities. A. R. POWELL.

**Coating metals [with silicon].** GEN. ELECTRIC CO., LTD., and W. SINGLETON (B.P. 309,393, 9.1.28).—The metal is heated in an inert gas containing silicon tetrachloride, and then annealed in hydrogen or other non-oxidising atmosphere. The resulting coating is resistant to oxidation at high temperatures and to attack by acids. A. R. POWELL.

**Manufacture of [metallic] catalysts.** HOWARDS & SONS, LTD., J. W. BLAGDEN, and G. C. H. CLARK (B.P. 309,743, 20.4.28).—An alloy of copper, nickel, and/or iron with magnesium, zinc, and/or calcium is oxidised by heating in the air or by pouring it in thin streams through heated air, and the resulting mass of oxides is crushed and used as a catalyst, with or without partial reduction in hydrogen. A. R. POWELL.

**Working-down metal residues.** M. and L. MEYER (HÜTTENWERKE TEMPELHOF A. MEYER) (B.P. 285,462—3, 16.2.28. Ger., 17.2.27).—(A) From the raw material (metal residues containing tin and at least two of the metals antimony, lead, and copper) in the form of oxides, the copper is extracted as sulphate by treatment with sulphuric acid, the lead sulphate thereby produced being separated as lead chloride by treatment with boiling chloride solution; the residue, on fusion with caustic alkali and alkali chloride, yields a mixture of alkali stannate, antimonate, and plumbate, which on lixiviation with water yields insoluble alkali antimonate, which is collected, and a solution from which the lead

may be precipitated as sulphide. The three components may then be treated by known methods. (B) Residues consisting of a mixture of the metals and oxides are fused with caustic alkali and alkali chloride at the outset, the molten mass is separated from the unchanged metal and extracted with water, and any copper oxide separated as copper sulphate from the sodium antimonate is removed by treatment with sulphuric acid. M. E. NOTTAGE.

**Production of aluminium.** J. WEBER and H. HAUSER, Assrs. to ALUMINIUM-IND. A.-G. (U.S.P. 1,709,759, 16.4.29. Appl., 3.6.26. Ger., 27.1.26).—See B.P. 265,170; B., 1928, 412.

**Production of mercury.** W. GLAESER, Assr. to GLAESER RES. CORP. (Re-issue 17,276, 23.4.29, of U.S.P. 1,637,481, 2.8.27).—See B., 1927, 819.

**Electrodeposition of metals.** T. W. S. HUTCHINS (U.S.P. 1,709,268, 16.4.29. Appl., 30.6.25. U.K., 24.7.24).—See B.P. 239,977; B., 1925, 926.

**Production of foundry moulds.** MORRIS MOTORS (1926), LTD., and A. SMITH (B.P. 310,187, 27.4.28).

**[Mould for] producing [wheel] castings.** W. E. EVANS. From GES. F. FÖRDERANLAGEN E. HECKEL M.B.H. (B.P. 310,663, 3.5.28).

**[Torch for autogenous] welding.** AIR REDUCTION CO., INC. (B.P. 303,896, 8.1.28. U.S., 13.1.28).

**[Apparatus for solvent] removal of grease and oil from metal articles.** E. C. R. MARKS. From E. HARBECK (B.P. 310,683, 25.5.28).

**Linings for furnaces** (B.P. 303,574).—See I.

## XI.—ELECTROTECHNICS.

**“Bent cathode test” for determining the optimum ratio of chromic acid to sulphate in chromium plating baths.** W. L. PINNER and E. M. BAKER (Amer. Electrochem. Soc., May, 1929. Advance copy. 11 pp.).—In order to be able to determine rapidly the necessary change to be made in the sulphate content of a chromium plating bath so as to remedy unsatisfactory working, a sample of the solution is removed and electrolysed in a beaker provided with a lead anode and a cathode consisting of a strip of copper sheet bent into an L-shape with the horizontal portion projecting towards the anode. From the character and distribution of the deposit on the bent cathode, the required change in the ratio of chromic acid to sulphate can be approximately estimated, and, since the chromic acid content of the bath is readily determined, the change to be made in its sulphate content is known. The method has the advantage of avoiding the lengthy sulphate determinations otherwise required, and also of indicating the true optimum sulphate ratio for an actual bath which is no longer of the standard composition in respect of other substances. Test experiments with the bent cathode apparatus indicate that increasing the chromic acid concentration from *M* to 6*M* lowers the optimum sulphate ratio (molar concentration of chromic acid : normality of sulphate) from about 75 to 30, the value 50 corresponding with 2.5*M*-chromic acid, but the permissible range of variation of the sulphate



ratio increases as the chromic acid concentration is increased to 3*M*, and then decreases again. Increasing amounts of tervalent chromium increase the optimum sulphate ratio, but the effect is small until the concentration reaches about 0.3*M*. Increasing amounts of iron in the solution first raise the optimum sulphate ratio, but a maximum is reached with about 6 g./litre of iron; higher concentrations of iron decrease the ratio again. Also the range of permissible variation of the sulphate ratio is greatest in solutions containing about 6 g./litre of iron, the optimum ratio then being about 70. This concentration of iron does not appreciably affect the throwing power of the bath, but higher concentrations decrease it, and also have the disadvantage of increasing the specific resistance. Increasing amounts of tervalent chromium decrease the throwing power considerably.

H. J. T. ELLINGHAM.

See also A., May, 496, **New superconductors** (VAN AUBEL and others). 521, **Anodic behaviour of diphenylacetic acid** (KATAGISHI and others). **Electrolytic reduction of aldehydes** (SHIMA). 531, **Analysis by electrolysis with mercury cathode** (MOLDENHAUER and others). 533, **Gauge for measurement of high vacua** (STANLEY). 535, **X-Ray photographs** (EBERT).

**Conduction in textiles.** MURPHY.—See V. **Electroplating of metals.** BLUM. **Copper-plating of steel.** BALLAY. **Chromium plating.** SCHNEIDEWIND.—See X.

#### PATENTS.

**Electrolytic rectifier.** G. D. BAGLEY and F. T. BOWDITCH, Asses. to NAT. CARBON Co., INC. (U.S.P. 1,706,950, 26.3.29. Appl., 28.6.24).—Electrodes comprising, respectively, aluminium and a conducting, solid metal oxide are immersed in an electrolyte containing a citrate radical.

J. S. G. THOMAS.

**Electrolytic apparatus.** R. C. BENNER, Ass. to NAT. CARBON Co., INC. (U.S.P. 1,706,951, 26.3.29. Appl., 28.6.24).—A tantalum electrode and one composed of graphite coated with lead peroxide are immersed in an electrolyte.

J. S. G. THOMAS.

**Electrode material.** W. B. GERO, Ass. to WESTINGHOUSE LAMP Co. (U.S.P. 1,707,002, 26.3.29. Appl., 26.7.26).—A gaseous conduction device of the point-to-point discharge type comprises an extended cathode and a small anode composed, at least in part, of porous mixed metal.

J. S. G. THOMAS.

**Manufacture of electron-emitting bodies.** WESTINGHOUSE LAMP Co., Asses. of C. V. IREDELL (B.P. 285,884, 24.2.28. U.S., 24.2.27).—A tungsten filament is coated with a mixture of thoria and a small proportion (1–3% of its thoria content) of ceria and the mixture is reduced. [Stat. ref.]

J. S. G. THOMAS.

**Ionisation chamber.** SIEMENS-REINIGER VEIHA GES. F. MED. TECHN. (B.P. 296,769, 23.3.28. Ger., 8.9.27).—The outer wall of an ionisation chamber consists of a hollow, pressed, and sintered graphite electrode protected by a thin sheet of elastic material, preferably celluloid.

J. S. G. THOMAS.

**Insulating materials [for under-water cables].** W. E. BEATTY. From BELL TELEPHONE LABS., INC.

(B.P. 309,851, 15.2.27. Cf. B.P. 307,966; B., 1929, 401).—Water-soluble substances and nitrogenous protein matter are removed from crude rubber or latex by treatment with water in a pressure tank at about 150°; one or more substances such as montan wax, montan pitch, balata, and gutta-percha may be added to give the product strength and plasticity.

J. S. G. THOMAS.

**Separation of materials of different physical qualities.** B. GRANIGG (B.P. 284,307, 29.9.27. Austr., 28.1.27).—The particles of materials having different permeabilities or dielectric constants are separated by being passed singly through an electro-magnetic or electrostatic field (preferably alternating) which is one of a pair that are exactly equal when no foreign bodies are present. The current induced in a circuit coupled to both fields caused by the presence of such materials is utilised to operate deflecting or collecting devices to remove the bodies into various paths according to their physical properties. The induced currents may be amplified by known means.

B. M. VENABLES.

**Pasted accumulator grid or plate.** W. HADDON and J. McD. BURNETT (U.S.P. 1,710,617, 23.4.29. Appl., 14.4.27. U.K., 19.4.26).—See B.P. 274,208; B., 1927, 705.

**Precipitation of hafnium and zirconium on an incandescent body [electric lamp filament].** J. H. DE BOER and A. E. VAN ARKEL, Asses. to N. V. PHILIPS' GLOEILAMPENFABR. (U.S.P. 1,709,781, 16.4.29. Appl., 6.10.25. Holl., 25.7.25).—See F.P. 604,391; B., 1926, 886.

**Galvanic cell [for pocket lamp batteries].** C. GAISER (B.P. 284,626, 21.1.28).

**[Depolarising bobbin for] dry cells.** E. C. R. MARKS. From NAT. CARBON Co., INC. (B.P. 309,769, 25.5.28).

**Luminous electrical discharge tube.** R. W. JAMES. From MANHATTAN ELECTRICAL SUPPLY Co., INC. (B.P. 310,066, 22.10.27).

**Electronic discharge bulbs.** ETABL. GAIFFE-GALLOT ET PILON (B.P. 301,855, 9.2.28. Fr., 7.12.27).

**Manufacture of electrical porcelain insulators.** C. H. THOMPSON (B.P. 310,201, 8.5.28).

**Removal of insulation from insulated wire.** F. M. VAN GELDEREN (B.P. 299,866, 6.9.28. U.S., 4.11.27).

**Linings for furnaces** (B.P. 303,574). **Drying and impregnating insulating materials** (B.P. 308,641).—See I. **Refining metals and alloys** (B.P. 310,119).—See X. **Electrodeposition of rubber** (U.S.P. 1,702,705).—See XIV. **Röntgen-ray photography** (B.P. 286,283 and 309,529).—See XXI.

#### XII.—FATS; OILS; WAXES.

**Colloidal calcium soaps.** E. SAUER (Chem. Umschau, 1929, 36, 129–132).—The conditions governing the formation of colloidal calcium soap in the reaction between alkali soaps and hard waters has been studied. The proportion of colloidal soap formed is increased by the presence of excess of alkali soap, but varies with the fatty acid and particular calcium soap employed. The presence of filter-paper fibres or textile fibres



induces precipitation of the bulk of the colloidal calcium soap, which is most effectively avoided by the use of suitable protective colloids, *e.g.*, gelatin, gum arabic.

