

BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

JANUARY 20, 1928.

I.—GENERAL; PLANT; MACHINERY.

Porosity and permeability of porous bodies.

W. L. HOWE and C. J. HUDSON (J. Amer. Ceram. Soc., 1927, 10, 443—448).—The apparent porosity, which is measured by means of an air-expansion porosimeter, is expressed as the percentage of the volume occupied by pores, whilst permeability is defined as the quantity of air flowing through an article of definite area and thickness in unit time, when tested under an arbitrary constant pressure difference. In measuring the permeability, air passes from a pressure-equalising tank to a plate box, where a pressure of 2 in. in excess of atmospheric is allowed to build up under the experimental plate (12 in. × 12 in. × 1 in.). Under these conditions the flow of air through the plate is determined by means of a previously calibrated gauge. An air-seal confines the passage of the air to the plate under investigation. The plates were made of a granular aluminous material of known grain size bonded with clay and fired at cone 12. The permeability was varied over a wide range, without appreciably changing the apparent porosity, by the adequate selection of grit size. The finer the grit the lower is the permeability. The permeability can also be changed by varying the content of bond clay, in which case the apparent porosity is changed. High bond contents result in producing bodies of lower apparent porosities and permeabilities. The permeability increases with increasing grain size. As finer grains are employed the body appears to become more dense; actually, however, it contains a greater number of finer pores, practically maintaining constant porosity.

A. T. GREEN.

Absorption towers. KAUFFMAN.—See II.

PATENTS.

Furnaces or kilns for heating goods. BRIT.

FURNACES, LTD., and E. W. SMITH. From SURFACE COMBUSTION Co. (B.P. 279,317, 22.3.27).—A furnace for, e.g., reheating steel is constructed with two gas producers, two recuperators, and two heating chambers preferably built into one structure. One heating chamber may be square-shaped to contain sheets, and the other elongated to contain bars. One producer is normally connected to one heating chamber and the other to the other, but there is provision for the gas from both producers to mingle and pass to either chamber, similarly with the heated secondary air from the recuperators.

B. M. VENABLES.

Annular rotary-hearth (sole plate) ovens. TROCK-

NUNGS-, VERSCHWELUNGS-, U. VERGASUNGS-GES.M.B.H., and F. BARTLING (B.P. 279,343—4, 26.5.27).—(A) The hearth which carries the goods is heated from below by stationary surface-combustion burners. (B) In addition

to the usual sand seal, an oven which has its rotary hearth heated from below is provided with a water-seal and cooling device to prevent escape of heat and to ensure that the supporting and driving mechanism remains cool.

B. M. VENABLES.

Heat interchangers. A. E. LEEK (B.P. 279,663, 8.12.26).—A heat exchanger with pairs of concentric gas and water tubes, in which the area available for the passage of air and/or gas is increased in steps from the inlet to the outlet.

B. M. VENABLES.

Producing a mixture of air and combustion products to be used for combustion in furnaces provided with rotating air preheaters. AKTIE-

BOLAGET LJUNGSTRÖMS ÅNGTURBIN (B.P. 263,492, 20.12.26. Swed., 22.12.25).—In addition to interchange of heat by conduction without mixing, a portion of the flue gases exhausting from the preheater is mixed with the entering air, whereby the primary combustion air will contain a proportion of carbon dioxide, which, by reduction to monoxide, will keep the lowermost layers of fuel and the firebars comparatively cool, avoiding corrosion and slagging of ash.

B. M. VENABLES.

Heating apparatus. F. PUENING (B.P. 255,866, 19.7.26. U.S., 24.7.25).—In a heating apparatus where the hot gases are pulsated by a piston, the latter is kept cool by air (or gas) admitted to its interior and exhausted through perforations on its surface in such a manner that a layer of cool air is formed, which is continually renewed and gradually mixes with the burning gases. The piston rod may be surrounded by an auxiliary piston and cylinder to pump the air.

B. M. VENABLES.

Apparatus for calcining cement, lime, dolomite, magnesite, etc., and for agglomerating ores.

E. W. STOLL (G.P. 444,569, 12.9.24).—The finely-divided material, gaseous, liquid, or pulverised solid fuel, and preheated combustion air are injected downwards or in a horizontal direction into a combustion chamber below a steam boiler, and the product is withdrawn at the bottom between cooling tubes.

L. A. COLES.

Pilger mills. SCHLOEMANN A.-G. (B.P. 279,353,

13.6.27. Ger., 18.3.27).—A feeding device for a pilger mill is provided with a brake comprising a quantity of water on one side of the feed piston which compresses air into a closed vessel during the feed motion, the pressure adverse to the feed rising rapidly and forming a practically definite but shockless stop, the position of which can be varied by altering the amount of air trapped in the vessel.

B. M. VENABLES.

Crusher. ALLIS-CHALMERS MANUF. Co., and R. C. NEWHOUSE (B.P. 279,742, 13.6.27).—A gyratory crusher which is driven by a motor, above, through a high-speed

shaft within the hollow crusher shaft, to reducing gearing and eccentric, below.

B. M. VENABLES.

Centrifugal machine. CONSTRUCTION FRANÇ. D'APPAREILS DE LATTERIE, and A. MINET (B.P. 279,318, 22.3.27).—In a centrifugal apparatus of the peg-top type, at speeds below the critical, the spindle is supported by centrifugal weights attached to it which slide against a fixed bearing surface, but at higher speeds the weights lift from the fixed surface, and the spindle and bowl run unsupported except at the bottom. B. M. VENABLES.

Concentrator. A. H. STEBBINS (U.S.P. 1,648,285—6, 8.11.27. Appl., [A] 2.7.26, [B] 19.7.26).—(A) A shaking table on which concentration is effected by air which is blown through the material in channels on the surface. (B) A shaking table; no mention of air or water is made in the principal claim.

B. M. VENABLES.

Classifying or separating machine. P. H. RAUN, Assr. to FREDERICK IRON & STEEL Co. (U.S.P. 1,647,812, 1.11.27. Appl., 7.1.26).—A separating machine comprises a number of rollers adjustably spaced in the same inclined plane, and having at the lower ends apertures through which water is sprayed to remove material lodging between them. Water sprays external to the rollers are also provided.

T. S. WHEELER.

Separating or classifying machine. W. A. RIDDELL (U.S.P. 1,647,815—6, 1.11.27. Appl., [A] 2.2.26, [B] 9.3.26).—(A) A separating machine comprising a number of rollers adjustably spaced in the same inclined plane is fitted with discs rotating between the rollers to prevent material lodging between them. (B) The rollers belong alternately to one of two sets, and means are provided for moving one set vertically with respect to the other to vary the distances between adjacent rollers.

T. S. WHEELER.

Apparatus for the treatment of materials by froth flotation. ELEKTRO-OSMOSE A.-G. (GRAF SCHWERIN GES.) (G.P. 443,616, 22.4.25).—To prevent adhesion of the froth to the side walls of the flotation vessel, secondary walls comprising a series of movable plates are provided within the froth zone. By means of a suitable mechanism, these walls may be drawn forwards in the direction of flow of the froth to accelerate removal of the froth from the flotation vessel.

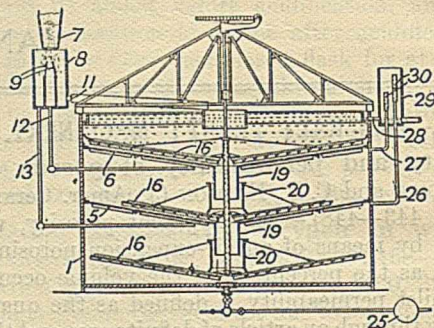
A. R. POWELL.

Apparatus for mixing and proportioning [liquid and solid] materials. E. P. HALLIBURTON (U.S.P. 1,649,062, 15.11.27. Appl., 16.9.26).—A feed hopper delivers the solid materials into an outlet pipe which is provided with a number of jets of the liquid. Each jet is supplied by its own pump, and the pumps are mechanically connected so that the ratio of their deliveries is positively determined.

B. M. VENABLES.

Separation of solids from liquids [in thickeners]. DORR Co., Assees. of W. C. WEBER (B.P. 262,479, 6.12.26. U.S., 5.12.25).—In a multi-deck or tray thickener, all the settled thick pulps are discharged at one place, viz., the extreme bottom, and dilution of the thick pulps by thin pulp is prevented. In the figure, 7, 8, and 9 indicate a feed splitter which ensures an equal supply of thin pulp to each of three settling compartments. The settled pulp from an upper compartment falls through a stationary sleeve or boot, 19, which is surrounded by

another sleeve or boot, 20, rotating with the rakes, and mingles with the settled pulp collected in the next lower compartment and so on until the lowest level of all is reached, and the combined thick pulp is removed through a pipe by, e.g., a diaphragm pump, 25. The



dilution of the thick pulp by thin feed pulp on its passage downwards is prevented by the sleeves, 19, extending below the sludge level of the lower compartment and by the adjustment described below. The clear overflow is drawn off through pipes 26, 27, and 28 from the top-most part of each compartment, and the hydrostatic head of the clear liquid in 26 and 27, is balanced against the head of the heavier thick pulp in the central column, and by altering this head by means of adjustable sleeves, 30, on the overflow ends of pipes 26 and 27, the rate at which the thick pulp is allowed to fall from each tray may be adjusted, and once adjusted the balance of thick pulp against clear liquid will be automatic, so that thin pulp cannot short-circuit through the central column.

B. M. VENABLES.

Separation of solids or semi-solids from liquids by drying or concentrating. J. A. REAVELL (B.P. 279,544, 27.7.26).—Heated air (or other gas) passes downwards with a whirling motion through a cylindrical casing at the top centre of which the liquid is sprayed centrifugally and horizontally. The liquid spray may be surrounded by a current of cold air which prevents premature evaporation. On arrival near the bottom of the apparatus the air is caused to turn sharply upwards into a zone of still larger diameter, so that its speed is reduced to such an extent that practically all the dried powder is deposited into the hopper-shaped bottom of the vessel.

B. M. VENABLES.

Washing solid material in centrifugal apparatus. F. SANDER, and I. G. FARBENIND. A.-G. (G.P. 444,062, 31.3.25).—The tubes conveying the washing water are spaced at such a distance on the circumference of a centrifugal drum that the contents can be discharged outwards. The orifices of the tubes are covered with filtering material.

L. A. COLES.

Drying apparatus with grate firing. HERRMANN & SÖHNE, KOMM.-GES. (G.P. 444,572, 23.8.23).—The drying chamber is protected from overheating by the provision of a lattice work of refractory bricks, oblong in shape and tapering upwards, between the grate and the walls of the chamber.

L. A. COLES.

Drying of moist material. KOHLENVEREDLUNG A.-G. (G.P. 443,272, 19.11.22).—The material is dried

in one or more compartments heated externally by steam at a temperature above that of the hottest of the escaping vapours, and drying is completed by replacing the steam by furnace gases. L. A. COLES.

Apparatus for mixing, compacting, degassing, or grinding more or less viscid material. A. SONSTHAGEN and G. PÖVERUD (B.P. 279,707, 6.4.27).—A mixer for compacting, degassing, or grinding viscous material is constructed with beaters giving an ordinary stirring motion and with shoes sliding on a surface which produce a wiping or grinding action. The grinding surfaces are provided with grooves, which ensure that there is always a film of material present and also act as vents for any gases emitted. Propellers are provided to keep the material in circulation between the two zones and a heating jacket may be provided.

B. M. VENABLES.

Atomiser. A./S. NIRO (B.P. 259,922, 4.8.26. Denm., 13.10.25).—A centrifugal atomiser comprising radial blades attached to a lower rotating disc is also provided with an upper disc either attached to the edges of the vanes or stationary, to prevent air being drawn in with the liquid.

B. M. VENABLES.

Atomisation of fluids. J. Y. JOHNSON. From INDUSTRIAL ASSOCIATES INC. (B.P. 279,925, 5.2.27).—A centrifugal sprayer comprises a centrifugal bowl to which the liquid is admitted, and in which it remains long enough to be accelerated to the full speed of the bowl. The spray is formed by the overflow of the liquid at both ends of the bowl.

B. M. VENABLES.

Spray-drying apparatus. W. H. DICKERSON, Assr. to INDUSTRIAL WASTE PRODUCTS CORP. (U.S.P. 1,648,939, 15.11.27. Appl., 9.1.23).—A stream of heated drying gas passes downwards without whirling through a cylindrical container, the liquid to be evaporated is sprayed by centrifugal means across the gas stream, and at a considerable distance below the spray cool gas is admitted to mix with the down-flowing combined stream. A collector is provided for dry material, and a wet one for vapours and any residual solid material, and the flow is induced by a fan.

B. M. VENABLES.

Vertical evaporator with long upright tubes. SOC. ANON. APPAREILS ET EVAPORATEURS KESTNER (G.P. 443,510, 5.7.24. Fr., 25.7.23).—The tubes are arranged so that channels for distributing the liquid in the lower compartment are formed between them, and the liquid from the centre or from the circumference of the compartment can flow through not more than three or four of the sets of tubes. Horizontal distributing plates are attached to opposite sections of the outer walls of the apparatus.

L. A. COLES.

Evaporator with horizontal tubes. E. SCHLEGEL (G.P. 443,740, 15.6.24).—The tubes of each group communicate with one another through compartments in front closed by a common cover, the removal of which exposes the interiors of all the tubes. The liquid from one group of tubes flows into another group through valves regulated by floats or by hand from the exterior of the apparatus.

L. A. COLES.

Apparatus for evaporating (concentrating) liquids without employing a vacuum. A. WURM (G.P. 443,511,

19.12.24. Addn. to G.P. 354,860; B., 1922, 737 A).—Means are described for improving the spraying effect of the bucket wheels in the apparatus described previously.

L. A. COLES.

Apparatus for rendering liquids homogeneous. MASKINFABR. "RAMIJE" (Dutch P. 16,212, 3.8.25).—The liquid flows through a channel on to the surface of a rotating cone enclosed in a suitable casing, and is forced between the cone and the casing.

L. A. COLES.

Clarification of liquids and solutions. E. MERCK, CHEM. FABR., Assees. of P. LANGENKAMP (G.P. 443,567, 3.9.25).—A powdered mixture of equivalent weights of potassium ferrocyanide and a compound which, after dissolution, forms an insoluble precipitate with it, such as copper sulphate, is added to the liquid or solution.

L. A. COLES.

Manufacture of absorbent materials. BRIT. DYE-STUFFS CORP., LTD., J. BADDILEY, and E. CHAPMAN (B.P. 280,262, 15.7.26).—Cotton wadding, absorbent paper, kieselguhr, or other materials intended for the absorption of aqueous liquids are impregnated with a wetting-out agent, viz., sulphonated aromatic, hydro-aromatic, aromatic-aliphatic, or polynuclear hydrocarbons, sulphonated alkylated mineral oil fractions, etc. or their salts, and dried. The rate of absorption by the treated materials is increased.