E. LEWKOWITSCH.

**Tung oil.** III. D. HOLDE, W. BLEYBERG, and M. A. AZIZ (*Farben-Ztg.*, 1929, 34, 1725—1726; *cf.* B., 1928, 612, 825).—The apparent tendency for the six-membered conjugated linking system of elæostearic acid to close on elimination of halogen hydride from the halogenated acid, giving rise to aromatic derivatives (*loc. cit.*), was apparently confirmed by the detection, among the oxidation products of elæostearic acid treated in this manner, of phthalic acid by the usual fluorescein reaction. Further investigation, however, showed that a number of other oxidation products feasibly present, *e.g.*, mono- and di-basic aliphatic acids, could give rise to similar fluorescence. The fluorescein test was therefore modified by omission of the sulphuric acid and by raising the temperature of fusion to 205—210°, under which conditions phthalic acid alone gave a fluorescing solution. On repeating the halogenation *etc.* of elæostearic acid, no phthalic acid was now detected.

S. S. WOOLF.

**Bromo-derivatives of linolenic acid.** W. KIMURA (*Chem. Umschau*, 1929, 36, 126—128).—Linolenic acid, prepared by the reduction of hexabromostearic acid (m.p. 183°), on treatment with the theoretical amount of bromine yielded a crystalline hexabromostearic acid and another oily hexabromide: the latter appears to be a mixture of isomeric liquid hexabromostearic acids, which darkens in air or on heating to a yellow or red-brown colour, but is stable at 100°. No partially saturated tetrabromide could be found, so that the formation of  $\beta$ -linolenic acid by debromination of the hexabromide is doubted. On repeated debromination and bromination of the liquid hexabromide a gradual decrease in the yield of solid and liquid hexabromides was observed, accompanied by a decrease in the iodine value, and an increase in the mol. wt. of the linolenic acid, probably due to the formation of oxidised and polymerised acids.

E. LEWKOWITSCH.

**American safflower-seed oil.** G. S. JAMIESON and S. I. GERTLER (*Oil & Fat Ind.*, 1929, 6, [4], 11—13).—Hot-pressed oil from safflower seed grown in Montana had  $d_{20}^{25}$  0.9243,  $n_D^{25}$  1.4744, acid value 5.56, iodine value 149.3 (Hanus), 149.1 (Wijs), saponif. value 190.5, acetyl value 12.5, Reichert-Meissl value 0.2, Polenske value 0.1, hexabromide 0.4%, unsaponifiable matter 0.59%. The oil contained 87.72% of unsaturated acids (iodine value 156) and 5.93% of saturated acids; from the detailed examination of these the composition of the oil was determined as: glycerides of acids—oleic 25.7%, linoleic 65.8%, linolenic 0.15%, myristic 0.04%, palmitic 4.1%, stearic 1.6%, arachidic 0.4%, lignoceric 0.06%; unsaponifiable 0.59%. Safflower-seed oil has better drying properties than sunflower-seed or soya-bean oils (probably due to the larger proportion of linoleic acid), and is suitable for use in the paint and varnish industries.

E. LEWKOWITSCH.

**Staphylea oil.** A. FERENCZ and G. CSERESZNYÉS (*Magyar Gyóg. Társ. Értes.*, 1928, 4, 24—29).—The oil has  $d_{20}^{15}$  0.9355,  $n_D^{25}$  1.47165, acid value 2.00, saponif. value 190.28, iodine value 108.34, Hehner value 95.51,

Reichert-Meissl value 2.64, Polenske value 0.50. The unsaturated acids (90.30% of the total) consist of oleic (94%), linoleic (5.50%), and linolenic (0.50%) acids.

CHEMICAL ABSTRACTS.

**Determination of iodine value of fatty drying oils.** VON REIBNITZ (*Farben-Ztg.*, 1929, 34, 1782—1784).—The iodine values of raw and cooked drying oils were determined by the Hübl-Waller and Hanus methods, the time and temperature of reaction being varied. The results show the marked influence of these variables on the iodine value of tung oil and, to a smaller extent, linseed oil. The Wijs method is less prone to these uncertainties, and is therefore recommended, although it gives higher values than the other two methods, which give concordant results when standard conditions obtain.

S. S. WOOLF.

**Accuracy of the determination of viscosity of oils and varnishes by the [rising] bubble method.** RUCHTI (*Farben-Ztg.*, 1929, 34, 1899—1901).—A close relationship was observed between the Engler viscosities of stand oil-mineral oil solutions and the times of rise of an air bubble in a narrow tube filled with these solutions. The times observed in the latter method may be converted directly by factor into the Engler values.

E. LEWKOWITSCH.

**Thermal analysis of beeswax.** J. STITZ (*Magyar Chem. Fol.*, 1928, 34, 18—22).—The f.p. of beeswax is markedly altered by adulteration. The f.p. of three fractions, obtained by means of cotton filters, are compared with tabulated values.

CHEMICAL ABSTRACTS.

See also A., May, 539, **Synthetic glycerides** (AVERILL and others). 540, **Degradation of saturated fatty acids** (NAEGELI and others). 541,  $\beta$ -**Dihydroxypalmitic acid** (VOTOČEK and PRELOG). 568, **Saponin of sugar beet** (REHORST). 607, **Decomposition of fats by bacteria** (HAAG). 609, **Chemical nature of vitamin-A** (DRUMMOND and BAKER). 610, **Determination of vitamin-A** (JONES and others).

**Report of Government Laboratory, Amsterdam.** STRAUB.—See XIX.

## PATENTS.

**Manufacture of margarine.** A. K. EPSTEIN (U.S.P., 1,707,800, 2.4.29. Appl., 8.3.26).—The warm liquid emulsion of fats and milk is stabilised by contact with cold water, the temperature of which is sufficient to solidify it into discrete particles. These are then conveyed in thin layers through relatively warmer water at below the m.p. of the solidified emulsion in order to bring about a rapid tempering process; the whole is finally worked into a plastic mass.

F. R. ENNOS.

**Neutralising free fatty acids by glycerin.** METALLGES. A.-G. (METALLBANK & METALLURGISCHE GES. A.-G.) (B.P. 291,767, 8.6.28, Ger., 8.6.27).—Neutralisation is effected under a high vacuum produced economically by the interposition of an ejector (preferably steam-operated) between the reaction vessel and the condenser, which is fitted with a vacuum pump.

E. LEWKOWITSCH.

**Heating stills particularly for steam-distillation of fatty acids.** METALLBANK & METALLURGISCHE GES. A.-G. (B.P. 291,093, 10.5.28. Ger., 27.5.27).



—Preliminary heating is effected by ordinary boiler steam, and the increasing steam temperature subsequently required is automatically produced by a steam compressor interposed between the boiler and the heating system of the still.  
E. LEWKOWITSCH.

**Treating castor oil to produce substances miscible with mineral oils.** M. MELAMID (B.P. 308,502, 27.4.28).—Castor oil is heated with metallic catalysts (*e.g.*, tin, bismuth, nickel, or their alloys) at about 280° under usual pressure or *in vacuo*.

E. LEWKOWITSCH.

**Cooling of margarine emulsions.** A. GERSTENBERG and H. J. J. BIGUM (B.P. 309,744, 23.4.28).

**Substances for cleansing purposes, more especially for removing [theatrical] make-up.** (SIR) G. C. MARKS. FROM CHESAUVON-FABR. CHEM.-TECHN. PHARM. PRÄPARATE GES.M.B.H. (B.P. 279,454, 18.10.27).

**Viscosity of oils** (B.P. 307,602).—See I. **Oxidation products of waxes etc.** (B.P. 309,875).—See II.

### XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

**Determination of oil absorption of pigments.** C. P. VAN HOEK (Farben-Ztg., 1929, 34, 1784—1785).—Agreement is obtained between oil absorption values as obtained by laboratory methods (*due, e.g.*, to Gardner or Wolff) and those obtained under working conditions in paint manufacture, if in laboratory determinations the pigment is added to the oil instead of *vice versa*. This is considered a logical procedure since a pigment-in-oil dispersion is sought. Oil absorption cannot be regarded as a criterion of a pigment since so many factors influence the results obtained, *e.g.*, size and shape of particles, adsorbed air and moisture, electric charges on the pigment, interfacial tension and chemical relationships between pigment and vehicle, acid value and viscosity of vehicle, time and method of mixing, etc.

S. S. WOOLF.

**Determination of oil absorption of pigments.** H. WOLFF, G. ZEIDLER, and W. TOELDT (Farben-Ztg., 1929, 34, 1901).—In answer to the criticism of van Hoek (*cf.* preceding abstract), it is re-asserted that the method described previously (Farben-Ztg., 1928, 33, 2730) gives the most reproducible characteristics and the lowest values so far obtained in practice, although the figures may not be identical with the theoretical minimum oil absorptions.  
E. LEWKOWITSCH.

**Crystallising lacquers and toluol resins.** H. A. GARDNER (Amer. Paint & Varnish Manufrs.' Assoc., April, 1929, Circ. No. 348, 321—331).—Crystallising or frosting lacquers may be produced by incorporating powdered synthetic resins, which are initially soluble in the combined solvents, but crystallise out as the solvents become concentrated by evaporation. Resins produced by condensation of toluene derivatives with formaldehyde are highly satisfactory; they are obtainable in various grades of hardness, are retained in colloidal solution with cellulose acetate, are soluble in the usual lacquer solvents but insoluble in linseed oil, are transparent to all wave-lengths contained in sunlight, and show little tendency to become yellow on exposure.  
E. LEWKOWITSCH.

**Determination of acid value of resins.** E. STOCK (Farben-Ztg., 1929, 34, 1727).—The acid value of a number of Albertol and other resins were determined by the normal direct-titration method and by Albert's back-titration method (full details of which are quoted). The results obtained by the two methods are in substantial agreement. It is pointed out, however, that the Albert method shows the advantage of a sharp colour change even in the cases of dark-coloured resins where the normal method gives an indefinite end-point.  
S. S. WOOLF.

See also A., May, 572, **Resin acid of Manila copals** (RUZICKA and HOSKING). 573, **Acid from Finnish pine resin** (NORDSTRÖM).

**Acetone-soluble acetylcellulose.** WERNER and ENGELMANN.—See V. **Colour-lake formation.** BAUR and SCHNYDER.—See VI. **Safflower-seed oil.** JAMIESON and GERTLER. **Viscosity of varnishes.** RUCHTI.—See XII.

### PATENTS.

**Nitrocellulose solutions and the like.** NOBEL INDUSTRIES, LTD. From E. I. DU PONT DE NEMOURS & Co. (B.P. 308,230, 14.10.27).—A homogeneous nitrocellulose solution, suitable for use in the production of artificial leather, contains a vegetable oil which causes stickiness and is a softener but a non-solvent for nitrocellulose, *e.g.*, blown castor oil, cottonseed oil, rape oil, together with 2—5% (on the total oil content) of a non-volatile paraffin or naphthene hydrocarbon oil in order to overcome the stickiness due to the vegetable oil.  
S. S. WOOLF.

**Nitrocellulose solutions or compositions.** W. J. JENKINS, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 310,062, 18.10.27).—Wet pigments and wet nitrocellulose containing 5—60% of water are incorporated, together with other ingredients, with a solvent volatile in the air and having a b.p. not below about 120°, *e.g.*, butyl acetate, ethylene glycol ethyl ether. Another solvent of higher b.p., *e.g.*, methylcyclohexanone, may be added when the water content of the composition is above 6%.  
L. A. COLES.

**[Production of coloured] nitrocellulose products and the like.** W. J. JENKINS, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 309,964, 11.10.27).—Pigmented celluloid, lacquers, etc. are produced by mixing cellulose esters with pigments while either (or both) of these is in a wet condition, with or without the addition of plasticising agents, softening agents, etc., and subsequently removing the water by passing the mixture between rollers at a suitable temperature, the dry product being dissolved in solvents when lacquers etc. are desired. [Stat. ref.]  
L. A. COLES.

**Coating composition.** M. BLANCATO, Assr. to KENT-BLANCATO Co., INC. (U.S.P. 1,709,056, 16.4.29. Appl., 2.5.27).—Celluloid is dissolved in a mixture of acetic acid and acetone containing ethyl sulphate.

H. ROYAL-DAWSON.

**Application of materials or bodies for the purpose of coating or otherwise covering surfaces.** A. C. HYDE (B.P. 310,080, 19.1.28).—Material, *e.g.*, finely-divided strontium sulphide, and an agglutinant.



*e.g.*, sodium silicate solution, are sprayed on to a surface through separate nozzles adjusted so that the sprays meet before reaching the surface. L. A. COLES.

**Production of oil-soluble phenol-aldehyde condensation products.** BAKELITE GES.M.B.H. (B.P. 283,124, 3.1.28. Ger., 3.1.27. Addn. to B.P. 282,414; B., 1929, 333).—Natural resins, *e.g.*, colophony, copal, shellac, or solutions of these in suitable diluents or in oils or varnishes, are mixed with the condensation products obtained with or without the use of catalysts as described in the prior patent. L. A. COLES.

**Manufacture of resinous condensation products of aldehydes with phenol and urea, or of aldehydes and urea.** J. W. CRUMP, and BAKELITE, LTD. (B.P. 309,849, 16.1.28).—A solution of urea in part of the aldehyde solution used for the condensation is added gradually to the remainder of the aldehyde solution which is kept hot or, preferably, at the b.p., and contains in solution the phenol, when this forms one of the constituents. Water and uncondensed material are removed from the initial condensation product, while this is still in a soluble form, by distillation *in vacuo*, preferably in the presence of a neutral dehydrating agent capable of forming a constant-boiling mixture with water, *e.g.*, butyl alcohol, followed by open-pan boiling. An alkaline condensing agent may be added towards the end of the condensation, and an acid agent, *e.g.*, oxalic acid, during the vacuum distillation. The ratio of phenol to urea may vary from  $\frac{1}{2}$ :1 to 5:1, the lower and higher ratios giving products suitable for the manufacture of moulded articles etc. and of lacquers etc., respectively. L. A. COLES.

**[Synthetic] resinous compounds.** BRIT. THOMSON-HOUSTON Co., LTD., H. W. H. WARREN, R. NEWBOUND, and A. T. WARD (B.P. 308,671, 23.12.27).—A "glyptal" or "plasticised glyptal" resin is heated under ordinary or raised pressure with a natural or another artificial resin for some hours until a transparent resinous product which will dissolve readily in fatty oils and is then soluble in benzol, turpentine, white (petroleum) spirit, etc. is obtained. S. S. WOOLF.

**[Roller] grinding mills [for paint etc.].** A. E. G. MACCALLUM (B.P. 307,312—3, 5.9.27).

**Testing the effect of light etc.** (B.P. 309,726).—See I.

#### XIV.—INDIA-RUBBER; GUTTA-PERCHA.

**Chart for the estimation of equivalent cures [conditions of vulcanisation of rubber].** C. L. BRIT-TAIN (Ind. Eng. Chem., 1929, 21, 362—364).—An "area diagram" is constructed with a horizontal axis graduated with a uniform "time" scale; the vertical "temperature" scale is so constructed that the distances of the "temperature" lines above the "time" axis are proportional to the corresponding rates of vulcanisation. The conditions of any vulcanisation, whether at constant or various temperatures, are plotted on this chart; the area enclosed between the "vulcanisation curve" and the time axis gives a mathematical expression of the intensity of the vulcanisation effect. D. F. TWISS.

**Accelerator consumption during vulcanisation.** L. V. WISTINGHAUSEN (Kautschuk, 1929, 5, 57—61,

75—77).—Experiments were made as to the proportion of mercaptobenzthiazole and diphenylguanidine, respectively, recoverable by means of extraction with acetone at various stages of vulcanisation. Diphenylguanidine was determined as the picrate, and mercaptobenzthiazole by dissolving the acetone extract in benzene and adding a benzene solution of copper oleate; the initially-formed cupric salt changes overnight into dibenzthiazole disulphide and the insoluble cuprous salt, the weight of mercaptobenzthiazole being obtained from the latter by using the factor 1.4556. With sprayed rubber the rate of consumption of either accelerator was greater than with crêpe rubber, Peruvian rubber occupying an intermediate position except for mercaptobenzthiazole with zinc oxide, when accelerator consumption was least for crêpe and greatest for Peruvian rubber, although the mixture containing the latter was less vulcanised. Increase of ratio of sulphur to rubber caused a marked increase in the rate of vulcanisation as judged by tensile characteristics. In the absence of zinc oxide, however, increased sulphur had little influence on the rate of disappearance of accelerator, but with zinc oxide present it induced increase in rate of vulcanisation and of accelerator consumption. In all cases the disappearance of mercaptobenzthiazole appeared to approach a more definite limit than that of diphenylguanidine. With neither accelerator is the action purely catalytic; in the presence of zinc oxide a zinc compound is formed which then reacts with sulphur. Certain forms of amorphous carbon, probably by adsorptive influence, reduce the percentage of extractible accelerator. D. F. TWISS.

**Electrokinetic potential of rubber.** B. N. GHOSH and P. STAMBERGER (Kautschuk, 1929, 5, 99—100).—Measurements of electro-osmotic flow provide the most convenient method for investigation of electrokinetic potential with rubber latex. Glass capillaries (approx. 0.5 mm. diam., and 5 cm. long) were lined with a film of rubber which had been applied by means of rubber solution or purified latex and, after drying, fixed in position by heating for 3 hrs. at 120—130°. Experiments were made with one or more such capillaries in parallel, and a potential of 200 volts, using water and solutions of sodium hydroxide, ammonia, hydrochloric and acetic acids, potassium and barium chlorides, and thorium nitrate. The relation of the results to the electrokinetic potential of natural latex, and the influence of composition of this on its potential and stability, are being investigated. D. F. TWISS.

#### PATENTS.

**Production of rubber from rubber latex.** J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 309,245, 23. and 27.1.28).—Latex is coagulated with acids or acid-producing substances in the presence of an organic substance which possesses soap-like properties and reduces the surface tension of the latex but is not decomposed by acid with formation of insoluble products. Suitable substances of this character are aromatic or hydro-aromatic sulphonic acids containing substituent alkyl, cycloalkyl, or aryl groups, or sulphonic acids derived from aliphatic tar oils or mineral oils. If the latex is quickly acidified to  $p_H < 2$  before or after the addition of such a substance, the whole mass sets to an irreversible



jelly which can easily be washed with water, sheeted, and dried. D. F. TWISS.

**Manufacture of synthetic rubber.** I. G. FARBERIND. A.-G. (B.P. 283,840—1, 16.1.28. Ger., [A] 14. and [B] 15.1.27).—In the conversion of butadiene hydrocarbons into rubber the process of polymerisation is expedited and a superior product obtained by (A) emulsifying the butadiene compound in an aqueous medium and effecting polymerisation in the presence of oxygen and/or of a substance, *e.g.*, a perborate or percarbonate, capable of yielding oxygen, or (B) polymerising in an atmosphere of hydrogen, nitrogen, or carbon dioxide with the aid of an alkali metal in the presence of an organic hydroxy-compound or ether, *e.g.*, starch, cellulose, a cellulose ether, or superficially oxidised rubber, and, if desired, with the additional presence of an inorganic hydroxide, *e.g.*, sodium hydroxide, and an inert solvent or swelling agent such as aromatic or aliphatic hydrocarbons. D. F. TWISS.

**Electrodeposition of rubber.** J. PORTER (U.S.P. 1,702,705, 19.2.29. Appl., 24.2.28. U.K., 13.2.28).—The rubber is deposited in sheet form on a rotating bipolar electrode of readily oxidisable material, *e.g.*, lead, separating the latex and the ammonia solution. R. BRIGHTMAN.

**Vulcanisation of rubber.** NAUGATUCK CHEM. Co., Asses. of S. M. CADWELL (B.P. 302,176, 5.10.27. U.S., 1.11.26).—A vulcanisation accelerator is produced by boiling the condensation product of an amine with an aldehyde containing a chain of carbon atoms, *e.g.*, heptaldehyde-aniline, with acid, *e.g.*, hydrochloric acid; the reaction product is precipitated from aqueous solution by sodium hydroxide. D. F. TWISS.

**Manufacture of rubber articles.** NAUGATUCK CHEM. Co., Asses. of E. HAZELL (B.P. 295,700, 23.12.27. U.S., 19.8.27).—In making rubber articles from latex, the rate of deposition of the rubber on a porous former is accelerated by increasing the filterability of the latex. This is effected by the presence of suitable substances, *e.g.*, colloidal sulphides or polysulphides, which may be formed *in situ*, *e.g.*, by the addition of a metallic oxide and a soluble sulphide such as zinc oxide and sodium polysulphide. The rate of deposition may be further increased by dilution, agitation, and heating. D. F. TWISS.

**Production of articles made of fabric coated, proofed, or impregnated with organic materials, and of sheetings of organic materials.** DUNLOP RUBBER Co., LTD., and G. W. TROBRIDGE (B.P. 309,391, 9.1.28).—Fabric or woven material is impregnated or covered with organic material, *e.g.*, rubber, in aqueous dispersion, by dipping; deposition of the organic material is facilitated by coating or impregnating the material, or the porous former on which it may be fitted, with solutions of substances, *e.g.*, alum, acetic acid, or calcium chloride, capable of effecting agglomeration of the dispersed organic material. When a porous former is used, deposition may be aided by imparting a pressure difference between the inside and outside. D. F. TWISS.

**Manufacture of products of or containing rubber**

**and/or rubber-like substances.** ANODE RUBBER Co. (ENGLAND), LTD. From P. KLEIN (B.P. 309,630, 14.1.28. Cf. B.P. 283,871; B., 1929, 295).—Articles of rubber, gutta-percha, etc. are manufactured from natural or artificial dispersions by building up the products from parts containing unmasticated rubber and different proportions of masticated rubber or similar material, plastic or tacky in character. D. F. TWISS.

**Manufacture of liquefied rubber composition.** H. P. BUTLER (U.S.P. 1,710,470, 23.4.29. Appl., 8.4.27).—See B.P. 274,742; B., 1927, 757.

**Manufacture of rubber conversion products.** B. F. GOODRICH Co., Asses. of H. L. FISHER (B.P. 282,778, 23.12.27. U.K., 28.12.26).—See U.S.P. 1,642,018; B., 1927, 917.

**Manufacture of rubber goods.** P. KLEIN and A. SZEGVÁRI, Asses. to ANODE RUBBER Co., LTD. (U.S.P. 1,708,181, 9.4.29. Appl., 5.6.25. U.K., 13.2.25).—See B.P. 254,765; B., 1926, 797.