C. HOLLINS.

Liquid flow and viscosity meters. A. BERAUD and G. JACQUET (B.P. 271,846, 4.5.27. Fr., 27.5.26).—The apparatus comprises an arc-shaped piston, counter-balanced and spring-controlled to swing about a pivot and provided with a pointer moving over a scale. The piston works with considerable clearance in an arc-shaped "cylinder," and the liquid on its way to the point of consumption is forced through the clearance space, the drag deflecting the pointer according to the rate of flow.

B. M. VENABLES.

Manufacture of plates or walls of vessels to be heated or cooled by passage of fluid through tubes. R. SAMESREUTHER (B.P. 273,306, 22.6.27. Ger., 22.6.26).—Instead of the known construction of drawn metal tubes cast in the cast-metal walls of a vessel, which is heavy and mechanically weak, a strong light vessel of wrought plate (*e.g.*, steel) may have the tube coil welded on to it.

B. M. VENABLES.

Heating of gases and vapours. H. DUPUY (B.P. 272,886, 31.5.27. Fr., 18.6.26).—A mass of solid combustible matter has its temperature raised by passing a combustion-supporting gas through it, the gas to be heated is then passed through, and so on in turn. Means for admitting a small quantity of igniting combustible are provided should the temperature drop too low for spontaneous re-ignition.

B. M. VENABLES.

Transmission of heat from one gas to another. GES. F. LINDE'S EISMASCHINEN A.-G. (B.P. 256,271, 3.8.26. Ger., 31.7.25).—One gas transfers its heat (or cold) to a circulating liquid by direct contact, and the liquid transfers the heat (or cold) to the other gas. For example, in the liquefaction of ethylene using toluene as a heat carrier, the ethylene gas under high pressure at ordinary or cooling-water temperature flows counter-current to cold toluene under high pressure in one tower,

the liquid being raised to ordinary temperature and the gas is thereby chilled sufficiently to produce partial liquefaction on expansion. The unliquefied ethylene at lower pressure meets the toluene in another tower and cools it. If a single liquid with the necessary properties—f.p. below the lowest temperature attained and substantially non-volatile at the highest temperature—is not obtainable, the heat-transfer may be in more than one stage, using a different liquid in each stage.

B. M. VENABLES.

Pyrometers. SIEMENS & HALSKE A.-G., Assees. of VER. DEUTS. EISENHÜTTENLEUTE (B.P. 274,096, 7.7.27. Ger., 8.7.26).—In a pyrometer in which a portion of the gas of which the temperature is to be measured is drawn through a conduit surrounding the thermometer bulb or thermocouple, the latter is surrounded by bodies which, having good heat conductivity and large area, quickly attain the temperature of the gas and protect the pyrometer from radiation effects from the wall of the conduit.

B. M. VENABLES.

[Means for measuring the extent of the reaction in] apparatus for effecting chemical reactions in liquid media, or for concentrating liquids. I. G. FARBENIND. A.-G., Assees. of M. LUTHER and E. HOCHHEIM (G.P. 443,454, 17.12.25).—The extent to which the reaction has taken place is ascertained by measuring the mechanical resistance of the liquid to a stirrer rotating in it, e.g., by observing the distortion of a spring connecting the two halves of the main shaft carrying the blades. The method is useful, e.g., in the production of condensation products from carbamide and formaldehyde.

L. A. COLES.

Mechanically operated gas analysers. G. H. BARKER. From A. B. CUNNINGHAM (B.P. 279,319, 24.3.27. Cf. U.S.P. 1,311,952; B., 1920, 708).—A measured quantity of gas is taken, subjected to absorption of one of its constituents, and remeasured. The measuring vessel and mechanism are submerged in non-volatile oil, and the operations are performed automatically.

B. M. VENABLES.

Determination of the absolute moisture content of air and other gases. L. LÖWENSTEIN (G.P. 444,760, 29.6.24).—Air or gas is brought to a constant temperature before entry into the hygrometer, by heating it above the desired temperature and then passing it through a coil immersed in a liquid which is kept boiling and has a constant b.p. below the temperature of the gas.

L. A. COLES.

Carrying-on of [exothermic] catalytic reactions. J. M. SELDEN (U.S.P. 1,647,317, 1.11.27. Appl., 2.1.20).—The ducts containing the catalyst are immersed in a bath of molten metal, cooled externally by a current of air the velocity of which is thermostatically controlled.

T. S. WHEELER.

Pulverising and separating machinery. J. C. CARLINE (U.S.P. 1,651,372, 6.12.27. Appl., 19.7.26).—See B.P. 265,841; B., 1927, 287.

Regenerative heat-exchange device. F. LJUNGSTRÖM, Assr. to AKTIEBOLAGET LJUNGSTRÖMS ÅNGTURBIN (U.S.P. 1,652,025, 6.12.25. Appl., 11.4.21. Swed., 23.4.20).—See B.P. 162,250; B., 1922, 795.

Fire extinguisher. J. L. FOHLEN (U.S.P. 1,650,985, 13.10.23. Ger., 7.10.22).—See E.P. 205,110; B., 1924, 497.

II.—FUEL; GAS; TAR; MINERAL OILS.

Rational utilisation of Rumanian lignites. II. Attempts to briquette the semi-coke. I. BLUM (Bul. Chim. Soc. Română Stiin., 1926, 29, 3—13; cf. B., 1926, 652).—Semi-cokes prepared by carbonising Rumanian lignites in a rotary retort at 500° have been crushed and briquetted, using as binder 6—7% of a mixture of lignite pitch and petroleum pitch. By distillation and partial oxidation about 45% of the lignite tar could be converted into pitch for this purpose. The briquettes are superior in heating qualities to the lignite itself or to the semi-coke, and are capable of withstanding transport.

A. B. MANNING.

Auto-ignition temperatures. H. J. MASSON and W. F. HAMILTON (Ind. Eng. Chem., 1927, 19, 1335—1338).—If drops of a combustible liquid fall on to a surface, the temperature of which is gradually raised, a minimum temperature is eventually reached at which a drop ignites immediately after contact with the surface; this is termed the auto-ignition or spontaneous ignition point. Its actual value depends on a number of variables which in previous experiments have been imperfectly controlled. In the apparatus described all variables except the composition of the liquid and the temperature of the surface are kept constant. The surface consists of a platinum-platinum-rhodium thermocouple welded to a platinum plate which is heated in an electric furnace. The liquid is dropped from a hypodermic needle, and dry air can be passed over the hot plate as required; by raising the temperature sufficiently slowly the ignition point can be determined and repeated to within 1° F. Figures for a large number of pure organic compounds are given and possible interpretations of these are discussed.

R. H. GRIFFITH.

Determination of hydrogen in fire-damp. HEYER (Kali, 1927, 21, 147—148; Chem. Zentr., 1927, II, 310—311).—A colorimetric modification of von Zenghelis' method (cf. B., 1910, 1376) is described. The gas, after removal of carbon monoxide and hydrogen sulphide, is passed through a suitable quantity of a solution prepared by dissolving 0.1 g. of molybdenum trioxide in dilute sodium hydroxide solution, adding 0.1 g. of colloidal platinum mixed with sodium protalbinat, and diluting to 200 c.c., the solution being acidified with dilute sulphuric acid immediately before use. The solution is compared with standards prepared by treating further quantities with gas having a known content of hydrogen.

L. A. COLES.

Fractionation analyses of several fuel gases with special reference to illuminants. W. P. YANT and F. E. FREY (Ind. Eng. Chem., 1927, 19, 1358—1361).—A number of gases of high calorific value have been analysed in detail with respect to the saturated and unsaturated hydrocarbons present. Gas from low-temperature carbonisation under four different sets of conditions, coke-oven gas, carburetted water-gas from coke and anthracite, oil-gas, and mixed coal and water-

gas were examined. The sample was separated by distillation into fractions containing 1, 2, 3, 4, and more than 4 carbon atoms per molecule, and the proportion of unsaturated hydrocarbons was determined by absorption in sulphuric acid. Comparison of the analyses of gases produced by increasing carbonisation temperatures show the degradation of the larger molecules; the effect of varying temperature and hydrogen concentration on the ratio of olefine to olefine plus paraffin is demonstrated. Orsat analyses were carried out on the gases in order to compare their accuracy with that of the fractionation method. Calorific values for individual olefines are given which may be used for calculating the value of mixtures.

R. H. GRIFFITH.

Manufacture of water-gas of low specific gravity.

L. STEIN and L. J. WILLEW (Chem. Met. Eng., 1927, 34, 676—677).—Straight coal-gas has d 0.38—0.43, whereas ordinary carburetted water-gas has d 0.70. The supply of the latter at periods of maximum demand leads to difficulties owing to great variations in the density of the gas as it reaches the consumer. It was found, however, that the hydrogen content of carburetted water-gas could be substantially increased by spraying oil into the superheater during the "back-run," the hydrogen being derived from the over-cracking of the oil. By this method of operation an additional 0.5 gal. of oil was used per 1000 cub. ft. of gas, with a saving of 7 lb. of coke. The gas thus made had d 0.50—0.55, and the effective capacity of the water-gas generator was increased 25—50%. The above refers to gas of 550 B.Th.U. throughout.

C. IRWIN.

Distillation of Schwabian shale by means of inert waste gases.

K. NEUBRONNER (Petroleum, 1927, 23, 1567—1572).—On account of the low content of bituminous substances in Schwabian shale, distillation for oil or gas alone does not pay, and economic operation of the industry depends on use of the ash for the preparation of cement etc. Like other bituminous clay marls, this shale shows a tendency to sinter or even melt at fairly low temperatures, and on this account careful control of carbonisation is necessary. A two-stage process is described in which the oil is first distilled, the shale being heated internally by a suitable mixture of waste gas and air. After this the ash is burned completely in another vessel, great care being necessary at this stage to prevent clinker formation. Operating data, such as throughput, oil and gas yields, etc., are given for different shales, and heat balances for carbonisation in the laboratory are compared with those obtained on the large scale.

R. H. GRIFFITH.

Composition and distillation of shale present in potash mines. P. DOMEK (Bull. Soc. Ind. Mulhouse, 1927, 93, 462—467).—The shale consists mainly of inorganic constituents, but contains 7.13% of organic matter, and when distilled at 400—500° in closed retorts it yields a gas consisting chiefly of carbon dioxide and methane, an ammoniacal liquid (d 1.004), and an oily product (d 0.854). Details are given of the results obtained in fractionally distilling these products.

A. J. HALL.

Dry refining of Rumanian oils. P. NOBEL (Petroleum, 1927, 23, 1399—1401).—The presence of naph-

thenic acids in Rumanian petroleum has made difficult the adoption of dry-refining methods, as these substances or their sulphonation products are not completely removed by fuller's earth, and the oils darken quickly. Older processes of washing with aqueous alkali gave troubles with emulsification, but a new method of alkali treatment has proved successful. Oxides, carbonates, etc. of the alkali metals or alkaline-earths are added to the crude oil, either in the still or in a suitably adapted preheater, and the mixture is agitated for some hours before distillation. The naphthenic acids remain in the still in the form of soaps; when lime is added the resulting asphalt has a higher ash content and is somewhat more brittle than a normal sample of the same hardness; if caustic soda is used the softer asphalts are gummy and emulsify easily with water. The distillate is almost completely neutral and suitable for dry refining. The general advantages of the method are emphasised with heavy oils which normally show high refining losses.

R. H. GRIFFITH.

Determination of nitrogen bases in petroleum oils.

R. H. MCKEE and H. H. PARKER (Ind. Eng. Chem., 1927, 19, 1343—1344).—When sulphuric acid absorption is used to determine the unsaturated content of an oil, nitrogen bases are simultaneously removed. A number of artificial mixtures containing basic substances have now been treated with sulphuric, hydrochloric, and acetic acids of varying strengths in Babcock test bottles whirled in a centrifuge. From the results obtained it is demonstrated that 25% acetic acid is most generally suitable for removing bases from a petroleum distillate, although hydrochloric acid could be employed at varying concentrations in different cases.

R. H. GRIFFITH.

Determination of volatility of gasoline.

R. STEVENSON and J. A. BABOR (Ind. Eng. Chem., 1927, 19, 1361—1366).—The Engler distillation method for the determination of the volatility of a gasoline is unsatisfactory because the process of vaporisation in an automobile engine is not a fractionation. The use of the dew point as an indication of the temperature of complete vaporisation has been recently introduced, and the principle is now developed to apply not only to gasoline but to gasoline-air mixtures. The apparatus consists of a vaporiser, jacketed with superheated steam, in which the gasoline is volatilised, and a Dewar bulb containing the black-surface dew indicator which is under intense illumination. The indicator is cooled at a suitable speed by an internal stream of compressed air. Results are compared favourably with those given by the phase-change method, and, for pure substances, with their b.p. Modifications of the apparatus necessitated by its use for gasoline-air mixtures are described, but in practice these values need seldom be determined, as an empirical relation between the equilibrium end-point and the dew points of mixtures with air has been found.

R. H. GRIFFITH.

Emulsification of transformer oils.

G. INCZE (Petroleum, 1927, 23, 1398—1399).—The breakdown voltage of an oil depends on its purity, and is lowered by the presence of mechanically suspended impurities, air bubbles, and moisture. Water may be present by absorption from the air or by decomposition of the oil during use, and tables are given showing the lowering of

the breakdown voltage caused by small amounts of water. A method of testing the suitability of an oil is described which depends on the ease of emulsification with water; the test also indicates the degree of efficiency to which the oil has been refined.

R. H. GRIFFITH.

Efficient design and operation of absorption towers [for gasoline]. H. L. KAUFFMAN (Chem. Met. Eng., 1927, 34, 671—672).—A bubbling tower used for the extraction of petrol from natural gas consists of ten trays with 1½-in. seals and a "mist extractor" with a 6-in. seal. The lower trays may be fitted with coils for temperature control. Such a tower 30 ft. × 6 ft. has a capacity of 8—12 million cub. ft. of gas per 24 hrs., at 30 lb. working pressure. The bubble caps occupy practically the whole area of the trays, and are covered by a 1-in. layer of mesh. Absorption oil should be of good colour, low viscosity, sufficiently low vapour pressure, and low in unsaturated compounds.

C. IRWIN.

PATENTS.

Apparatus for extracting volatile matter [from coal]. K. E. CLAYTON-KENNEDY, Assr. to AMER. HYDROCARBON Co., INC. (U.S.P. 1,647,273, 1.11.27. Appl., 26.5.26).—A tumbler for use in rotary kilns for the distillation of coal is formed of two rectangular metal sheets with staggered perforations, intersecting at right angles and somewhat shorter in length than the kiln.