**Manufacture of rubber or the like [hollow] articles.** C. MACINTOSH & Co., LTD., S. A. BRAZIER, and G. F. THOMPSON (B.P. 310,602, 22.2.28).

**Manufacture of goods of india-rubber or the like, *e.g.*, hot-water bottles.** CAMPBELL, ACHNACH, & Co., LTD., J. GILLAN, J. MCP. SWAN, and T. GARSTANG (B.P. 310,629, 3.4.28).

**Heat-insulating material** (B.P. 309,662). **Concentration or drying of liquids** (B.P. 307,315).—See I. **Insulating materials** (B.P. 309,851).—See XI.

## XV.—LEATHER; GLUE.

**Analyses of some English bookbinding leathers.** R. W. FREY, L. R. LEINBACH, and E. O. REED (J. Amer. Leather Chem. Assoc., 1929, 24, 190—196).—Of 23 samples of goatskin, sheepskin, calfskin, cowhide, and pigskin leathers, only 5 had a breaking strength below 2000 lb./in.<sup>2</sup>; the free mineral acid content of four of these was more than 0.5%. No relationship was observed between strength and the direction of the skin. On analysis the leathers gave (%) total ash 0.2—0.8, insoluble ash 0.2—0.9, petroleum spirit extract 0.9—11.1, water-soluble matter 2.4—14.6, combined tannin 24.0—39.4, hide substance 48.0—62.9, uncombined tannin 0.8—7.1, and had acidity (Procter-Searle) 0.0—2.2,  $p_H$  of water extract 2.4—4.7. Six leathers were tanned with mixtures of pyrocatechol and pyrogallol tanning materials; the rest with pyrogallol tannins alone. Of 13 leathers specified as "free from injurious acids," 9 contained no acid, and the rest only 0.2—0.3%. Most of the leathers were overtanned, and their grease content was low; the majority, however, complied with the chemical requirements of durable bookbinding leathers. D. WOODROFFE.

**Modified shaking method for analysing tannins and the Darmstadt apparatus.** G. BALDRACCO (Boll. Uff. Staz. Sperim. Ind. Pelli, 1929, 7, 82—94).—The advantages of this method (B., 1920, 123, 460, 496, 523), in conjunction with Stiasny's apparatus (Collegium, 1928, 383; cf. Parker, B., 1929, 140), are confirmed, and



the following procedure is recommended: 6.5 g. of dry hide powder, previously chromed with chrome alum, are introduced, together with 75 c.c. of the tannin solution to be examined, into the Darmstadt apparatus, which is closed with its two covers and shaken for 15–20 min. The liquid is then withdrawn by suction and the residue shaken for 15 min. with a further quantity of 75 c.c. of the tannin solution. The liquid is transferred to a clean, dry dish, and filtered through filter-paper, 50 c.c. of the clear liquid being used for the determination of the non-tannins. T. H. POPE.

**Analysis of [tannery] beam-house liquors.** J. H. HIGHBERGER and E. K. MOORE (*J. Amer. Leather Chem. Assoc.*, 1929, 24, 68–76).—(a) *Total nitrogen.* The Kjeldahl–Gunning method is used. (b) *Total protein-nitrogen.* A sample (50 c.c.) is acidified to phenolphthalein with 2*N*-hydrochloric acid, mixed with 150 c.c. of a sodium chloride-chloroacetic acid reagent, left overnight, the precipitate washed with diluted reagent, and the nitrogen determined as above. (c) *Non-protein-nitrogen.* This value is given by  $a - b$ . (d) *Heat-coagulable protein-nitrogen.* 100 c.c. of the sample are acidified with acetic acid, weighed, heated to boiling for 5 min., cooled, made up to original weight with distilled water, shaken, and filtered. By making a Kjeldahl determination for total nitrogen on an aliquot portion of the filtrate and deducting the result from the corresponding value for (a) the value of  $d$  is obtained. (e) *Volatile bases.* A measured volume of the liquor is distilled under reduced pressure with excess of lime, the distillate collected in a known quantity of 0.1*N*-sulphuric acid, using the Van Slyke apparatus, and the excess acid is determined by titration with standard alkali. (f) *Ammonia and amines.* The titrated distillate from (e) is transferred to a 500 c.c. graduated flask, diluted to 480 c.c., 5 c.c. of 20% sodium hydroxide solution and 5 c.c. of 30% sodium carbonate solution are added, the mixture is made up to 500 c.c., poured into a brown glass bottle, and 0.1 g. of yellow mercuric oxide is added for each c.c. of 0.1*N*-acid equivalent to the total volatile nitrogen present; the bottle is then stoppered, covered with a black cloth, shaken for 1 hr., allowed to remain overnight, and the supernatant liquor forced through a cotton filter. 400 c.c. of the filtrate are distilled into 0.1*N*-sulphuric acid and the acid neutralised represents the volatile, aliphatic amino-nitrogen. The free ammonia-nitrogen is the difference between this value and that of the total volatile nitrogen. (g) *Chlorides.* 20 c.c. of the filtered soak or lime liquor are made up to 100 c.c. with distilled water, and to 15 c.c. of the mixed liquids 25 c.c. of 0.1*N*-silver nitrate and 10 c.c. of nitric acid are added; after being heated to just below boiling for 2–3 hrs., the mixture is cooled, diluted to 100 c.c. with distilled water, and the excess silver nitrate determined by titration with 0.1*N*-potassium thiocyanate. The presence of sulphides in the lime liquor does not interfere with this method.

D. WOODROFFE.

See also A., May, 533, **Shaker for Clark hydrogen electrode vessel** (CAMERON and SHEARER). 574, **Nontans in extract of badan root** (TSCHITSCHIBABIN and others).

## PATENTS.

**Manufacture of imitation doe-skin [from rubber-coated fabrics].** C. E. SIMPSON (B.P. 309,675, 18.2.28).

**Nitrocellulose solutions** (B.P. 308,230).—See XIII.

## XVI.—AGRICULTURE.

**“Single value” soil properties: significance of certain soil constants. II. Natal soils.** J. R. H. COUTTS (*J. Agric. Sci.*, 1929, 19, 325–341; cf. Keen and Coutts, B., 1928, 905).—Determinations have been made of the sticky point, loss on ignition, clay content, and water content in equilibrium with an atmosphere of 50% R.H., of a number of Natal soils, and it is shown that the first and second, and the third and fourth pairs of quantities exhibit close correlation. With reference to the Keen–Raczkowski box data, correlation exists between pore space and clay content, and between volume swelling and water retained, and hence with sticky point. E. A. LUNT.

**Formation and composition of humus matter [in soil].** K. LIESCHE (*Landw. Jahrb.*, 1928, 68, 435–488; *Bied. Zentr.*, 1929, 58, 156–158).—Comparison is made of humus from various sources, both natural and artificial. Humus from glycine, tyrosine, cystine, and dextrose contains more carbon and less nitrogen than the natural product from green-manuring. In nitrification experiments the behaviour of artificial humus was generally similar to that of the natural material, although tyrosine- and cystine-humus were slightly inferior. Examination of the carbon dioxide production from humus in soil showed no marked difference between the natural and artificial materials. The permanganate consumption of humus in acid and alkaline solutions is not directly proportional to the carbon content. Natural humus favoured nitrogen fixation by azotobacter, but with the exception of cystine-humus this was not the case with artificial samples. During humus formation the production of yellow and brown substances from dextrose and nitrogen compounds takes place earlier in the presence of soil organisms than in their absence. The slow nitrification of natural humus indicates that its nitrogen constituents are neither adsorbed nor combined as ammonium compounds. The existence of a mixture of nitrogen-free and nitrogen-containing substances in natural humus is suggested.

A. G. POLLARD.

**Unsaturated soils.** N. P. REMESOV (*Z. Pflanz. Düng.*, 1929, 13A, 228–242).—In the examination of unsaturated soils the adsorbed hydrogen ions are not completely removed from the clay complex when the reaction of the soil suspension is adjusted to  $p_H$  7. No essential difference exists between exchange and hydrolytic acidity, the more complete displacement of hydrogen ions by treatment of the soil with salts of weak acids being due entirely to the more alkaline reaction of their solutions. To determine the lime requirement of soil a series of samples (10 g.) are treated with 25 c.c. of *N*-calcium chloride, and 0.004*N*-calcium hydroxide is added in increasing proportions through the series. The samples are shaken and after 24 hrs. the  $p_H$  values are determined by the quinhydrone electrode. The



lime requirement is calculated from the amount of lime necessary to bring the final  $p_H$  of the soil suspension to 7.0. Parallel experiments using chlorides and hydroxides of bases other than calcium yielded slightly different results, but the substitution of calcium acetate for the chloride did not alter the figures. A. G. POLLARD.

**Determination of the saturation condition of soils.** H. KAPPEN (Fortsch. Landw., 1928, 3, 1009; Bied. Zentr., 1929, 58, 147—148).—Exchangeable bases in soil are determined by treating 50 g. of soil with 250 c.c. of 0.1N-hydrochloric acid and shaking for 1 hr. After 24 hrs. the mixture is filtered and the filtrate titrated with 0.1N-alkali. From the acid consumption is calculated the mg.-equivalent of dissolved bases per 100 g. of soil. The base requirement for the complete saturation of the soil is determined electrometrically (Jensen) to  $p_H$  8.5. A. G. POLLARD.

**Determination of the nutrient content of arable soils by Mitscherlich's method.** OPITZ and RATHSACK (Landw. Jahrb., 1928, 68, 321—348; Bied. Zentr., 1929, 58, 145—147).—Considerable lack of agreement exists between the soil nutrient content as determined by pot experiments and those obtained in field trials, the latter showing greater values in the majority of cases. Nitrogen added to the soil by green manuring and by the growth of legumes is not registered in pot experiments by Mitscherlich's method. The "effect factor" for nitrogen was smaller in reference to grain yields than straw yields. In sand cultures the effect factor for nitrogen in ammonium nitrate was greater than that for ammonium sulphate, and fluctuated with the nature of the phosphatic manure used. It is also smaller after heavy green manuring. A. G. POLLARD.

**Effects of carbon disulphide treatment of soil for the Japanese beetle on the abundance of micro-organisms and on the ammonia and nitrate content.** W. E. FLEMING (Soil Sci., 1929, 27, 153—158).—Treatment of soil with carbon disulphide at the rate of 1 lb. per cub. yd. stimulated the growth of fungi without affecting the numbers of bacteria present. Accumulation of ammonia occurred. In poorly-drained land plant injury resulting from the use of carbon disulphide emulsions is considered to be largely the outcome of detrimental effects on micro-organisms, the decrease in nitrate production, and the accumulation of ammonia. In well-drained soils the effects of carbon disulphide emulsions are similar to those following fumigation. The importance of aerating soils after fumigation is noted. A. G. POLLARD.

**Comparison between the culture methods of Mitscherlich and Wiessmann [for determining nutrient values of soils].** H. WIESSMANN (Z. Pflanz. Düng., 1929, 13A, 205—208).—A reply to Behrens (B., 1929, 183). A. G. POLLARD.

**Determination of organic carbon in soils.** G. W. ROBINSON, W. MCLEAN, and R. WILLIAMS (J. Agric. Sci., 1929, 19, 315—324).—The method used consists in determining the amount of sulphur dioxide produced in the ordinary Kjeldahl digestion by absorption in standard iodine solution. The results for British soils average  $89.6 \pm 1.03\%$  of the figures obtained by combustion.