T. S. WHEELER.

Apparatus for carbonising wood. R. MALBAY (F.P. 619,791, 3.8.26).—A number of retorts are grouped in pairs coupled together at the top by a tube leading into a suction chamber, and by another tube leading into a second chamber. A fan is provided to circulate the gases through both retorts.

L. A. COLES.

Apparatus for indicating accumulations of fire-damp in mines, and for preventing explosions therefrom. F. W. MOLL SÖHNE (G.P. 443,270, 30.6.25).—A portion of the air surrounding a methane indicator is drawn through the lamp in such a manner that the temperature of the flame varies with the methane content of the air. When the temperature exceeds a pre-determined limit, it closes a weak electric circuit, and the supply of air to that portion of the mine is regulated automatically or by hand, so as to minimise risk of explosion.

L. A. COLES.

Apparatus for indicating the methane content of the air in mines. H. FLEISSNER (G.P. 443,269, 13.9.25).—A benzine safety lamp contains a vertical sheet of incandescent material in the form of gauze or grating placed immediately above the normal height of the flame. An increase in the methane content of the air is indicated by extension of the incandescent area.

L. A. COLES.

Drying and removing oil from gases and vapours. G. DE GEYTER (F.P. 620,874, 30.8.26. Belg., 5.5.26).—The gases pass over rotating conducting surfaces in a cylindrical vessel provided with consecutive inlets and outlets for the gases.

L. A. COLES.

Refining heavy mineral oils. L. EDELEANU, K. PFEIFFER, K. GRESS, and P. JOECK (U.S.P. 1,651,328, 29.11.27. Appl., 13.9.24. Ger., 19.9.23).—The oil is mixed with liquefied sulphurous acid and the mixture

passes to a settling chamber, the velocity of the liquid entering this chamber being retarded. Separation of the oil from impurities and sulphurous acid is effected by the action of gravity.

C. O. HARVEY.

Treatment of lubricating oil stocks. J. W. WEIR and W. J. RYAN, JUN. (U.S.P. 1,650,782, 29.11.27. Appl., 3.3.26).—Substantially sludge-free, sulphuric acid-treated lubricating oil stock is treated with an alkaline solution in such quantity that practically no excess of alkali above that required for neutralisation remains, and the soap is removed from the resulting emulsion by treatment at a temperature above 100° with a finely-divided adsorbent material and subsequent filtration.

C. O. HARVEY.

Oil-distillation process. E. C. D'YARMETT, Assr. to O. K. HERNDON (U.S.P. 1,646,449, 25.10.27. Appl., 16.12.26).—Liquid hydrocarbons are caused to flow longitudinally over a heated surface maintained at progressively increasing temperatures, and the moving liquid is caused by convection to undergo a number of local circulations in a vertical and transverse direction with respect to the main oil flow. The evolved vapours are withdrawn.

C. O. HARVEY.

Oil-distilling apparatus. E. C. D'YARMETT, Assr. to O. K. HERNDON (U.S.P. 1,646,448, 25.10.27. Appl., 2.4.26).—Entrained liquid is removed from vapours by passage through an inclined dephlegmator having upwardly and downwardly extending baffles arranged to vary intermittently the velocity of vapour and liquid.

C. O. HARVEY.

Cracking of oils. W. C. KIRKPATRICK, Assr. to NAT. REFINING PROCESS CORP. (U.S.P. 1,646,543, 25.10.27. Appl., 27.8.25).—Hydrocarbons are heated at about 260—316°, and forced at 600—700 lb./sq. in. through a nozzle which discharges into a still maintained at 150—200 lb./sq. in. and about 416°. The still is provided with means for discharging the resulting vapours and carbonaceous deposit.

C. O. HARVEY.

Cracking still [for hydrocarbons]. A. A. PHELAN (U.S.P. 1,646,929, 25.10.27. Appl., 1.11.26).—The top of a vertical cylindrical tank carries an inlet for heated liquid and a vapour outlet, the tank being provided with a partition extending from top to bottom dividing it into a liquid receiving chamber and a vapour outlet chamber intercommunicating through apertures in the lower end of the partition. The former chamber is provided with downwardly-inclined baffles spaced from the walls of the tank, and the latter chamber is partitioned off into a carbon-precipitating compartment (provided with baffles), from the base of which precipitated carbon admixed with liquid is withdrawn, and a liquid overflow compartment provided with an outlet controlled by a liquid-level valve.

C. O. HARVEY.

Apparatus for cracking [hydrocarbon] oil. G. EGLOFF and H. P. BENNER, Assrs. to UNIVERSAL OIL PRODUCTS Co. (U.S.P. 1,649,105, 15.11.27. Appl., 11.2.21).—Oil, heated in a tube still, passes through a transfer line into an expansion chamber, the discharge end of the transfer line being subdivided into a number of internally-rifled nozzles which cause the oil to emerge into the expansion chamber at a high velocity in a number of circulatory paths.

C. O. HARVEY.

Treatment of hydrocarbon oils. G. EGLOFF and R. T. POLLOCK, Assrs. to UNIVERSAL OIL PRODUCTS Co. (U.S.P. 1,649,104, 15.11.27. Appl., 9.12.20. Renewed 5.2.27).—Relatively heavy asphaltic and emulsified oils (d 0.933 or over) are distilled under reduced pressure, heat being applied to the upper surface of the oil by means of an electrically-heated element. C. O. HARVEY.

Treatment of emulsified [hydrocarbon] oils. G. EGLOFF and H. P. BENNER, Assrs. to UNIVERSAL OIL PRODUCTS Co. (U.S.P. 1,649,102—3, 15.11.27. Appl., [A] 18.9.20, [B] 23.10.20. Renewed, [A] 12.2.27, [B] 15.2.27).—(A) The oil is heated at a temperature adequate for dehydration and then cracked under pressure at a higher temperature. (B) The oil is forced, by means of a reciprocating piston, through a number of spaced foraminated partitions situated within a horizontal cylindrical chamber. C. O. HARVEY.

Refining [centrifugal separation of] lubricating oils. O. C. BREWSTER, Assr. to SHARPLES SPECIALTY Co. (U.S.P. 1,649,095—6, 15.11.27. Appl., [A] 18.10.21, [B] 19.11.21).—(A) Mineral oil is separated centrifugally from waxy constituents, and a carrier liquid at a temperature high enough to melt the wax is fed to the centrifugal rotor at the place of discharge of the latter. (B) A centrifuge for carrying out the process described in (A). C. O. HARVEY.

Retort for treating oil shale. E. B. ROTH (U.S.P. 1,649,195, 15.11.27. Appl., 30.6.26).—A vertical, double-walled retort is divided by floors into several compartments, each compartment being in communication with the gas space between the walls of the retort. A rotating vertical shaft carries agitating arms which extend into the compartments, and each compartment communicates by means of pipes with a chamber for receiving heated gases, situated around and opening into the lowest compartment. C. O. HARVEY.

Recovery of petroleum from oil-bearing sands. H. ATKINSON, Assr. to H. ATKINSON, F. K. HOLMESTEAD, and J. B. ADAMS (U.S.P. 1,651,311, 29.11.27. Appl., 4.4.26).—An alkaline solution, of strength sufficient to displace the oil, is introduced into the sand, which has previously been saturated with water.

H. ROYAL-DAWSON.

Fuller's earth treating process. R. R. ROSENBAUM (U.S.P. 1,649,193, 15.11.27. Appl., 29.1.27).—Fuller's earth is revived by washing it with liquid sulphur dioxide. C. O. HARVEY.

Liquid fuel. H. PLAUSON and P. SCHRÖDER, Assrs. to L. W. BATES (U.S.P. 1,647,471, 1.11.27. Appl., 26.8.21. Austr., 16.2.14).—See B.P. 4340 of 1914; B., 1915, 948.

Automatically-cleaned tar separators. COMP. POUR LA FABR. DES COMPTEURS ET MATÉRIEL D'USINES À GAZ (B.P. 272,237, 7.6.27. Fr., 4.6.26).

Froth flotation apparatus (G.P. 443,616).—See I. **Manufacture of sulphur** (B.P. 256,638).—See VII. **Linings for petrol tanks** (B.P. 279,291).—See XIV.

III.—ORGANIC INTERMEDIATES.

Alcohol from vegetable matter. CARRIÈRE.
Alcohol from sulphite spirit. SCHLUMBERGER.—See V.

PATENTS.

Production of carbon disulphide from its elements. I. G. FARBENIND. A.-G., Asses. of CHEM. FABR. GRIESHEIM-ELEKTRON (B.P. 260,969, 11.10.26. Ger., 3.11.25. Addn. to B.P. 174,040; B., 1922, 708 A).—In the manufacture of carbon disulphide by electrical heating with a movable electrode suspended vertically and a stationary bottom electrode, the latter is constructed as a crucible in which molten slag accumulates, ensuring a more regular passage of current, and forming a heat accumulator as well as preventing the carbon crucible from reacting with sulphur. W. G. CAREY.

Production of concentrated acetic acid. E. VON RETZE, Assr. to HOLZVERKOHLUNGS-IND. A.-G. (U.S.P. 1,647,676, 1.11.27. Appl., 14.6.26. Ger., 17.6.25).—Acetic acid in dilute aqueous solution is esterified, *e.g.*, to the ethyl ester, which is separated, and hydrolysed with a limited amount of water. T. S. WHEELER.

Manufacture of aromatic acid anhydrides. BRIT. DYESTUFFS CORP., LTD., J. B. PAYMAN, and N. HALL (B.P. 280,373, 29.11.26).—A compound of the type of benzotrichloride is heated with 1.5 mols. of water at 100—115° in presence of a suitable catalyst, *e.g.*, zinc chloride, ferric chloride, ferrous sulphate, organic sulphonates or other salts of zinc, copper, iron, aluminium, tin, etc. Crystallised ferrous sulphate may be used to provide both the water and the catalyst. C. HOLLINS.

Manufacture of aliphatic acid anhydrides. H. DREYFUS (B.P. 279,916, 1.6.26).—Acetic anhydride does not combine with dry steam, and hence may be obtained from acetic acid of any dilution by passing the acid vapour over a suitable catalyst and condensing anhydride without condensation of water. This is achieved by using a suitable condenser temperature, or preferably by means of a high-boiling solvent (chlorobenzene, *p*-dichlorobenzene, dibenzyl ether, tetrachloroethane, kerosene, glyceryl acetates, phenetole, anisole, cresols, *p*-tolyl acetate), especially such as are insoluble in water and non-volatile in steam. Other aliphatic anhydrides are similarly prepared. [Stat. ref. to B.P. 257,968, 256,664, and 256,663.] C. HOLLINS.

Manufacture of alkynaphthalenes. I. G. FARBENIND. A.-G., Asses. of FARBW. VORM. MEISTER, LUCIUS, & BRÜNING (B.P. 260,604, 28.10.26. Ger., 28.10.25).—Naphthalene is alkylated by treatment with an alkyl halide in presence of a metal halide and a metal oxide as acid-binding agent. Even methyl and ethyl chlorides react readily under these conditions at 160—180° (pressure 42—45 atm. with methyl chloride, 26 atm. with ethyl chloride). C. HOLLINS.

Manufacture of 1-diazoanthraquinone-2-carboxylic acids. I. G. FARBENIND. A.-G. (B.P. 262,119, 25.11.26. Ger., 28.11.25).—When the anthraquinone-1:2-*isooxazoles* of B.P. 147,001 (B., 1922, 50 A) are treated with nitrous acid or substances yielding nitrous

acid (e.g., nitrosylsulphuric acid), they are converted into 1-diazoanthraquinone-2-carboxylic acids. 1-Diazoanthraquinone-2-carboxylic acid is obtained in solution as sulphate or hydrochloride. 5-Nitro-1-diazoanthraquinone-2-carboxylic acid, prepared as crystalline sulphate from the 5-nitro-1-isooxazole, is converted by cuprous chloride into 1-chloro-5-nitroanthraquinone-2-carboxylic acid, m.p. 301°. C. HOLLINS.

Manufacture of sodium formate-formic acid compounds. E. ELÖD, Assr. to R. KOEPP & Co. (U.S.P. 1,650,984, 29.11.27. Appl., 24.9.23. Austr., 5.9.22).—See G.P. 424,017; B., 1926, 772.

Manufacture of lactic acid esters. H. W. MATHE-SON and K. G. BLAIKIE, Assrs. to CANADIAN ELECTRO PRODUCTS Co. (U.S.P. 1,650,950, 29.11.27. Appl., 4.9.25).—See B.P. 257,907; B., 1927, 796.

Production of emulsions. W. KRANNICH, H. KRZIKALLA, and C. SCHUSTER, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,652,016, 6.12.27. Appl., 10.3.27. Ger., 10.3.26. Renewed 2.11.27).—See B.P. 267,534; B., 1927, 869.

Absorbent materials (B.P. 280,262).—See I.

IV.—DYESTUFFS.

PATENTS.

Manufacture of a greenish-yellow azo dye. O. Y. IMRAY. From I. G. FARBENIND. A.-G. (B.P. 280,436, 5.5.27).—4-Chloro-2-nitroaniline is diazotised and coupled with acetoacetic *p*-chloroanilide to give a greenish-yellow pigment useful for lakes.

C. HOLLINS.

Manufacture of benzanthrone derivatives containing sulphur. I. G. FARBENIND. A.-G., Asses. of FARBW. VORM. MEISTER, LUCIUS, & BRÜNING (B.P. 259,608, 9.10.26. Ger., 10.10.25).—3:3'-Bisbenzanthronyl sulphide, m.p. 347° (cf. B.P. 256,059; B., 1926, 867), is obtained by heating 3-bromo- or 3-chloro-benzanthrone with hydrogen sulphide, sodium thiosulphate, sulphur and sodium acetate, or other sulphurising agent (excluding sulphides or polysulphides). C. HOLLINS.

Brown substituted benzidine wool dyes. W. NEELMEIER, Assr. to GRASSELLI DYESTUFF CORP. (U.S.P. 1,646,793, 25.10.27. Appl., 16.9.26. Ger., 25.9.25).—Tetrazotised 2:2'-dihalogeno- or -alkyl-benzidines are coupled with a diaminobenzenedisulphonic acid (1 mol.), and with a 7-amino- α -naphthol-3-sulphonic acid, or a derivative in which a hydrogen atom of the amino-group is substituted by alkyl or aryl, to give soluble dyes, which yield on wool and silk from an acid bath reddish-brown shades, particularly fast to fulling.