The advantages claimed for this method are its applicability to carbonate soils without the necessity for any correction for inorganic carbon, and its technical simplicity. E. A. LUNT.

**Availability of potash in a typical Mauritius soil.** N. CRAIG and R. LINCOLN (J. Agric. Sci., 1929, 19, 397—403).—The application of potassium salts to Mauritius lateritic soil effects a gradual increase in the amount of non-available potassium oxide, potassium sulphate being more potent in this respect than potassium nitrate. Conversely, the application of molasses to the soil produces a decrease in the amount of non-available potassium. E. A. LUNT.

**Nutritive value of pasture. IV. Influence of intensity of grazing on yield, composition, and nutritive value of pasture herbage. II.** H. E. WOODMAN, D. B. NORMAN, and J. W. BEE (J. Agric. Sci., 1929, 19, 236—265; cf. B., 1928, 381).—Pasture grass obtained under a system of 3-weekly cuts is slightly less rich in digestible protein than grass cut fortnightly, but equal in respect of total digestible organic matter and of starch. The total yield over the whole season obtained by cutting at 3-weekly intervals is 62.3% greater than that obtained by weekly cutting. E. A. LUNT.

**Influence of feeding on the composition of milk.** H. T. CRANFIELD (J. Agric. Sci., 1929, 19, 302—310).—Dried sugar-beet pulp feeding produces a higher yield of milk and of milk solids than mangel feeding. The average composition of the milk is the same on both diets. E. A. LUNT.

**Factors affecting yield and quality of milk. I. Age of the cow.** R. R. KAY and A. C. M'CALLISH (J. Agric. Sci., 1929, 19, 342—372).—Milk and butter fat production in cows reaches a maximum at 7 years of age, whilst the percentage of fat reaches its maximum at 3 years of age and then remains constant until advanced ages. E. A. LUNT.

**Action of carbon monoxide on green plants.** M. PADOA and N. VITA (Annali Chim. Appl., 1929, 19, 141—148).—Carbon monoxide is absorbed by alcoholic solutions containing either carotin and chlorophyll or pure chlorophyll (A and B) alone and is expelled from such solutions only by a large excess of carbon dioxide. In presence of the xanthophyll or other ingredients of the alcoholic extracts, carbon monoxide is apparently oxidised to the dioxide. The assimilative power of *Plantago major*, *Lemna minor*, and *Elodea Canadensis* is inhibited by a large excess or sensibly diminished by a small amount of the monoxide, but, even when highly concentrated, the gas does not impede the respiratory processes of these plants. Unlike other anaesthetics, carbon monoxide does not demolish the cell-walls separating enzymes from glucosides, e.g., emulsin from amygdalin in cherry-laurel leaves, and hence does not give rise to formation of hydrocyanic acid. The monoxide inhibits alcoholic fermentation and greatly retards the inversion of sucrose. T. H. POPE.

**Soil reaction and the growth of meadow plants.** K. E. LANDGRAF (Z. Pflanz. Düng., 1929, 13A, 213—228).—Changes in the reaction and in physical and chemical properties of soil produced by treatment with small quantities of sulphuric acid and sodium hydroxide were



examined. The citric solubility of the soil nitrogen increased with both acid and alkaline treatments, that of phosphorus increased with alkali and decreased with acid, that of potash decreased with both, and that of calcium increased slightly with acid and was not appreciably affected by alkaline treatment. From within the reaction range  $p_H$  4.4—4.7 the water capacity and hygroscopicity of soils increased with both acid and alkali treatment up to maximum points, beyond which the values again decreased. The growth curve in treated soils of *Festuca pratensis* showed maximum points in both the acid and alkaline regions. This is almost entirely the outcome of changes in the solubility of nutrients due to the soil treatments. In respect of soil reaction *Festuca pratensis* exhibits a region of optimum growth over the range  $p_H$  4.0—7.0, within which growth is governed, not by soil reaction, but by the extent to which "growth factors" are effective. The optimum reaction range of the cell sap is  $p_H$  5.95—6.25. Changes of reaction towards neutrality induced by alkaline soil treatment result in an increased calcium content, and *vice versa*. A change of 0.3  $p_H$  unit affected the growth of the plant. No relationship exists between the reaction of the cell sap and that of the soil. The former is governed by the presence of definite ions in the nutrient medium. A. G. POLLARD.

**Crop variation. VI. Response of the potato to potash and nitrogen.** T. EDEN and R. A. FISHER (J. Agric. Sci., 1929, 19, 201—213).—Experiments are recorded with reference to the effect on crop in the potato of potash manuring in the form of sulphate, chloride, and low-grade salt, in the presence and absence of nitrogenous manures. E. A. LUNT.

**Influence of potassium on the structure of fibre cell-walls in fibre plants.** F. TOBLER (Z. Pflanz. Düng., 1929, 13A, 208—213).—Potassium sulphate increased the yield of fibre from flax to a greater extent than did "potash salts." Differences in the length of straw were not marked. With potash salts the individual fibre bundles were round in outline, but the sulphate produced more compact, angular, and narrower bundles. Regarding the individual cells, potash salts induced rounder and fuller cells, larger cavities, and thinner walls, whereas potassium sulphate produced larger cells, more angular in section, thicker walled, and more closely united with neighbouring cells. With hemp similar results were obtained, but the effects of the different fertilisers were less accentuated. Following the potash fertilisation of ramie, the loosely arranged fibres in the tissue tend to concentrate into bundles. Potassium sulphate produces thicker walls than potash salts. In general, potash fertilisers induce the formation of smoother fibres, with consequent decreased loss in separating and improved spinning qualities. A. G. POLLARD.

**Factors influencing the growth and sugar contents of cane.** K. K. RAO (Agric. J. India, 1929, 24, 91—101).—A review of published information.

A. G. POLLARD.

**Treatment of beet seed with naphthalene.** V. STEHLÍK (Z. Zuckerind. Czechoslov., 1929, 53, 333—339).—Naphthalene mixed with the seed before planting

with the object of checking pest infestation gave negative results. The application had no effect on the stand, yield, or sugar content. J. P. OGILVIE.

**Adventitious roots and the supply of nitrogenous and mineral substances to oats.** T. TSCHIRIKOV (Z. Pflanz. Düng., 1929, 13A, 201—204).—Comparison of the chemical analyses of oat plants and the development of adventitious roots indicates that the number of the latter present controls the quantity of mineral nutrients absorbed by the plants. A. G. POLLARD.

**Effects of hydrogen-ion concentration on rice cultures.** S. K. MITRA and L. N. PHUKAN (Agric. J. India, 1929, 24, 109—116).—Rice plants were grown in water cultures the  $p_H$  values of which varied from 3.0 to 8.4, and the total length of root produced was taken as a measure of the plant growth. Maximum growth was obtained at  $p_H$  7.9. At  $p_H$  6 growth was below normal, at  $p_H$  3.9 the culture solution was strongly toxic, and at  $p_H$  3.3 growth was inhibited. Evidence is presented that toxicity was due directly to the hydrogen-ion concentration and not to the titratable acidity or alkalinity. A. G. POLLARD.

**Leaching-out of autumnal dressings of nitrogenous fertilisers.** H. H. NICHOLSON and B. PANTIN (J. Agric. Sci., 1929, 19, 297—301).—Over 50% of a normal autumnal dressing of ammonium sulphate, calcium cyanamide, and rape dust is lost by leaching-out during the winter, the loss being greatest in the case of ammonium sulphate and least with rape dust. The rate of the loss by leaching is dependent on rainfall and temperature. E. A. LUNT.

**Pyrethrin I and II; their insecticidal value and determination in pyrethrum (*Chrysanthemum cinerariæfolium*).** I. F. TATTERSFIELD and R. P. HOBSON (J. Agric. Sci., 1929, 19, 266—296).—Experiments are described in agreement with those of Staudinger and Ruzicka (B., 1924, 398, 573) showing that pyrethrin I is more highly toxic to *Aphis rumicis* than is pyrethrin II. Two micro-methods for determining pyrethrin are described: (a) from the acids liberated on hydrolysis, (b) by means of the semicarbazone.

E. A. LUNT.

See also A., May, 523, **Development of chlorophyll in seedlings in light of different wave-lengths** (SAYRE). 611, **Soil respiration and activity of forest soils** (FEHÉR). 612, **Root-forming substance** (WENT).

PATENT.

**Calcium nitrate-ammonium nitrate** (B.P. 310,276). See VII.

## XVII.—SUGARS; STARCHES; GUMS.

**Colloid chemistry in relation to sugar manufacture.** J. BERGÉ (Bull. Soc. chim. Belg., 1929, 38, 31—46).—It has not yet been found possible to extract the sugar from beets without accompanying colloidal matters. Although liming of the diffusion juice at the rate of 100 g. CaO per 100 kg. of beets suffices to produce flocculation of colloids, difficulties of filtration necessitate the addition of very much more lime,



followed by carbonation. Some of the most promising attempts to reduce the consumption of lime are those in which the diffusion juice, before liming, is mixed with a proportion of unfiltered carbonation juice and filtered as a means of preliminary purification. The Raffinerie Tirlemontoise has succeeded in drying carbonation scums to a powdery condition by means of centrifuges of very high speed. Heating carbonated juices to 90–95° has been found to facilitate filtration considerably. The thick juice from the evaporators contains an appreciable amount of precipitated colloids; some factories filter with kieselguhr at this stage, but decolorising carbon is more effective. The effect of colloids in retarding the crystallisation of sugar is discussed, and also their tendency to be obstinately retained by sugar crystals, influencing the colour of the latter. The purity of centrifuged sugars can be much improved by the use of centrifuges of very high centrifugal force, e.g., 1200–7000 times the force of gravity instead of 500 times as usually employed.

J. H. LANE.

**$p_H$  Curves [of sugar solutions] following phenolphthalein titrations.** V. MAJER (Z. Zuckerind. Czechoslov., 1929, 53, 301–305).—Ten c.c. of liquid (e.g., alkaline beet juice) were titrated with 0.1N-hydrochloric acid, using phenolphthalein as indicator, and continuing the addition to the point at which the pink shade just disappeared. The  $p_H$  of the liquid was then determined colorimetrically, using bromothymol-blue or bromocresol-purple; a few more drops of the standard acid were added, and the  $p_H$  was again determined. Curves having the additions of 0.1N-acid as abscissæ and the  $p_H$  values found as ordinates gave "titration curves" which were characteristic. In sugar solutions containing lime the phenolphthalein titration finished at  $p_H$  7.0, and gave curves which fell sharply before a further addition of 0.1 c.c. of 0.1N-acid had been made. On the other hand, in well-buffered solutions the titration finished at about  $p_H$  8.0, whilst a further addition of 0.4 c.c. of acid could be made before the  $p_H$  fell to 6.0.

J. P. OGILVIE.

**[Determination of sugar with] alkaline copper solutions [Fehling's solution].** J. DE VILMORIN and E. CAZAUBON (Bull. Assoc. Chim. Sucr., 1929, 46, 54–61).—A discussion of the nature of the reactions involved in the determination of reducing sugars, with special reference to Fehling's original method, the gravimetric method, and the methods of Bertrand, Saillard, and Possoz.

J. H. LANE.

**Methyl and ethyl alcohols in sugar beet pulp.** M. JEDLIČKA (Z. Zuckerind. Czechoslov., 1929, 53, 293–299).—By boiling beet pulp with water containing lime, methyl and ethyl alcohols were liberated in approximately equal amount, equivalent to a total of about 38.8 c.c. of absolute alcohol per 100 kg. Small amounts were also identified in the condensed waters from the second body of the evaporator.

J. P. OGILVIE.

**Determination of the starch value of frozen potatoes.** W. EKHARD (Z. Spiritusind., 1929, 52, 77–78).—Before the starch value of potatoes which are completely or almost completely frozen can be deter-

mined, thawing and washing in luke-warm water are necessary. On account of their softness, careful handling is necessary, and it is not advisable to attempt to wipe them before weighing. Experience has shown that a deduction of 1% should be made from the starch value of frozen potatoes to allow for the unavoidable loss of sap from the tubers in their thawing and cleaning. The indirect determination of the starch value of frozen potatoes from their content of dry substance, as found by actual drying, is tedious and not more accurate than the use of the potato balance.

J. H. LANE.

**Determination of starch by the diastase method.** H. COLIN (Bull. Assoc. Chim. Sucr., 1929, 46, 177–179).—Since ordinary hydrolysis by diastase is never complete, it is best to liquefy first by diastase and complete the hydrolysis by hydrochloric acid. Commercial preparations of diastase may be freed from reducing sugars by shaking with methyl alcohol. "Rapidase," prepared from *Tyrophrix*, is very suitable; it has high liquefying and low saccharifying powers. By the use of yeast autolysate in addition to diastase, dextrose is formed by the action of yeast maltase. Preparations such as taka-diastase and "biolase," from *B. subtilis* or a similar organism, also hydrolyse starch to dextrose. The varying proportions of amylose and amylopectin in starches of different origins prevent the employment of physical methods for their determination.

See also A., May, 568, Saponin of sugar beet (REHORST). 612, Sugar from pine wood (HÄGGLUND).

**Adhesion etc. of glazes.** FOSTER.—See VIII. **Sugar contents of cane.** RAO. **Treatment of beet seed.** STEHLÍK.—See XVI.

#### PATENTS.

**Saturation of sugar juices in the manufacture of beetroot and cane sugars.** F. BLANKE (B.P. 283,202, 15.12.27. Ger., 8.1.27).—In an apparatus for the continuous, automatically-controlled saturation of sugar juices with carbon dioxide or sulphur dioxide, the outlet pipe from the bottom of a raw juice container communicates with the lower end of a tall vertical pipe into which, near the lower end, the gas is also injected. In passing up this pipe the juice becomes saturated, and near the upper end it flows through two cross-pipes fitted with an electrometric indicator into a descending pipe which delivers it to another container. Float valves automatically stop the flow of juice in the event of either container becoming too full. If the electrometric indicator shows too low an alkalinity in the saturated juice, a proportion of air is automatically mixed with the injected gas until the correct alkalinity is again indicated.

J. H. LANE.

**Desaccharification of syrups and molasses.** J. BERGÉ (B.P. 308,867, 14.2.28).—To promote the further crystallisation of sugar from masseuites, or from centrifuged syrups or molasses, these are mixed with pure sugar crystals so that the liquid is distributed as a thin layer over a large area of crystal surface, and the mixtures may be kept under conditions favourable to crystallisation. The final separation of the exhausted syrups from the crystals may be effected by means of



centrifuges of specially high centrifugal force, and the separated crystals may be used again for a similar purpose.

J. H. LANE.

**Recovery of sugar from the exhausted sludges or scums of [beet] sugar manufacture.** H. CLAASSEN (B.P. 296,985, 24.8.28. Ger., 10.9.27).—The greater part of the sugar at present lost in carbonatation scum cakes, which is considerably more than the usual methods of analysis indicate, may be recovered by mashing the cakes with water in a mixing apparatus, heating to about 80°, and separating the watery liquor from the solid by sedimentation. The watery liquor, containing  $\frac{1}{2}$ —1% or more of sugar, may be used for washing later scums in the presses. A saving of at least 0.1% of sugar, calculated on beets, is claimed.

J. H. LANE.

**Purification of saccharine liquids.** H. WIESE, and ANGLO-SCOTTISH BEET SUGAR CORP., LTD. (B.P. 308,529 21.6.28).—The dark affination syrups obtained by the washing of raw sugars prior to refining are mixed with a proportion of carbonatation or sulphitation cake obtained in the purification of affined sugars in accordance with B.P. 12,642 of 1911 (B., 1912, 653), and heated to about 82° and filtered. This neutralises any acidity and improves the quality of the raw sugars and molasses obtained from the affination syrups. By applying similar treatment to solutions of the affined sugars their subsequent purification (*loc. cit.*) can be simplified by the omission of sulphitation, or of one of the carbonatation stages.

J. H. LANE.

**Production of dextrose.** R. E. DALY, ASSR. to AMER. MAIZE PRODUCTS CO. (U.S.P. 1,708,940, 16.4.29. Appl., 15.8.24).—Sugar liquor derived from converted starch is brought to  $d$  1.34—1.41, cooled to 49°, seeded with dry crystals, cooled to 38°, introduced into a crystalliser containing wet seed crystals in amount equal to half of the introduced liquor, agitated slowly while the temperature is reduced to 32—35°, and kept at this temperature till permeated with crystals. The temperature is raised to 43—49° to cause the finer crystals to dissolve, again lowered to 32—35° to allow the unmelted crystals to grow, and kept at this temperature for 12 hrs. with slow agitation of the liquid. Finally the crystals are centrifuged from the mother-liquor.

W. J. BOYD.

Alcohol (U.S.P. 1,709,610).—See XVIII.

## XVIII.—FERMENTATION INDUSTRIES.

**[Starch] liquefying and saccharifying powers of [German] malts of the 1928 harvest.** H. LÜERS and F. WIENINGER (Woch. Brau., 1929, 46, 173—174).—The amylases of two malts, I and II, from different barleys but of similar appearance and growth, were followed during flooring and kilning. In both the saccharifying amylase developed normally, but though I showed a moderate development of liquefying amylase, II was decidedly lacking in this respect. The saccharifying and liquefying powers are evidently independent. Since I, of colour 0.55 (c.c. of 0.1N-iodine) and diastatic power 96.5 (Windisch-Kolbach), saccharified in 35 min., whilst II, of colour 0.35—0.40 and diastatic power 103.5, required 40 min., it is considered probable that

the slow saccharification characterising these malts is due to low liquefying power. No difference could be detected between the starches of the malts in question.

F. E. DAY.

**Alteration of hemicellulose-splitting enzymes during flooring and kilning [of malt].** H. LÜERS and L. MALSCH (Woch. Brau., 1929, 46, 163—164).—Contrary to the finding of Lüers and Volkamer (B., 1928, 281) for high enzyme concentrations, at low concentrations and short durations of action the degree of hemicellulose hydrolysis is proportional to the amount of cytase. Taking the original cytase content of a barley, measured by its action on elder-pith xylan, as unity, the activity during malting decreased to 0.63 on the second day on the floor, increased steadily to 2.59 at withering, and decreased to 0.59 on the kiln.

F. E. DAY.

**Improvement of brewing waters containing much [calcium] carbonate by lactic acid.** V. KOUDELKA (Woch. Brau., 1929, 46, 164—170, 174—178).—Laboratory experiments show that though reduction of temporary hardness by the action of lime, with addition of calcium sulphate or chloride, effects some improvement, much better results are obtained by the addition of lactic acid. A slight excess is not objectionable since, owing to greater protease and phosphatase action, buffering is increased, though too great an excess may restrict diastatic action. The worts from hard waters treated with lactic acid "break" better on boiling and contain more proteins and phosphates. The yeast settles better, and the resulting beers are paler and have a finer though less bitter flavour. The conclusions are supported by the results of two comparative technical brewings.

F. E. DAY.

**Detection of coal-tar dyes in red wines.** D. MAROTTA (Annali Chim. Appl., 1929, 19, 148—164).—Certain of the methods published for the detection of artificial colouring matters in wines give false results, but the following two methods are sufficient to obtain exact indications:—(1) 100 c.c. of the wine are boiled down to 60 c.c., treated with 2 c.c. of 10% hydrochloric acid, and boiled for 5 min. with about 0.5 g. of defatted embroidery wool. The liquid is decanted off and the wool rinsed in water and boiled for 5 min. with 100 c.c. of water containing 1 c.c. of 10% hydrochloric acid, this treatment being repeated with fresh quantities of the dilute acid until extraction of colour from the wool ceases. The wool is then freed from acid by repeated washing with water and is subsequently boiled with 50 c.c. of water and 10—15 drops of 10% ammonia solution. The alkaline liquid is decanted into another beaker, rendered distinctly acid to litmus with hydrochloric acid, and boiled for a few minutes with a woollen thread about 50 cm. long. A red or pink coloration of the wool shows the presence of an artificial acid dyestuff in the wine. If the colour is weak or uncertain, the wool is boiled with the dilute ammonia and the colour fixed on fresh woollen yarn. (2) 50 c.c. of the wine are mixed with 5 c.c. of 20% ammonia solution and 10 c.c. of perfectly colourless amyl alcohol and shaken gently. The two liquids are separated and the alcohol is washed with water until it loses its alkaline reaction



and is then filtered through a dry paper. If the filtrate is coloured more or less intensely red or yellow, or if it becomes coloured on acidification with acetic acid, the wine contains artificial colouring matters.

T. H. POPE.

**Determination of formic acid in vinegar.** W. SCHUT (Chem. Weekblad, 1929, 26, 228—229).—One c.c. of the sample is treated with concentrated sulphuric acid, stirred, and heated to 105°, and the volume of carbon monoxide driven off is measured.

S. I. LEVY.

**Alcohol from apples.** M. L. LÉVY (Bull. Assoc. Chim. Sucr., 1929, 46, 148—155).—Extraction of the juice by hydraulic and continuous presses and by other methods is discussed, the first method being preferred. Details are given of the author's methods of building up a yeast culture and of carrying out the fermentation. The yield is often only 50 litres, at most 57 litres, per 100 kg. of sugar. The residues from the distillation are most difficult of disposal. Types of plant suitable for distillation and rectification are mentioned. The product is used in the preparation of certain liqueurs.

F. E. DAY.

**Lime treatment for the preparation of anhydrous alcohol.** O. VON KEUSSLER (Z. Spiritusind., 1929, 52, 147—148).—Rectified spirit (about 94%) is stirred with 20—25 kg. of quicklime per hectolitre for about 1½ hrs. in an autoclave at 4—5 atm. at 125—130°. It is distilled from the same vessel, with continued stirring, finishing under vacuum to remove the last traces of alcohol. The powdery residue of slaked lime is either blown out by steam or mixed with water to a sludge. Part of the alcohol distilled from lime contains colloidal lime, which is removed, before re-distillation, by partial (30—50%) neutralisation with sulphuric acid, when the precipitated gypsum carries down the excess of lime. The process occupies only 10 hrs. as against 48 hrs. by the usual method, and the loss is about 2% instead of the usual 5—8% (cf. B.P. 270,612; B., 1927, 541).