T. S. WHEELER.

Production of substantive dyes of the stilbene series fast to alkali. CHEMICAL WORKS FORMERLY SANDOZ [CHEM. FABR. VORM. SANDOZ] (B.P. 263,192, 18.12.26. Ger., 19.12.25).—The dyes obtained by condensing aminoazo-compounds with dinitrostilbene- or dinitrodibenzyl-disulphonic acid or with the dyes prepared by action of alkali on *p*-nitrotoluene-*o*-sulphonic acid are oxidised, e.g., with chlorine or hypochlorites, to give direct cotton dyes fast to alkali. Examples are

the oxidation of condensation products from dinitrostilbenedisulphonic acid and metanilic acid \rightarrow cresidine, or sulphanilic acid \rightarrow α -naphthylamine, and from Curcumine S and aminoazotoluenedisulphonic acid.

C. HOLLINS.

Manufacture of triarylmethane dyes. I. G. FARBENIND. A.-G. (B.P. 275,609, 27.7.27. Ger., 9.8.26).—Triarylmethane dyes containing as one of the aryl groups a 4-alkoxydiphenylamine residue show increased light-fastness. Examples are: tetramethyldiaminobenzophenone condensed with *p*-methoxydiphenylamine and sulphonated (blue), and Guinea Green 2G condensed with *p*-phenetidine (blue).

C. HOLLINS.

Manufacture of a greenish-yellow azo dye. H. WAGNER and A. FUNKE, Assrs. to GRASSELLI DYESTUFF CORP. (U.S.P. 1,644,003, 4.10.27. Appl., 8.10.25).—See B.P. 280,436; preceding.

Vat dyes of the anthraquinone series. M. KUGEL, Assr. to GRASSELLI DYESTUFF CORP. (U.S.P. 1,651,461, 6.12.27. Appl., 23.3.25. Ger., 31.3.24).—See B.P. 231,532; B., 1925, 910.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

De-suinting and scouring of wool. E. JUSTINMUELLER (Bull. Soc. Ind. Mulhouse, 1927, 93, 459—461).—Treatment (de-suinting) of raw wool with water at 55—60° for 5—7 min., and then two successive treatments (scouring) of 5 min. each (with squeezing between) at 45° with an alkaline solution containing 0.2% of Marseilles soap and 0.2% of soda ash resulted in losses of 47.9 and 51.2%, respectively. Microscopical examination indicated that the epithelial scales of the raw wool fibres were invisible owing to a superficial covering of amorphous and crystalline impurities, but immediately after treatment with water they became visible although the crystalline impurities closely resembling isocholesterol remained attached. By de-suinting with warm water and scouring with soap, the resulting losses were 13.0% of fatty substances other than waxes (e.g., lanoline) and 3.1% of wax substances (e.g., cholesterol and isocholesterol) respectively. Raw wool contains sufficient potash so that by treatment with warm water the whole of the fatty substances other than waxes are removed. Soap is necessary in the scouring of wool since aqueous solutions of sodium carbonate are unable to emulsify the waxes present.

A. J. HALL.

Moisture relations of colloidal fibres. J. J. HEDGES (J. Text. Inst., Spec. Issue, 1927, 18, 350—359 T).—The percentage regain of wool obtained by use of a commercial oven is always lower than that given by a laboratory method. A Bradford Conditioning House oven gives results as near the true moisture content as can be obtained without circulating dry air through the oven, the attraction for the last traces of moisture being very great. Curves for the variation of moisture content of chemically-pure wool with atmospheric R.H. are of the usual sigmoid character given by other hygroscopic colloids. The heat of wetting of dry wool is considerable, being 24.1 g.-cal./g. Wool and its absorbed water may be considered as a two-phase system in which a little water is adsorbed by the colloid particles, whilst the bulk is held in a system of pores. The differ-

ence between the apparent (in water) and true specific volumes of wool is much greater than that between the corresponding values for cotton, which, in conjunction with the relative values of the saturation moisture contents, points to a much greater contraction in total volume for wool. Wool, artificial silk, and silk (except heavily weighted silk) are perfect electric insulators when dry and all, except chemically-pure wool, increase in conductivity with increasing humidity. The fastness to light of dyed fabrics also appears to depend on the amount of moisture present. B. P. RIDGE.

Preparation of cross-sections of artificial silk. A. HERZOG (*Textilber.*, 1927, 8, 429—430).—A bundle of artificial silk fibres are coated with thick collodion or a solution of celloidin before embedding in the paraffin wax, a slight twisting of the bundle being also desirable, since it increases the rigidity of the cross-sections. If the sections are not stained, improved definition is obtained by means of oblique illumination under the microscope. A. J. HALL.

Viscose. XII. G. KITA, R. TOMIHISA, K. NAKAHASHI, and J. ONOHARA (*J. Cellulose Inst.*, Tokyo, 1927, 3, 265—273).—In the progressive stages of ripening, the capacity of the viscose to give a continuous thread varies with the temperature of the coagulating bath between 30° and 60° in the sense that the ability to spin at the lower temperatures covers a much smaller range of ripeness than at the higher temperatures. With under-ripe viscose this is due to difficulty of coagulation, whereas with over-ripe viscose, with rapid coagulation the threads become too fine to withstand the tension. A high temperature lowers the viscosity and facilitates the extrusion, but at the same time it increases the rate of coagulation so that the filaments may be finer. The tenacity of threads from the same viscose is generally greater the finer the filament, but the extensibility varies in the contrary direction. The properties of the thread change with the degree of ripening, for which there is an optimum point. In an ammonium sulphate-glucose bath, with sulphuric acid ranging from 4 to 12%, an under-ripe viscose first becomes capable of spinning with the higher concentration of acid, and with the higher concentrations an over-ripe viscose first ceases to give a thread. The threads spun from under-ripe viscose in strongly acid baths are lustreless and voluminous. A similar relation exists with high concentrations of ammonium sulphate as with high concentrations of sulphuric acid, except that the threads spun from under-ripe viscose with strongly saline baths are lustrous; they have also good tenacity. With weaker concentrations of ammonium sulphate the quality of the threads depends more intimately on the attainment of the optimum degree of ripening. J. F. BRIGGS.

[Physical] properties of artificial silk filaments consisting of mixtures of nitrocellulose and cellulose acetate. H. EVERS (*Textilber.*, 1927, 8, 873).—The dry and wet tensile strengths and extensibilities of artificial silk filaments dry-spun from 18% solutions in acetone of mixtures of nitrocellulose (containing 11.33% N) and cellulose acetate were compared. The dry tensile strength of the filaments decreased with an increasing proportion of cellulose acetate, the wet tensile strengths

being about 5% less. The extensibilities of the dry filaments were inappreciably affected by change in composition; when wetted, they swelled only slightly, but had an increased extensibility of 12%. The inflammability of a cellulose acetate filament containing but 5% of nitrocellulose was equal to that consisting entirely of nitrocellulose. A. J. HALL.

Rapid method for determining the degree of digestion of cellulose. C. B. BJÖRKMÄN (*Papier-Fabr.*, 1927, 25, 729—730).—A modification of the permanganate method is described, according to which 150 c.c. of 0.02N-permanganate and 5 c.c. of N-sulphuric acid are placed in a beaker at 25° and agitated by means of a glass stirrer operated by a motor at 1000 r.p.m. To this liquid a quantity of squeezed moist pulp containing about 60% of moisture and corresponding to 2 g. of dry cellulose is added while the stirrer is running, and the time of action is accurately gauged by a stop-watch at exactly 30 sec. At that moment 100 c.c. of 0.02N-acid ferrous ammonium sulphate are added and washed in with 40 c.c. of water, the stirrer being then stopped. The total quantity of liquid in the test-beaker being known, an empty Gooch crucible is pressed down into the mass and 100 c.c. of clear liquid are withdrawn through it by a pipette. The excess of ferrous sulphate is determined by titration with permanganate, and the oxygen consumed by the pulp is thence calculated. The results may be converted into the standard chlorine consumption values by reference to a graph, the whole test requiring only about 3 min. J. F. BRIGGS.

Ethyl alcohol from vegetable matter. CARRIÈRE (*Bull. Soc. d'Encour.*, 1927, 126, 612—617).—The problem of the conversion of cellulose into sugar, particularly from vine shoots and twigs, by the action of mineral acids, with the subsequent production of alcohol, is reviewed, reference being made to the Prodor, Meunier, and Dupont de Nemours processes, and to others in operation in Sweden and Germany. In the saccharification of vine stems etc. the results are dependent on time, and on the concentration and nature of the acid used, the best results being obtained by using a 1% solution of hydrochloric acid; after 7 hrs. the sugar obtained is 35.4% on the dry raw material. With sulphuric acid of similar concentration, even after 19 hrs., the sugar yield is only 32%. The quantity of sugar produced is 50% more from hard wood than from soft. The broken-up raw material is boiled for 4 hrs. with seven times its weight of 1.2% hydrochloric acid, the saccharine liquor separated from the residue, and the liquid boiled for a further 4 hrs. in contact with fresh raw material; this process is repeated in all four times, after which the solution is separated from the residue. The solution after filtration is neutralised and fermented. The amount of sugar in the solution is determined by means of Fehling's solution. H. M. LANGTON.

Explosion risks in the industrial preparation of absolute alcohol from sulphite spirit. E. SCHLUMBERGER (*Papier-Fabr.*, 1927, 25, 704).—The explosion range of alcohol-air mixtures is considerably greater than that of benzene-air mixtures, and although the heat of combustion of alcohol is less than half that of benzene vapour, the heats of combustion of explosive

mixtures of the two substances with air are nearly equal (about 475 kg.-cal./litre), as are also the theoretically possible explosion temperatures (about 1340°) and the ignition temperatures (about 600°). Precautions such as the use of an inert gas should therefore be taken in the manufacture of absolute alcohol from sulphite spirit, especially when the alcohol retained by the lime used for dehydration is removed in an air-stream.

W. J. POWELL.

De-inking of paper. T. R. BRIGGS and F. H. RHODES (Fourth Colloid Symposium Monograph, 1926, 311—327).—The "apparent" degree of de-inking of newspaper was determined as follows (30—40 min., 50 g. in 1 litre with paddle 1300 r.p.m.): sodium oleate (5 g.), 100; fuller's earth (10 g.) in 0.02*N*-sodium hydroxide, 95; 0.1*N*-sodium silicate, 84; sodium resinate (5 g.), 83; 0.1*N*-sodium hydroxide, 82; 0.02*N*-sodium hydroxide, 78; 0.1*N*-borax, 75; gelatin in 0.02*N*-sodium hydroxide, 71; sodium hydroxide (70—55°), 70; 0.1*N*-sodium carbonate, 69; gum arabic (10 g.) 65; gelatin (10 g.), 55; 0.1*N*-sucrose, 46; distilled water, 30; egg-albumin (10 g.), 26; 0.1*N*-sodium, calcium, or aluminium chloride, or lime water, 0. The ideal de-inking agent is a substance, preferably colloidal, which is adsorbed much more strongly by ink than by paper; if the reverse is the case, a mordanting action results. CHEMICAL ABSTRACTS.

Pulping of pine wood by the sulphite process. E. HÄGGLUND (Cellulosechem., 1927, 8, 111—112).—A reply to the criticisms of Schwalbe and Berndt (cf. B., 1927, 519).

W. J. POWELL.

Cellulose esters. G. KITA, I. SAKURADA, and T. NAKASHIMA (Cellulosechem., 1927, 8, 105—110, and Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1927, 6, 197—213).—See B., 1926, 944.

Hydrolysis of starch. FARGHER and PROBERT.—See XVII.

PATENTS.

Manufacture of felt. H. HAAKH (E.P. 275,939, 7.6.27. Ger., 14.8.26).—The manufacture of, *e.g.*, hats from felt is facilitated by treating the felt at any desired stage with chlorinating or brominating agents; the liquor resulting from the electrolysis of a solution of sodium chloride containing 5 g. of chlorine per kg. of felt can thus be used.

D. J. NORMAN.

Treatment of fibrous materials. T. L. DUNBAR, Assr. to STEBBINS ENGINEERING & MANUF. CO. (U.S.P. 1,646,084, 18.10.27. Appl., 3.9.26).—In a pulping process, fresh liquor heated to a predetermined temperature is pumped into the digester during the cooking process in order to build up a relatively high pressure while maintaining a relatively low temperature in the digester.

D. J. NORMAN.

Treatment of fibrous vegetable material. R. FORTYH, Assr. to H. J. RODGERS (U.S.P. 1,646,087, 18.10.27. Appl., 7.2.24).—The material is treated with hot distilled water containing a very small quantity of hydrochloric acid, squeezed to remove gums etc., and treated with hot distilled water containing a small percentage of sodium carbonate. After further squeezing, the material is rinsed with boiling distilled water, dried

slowly at a moderate temperature, and the bast fibres are mechanically separated from woody matter.

D. J. NORMAN.

Manufacture of fibrous compounds and articles moulded therefrom. JAROSLAW'S ERSTE GLIMMERWAREN-FABR., and R. SCHROEDER (E.P. 278,038, 26.5.26).—A fibrous material capable of being moulded into non-hygroscopic products of high mechanical strength and in which each individual fibre is coated with a binding medium, is prepared by coating or impregnating paper or fabric with a synthetic resin and afterwards completely disintegrating it by scutching it in high-speed mills etc. so that the fibres are separated but not broken; further binding agents may be added to the disintegrated material.

A. J. HALL.

Manufacture of artificial silk. E. ELSAESSER and A. HARTMANN, Assrs. to AMER. BEMBERG CORP. (U.S.P. 1,646,788, 25.10.27. Appl., 8.4.24. Ger., 7.12.23).—The threads are spun into the precipitating liquid in the inner of two inverted co-axial cones, and the liquid is fed to the upper portion of the outer cone. Formation of currents, which tend to break the silk as spun, is avoided.

T. S. WHEELER.

Spinnerette [for artificial silk]. R. V. WILLIAMS (U.S.P. 1,647,822, 1.11.27. Appl., 12.10.25).—The spinnerette is composed of an alloy containing 80—99% Au and 20—1% Ni.

T. S. WHEELER.

Production of non-glowing paper. M. LANGE and L. KAISER (G.P. 443,766, 28.4.25).—The paper is impregnated with salts of the rare-earth metals, *e.g.*, with a mixture of thorium and cerium salts.