F. E. DAY.

**Ropiness in wine.** G. MEZZADROLI and E. VARETON (Zymologica, 1929, 4, 6—20).—See B., 1929, 373.

**Acetone-butyl alcohol fermentation and its application to molasses.** G. MEZZADROLI and G. MAGNO (Zymologica, 1929, 4, 21—30).—See B., 1929, 145.

See also A., May, 603, Preparation of bone phosphatase (MARTLAND and ROBISON). 604—5, Specific action of enzymes, and fission of polypeptides (ABDERHALDEN and others). 604—6, Influence of erepsin and trypsin-kinase on polypeptides etc. (ABDERHALDEN and others). 607, Phosphoric esters in alcoholic fermentation (BOYLAND). Equation of alcoholic fermentation (HARDEN and HENLEY). Alcoholic fermentation (KOSTYTSHEV and JEGOROVA). Top yeast (VON EULER and NILSSON). Ergosterol content of yeast (HEIDUSCHKA and LINDNER). Decomposition of fats by bacteria (HAAG). 608, Rennin production (WAHLIN).

#### PATENTS.

**Malt and maltose preparation.** A. E. NIENSTADT, Assr. to A. F. STREGER, INC. (U.S.P. 1,209,366, 16.4.29.

Appl., 20.9.23).—An aqueous solution of edible albuminous matter, which is coagulable at moderate temperature, is added to a viscous extract of malt of about *d* 1.38 and the mixture heated to approx. 70° and filtered.

C. RANKEN.

**Production of alcohol.** J. J. DE LA ROZA, Assr. to BAGASSE PRODUCTS CORP. (U.S.P. 1,709,610, 16.4.29. Appl., 22.3.27).—Burned green sugar cane is allowed to remain under ordinary atmospheric conditions until the contained sugar is inverted. The liquid content is extracted and distilled after fermentation.

C. RANKEN.

**Treatment of air for cooling and drying [brewing] casks and such like.** CHARRINGTON & Co., LTD., and A. C. REAVENALL (B.P. 307,371, 2.12.27).

**Dietetic preparations (B.P. 309,097).**—See XIX.

#### XIX.—FOODS.

**Report of the Government Laboratory at Amsterdam for 1928.** J. STRAUB (Chem. Weekblad, 1929, 26, 212—215).—Work done in the various departments of the laboratory is summarised. In milk examination comparison was made of the Ringeling and "pegallac" methods for detection of *B. coli*, and many cases were observed in which one method gave positive, the other negative, results. The plate method and the reductase method of counting bacteria were not found to give parallel results in examination of some 200 samples. Experiments were in hand with silver chromate paper to distinguish milk from inflamed udders. In examination of edible oils and fats, data are being collected for the preparation of m.-p. and setting-point diagrams so that curves prepared with the aid of standard apparatus may be used in detecting adulteration. Work has been published on fluorescence of oils and fats. The Meihuizen apparatus for determination of water is not so suitable for milk products as for starch and flour. An earlier investigation into calorific value, albumin content, and price of the average diet for different sections of the population has been resumed. Work has been published on analysis of mixtures of starch and sugar syrups.

S. I. LEVY.

**Influence of cooking on the nutritive value of food.** N. JARUSOVA (Biochem. Z., 1929, 207, 395—404).—Feeding experiments with rats show that heating food for several hours at 100° does not noticeably affect its nutritive value.

P. W. CLUTTERBUCK.

**Correlation studies with diverse strains of spring and winter wheats: inheritance of quality.** H. K. HAYES, F. R. IMMER, and C. H. BAILEY (Cereal Chem., 1929, 6, 85—96).—Data from milling and baking trials of wheats have been studied by means of correlation coefficients in order to determine the practical value of selecting new strains by means of determinations of kernel texture and protein content. There is no indication that such determinations are valuable as a means of obtaining high-quality wheat strains.

W. J. BOYD.

**Relation of hydrogen-ion concentration and buffer value to the baking quality of flour.** II.



E. A. FISHER and P. HALTON (Cereal Chem., 1929, 6, 97—114; cf. B., 1929, 262).—It is confirmed by baking tests that the  $p_H$  value is not a factor of great importance in determining dough or loaf quality even when the variations in  $p_H$  are much greater than those produced by prolonged over-fermentation. Increased hydrogen concentration may produce increased dough toughness, more pronounced flavour, and improved colour of crumb.  
W. J. BOYD.

**Determination of starch in cereals and mill products.** C. VON SCHEELE and G. SVENSSON (Tekn. Tidschr., 1928, 58, Kemi, 57—60, 65—72; Chem. Zentr., 1928, ii, 2202).—Comparative experiments show that the method of Lüers and Wieninger is the most accurate; in control work the method of polarisation after treatment with diastase, or Evers' method employing corrections, is recommended. The methods are described.  
A. A. ELDRIDGE.

**Germination, food value, and vitamin-B of rice preserved for 4 years in carbon dioxide and air-tight containers.** M. KONDÔ, S. MATSUSHIMA, and T. OKAMURA (Proc. Imp. Acad., Tokyo, 1929, 5, 159—160).—Rice so preserved showed no loss in germination, food value, and vitamin-B content when compared with freshly harvested rice, whilst rice kept in straw sacks over the same period showed a total loss of vitality.  
C. C. N. VASS.

**Bacterial content and keeping quality of milk.** H. BARKWORTH, L. S. MEANWELL, and M. G. D. TAYLOR (J. Min. Agric., 1929, 36, 170—173).—Tables compiled from examination of a further 2400 samples in the course of 8 further competitions confirm the deleterious effect of the presence of *B. coli*, and the falling off in keeping quality as bacterial content increases.  
S. I. LEVY.

**F.p. of milk.** A. VAN RAALTE (Analyst, 1929, 54, 266—268).—The normal f.p. of unaltered milk with an acidity not exceeding 9 (c.c. of 0.25N-alkali/100 c.c. of milk) is taken as  $-0.54^\circ$  to  $-0.57^\circ$ . Milk from cows with diseased udders can have f.p. below  $-0.57^\circ$  owing to formation of lactic acid (not shown in the acidity). In Holland about 1 sample of milk is analysed yearly per 30 inhabitants, and the f.p. is taken of any milk with solids-not-fat of 8.2 or less in winter or 8.0 in summer.  
D. G. HEWER.

**Analysis of egg paste.** M. SETTIMI (Annali Chim. Appl., 1929, 19, 182—188).—The egg albumin in this material is best detected by Leone's method (B., 1925, 687). To determine the presence of yolk, tests should be applied for lecithin by extracting with absolute alcohol and precipitating with cadmium chloride; for cholesterol by extracting with chloroform, saponifying, and using the colour reaction with concentrated sulphuric acid; and for lipochromes by taking advantage of their resistance to decolorisation. The tests are described in detail.  
T. H. POPE.

#### PATENTS.

**Treatment of grain.** H. J. WHITE, Assr. to BETHLEHEM MILLING Co. (U.S.P. 1,706,760, 26.3.29. Appl., 25.2.27).—Grain particles are mixed with potassium carbonate while heating.  
H. ROYAL-DAWSON.

**Manufacture of food or dietetic preparations.** G. M. CLARK. From MATRO GES.M.B.H. (B.P. 309,097, 28.12.27).—The rootlets of malted grain or flours made therefrom are mixed with dry or diluted alkalis, alkaline-reacting salts, or lime, and the mixture is added to corn meal; the bitter taste of the material is thereby removed. If it is unnecessary to retain the vitamins the mixture of rootlets and alkali may be roasted for a short time at above  $100^\circ$ . The rootlets may be freed from dirt, sifted, soaked in sufficient alkaline solution, dried at a low temperature, sifted, and ground to a flour suitable for adding to the corn meal. They may also be steamed before treatment. The finished product contains 27—30% of nitrogenous material.  
W. J. BOYD.

**Food product.** B. DASS, Assr. to ELLIS-FOSTER Co. (U.S.P. 1,708,914, 9.4.29. Appl., 4.10.21).—Dried yeast is incorporated with peanut butter in the absence of sufficient moisture to permit fermentation.  
H. ROYAL-DAWSON.

**Manufacture of food products.** CALIFORNIA FRUIT GROWERS' EXCHANGE (B.P. 283,581 and 284,278, 3.1.28. U.S., [A] 15.1.27, [B] 27.1.27).—(A) A mixture of fruit juice, especially of citrus fruits, and milk is agitated to ensure fine subdivision of the curd, passed through a homogeniser, and dried in powder or flake form. (B) A protective colloid, e.g.,  $\frac{1}{8}$ —2% of pectin, may also be added.  
W. J. BOYD.

**[Non-hygroscopic] food product.** CALIFORNIA FRUIT GROWERS' EXCHANGE (B.P. 283,579, 3.1.28. U.S., 15.1.27).—A solution of lactose in fruit juice is dehydrated rapidly to a powder at low temperature. The lactose added must be equal to 10% or more of the weight of fruit juice solids present. Other sugars may be added.  
W. J. BOYD.

**Concentration of fruit juices and other liquids containing aromatic constituents.** M. K. SERAILIAN (B.P. 303,956, 8.11.27).—The liquid is evaporated while flowing in a continuous stream, first in a smaller evaporator the aromatic vapours from which are recovered by condensation, and then in a larger evaporator until the required density is obtained. The second evaporator is not necessarily provided with a condenser, but should have a connexion to a vacuum pump. The evaporators differ only in size, and preferably comprise a cylindrical lower part divided by radial walls into a number of segments through which the liquid flows in succession, leaving at the segment next to the point of entry, while evaporation and local circulation are effected by a (steam) heater at the centre. The vapour dome is common to all segments.  
B. M. VENABLES.

**Heat treatment of cereal substances.** C. W. CHITTY and D. W. KENT-JONES, Assrs. to WOODLANDS, LTD. (U.S.P. 1,710,472, 23.4.29. Appl., 28.6.26. U.K., 24.7.25).—See B.P. 263,897; B., 1927, 203.

**Preparation of mild aromatic yoghurt-curdled milk or sweet yoghurt junket.** G. WINKLER, Assr. to A. ZIERER (U.S.P. 1,710,133, 23.4.29. Appl., 18.5.27. Austr., 9.6.26).—See B.P. 272,468; B., 1928, 909.

**Cooking retorts.** R. A. SINDALL (B.P. 310,643, 17.4.28).



**Drying of cereals** (B.P. 308,548).—See I. **Margarine** (U.S.P. 1,707,800).—See XII.

## XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

**Mechanism of the [biological] action of colloidal sulphur.** R. AGNOLI (*Zymologica*, 1929, 4, 31—34).—The effects produced in the animal organism by injection of colloidal sulphur appear to be due, not merely to the poisonous action of the resulting hydrogen sulphide, but also to a colloidoclastic influence, which is due to the colloidal nature of the sulphur and is capable of producing a fatal shock. T. H. POPE.