L. A. COLES.

Manufacture of cellulose esters. P. BERTHON, Assr. to SOC. DE STEARINERIE & SAVONNERIE DE LYON (U.S.P. 1,651,990—1, 6.12.27. Appl., [A] 12.2.24, [B] 8.5.25. Fr., [A] 31.7.23).—See B.P. 219,926; B., 1925, 37.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Dyeing [of cotton] with Indanthrene Blue GCD. G. DURST and H. ROTH (Textilber., 1925, 6, 837—839).—Small-scale experiments supplemented by large-scale trials in jigs without submerged rollers show that in dyeing cotton with Indanthrene Blue GCD at 60°, the dye is uniformly absorbed during the first 30 min., and that subsequent absorption up to 1 hr. is much slower and small. During the first 5 min. a decrease (about 20%) of alkalinity of the dye liquor occurs due to adsorption by the cotton, but no further loss occurs during the remainder of the dyeing process. The unavoidable adsorption of atmospheric oxygen accompanied by a corresponding loss of hyposulphite which occurs during dyeing is greater the higher the temperature of the dye liquor; under comparative conditions, a cold dye liquor lost 1% of its hyposulphite per hour during a period of 26 hrs., but at 60° the corresponding loss was 18.5% per hour during 3 hrs. The absorption of Indanthrene Blue GCD by cotton is most rapid at 45°; increase of temperature of the dye liquor above 60° produces an inappreciable increase in the rate of absorption.

A. J. HALL.

[Dyeing of cotton with] **Indanthrene Blue RS.** G. DURST and H. ROTH (Textilber., 1927, 8, 158—160).—The methods previously described (cf. B., 1926, 819) for determining the composition of Indanthrene dye vats have been used for following the changes which occur in dye vats containing Indanthrene Blue RS during the dyeing of cotton. The rate of absorption of dye by the cotton is most rapid during the first 15 min., Indanthrene Blue RS thereby behaving differently from Indanthrene Blue GCD as determined by earlier investigations (see preceding abstract). Similarly, a marked loss of hyposulphite and caustic soda occurs during the first 5 min. of dyeing. The methods of analysis have proved sufficiently accurate and rapid to allow their application to the control of the composition of Indanthrene dye vat liquors used for padding cotton fabrics.

A. J. HALL.

[Dyeing with] **Indanthrene dyes.** G. DURST and H. ROTH (Textilber., 1927, 8, 785—787).—Curves are given showing the changes in the concentrations of dye and sodium hyposulphite which occur in dye liquors containing Indanthrene Yellow GK, Indanthrene Brown R, or Indanthrene Orange RRTS, when used for dyeing cotton under various conditions of time and temperature, the methods of analysis used being those previously described (B., 1926, 819). The rate of absorption by cotton of a "cold-dyeing" dye (e.g., Indanthrene Orange RRTS) is much less affected than that of a "hot-dyeing" dye (e.g., Indanthrene Brown R) by a change in the temperature of the dye liquor. The minimum loss of hyposulphite produced by atmospheric oxidation occurs in dye liquors containing about 5 g./litre of sodium hyposulphite.

A. J. HALL.

[Printing of] **green discharges on [indigo-]blue ground.** R. HALLER (Sealed Note 1861, 18.9.08. Bull. Soc. Ind. Mulhouse, 1927, 93, 456—457). Report by C. VAUCHER (*Ibid.*, 457—458).—Excellent green discharges are obtained by printing cotton fabric dyed with indigo with a discharge paste consisting of 540 g. of a 50% solution of gum, 150 g. of Rongalite, 86 g. of aniline, 110 g. of tannic acid, 70 c.c. of water, 16 g. of Acridine Yellow, 10 g. of Methylene Blue B, and 124 g. of 96% alcohol, then steaming for 5 min. in a Mather-Platt in the absence of air (oxygen), passing for 1 min. through a vat containing a boiling liquor consisting of 1000 litres of water, 25 litres of a 10% solution of soap, and 6 litres of an alkaline solution of glycerin and tartar emetic (3 litres of water, 2 kg. of glycerin, 500 g. of tartar emetic, and 1 litre of caustic soda, *d* 1.16), the rollers of the vat being submerged so that reoxidation of the indigo-white in the discharged parts is avoided. Subsequently the fabric is washed thoroughly so that any reduced Methylene Blue is oxidised, and then soaped and washed. Pure white discharges may be obtained simultaneously by use of a discharge paste consisting of 1 litre of a 50% solution of British gum, and 150 g. of Rongalite. Vaucher reports favourably on the process.

A. J. HALL.

Printing of Alizarin Red on non-prepared fabric. LA MANUF. SCHEIBLER [with A. LISZKOWSKI] (Sealed Note 1886, 1.3.09. Bull. Soc. Ind. Mulhouse, 1927, 93, 449—450). Report by P. WILHELM (*Ibid.*, 451).—

In printing Alizarin Red the usual preparation of the cotton fabric with Turkey-red oil is dispensed with and 10—15% of a compound of ricinoleic acid and aniline is added to the printing paste. *E.g.*, a very bright red shade is obtained by printing fabric with a paste consisting of 45.3 pts. of a starch thickening (prepared with 26 pts. of wheat starch, 5 pts. of acetic acid of *d* 1.036, and 51 pts. of water), 3 pts. of Alizarin ID (B.A.S.F.) 20% paste, 12 pts. of Alizarin GFX (Bayer) 20% paste, 10 pts. of aluminium thiocyanate (*d* 1.116), 3 pts. of aluminium nitrate (*d* 1.116), 8 pts. of calcium acetate (*d* 1.116), 1.2 pts. of stannic oxalate (*d* 1.125), 2 pts. of tartaric acid 15%, 3.5 pts. of 60% formic acid, and 12 pts. of the product obtained by heating 300 pts. of ricinoleic acid with 95 pts. of aniline (this product is soluble in ammonia). Wilhelm reports that the resulting shades are as bright and fast to soaping as those obtained by the usual method on oil-prepared fabric. During steaming, the aniline neutralises the acids present and thus prevents tendering of the fabric.

A. J. HALL.

New reserve effects under Aniline Black [by printing]. G. KNOOP (Sealed Note 1889, 16.3.05. Bull. Soc. Ind. Mulhouse, 1927, 93, 452—453). Report by P. BINDER (*Ibid.*, 453—455).—Reserve effects under Aniline Black, as clearly defined as those produced by the usual Prud'homme method, are obtained by printing cotton fabric with a reserve paste containing a gum thickening, zinc oxide, and Turkey-red oil, drying, then padding with the usual "prussiate" Aniline Black liquor, ageing in a small Mather-Platt, and after-chroming. Coloured effects are obtained by adding basic dyes (Thioflavine T, Brilliant Green, Victoria Blue BO, and Turquoise Blue are suitable) to the reserve paste. A satisfactory reserve consists of 1 kg. of gum thickening, 370 g. of zinc oxide, 500 g. of Turkey-red oil, 30 g. of ammonia solution (*d* 0.915), and 50 g. of a basic dye. Binder reports favourably on the process especially as regards the production of clear-cut edges to the pattern effects.

A. J. HALL.

PATENTS.

Dyeing [regenerated cellulose materials]. BRIT. DYESTUFFS CORP., LTD., and J. BADDILEY (B.P. 280,320, 7.9.26).—Level shades on viscose silk are obtained by using monoazo dyes containing as coupling component 2-amino-5-naphthol-7-sulphonic acid ("J-acid") or its *N*-substituted derivatives. Eighteen examples are mentioned, in which J-acid, its *N*-phenyl, *p*-tolyl, *o*-anisyl, β -naphthyl, and benzoyl derivatives, and 5-hydroxy-2-naphthylglycine-7-sulphonic acid are coupled with diazotised aniline, *p*-chloroaniline, *p*-nitroaniline, *p*-aminoacetanilide (with subsequent hydrolysis), *o*-anisidine, 2-chloro-*p*-toluidine-5-sulphonic acid, dehydrothio-*p*-toluidinesulphonic acid, β -naphthylamine, β -naphthylamine-6-sulphonic and -6:8-disulphonic acids. The shades are orange to red and violet. C. HOLLINS.

Colouring of furs and other materials. BRIT. DYESTUFFS CORP., LTD., R. S. HORSFALL, and L. G. LAURIE (B.P. 279,942, 4.8.26).—The solubility of dyes of all classes in aqueous liquids is greatly enhanced by the presence of hydroxylated benzene derivatives, *e.g.*, phenol, pyrogallol, and particularly resorcinol. The

deeply-coloured solutions are used for colouring furs, bone, ivory, horn, resins, and celluloid films.

C. HOLLINS.

Colour printing on fabrics [containing cellulose acetate]. ETABL. PETITDIDIER (ANC. MAISON JOLLY-BELIN) (B.P. 256,238, 27.7.26. Fr., 1.8.25).—Fabrics containing cotton (or viscose silk) and acetate silk are printed with a colour having affinity for acetate silk, steamed, and rinsed, and the whites finally cleared with 0.1% solution of sodium hyposulphite. For the printing pastes, Duranol or Setacyl colours are diluted with water and thickened with gum etc.; basic colours are used with "acetanol" (a pyridine salt manufactured by Etabl. Kuhlmann); Ionamines are excluded. C. HOLLINS.

Colour printing on fabrics having a foundation of silk or wool. ETABL. PETITDIDIER (ANC. MAISON JOLLY-BELIN) (B.P. 258,562, 6.8.26. Fr., 17.9.25. Addn. to B.P. 256,238; preceding).—In the application of the prior invention to fabrics of acetate silk and silk the whites are cleared by means of an acid bath (0.1% sulphuric acid) or by means of 0.2–0.3% sodium hyposulphite solution. For acetate silk-wool mixtures the hyposulphite solution may be 0.5%. C. HOLLINS.

Manufacture of wetting-out agents etc. BRIT. DYESTUFFS CORP., LTD., J. BADDILEY, and E. CHAPMAN (B.P. 279,990, 20.9.26).—Wetting-out agents are obtained by sulphonation with 100% sulphuric acid or weak oleum of a mineral oil fraction, b.p. 240–300°. C. HOLLINS.

Mordant paste. S. NIISATO (U.S.P. 1,647,539, 1.11.27. Appl., 21.4.27).—A mixture of a sodium soap, tannic acid, acetic acid, sodium chloride, and the solution obtained by extracting rice bran with boiling water is claimed. T. S. WHEELER.

Discharge effects on [textile] materials containing acetyl cellulose. L. SMITH, ASSR. to BRIT. DYESTUFFS CORP., LTD. (U.S.P. 1,651,639, 6.12.27. Appl., 23.9.26. U.K., 25.11.25).—See B.P. 262,254; B., 1927, 71.

Preparation of cotton fibres [for direct dyeing]. P. KARRER, ASSR. to CHEMICAL WORKS FORMERLY SANDOZ (U.S.P. 1,650,989, 29.11.27. Appl., 6.3.26. Ger., 11.3.25).—See B.P. 249,842; B., 1927, 71.

Treatment of articles with soaps (B.P. 253,105 and 280,110).—See XII.

Decoration of fabrics (G.P. 441,690).—See XXI.

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

Volumetric and thermal relations of contact sulphuric acid. R. NITZSCHMANN (Continental Met. Chem. Eng., 1927, 2, 176–178, 208–209).—Equations are given for the calculation of the volumes of oxygen, nitrogen, and sulphur dioxide as a function of the percentage conversion and the percentage of sulphur dioxide in the initial burner gas. Data are also given for the heat content of roaster gases (from iron pyrites) as a function of the theoretical temperature of combustion, the maximum temperature difference between the gases entering and leaving the converter as a function of the percentage conversion, the temperature of the

gases leaving the contact catalyst as a function of the percentage conversion, and the relations of the heat exchange up to emergence from the catalyst.

CHEMICAL ABSTRACTS.

Determining heat consumption for caustic [soda and potash] dehydration. G. ANGEL (Chem. Met. Eng., 1927, 34, 683–685).—Whilst the heat absorbed in the separation of solid caustic soda or potash from solution is equal to the heat liberated on dissolution, and the heat for evaporation of the water is also calculable, the question of heat absorbed in raising the temperature of the solution to its final b.p. presents difficulties. The problem can, however, be regarded as the determination of the total of the following:—Heat required to raise pure sodium hydroxide to the final temperature, total heat and superheat of saturated steam at this temperature, and the heat of dilution. It is shown that this total can be approximately calculated, using mean values for the specific heats of solid sodium and potassium hydroxides; the results indicate that the efficiency of certain coal-fired caustic pots was 46½%. Electrically-heated pots may have 85% efficiency. Dehydration *in vacuo* was shown to effect a saving of only 4% of the heat consumed in the latter case, but with coal-fired pots, owing to indirect savings, the economy is 20%.

C. IRWIN.

Function of steam in the lime kiln. E. E. BERGER (U.S. Bur. Mines, Tech. Paper No. 415, 1927, 43 pp.).—It is usual in lime-burning to place a steam-jet under the grate. This has been generally considered to accelerate the process by specific chemical action, a view based mainly on experiments by Herzfeld. To investigate the point an apparatus was designed by which granulated limestone could be ignited in a quartz tube with constant air supply. The rate of calcination at varying temperatures was then determined with similar feeds of air, steam, and helium, the latter being chosen on account of its absolute inertness. It was found with all three that decomposition commenced at 600°. It was slightly more rapid with steam than with air and still more so with helium. It is concluded, therefore, that the differences are due to varying rates of heat-transfer, and that any chemical action of the steam is excluded. The differences are in accordance with the heat capacity and conductivity of the gases. In the lime kiln where only 5% of steam is used, the effect of these differences must be negligible. Steam, however, by its reactions with carbon cools the fuel bed, it being certain that under the conditions obtaining in practice a large part of it must be reduced in the upper part of the bed. This effect also minimises clinkering of the ash. The combustion of the resulting hydrogen and carbon monoxide with the secondary air give the desirable long flame. It is recommended that only enough steam should be introduced to prevent clinkering. If this is not sufficient to produce the necessary draught a fan should be used rather than excess steam. In some plants waste flue gas is used in place of steam, the effect of carbon dioxide on the fuel bed being very similar to that of steam. It is shown that with 5% of carbon dioxide in the feed gases the thermal loss at the stack is less than with 0.5 lb. of steam per lb. of fuel. The loss rises rapidly if more carbon dioxide is used. C. IRWIN.

Detection of iodides in alkali bromides. S. V. ΜΙΚΟ (Pharm. Zentr., 1927, 68, 763—765).—The presence of 0.4 mg. of potassium iodide can be detected in 5 c.c. of a 5% alkali bromide solution by oxidation with 5 drops of 0.1*N*-potassium permanganate in 5*N*-hydrochloric acid solution, and shaking the mixture with 2 c.c. of xylene; the bromine is decolorised within 1 min. and the rose colour of the iodine remains. S. I. LEVY.

Determination of the purity of elementary boron. J. W. ANDREWS (Chemist-Analyst, 1926, No. 47, 16).—The boron is fused in a covered silver crucible with a mixture of sodium hydroxide and potassium nitrate, the product is slightly acidified with hydrochloric acid, and the carbon dioxide boiled off under reduced pressure. The liquid is neutralised (using *p*-nitrophenol as indicator), mannitol is added, and the boric acid is titrated in the usual way, employing phenolphthalein. CHEMICAL ABSTRACTS.

Shale from potash mines. DOMEC.—See II.

Germicidal efficiency of sodium salts. LEVINE and others.—See XXIII.

PATENTS.

Production of nitric acid. METALLBANK U. METALLURGISCHE GES. A.-G., and DEUTS. SPRENGSTOFF A.-G., Assees. of W. MELZER and W. VON BOLTENSTERN (G.P. 443,338, 15.1.26. Addn. to G.P. 440,657; B., 1927, 813).—The oxidation and condensation stages in the process described previously are effected by the action of ozone formed at the electrodes. The quantity of ozone formed can be regulated by varying the electrical potential, and can be augmented from other sources.

L. A. COLES.

Production of anhydrous sodium sulphate from Glauber's salt. FELNER & ZIEGLER A.-G., and B. YOUNG (G.P. 444,048, 29.8.23).—The salt is dried in a rotating drum of which the first section is conical in shape and is provided with a perforated screw conveyor and with outlets for the expelled water. L. A. COLES.

Manufacture of readily soluble salts of hydrofluosilicic acid. W. MÖLLER and W. KRETH (B.P. 263,780, 7.12.26. Ger., 23.12.25).—A highly concentrated solution of hydrofluosilicic acid is mixed with a quantity of a readily-soluble salt (*e.g.*, magnesium chloride) several times greater than that theoretically required to form the silicofluoride, and preferably in a solid state, the silicofluoride being precipitated in crystalline form. After separation of the mother-liquor, the excess of salts and the acid liberated may be recovered therefrom.

W. G. CAREY.

Conversion of barium carbonate into barium oxide. P. ASKENASY and R. ROSE (G.P. 443,237, 23.1.25).—Barium carbonate is heated with a large excess of carbon, preferably petroleum coke, and during or after the process excess carbon is removed by heating the material in a current of air or sulphur dioxide at a temperature sufficiently high to prevent conversion of the oxide back into the carbonate. L. A. COLES.

Utilisation of barium and strontium sulphates. RHENANIA-KUNHEIM VER. CHEM. FABR. A.-G., Assees. of F. ROTHE and H. BRENEK (G.P. 443,320, 13.11.24).—Mixtures of the sulphates with silica or siliceous material

in such quantities that silicates of the type M_2SiO_4 to M_3SiO_5 are formed are heated at the decomposition temperature (1100°) or higher, in an oxidising atmosphere and in the presence of steam, which may be added as such or formed during the process by passing in gases containing hydrogen. Silica recovered on decomposing the products with mineral acids, or residual alkaline-earth metasilicates obtained by decomposing them with water, are used for the decomposition of fresh material. L. A. COLES.

Impregnation of calcium carbide [to protect it against moisture]. OFFICE CENTRAL DE L'ACÉTYLÈNE ET DE LA SOUDURE AUTOGÈNE. (F.P. 619,959, 5.8.26).—Lubricating oil, after use in internal-combustion engines, is used for the purpose. L. A. COLES.

Production of a basic calcium aluminium nitrate. I. G. FARBENIND. A.-G., Assees. of K. BLUMRICH, P. OSSWALD, and W. GEISLER (G.P. 443,568, 4.12.25).—Calcium oxide is added to calcium nitrate solution containing alumina or aluminium nitrate. L. A. COLES.

Production of crystalline basic aluminium nitrate. I. G. FARBENIND. A.-G., Assees. of H. FINKELSTEIN (G.P. 444,517, 25.1.25).—A solution of aluminium hydroxide in nitric acid in such proportions that the constitution of the solute lies between the mono- and di-hydroxynitrate, or the acid content of which does not greatly exceed that required by the former, is allowed to crystallise to such an extent that the crystals approximate to the dihydroxynitrate, and, after removal of the crystals, the mother-liquid is used for the dissolution of more aluminium hydroxide. L. A. COLES.

Decomposition of potassium magnesium bicarbonate. VER. FÜR CHEM. U. MET. PRODUKTION (G.P. 443,456, 10.4.25).—The double salt ($KHCO_3, MgCO_3, 4H_2O$) is decomposed by treatment with magnesium hydroxide, and, immediately the reaction is complete, carbon dioxide is led into the potassium carbonate solution formed while it is still in contact with the precipitated magnesium carbonate ($MgCO_3, 3H_2O$). L. A. COLES.

Production of chromium salts free from iron [from mixtures of chromic and ferric salts]. I. G. FARBENIND. A.-G., Assees. of C. MÜLLER and L. SCHLECHT (G.P. 443,624, 24.7.24. Addn. to G.P. 410,927; B., 1927, 546).—Iron is precipitated as ferric hydroxide or as a basic salt, which is removed from the solution, by heating aqueous solutions of the mixed salts at high temperatures, preferably above their b.p. L. A. COLES.

Production of acid pyrophosphates. J. A. BENCKISER CHEM. FABR., and K. KLINGBIEL (G.P. 443,196, 6.1.22. Addn. to G.P. 410,098; B., 1925, 401).—Primary alkali or alkaline-earth phosphates are heated together with small quantities of oxidising salts of non-volatile bases. L. A. COLES.

Production of arsenates and pyroarsenates. E. BRITZKE (G.P. 443,286, 26.7.25).—A mixture of arsenic trioxide vapour with an excess of air or oxygen is passed over bases at 500° or 800° for the production of arsenates or pyroarsenates, respectively. L. A. COLES.

Recovery of carbon dioxide from gas mixtures. EISEN- U. STAHLWERK HOESCH A.-G. (G.P. 443,684,

17.10.25).—The gases are passed through alkali solutions, and carbon dioxide is subsequently liberated from solution by electrolytic means. L. A. COLES.

Production of solutions and compounds of chlorine. G. ORNSTEIN (G.P. 443,683, 31.7.26).—Liquid chlorine and a solvent or reacting liquid are sprayed, in such a manner that intimate admixture of the particles is effected, into a chamber insulated to prevent loss of heat by radiation. L. A. COLES.

Production of hydrogen bromide from its elements. J. D. RIEDEL A.-G. (G.P. 443,195, 27.4.24).—Bromine vapour and hydrogen are passed together or separately through a heated, perforated or porous device constructed of refractory material resistant to the action of bromine. L. A. COLES.

Manufacture of sulphur. C. STILL, Assee. of GES. F. KOHLENTCHNIK M.B.H. (B.P. 256,638, 6.8.26. Ger., 6.8.25).—Crude material containing sulphur, *e.g.*, coal-gas purification material, is treated with ammonium sulphite solution containing free ammonia in a steam-heated vessel fitted with stirring gear, and, after settlement of the insoluble material, which is again used for gas purification, the ammonium thio-sulphate is run off and kept at 90° for about 8 hrs. with a measured amount of sulphuric acid, the precipitated sulphur being separated and purified. To obtain the ammonium sulphite, the crude material, with the addition of pyrites, is roasted in a rotary furnace and the resulting sulphur dioxide is purified, cooled, and absorbed in ammonia in a vertical scrubber. W. G. CAREY.

Production of precipitated material containing silicon [for coating articles]. SIEMENS & HALSKE A.-G., Assees. of E. KRAUSE (G.P. 444,363, 21.10.25).—A mixture of a non-reacting gas, *e.g.*, carbon monoxide, with a hydrocarbon derivation containing silicon, *e.g.*, silicon tetraethyl, is passed over the heated article upon which it is desired to form a siliceous deposit. L. A. COLES.

Production of arsenic acid and its solutions. P. ASKENASY and E. ELÖD (U.S.P. 1,650,860, 29.11.27. Appl., 29.1.25. Ger., 29.3.24).—See B.P. 255,522; B., 1926, 823.

VIII.—GLASS; CERAMICS.

Frosting of glass by mixtures containing hydrofluoric acid and alkali fluorides. C. D. SPENCER and L. OTT (J. Amer. Ceram. Soc., 1927, 10, 403—410).—The crystal-like areas on acid-frosted glass, which are detected by microscopic examination at high magnifications, have been explained by three theories. The first assumes that the glass has a crypto-crystalline structure, the second that etching results from the deposition of a crystalline or amorphous precipitate, whilst the third, which is accepted by the authors, postulates that these areas are merely amorphous glass, the appearance of crystallinity being due to the protective action of crystals of silicofluorides during etching, with the consequent selective attack by the solvent. Observations show, in the initial stages of etching, the formation of a finely-divided precipitate at the interface between the glass and the solution. After a short time crystals of silicofluorides make their appearance in the solution

contiguous to the glass surface, and then settle in contact with the glass itself. These crystals expand laterally, and finally establish contact with their neighbours, protecting the glass immediately beneath them from further attack. Thus the glass surface obtains a crystalline appearance by reason of this peculiarity of the acid attack. Surface tension also influences the development of this surface structure. A theory of the mechanical weakness of frosted hollow-ware, based on the physical properties of fissures of small radius of curvature, is put forward. It is suggested that by increasing this radius—by the fortifying action of different solvents—increased strength can be obtained. A. T. GREEN.

Third progress report on investigation of saggar clays; their elasticity and transverse strength at several temperatures. R. A. HEINDL and W. L. PENDERGAST (J. Amer. Ceram. Soc., 1927, 10, 524—534; cf. B., 1926, 539, 917).—The apparatus used in the determination of the elasticity and transverse breaking strength, at three temperatures ranging up to 950°, together with its calibration and precision, is described. Specimen bars, 1 sq. in. in cross-section and about 11 in. long, made of 50% of clay and 50% of grog, were prepared and fired at 1230°, and finally subjected to the tests. The load-deflection curves show that, in the majority of cases, Hooke's law holds good, and that the yield point and point of rupture of clays are, generally, reached simultaneously. One material, however, of high porosity and low strength, shows a definite yield point under a load of 37½ lb., and a point of rupture at 60 lb. The seventeen clays tested can be divided into three groups, showing for the modulus of elasticity (1) a decrease at the highest temperatures; (2) a great increase at the highest temperatures; (3) an increase approximately proportional to the temperature increase. The majority of clays increase in modulus of elasticity when tested at 750° as against room temperatures. Only those clays which were comparatively weak increase greatly in strength at 750°, the majority showing little variation from their corresponding values when cold. An approximately direct relationship exists between transverse strength and elasticity, and an inverse one between porosity and elasticity. With two clays plastic deformation started at 950° with a load of 60 lb./in.² Irrespective of applied load, this was the lowest temperature for plastic deformation. The resistance of a saggar to failure is directly proportional to its modulus of rupture and inversely to its modulus of elasticity and coefficient of linear thermal expansion. This empirical relationship is satisfactory for values obtained between 500° and 700°. A. T. GREEN.

Changes in the viscosity of clay slips and glaze suspensions on ageing and by treatment with electrolytes. J. R. BOWMAN (J. Amer. Ceram. Soc., 1927, 10, 508—516).—The thinning of a glaze suspension or clay slip (*i.e.*, reduction in viscosity on being kept) was examined in the case of two glazes, both showing a strong tendency to thin out—one fritted and the other raw—and of an English ball clay. These slips and glazes were mixed with water and ground in a ball mill. Viscosity was measured by the "pipette" method, precautions being taken to control the temperature. The

viscosity of a thin clay slip decreased slightly during the ageing period, but with a "thick" slip a much greater reduction took place, the minimum being reached after six days. With glaze suspensions a very pronounced decrease in viscosity was noted after two days, the rate of decrease becoming very slow after six days. This spontaneous thinning was greatly accelerated by heat. Glaze suspensions, aged until thinning was complete and then brought back to their original condition of viscosity by means of an electrolyte, were not nearly so liable to a repetition of the phenomenon of thinning, and when thinning occurred it did so to a much less extent. Further viscosity reduction in the acid-treated sample was smaller and less rapid than in the base-treated suspension. The behaviour of glaze suspensions in practice can be controlled either by heating until thinning is completed and then bringing them up "to gauge" with an electrolyte, or by keeping the glaze for several days and then treating it with an electrolyte. The merits of the second method have been proved. A. T. GREEN.

Hydrogen-ion concentration and electrical conductivity of clay slips. I. Plant study. A. H. FESSLER and H. M. KRANER (J. Amer. Ceram. Soc., 1927, 10, 503—507).—To elucidate a method of clay slip control in industrial operations, daily samples of tap water, casting and plastic slips, consignments of clay, and the clay slips in blungers were examined. Measurements of the slip consistency, viscosity, p_H value, and electrical conductivity of many individual samples are reported in graphical form. Although considerable variations in the p_H value of tap water and of casting and plastic slips are noted, these do not correspond with any apparent variation in the workability of the body made from these slips. There is no relation between the p_H value of the tap water used in blunging and the viscosity of the slips. Although different consignments of clay showed differing p_H values, no corresponding differences in the properties of the clay could be detected. Changes in the viscosity and density of plant slips do not necessarily produce changes in their conductivity. Further, hydrogen-ion concentration is not influenced as much as is viscosity by the electrolyte present. Viscosity determination remains the best method of slip control. Methods for determining the p_H value and electrical conductivity are described. A. T. GREEN.

Effect of fine grinding on an indurated clay. T. C. WALKER (J. Amer. Ceram. Soc., 1927, 10, 449—450).—A clay mined in an indurated form was found to lack plasticity in normal use. With the object of testing improvement in this property, the clay was ground to pass a 10, 30, 100, and 150 mesh, respectively. It was found that fine grinding gives a direct increase in the plastic properties, and increases the water of plasticity, tensile strength, and drying shrinkage of the raw clay. The fired samples showed increased shrinkage and a decrease in percentage absorption and porosity, with augmented fineness of the raw clay. A. T. GREEN.

Mechanical introduction of barium into clay bodies. M. W. BLAIR (J. Amer. Ceram. Soc., 1927, 10, 464—466).—Barium carbonate is added to clay bodies to prevent scumming. The amount of this addition, which should always be experimentally determined,

varies from 2 to 20 lb. per thousand bricks. Its addition as a dilute solution forming the pugging water is not efficient since the amount of water required varies with the clay condition, and results in a variable amount of the barium salt being introduced. When added as a concentrated solution, disadvantages arise by reason of the amount of scrap returned to the pug mill and the tendency of barium carbonate to settle out when the solution flows appreciable distances. The sprinkling of the correct amount of the salt on to a raw clay before it is subjected to grinding is inadequate owing to the indefinite nature of the mixing. More accurate methods are based on the principle of feeding the salt into the dry pan in proportion to the speed of the feeding conveyor.