**Oil containing geraniol.** B. RUTOVSKI and N. MAKAROVA-SEMLJANSKAJA [with I. V. VINOGRADOVA]. (*Riechstoffind.*, 1928, 3, 140—161; *Chem. Zentr.*, 1928, ii, 2197).—Oil of *Laserpitium hispidum*, M.B., during blossoming contains little alcohol, whilst in the fruit the alcohol seems to accumulate; it is chiefly contained in the fractions having  $d_{20}^{20} 0.8544$ — $0.8884$ ,  $\alpha_D +8.6^\circ$  to  $\pm 0^\circ$ ,  $n_D^{20} 1.4720$ — $1.5665$  (89.35% of the total). Oil from umbels of ripe or partly ripe fruit yielded geraniol, which is present in the essential oil to the extent of about 40%. A. A. ELDRIDGE.

**Essential oil of flowers of *Polianthes tuberosa*.** L. F. ELZE (*Riechstoffind.*, 1928, 3, 154; *Chem. Zentr.*, 1928, ii, 2198).—Eugenol, geraniol, nerol, methyl anthranilate, and methyl and benzyl benzoates are present. A. A. ELDRIDGE.

**Determination of citronellal in Java citronella oil.** SCHIMMEL & Co. (*Ber. Schimmel*, 1928, 20—21; *Chem. Zentr.*, 1928, ii, 2199).—The various methods have been critically examined. In most of the Java citronella oils examined the values obtained by the methods of Dupont and Labaune and of Reclaire and Spoelstra were in accord. Holtappel's modifications of Bennett and Salamon's method give good results if the final result of the titration is not recorded until the following day. A. A. ELDRIDGE.

**Non-heptane constituents of Jeffrey pine.** P. A. FOOTE (*J. Amer. Pharm. Assoc.*, 1929, 18, 350—353).—*n*-Octoic, *n*-nonoic, and *n*-decoic aldehydes have been identified in Jeffrey pine oil from California. E. H. SHARPLES.

**Bromometric and thiocyanometric examination of essential oils. II.** H. P. KAUFMANN [with H. BARICH] (*Arch. Pharm.*, 1929, 267, 249—267).—The bromometric and thiocyanometric iodine values of many constituents of essential oils very frequently differ, and use has been made of this fact to determine successfully the composition of several arbitrary mixtures. The method was then applied to various essential oils with the following results, the two sets of numbers in each case referring to the bromometric and thiocyanometric iodine values (the latter in parentheses), respectively: aniseed oil 188.8—177.5 (162.6—161.7), caryophyllin oil 335.9—307 (110—127.4), cinnamon oil 185.2—207 (10.07—30.3), juniper oil 352—364 (241.7—217.7), lavender oil 240—266 (141—145), rosemary oil 149.9—180.8 (107—110.8). Calamus oil, peppermint oil, thyme oil, caraway oil, and fennel oil afforded variable values, but in the case of the last-

mentioned oil the thiocyanometric method differentiated between old and fresh samples. *iso*Butylene reacts quantitatively with both bromine and thiocyanogen, but stilbene reacts only with bromine. Winkler's statement (B., 1927, 669) that the bromometric iodine value of an essential oil is characteristic is not strictly true, but in certain cases it is of value. S. COFFEY.

See also A., May, 528, **Ultra-violet light in quantitative chemical examination** (EISENBRAND). 553, **6-Amino-*m*-cresol and derivatives** (BOGERT and CONNITT). 576,  **$\gamma$ -Pyrrolidino- and  $\gamma$ -pyrrolino-propyl benzoates** (ANDREWS and MCELVAIN). 577, **Piperidine derivatives** (BOLYARD and MCELVAIN). **Local anæsthetics** (MARVEL and SHELTON). 583, **Test for ephedrine and related compounds** (CHEN). 584, **Microchemical reactions of cinchonine, cinchonidine, quinine, and quinidine** (WAGENAAR). **Reactions of morphine** (EKKERT). 600, **Basic titanium salicylate** (PICHON). 613, **Corn-silk** (NOGUCHI). **Determination of nitrate content of tobacco** (ANDREADIS).

### PATENTS.

**Manufacture of a therapeutically active iron preparation having yeast as its basic substance.** C. MASSATSCH, Assr. to MATRO GES.M.B.H. (U.S.P., 1,710,584, 23.4.29. Appl., 21.12.27. Ger., 12.11.25).—See B.P. 304,895; B., 1929, 303.

**Manufacture of arylazodiaminopyridines useful as bactericides.** I. OSTROMISLENSKY, Assr. to PYRIDIUM CORP. (Re-issue 17,281, 23.4.29, of U.S.P. 1,680,108, 7.8.28).—See B., 1928, 837.

**Viscosity of oils** (B.P. 307,602).—See I. **Concentration of aromatic liquids** (B.P. 303,956).—See XIX.

## XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

**Substances activating or determining the sensitivity of silver salts embedded in gelatin.** E. CALZAVARA (*Bull. Soc. Franç. Phot.*, 1929, 16, 56—59).—Doubt is expressed as to the conclusiveness of the proofs put forward for the pre-existence of compounds such as thiosinamine, cystine and its decomposition products, in naturally active gelatins. Up to the present no specific microchemical tests of sufficient sensitivity have been devised for the detection of either of these types of compounds *in situ* in the gelatin. Sullivan's test for cystine, using the sodium salt of 1:2-naphthaquinone-4-sulphonic acid, although specific, is too insensitive since it will only detect 1 pt. of cystine in 2500 pts. of water. A study of the variations in the sensitometric characteristics (gamma, inertia, etc.) of a standard emulsion, produced by the addition of these compounds during the ripening period, may afford a possible method for their identification. J. W. GLASSETT.

**Anti-fogging and anti-sensitising effects.** S. E. SHEPPARD (*Phot. J.*, 1929, 69, 206).—A reply to criticisms by Hamer and Price of the author's paper (B., 1929, 151). J. W. GLASSETT.

See also A., May, 522, **Coloration of thin layers of silver iodide in light** (JENCKEL). **Theory of the**



photographic process (KIESER). Photographic effects with silver bromide emulsions (TOLLERT). Coloration produced by dyes and silver halides (STEIGMANN). 535, X-Ray photographs (EBERT).

## PATENTS.

**Röntgen-ray photography. Röntgen diaphragm.** K. MAYER (B.P. 286,283 and 309,529, [A, B] 11.10.27).—Two diaphragms for the stopping of secondary radiation from the object or scatter from the fluorescent screen are described, of which (A) consists of finely-divided silver particles embedded in gelatin, prepared by development of ordinary sensitive plates or films which have been exposed to a parallel beam of X-rays; and (B) comprises a thin apertured screen of material opaque to X-rays, which may be in the form of a suitably slotted, endless band arranged to move over rollers past the plate. J. W. GLASSETT.

**Photographic printing.** R. FRITSCH (B.P. 309,747, 27.4.28).—The ordinary blue-print image of Turnbull's blue is converted into a more stable green-coloured uranium compound by treatment after washing with a mixture of the following solutions: (a) uranium nitrate, 10 g., water, 1 litre; (b) potassium ferricyanide, 10 g., water, 1 litre; (c) 100 c.c. of acetic acid. J. W. GLASSETT.

**Production of photographs in natural colours.** W. LANGGUTH and C. HUMMEL (U.S.P. 1,710,455, 23.4.29. Appl., 29.8.27. Ger., 9.7.26).—See B.P. 274,129; B., 1928, 503.

## XXII.—EXPLOSIVES; MATCHES.

## PATENTS.

**Rendering explosives non-deliquescent.** L. J. W. JONES (U.S.P. 1,706,668, 26.3.29. Appl., 21.3.27).—The ingredients, including commercial impurities such as magnesium and calcium chlorides, are mixed with dehydrated sodium carbonate and ground. After drying, the mixture is coated with a mixture of liquid nitrotoluenes. S. BINNING.

**Recovery of explosives from shells.** J. H. ROBERTS, Assr. to F. W. OLIN (U.S.P. 1,706,938, 26.3.29. Appl., 13.11.26).—Amatol (80:20) is recovered from shells by dissolution in 100% of hot 95% alcohol. On cooling the solution the resultant explosive crystals may be recovered in a non-compact form. S. BINNING.

**Manufacture of fuse compositions.** B. W. FOSTER, A. G. WHITE, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 309,625, 13.1.28).—Pitch or a mixture of pitch and sulphur is heated and cooled, after which the salt-petre and other ingredients (if any) are added without further heating. S. BINNING.

## XXIII.—SANITATION; WATER PURIFICATION.

**Water treatment to prevent embrittlement [in steam boilers].** F. G. STRAUB (J. Amer. Water Works' Assoc., 1929, 21, 511—523).—Embrittlement in high-pressure steam boilers, manifesting itself as cracks in highly stressed areas, e.g., seams and joints, is thought to be due to the presence of sodium hydroxide in the

boiler water as a result of the decomposition of sodium carbonate under the conditions attained, the carbon dioxide being driven off along with the steam. When a proper sodium sulphate to sodium carbonate alkalinity ratio is maintained embrittlement is prevented, and it is suggested that the ratio, suitable for the particular steam pressure of the boiler recommended by the Amer. Soc. Mech. Eng. boiler code should be adhered to, the proportion of sodium sulphate being adjusted by any convenient means. Addition of tannin and phosphate will also inhibit embrittlement, but careful control is necessary to ensure that the proper conditions are maintained within the boiler. C. JEPSON.

**Bacterium coli in iced and uniced samples of water.** G. ELLISON, H. W. HACKLER, and W. A. BUICE (J. Amer. Water Works' Assoc., 1929, 21, 528—530).—Samples of water sent for examination showed after 20—72 hrs. very little variation in *B. coli* content whether they had been dispatched in iced containers or not. On arrival, the ice was always melted, but the samples had a definitely lower temperature in each case. C. JEPSON.

**Chlorophenol tastes in waters of high organic content.** L. B. HARRISON (J. Amer. Water Works' Assoc., 1929, 21, 542—549).—Superchlorination and subsequent dechlorination with sulphur dioxide may only be successfully employed in preventing chlorophenol tastes when the water is of high organic purity, otherwise side tastes are produced which are considered to be worse. The addition of ammonia prior to chlorination fails to prevent the production of chlorophenol tastes, but is of value in preventing chlorinous odours. It has been shown on a practical scale that with waters of both high and low organic content a chlorinated water free from objectionable tastes can be obtained by the addition of potassium permanganate prior to coagulation and filtration; the amount used must be small enough to be entirely precipitated in the coagulation basins or a musty taste will be caused (cf. B., 1927, 381). C. JEPSON.

**Pyrethrin insecticides,** TATTERSFIELD and HOBSON.—See XVI. **Brewing waters.** KOUDELKA.—See XVIII.

## PATENTS.

**Sterilisation of air.** J. F. SCHILLER and W. W. WESCOTT (U.S.P. 1,706,594, 26.3.29. Appl., 14.5.24).—Air is compressed to approx. 3 atm. and then expanded by several successive stages and in minute streams to approx. 2½ atm. H. ROYAL-DAWSON.

**Sewage disposal system.** R. M. BIRNBACH (U.S.P. 1,708,864, 9.4.29. Appl., 8.6.25).—Sewage is passed through a number of closed cells in series, under strictly anaerobic conditions, each cell being fitted with a vent through which any air entrained with the sewage may be withdrawn. C. JEPSON.

**Chambers for the fermentation of offal, garbage, and like manurial matter.** M. VALTANCOLI (B.P. 310,402, 25.1.28).

**Respirators.** R. E. LANE, and CHLORIDE ELECTRICAL STORAGE Co., LTD. (B.P. 309,770, 26.5.28).