A. T. GREEN.

Bureau of Standards investigation of felspars—second progress report. R. F. GELLER (J. Amer. Ceram. Soc., 1927, 10, 411—434).—Screen analyses and air elutriation, chemical analyses, softening range, softening point, and true specific gravity determinations on nineteen felspars are reported. Whiteware bodies, in which these felspars were the only variable constituents, were made and tested for mechanical strength, colour, light transmission, firing behaviour, and thermal expansion. Glazed specimens were subjected to tests for crazing. Chemical analyses indicate that the felspars can be divided into three fairly distinct groups. The refractoriness increases and the softening range decreases with increasing K_2O content. The true specific gravity of crystalline felspar ranges from 2.635 for commercially pure soda felspar to 2.572 for commercially pure potash felspar. The volume shrinkage of vitreous bodies appears to decrease with increase in the K_2O content. Whereas the colour of a body in reflected light is not influenced by the felspar, the translucency increases with increase of the potash content. The mechanical strength of a body is affected more by the method of firing than by the nature of the felspar. The thermal expansion is increased by rapid firing and by an increased content of soda in the spar. A. T. GREEN.

Solubility of fired [ceramic] bodies in hot sulphuric acid. A. V. BLEININGER (J. Amer. Ceram. Soc., 1927, 10, 535—537).—The assumption that the solubility of an earthenware body decreases with the temperature of firing is made. Details of the method of determining solubility are given. The results are not concordant, and do not justify the hypothesis. A. T. GREEN.

Dissolution of fused aluminous materials. R. W. ELLISON (J. Amer. Ceram. Soc., 1927, 10, 463).—A method of analysis of fused aluminous products, such as silicates of the sillimanite and mullite series, based on a combination of a bisulphate and a sodium carbonate fusion, is described. A. T. GREEN.

Rumanian kaolins. A. I. BRANISKI (Bul. Chim. Soc. Română Stiin., 1926, 29, 15—77).—The Rumanian kaolins have been analysed and classified. None is of markedly superior quality, and many will find application only in the manufacture of stoneware and refractory materials. A few, however, can be used in the manufacture of porcelain, although of a variety inferior to and less translucent than that of Sévres.

A. B. MANNING.

Properties of refractories in zinc metallurgy.

E. S. WHEELER, A. H. KUECHLER, and H. M. LAWRENCE (Bull. School Mines Met., Miss., 1927, 10, [2], 1—139).—For the manufacture of retorts and condensers for zinc distillation the use of reclaimed retort material as part of the grog is of doubtful economy, but old bricks may be used if they were originally made of a good refractory clay, and the addition of a quantity of properly calcined flint clay is recommended. Diaspore clay is the best grog material, but is usually too expensive. Burley clay is probably the second-best clay material, as bodies made from this clay show less sag and firing shrinkage, and are more resistant to spalling than bodies made from the standard grog of broken saggars. If carborundum fire-sand is used it should have a low iron content, and cyanite must be calcined at 1400° until conversion into mullite is completed. Sagger clays and high-silica grogs usually give less sag and firing shrinkage but a lower modulus of rupture than the standard grog. Tests of various American clays from different localities showed relatively little difference, indicating that the nature of the grog is of more importance than that of the clay. The bulletin contains numerous tables showing the composition and properties of American clays and grogs, and graphs showing the variation of the physical properties of the refractory according to its composition.

A. R. POWELL.

Porosity and permeability. HOWE and HUDSON.—See I.

PATENTS.

Manufacture of hollow bodies from quartz and similar materials. W. CARPMAEL. From I. G. FARBEIND. A.-G. (B.P. 280,291, 12.8.26).—Hollow bodies closed at one end are made by the electric fusion of quartz etc. by using a hollow resistor closed at one end and having both terminals at the other end, one being connected to the body of the resistor and the other to a tubular internal stem leading to the closed end. The resistor may be spiral, so that heat is radiated through the intermediate spaces.

W. G. CAREY.

Furnace [cement kiln] lining. A. G. CROLL, Assr. to ATLAS PORTLAND CEMENT Co. (U.S.P. 1,647,083, 25.10.27. Appl., 5.7.23).—A rotary cement kiln is lined with bricks of which the outer faces are composed of heat-insulating material, *e.g.*, a mixture of cement and clinker, and the inner faces of a mixture of cement and a heat-conducting material, *e.g.*, iron. Preferably, the latter mixture is formed in layers, in which the percentage of iron increases as the inner surface is approached.

T. S. WHEELER.

IX.—BUILDING MATERIALS.

X-Ray study of magnesium oxychloride cement.

T. MAEDA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1926, 5, 95—102).—An X-ray study of powdered magnesium oxychloride cements shows the presence of crystalline $3\text{MgO}\cdot\text{MgCl}_2\cdot 12\text{H}_2\text{O}$ in the cement after setting. Magnesium hydroxide together with magnesium chloride solution yields a product in which definite crystalline structure could not be found, although it appears possible that imperfect crystals might be present. The diffraction lines of magnesium oxide

cannot be found in the diffraction diagram of hardened cement. The presence of crystals in the cement is not, however, a confirmation of Le Chatelier's theory (Trans. Faraday Soc., 1919, 14, 8), as these crystals may be of the dimensions of colloidal particles. R. TRUSZKOWSKI.

Reactions taking place after treatment of calcareous [building] stones with sodium silicate. P. GAVELLE (Chim. et Ind., 1927, 18, 564—585).—Commercial sodium silicate solutions (*d* 1.32) containing 33% of solid silicate ($\text{Na}_2\text{O}\cdot 3\cdot 5\text{SiO}_2$) behave on dialysis and in diffusion tests as true colloidal solutions, practically no separation of silica and soda taking place in either test. On mixing such solutions with precipitated calcium carbonate and exposing the mixture in thin layers to the air a rapid loss in weight occurs during the first few days due to evaporation of water, but subsequent loss is slight and the total loss is always 46.6% calculated on the weight of silicate solution. The first apparent action is the formation of a gel, followed after prolonged keeping by the appearance of small needle-shaped crystals of hydrated sodium metasilicate. Even after the lapse of a year no appreciable change takes place in the calcium carbonate particles. After a short period of exposure, addition of water regenerates the original colloidal solution, but after longer periods an irreversible gel is formed. In the presence of carbon dioxide the separation of the gel is accelerated. From these results the mechanism of the silicification of calcareous building stones after treatment with sodium silicate is explained as follows. The solution dries on the surface with the formation of a film of gel which slowly becomes irreversible, whilst crystals of hydrated sodium metasilicate form in the interior. The outer layers are slowly decomposed by the carbon dioxide of the air with the deposition of amorphous silica, the sodium carbonate simultaneously formed being washed away by rain. The solution which has penetrated into the pores of the stone is slowly decomposed by the impurities present, calcium carbonate itself being inert, and insoluble double silicates are thus formed in the pores, thereby strengthening the resistance of the stone to further atmospheric denudation.

A. R. POWELL.

Schwabian shale. NEUBRONNER.—See II. **Steam in the lime kiln.** BERGER.—See VII.

PATENT.

Manufacture of a [wood] preservative. R. H. SCHUMACHER, Assr. to B. W. and E. W. FULGHUM, and W. R. SADLER (U.S.P. 1,647,937, 1.11.27. Appl., 15.2.23).—The product obtained by the action of alkali on an oil containing free fatty acids, *e.g.*, fish oil, is mixed with creosote and copper oleate.

T. S. WHEELER.

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

Apold-Fleissner process of roasting [iron ores in shaft furnaces]. R. BRANHOFFER (Stahl u. Eisen, 1927, 47, 2061—2066).—In the Apold-Fleissner method of roasting spathic iron ore, the ore is passed downwards in a continuous stream through a shaft furnace, through which is passed a current of hot air or flue gas with a low content of carbon dioxide, while a current of cold air passes upwards through the lower part of the shaft

below the hot-air tuyères, this part acting as a cooling chamber for the ore and a preheating flue for the air which rapidly and completely oxidises the ferrous oxide formed in the upper zones of the furnace. The quantity and temperature of the hot gases and cold air used are carefully regulated so as to keep the carbon dioxide content of the flue gas at a minimum and thereby ensure a thorough roasting of the ore at the lowest possible temperature. Diagrams of the furnace used and calculations of the heat balance are given. It is claimed that a furnace roasting 200—450 tons/day requires about 160,000—200,000 kg.-cal./ton with a heat efficiency of 73%.
A. R. POWELL.

Blast-furnace gas. J. F. BARKLEY (U.S. Bur. Mines Tech. Paper, 1927, No. 401, 1—9).—A record of actual and calculated yields of gas per ton of iron.

CHEMICAL ABSTRACTS.

Problem of sulphur in cast iron and steel. J. CIOCHINA (Chim. et Ind., 1927, 18, 600—604).—Striking a balance between the input of sulphur into the blast furnace in the ore, fuel, and fluxes and the output in flue gas, slag, and metal about 50% of the input remains to be accounted for. Evidence is adduced to show that this escapes from the stream of metal during casting, and it is suggested that it volatilises as free sulphur produced by the thermal dissociation of sulphides in the metal stream.
A. R. POWELL.

Calcium carbide as an agent for removing sulphur and phosphorus from iron and steel. W. J. FARRELL, JUN. (J. Western Soc. Eng., 1927, 32, 206—218).—Calcium carbide removes sulphur under reducing conditions and phosphorus during oxidising conditions. The iron is preferably treated with calcium carbide in the hot furnace and poured over a surface covered with the carbide.
CHEMICAL ABSTRACTS.

Desulphurising action of manganese in iron. C. H. HERTY, JUN., and J. M. GAINES, JUN. (U.S. Bur. Mines Rep. Invest., 1927, No. 2817, 8 pp.).—The concentration of manganese and sulphur is expressed by an equilateral hyperbola. The relation between the temperature and the solubility product ($\% \text{ Mn} \times \% \text{ S}$) for manganous sulphide in iron in contact with solid manganous sulphide is shown at 1100—1440° and 1—1.75% Mn. In this range the dissolved manganous sulphide increases rapidly from 0.03 to 0.65%. Probably manganese cannot act in the blast furnace and in the open hearth directly as a desulphuriser.
CHEMICAL ABSTRACTS.

Von Seth's method of extracting vanadium from pig iron. R. VON SETH and G. HULT (Tek. Tid., Uppl. C [Bergsvetenskap], 1927, 57, 20—22).—A description of works' practice for the removal of vanadium and its recovery from the slag. The latter, after grinding and magnetic separation of iron particles, is roasted for 5—8 hrs. at 750—825° with 20% of sodium chloride and a little lime, whereby 75—80% of the vanadium is converted into soluble sodium metavanadate.
CHEMICAL ABSTRACTS.

Iron blast-furnace reactions. S. P. KINNEY, P. H. ROYSTER, and T. L. JOSEPH (U.S. Bur. Mines Tech. Paper, 1927, No. 391, 1—65).—The results of gas-sampling in six planes indicate that the combustion of

coke takes place in a restricted zone at the nose of each tuyère; the extent of the combustion zone controls movement in the upper part of the furnace. The higher carbon dioxide content near the wall indicates greater reduction there in unit area and time.

CHEMICAL ABSTRACTS.

Determination of manganese in steels and other alloys with a high content of chromium or cobalt. E. ROUSSEAU (Chim. et Ind., 1927, 18, 772—780).—The alloy (0.2 g.) is dissolved in 15 c.c. of sulphuric acid diluted with 30 c.c. of water, and organic material derived from the carbides present is oxidised with 3 c.c. of a cold saturated solution of ammonium persulphate. The liquid is neutralised with ammonia, heated to 80° with a further 3 c.c. of persulphate solution, and poured into 40—50 c.c. of ammonia solution. After boiling for 3 min. the liquid is filtered and the precipitate, containing all the iron and manganese, but free from chromium and cobalt, is dissolved in dilute sulphuric acid; the manganese is then determined colorimetrically after oxidation with persulphate in the presence of silver nitrate.
A. R. POWELL.

Colorimetric determination of molybdenum in steel. J. KASSLER (Chem.-Ztg., 1927, 51, 953—954).—A sample (1 g.) of steel drillings is dissolved in 50 c.c. of hydrochloric acid (d 1.12) containing 60 g./litre of sodium phosphate, the solution is oxidised with 25 c.c. of 5% potassium chlorate solution, boiled to expel excess chlorine, diluted with 100 c.c. of hot water, and neutralised with sodium hydroxide, and the vanadic acid reduced with 3 g. of ferrous chloride. The hot solution is then poured in a thin stream into 100 c.c. of 16% sodium hydroxide solution, and the mixture is cooled and diluted to 500 c.c. in a graduated flask; 20 c.c. are filtered through a dry paper, treated with 10 c.c. of 10% potassium thiocyanate solution and 10 c.c. of stannous chloride in hydrochloric acid, and the resulting brown colour compared with that of a standard prepared from pure molybdenum trioxide dissolved in sodium hydroxide and treated in a similar manner. The stannous chloride solution is made by dissolving 30 g. of the salt in 150 c.c. of hot, concentrated hydrochloric acid, diluting to 500 c.c. with acid of d 1.12, and adding 500 c.c. of water.
A. R. POWELL.

Etching agent for determining sulphide inclusions in technical iron. M. KÜNKELE (Werkstoffaussch. Ver. deut. Eisenh. Ber., 1925, No. 75, 3 pp.).—A few drops of a reagent, prepared by dissolving gelatin (5 g.) in water (20 c.c.), adding glycerol (20 c.c.) and sulphuric acid (2 c.c.), and, after mixing, 0.8 g. of silver nitrate in aqueous solution, are spread on the polished surface. The blackened surface is rinsed with water, the thin film of silver rubbed off under water, and the specimen dried with alcohol. The liberated hydrogen sulphide precipitates silver sulphide, which protects the sulphide inclusion and its neighbourhood from further action.
CHEMICAL ABSTRACTS.

Binary systems silicon-iron, iron-phosphorus, iron-manganese. H. ESSER and P. OBERHOFFER (Werkstoffaussch. Ver. deut. Eisenh. Ber., 1925, No. 69, 7 pp.).—With increase in the silicon, phosphorus, and manganese content, the temperature of the A3 trans-

formation rises, whilst the intensity decreases proportionally with the silicon content. Below 2.4% Si (0.4% P) at 1100°, the α - γ change cannot be observed; the temperature of the γ - δ change falls with increase of phosphorus. Up to 1% P the temperature of the A2 change is almost constant; it falls to 1.9%, and is constant at 740° to 13%.

CHEMICAL ABSTRACTS.

Rapid determination of iron in brass. A. ZIMMERMANN (Chem.-Ztg., 1927, 51, 915).—The drillings (2 g.) are dissolved in 10 c.c. of nitric acid (d 1.4), and the solution is evaporated with 10 c.c. of 50% sulphuric acid until copious white fumes are evolved. After addition of 40 c.c. of water and warming until the salts are dissolved, the solution is heated with a zinc rod for 30 min. on the water-bath to reduce the iron to ferrous sulphate and precipitate copper, tin, and lead as sponge metals, decanted from the latter, and titrated with permanganate.

A. R. POWELL.

Aluminium alloys and sea-water corrosion. K. L. MEISSNER (Metallurgist, 1927, 143, 71–74).—Corrosion of "lantal" (cf. B., 1927, 168) and duralumin by the oxidising sodium chloride method increases rapidly with ageing temperature (up to 200° for 16–24 hrs.), and is greater for longer ageing.

CHEMICAL ABSTRACTS.

[Aluminium wires for] electrical transmission lines. VON ZEERLEDER and M. BOSSHARD (Z. Metallk., 1927, 19, 459–470).—The effect of heat-treatment on most of the common aluminium alloys with a high content of aluminium is usually to increase the tensile strength at the expense of the electrical conductivity so that, although the wires obtained are strong enough for use as overhead transmission lines, their conductivity is so much reduced that overheating is likely to occur. Ageing at the ordinary or at elevated temperatures has also a deleterious effect on the electrical conductivity. With alloys containing over 98% Al and small quantities of copper or magnesium together with the usual iron and silicon, satisfactory electrical properties are obtained by annealing for some hours at 160–180°. Thus, after annealing the alloy Aldrey (cf. Fuchs, B., 1927, 846) at 160° for 10 hrs. a conductivity of 33 m./ohm-mm.² is obtained with a tensile strength of 34 kg./mm.², compared with 37.5 m./ohm-mm.² and 7–10 kg./mm.² for 99.9% Al.

A. R. POWELL.

Galvanising duralumin. M. HAAS and O. PÖTTKEN (Z. Metallk., 1927, 19, 448–451).—In order to obtain good adhesion of the deposited metal on duralumin it is necessary to remove completely the thin oxide film. This may be effected by pickling in hot 10% sodium hydroxide solution followed by burnishing with finely-ground porcelain until a clean matt surface is obtained. The article is then made the anode for 40–50 sec. in a bath containing 200 g. of ferrous chloride and 175 g. of calcium chloride per litre. Without removing the article from the bath the current is reversed, and in 5–10 sec. a thin coating of iron is deposited which prevents further film formation. For both the preceding operations a current density of 3 amp./dm.² is employed, and the bath is kept at 18–20°. After rinsing the article in water it is plated with a thin coating of copper (0.005 mm. thick) from an acid or

cyanide bath, and finally plated with zinc, nickel, cadmium, or chromium as required. The acid copper bath comprises a solution of 180 g. of copper sulphate crystals, 60 g. of sulphuric acid, and 2 g. of gelatin in 1 litre of water, and is operated at 0.4–0.5 amp./dm.² at 20°. The cyanide bath contains 14 g. of copper as potassium cupricyanide and 10 g. of free cyanide per litre; the best results are obtained at 40° with a current density of 0.4 amp./dm.², the bath being agitated during use. In either case the deposit obtained in 30 min. is sufficient to resist penetration by 10% sodium hydroxide solution for at least 15 min.

A. R. POWELL.

Constitution of magnesium alloys. W. SCHMIDT (Z. Metallk., 1927, 19, 452–455).—Magnesium and silicon form a single compound Mg₂Si, which forms a eutectic with magnesium containing 1.4% Si (m.p. 645°); the compound does not enter into solid solution in magnesium, so that as little as 0.1% Si in magnesium may be detected in the microstructure by the presence of the eutectic along the grain boundaries. The saturated solid solution of aluminium in magnesium contains 7.5% Al at temperatures below 300°; at higher temperatures the solubility increases to a maximum of 11% Al at the eutectic temperature, 436°, hence alloys containing 7.5–11% Al show age-hardening phenomena. The solubility of MgZn₂ in solid magnesium is equivalent to 1.8% Zn between 0° and 150°, then increases rapidly to the equivalent of 6% Zn at the eutectic temperature, 344°; alloys containing 1.8–6% Zn are therefore hardened by quenching from 325° and ageing at 100°. Magnesium retains 18% Pb in solid solution at temperatures up to 300° and 26% Pb at the eutectic temperature, 459°. Manganese forms no solid solution or eutectic with magnesium, but a compound of uncertain composition appears to be present in alloys containing over 95% Mg.

A. R. POWELL.

Reduction of metallic oxides by hydrogen. III. Nickel oxide. IV. Cobalt oxide. G. GALLO (Annali Chim. Appl., 1927, 17, 535–543, 544–552. Cf. B., 1927, 278, 279).—III. The reduction of nickel sesquioxide to metallic nickel by hydrogen proceeds continuously, the green oxide, NiO, being formed as an intermediate product. The first stage, Ni₂O₃ + H₂ → 2NiO + H₂O, begins at 92–95°, at which temperature the dissociation pressure attains an appreciable magnitude, whilst reduction of the green oxide requires the temperature 118–120°. In presence of water vapour of pressure 20 (92) mm., reduction of the sesquioxide commences at 120–122° (130–135°) and requires longer for its completion than by the dry gas. The difference between these results and those obtained by Glaser (B., 1903, 1051) rests on the facts that an appreciable amount of water vapour would be necessary to change the colour of the anhydrous cobalt chloride used by this author to detect the commencement of the reduction, and that part of the water vapour would, doubtless, escape absorption by the indicator.

IV. In presence of pure hydrogen, the dissociation pressure of the oxides Co₂O₃ and Co₄O₅ becomes appreciable, indicative of incipient reduction, at 80–85°. When the reduction is continued at a higher temperature, the oxide Co₃O₄ is apparently formed transitorily and

begins to undergo reduction at about 90° to form the more stable CoO. Reduction of the latter appears to commence at 118–120°, but metallic cobalt is obtained only after 4 hrs. at 400°, 3 hrs. at 500°, 1 hr. at 600°, or 15 min. at 700°; the oxide Co₂O does not form an intermediate step in this reduction. In two instances, reduction of the sesquioxide was accompanied by the appearance, at 200–250°, of a characteristic pink unstable mass of the composition Co₄O₅, although the ordinary oxide of this formula is black and stable. In presence of water vapour of pressure 20 (92) mm., reduction of cobalt sesquioxide by hydrogen begins at about 95° (110°).

T. H. POPE.

Corrodibility of metals used for [cooking] utensils. F. SPRINKMEYER (Z. Unters. Lebensm., 1927, 54, 216–227).—A number of metals and alloys have been examined to determine the extent to which food-stuffs are liable to be contaminated by such metals as lead, zinc, nickel, and copper. Spoons made from the metals under investigation were partially immersed in acetic acid (3.5–4.0%), and in dilute commercial vinegar; in some cases sodium chloride was added. A definite area of each spoon was exposed to the acid at temperatures of 15°, 50°, and 100°, and for times varying from ¼ hr. to 24 hrs., the amounts of metal in solution being subsequently determined. With Britannia metal of different grades and containing from 2 to 30% Pb, the amounts of lead dissolved by the dilute acetic acid were very small, the maximum being 1.37 mg. when 40 cm.² of metal were exposed for 12 hrs. at 17–18°. With diluted vinegar the results were appreciably higher, being 3.8 mg. after 6 hrs. exposure at 17–18° and 4.15 mg. after 1 hr. at 50°. With more dilute acid and with alloys less rich in lead, the amounts dissolved were proportionately smaller. The weight of lead dissolved by an aqueous solution of sodium chloride (3.5%) was never higher than 1.0 mg. With a mixture of 0.5% tartaric acid and 0.5% acetic acid at 17–18°, 0.72 mg. of lead was dissolved in 6 hrs. from the 30% lead alloy, and 0.75 mg. in 1 hr. at 50°. Similar experiments were conducted with zinc alloys, zinc-coated brass, and German-silver utensils. Considerable amounts of zinc were dissolved in some cases. With an alloy containing 92% Zn, after immersion for 24 hrs. at ordinary temperatures in a solution containing 3.5% of acetic acid and 0.5% of sodium chloride, 3006 mg. of zinc were found in solution, whilst with a 65% zinc alloy 2009 mg. were found. At higher temperatures the amounts dissolved were considerably increased. With brass and German silver there was very little zinc or copper dissolved at any temperature. The corrosion of the metals was apparent from the changed appearance of the spoons and from the scum which formed on the liquid. The action of a weakly alkaline mineral water was also investigated, but only insignificant amounts of zinc were dissolved. The author urges that the manufacture and sale of utensils made from zinc or alloys containing more than 45% Zn should be prohibited.

H. J. DOWDEN.

Granulation of slags. B. BOGITCH (Rev. Mét., 1927, 24, 695).—To avoid risk of explosion when granulating slags, the stream of slag should be at such a temperature that it flows freely from the furnace into

water preheated at 35–40°. Care should be taken that no slag runs down the walls into the side of the granulation tank, as this almost invariably gives rise to explosions.

A. R. POWELL.

Magnesium and its alloys. I, II. S. L. ARCHBUTT (Metallurgist, 1926, 141, 4–6).

Refractories. WHEELER and others.—See VIII.

PATENTS.

Furnace with blast heater. E. VANDERSTEIN (U.S.P. 1,649,201, 15.11.27. Appl., 21.1.25. Belg., 29.10.24).—A pair of blast furnaces have retort chambers at opposite sides of each furnace, these chambers being in direct communication with regenerators and preheaters. A reversing valve control box is so arranged that, when the air supply communicates with the regenerating system of one furnace, that of the other furnace communicates with the exhaust, and *vice versa*.

C. O. HARVEY.

Reverberatory furnace. G. W. PRINCE, ASSR. to UNITED VERDE EXTENSION MINING Co. (U.S.P. 1,650,907, 29.11.27. Appl., 23.7.26).—Fettling material is supplied, at the firing end of the furnace chamber, to the side walls thereof, to protect them from the action of the smelting ore and the intense heat of the chamber.

H. ROYAL-DAWSON.

Production of cast iron of low carbon content in cupola furnaces. SOC. ALSACIENNE DE CONSTRUCTIONS MÉCANIQUES (F.P. 618,597, 17.11.25).—Steel scrap in small pieces, mixed with predetermined quantities of silicon and manganese, is melted rapidly in a cupola. This is effected by using a larger proportion of coke than usual, enlarging the cross-section of the tuyères, and increasing the pressure of the air blast.

A. R. POWELL.

Preventing the diffusion of carbon into iron during cementation. A. LENNARTZ (G.P. 444,126, 16.2.26).—To prevent diffusion of carbon into certain parts of an iron or steel article during cementation of the remainder, the parts are covered with a mixture of kaolin or the like and a sulphur compound non-volatile below 850°, *e.g.*, ferrous sulphide.

A. R. POWELL.

Refining of iron. G. S. EVANS, ASSR. to MATHIESON ALKALI WORKS (U.S.P. 1,646,728, 25.10.27. Appl., 7.6.26).—Molten iron is led through an elongated passage in which it is thoroughly mixed with soda ash, and thence into a receptacle in which the slag formed is separated.

T. S. WHEELER.

Steel alloy. D. J. GILES, ASSR. to LATROBE ELECTRIC STEEL Co. (U.S.P. 1,650,707, 29.11.27. Appl., 2.4.26).—An alloy which is highly resistant to attack in either its annealed or hardened state contains 17.00% Cr and 0.60% C, the remainder being iron, together with the usual amounts of other elements which enter during its manufacture.

F. G. CROSSE.

Production of corrosion-resisting coatings on iron and steel products. C. H. HUMPHRIES, ASSR. to METALS PROTECTION CORP. (U.S.P. 1,651,278, 29.11.27. Appl., 5.6.24).—The surfaces are plated first with copper and then with chromium.

F. G. CROSSE.

Corrosion-resisting alloy. P. D. SCHENCK, ASSR. to DURIRON Co., INC. (U.S.P. 1,651,970, 6.12.27. Appl.,

11.8.25).—The alloy contains approximately 89% Cu, 7% Al, 3% Fe, and 1% Ni. F. G. CROSSE.

Manufacture of welded high-pressure vessels from vanadium steel. R. FRENZEL (G.P. 443,999, 20.9.25).—Vessels of several metres in diameter and 12–15 m. in length, resistant to pressure at moderately high temperatures, are constructed of ingot steel with a low carbon content and containing 0.15–0.25% V.

L. A. COLES.

Recovery of copper and nickel from solutions and residues. E. ABEL (G.P. 443,910, 28.3.23. Austr., 8.4.22).—Residues containing copper and nickel are heated in an atmosphere of hydrogen chloride with only a limited supply of air so that the copper is converted mainly into cuprous chloride. The produce is leached with hot dilute hydrochloric acid so that the solution, after cooling, is saturated with respect to both cuprous and nickel chlorides. The insoluble portion is leached with a strong solution of a chloride to dissolve the cuprous chloride, and the solution of the soluble portion is treated with nickel scrap to remove the remainder of the copper.

A. R. POWELL.

Recovery of copper, lead, zinc, and silver from low-grade calcareous ores. V. TAFEL and W. WITTER (G.P. 444,612, 24.7.25).—The ore is given a chloridising roast at a sufficiently high temperature to effect complete volatilisation of the chlorides of copper, lead, zinc, and silver.

A. R. POWELL.

Production of silicon-iron and aluminium-copper alloys. F. D. SHUMAKER, Assr. to ALUMINUM CO. OF AMERICA (U.S.P. 1,644,000, 4.10.27. Appl., 7.3.23).—The application of the process described in E.P. 208,716 (B., 1925, 508) is facilitated by the addition of magnesium oxide in the primary smelting operation.

T. S. WHEELER.

Purification of beryllium. SIEMENS & HALSKE A.-G., Assees. of H. FISCHER (G.P. 443,944, 11.9.25).—Compact beryllium metal is immersed in molten mixtures of alkali chlorides containing lithium chloride, whereby the outer layer of impurities is dissolved in a few minutes. The metal is removed from the bath, washed, dried, and burnished lightly.

A. R. POWELL.

Production of pure magnesium. A. JESSUP (F.P. 618,875, 20.11.25).—A solution of magnesia in molten magnesium fluoride is electrolysed using as cathode lead, tin, or copper silicide so as to obtain a magnesium alloy, which is then heated more strongly in order to volatilise the magnesium.

A. R. POWELL.

Solder for aluminium and its alloys. A. PASSALACQUA (Addn. No. 31,454, 27.7.25, to F.P. 611,114; B., 1927, 969).—A solder for aluminium consists of tin, antimony, zinc, aluminium, magnesium, lead, sodium, phosphorus, and copper in suitable proportions.

A. R. POWELL.

Manufacture of liquid zinc from blue powder. F. THARALDSEN (U.S.P. 1,647,381, 1.11.27. Appl., 21.11.23. Norw., 28.11.22).—Zinc dust is melted in a rotary kiln, the inner surface of which is fitted with scoops for raising the molten metal and pouring it on to the powder.

T. S. WHEELER.

Recovery of zinc oxide [from ores]. C. A. H. DE SAULLES, Assr. to AMER. SMELTING & REFINING CO.

(U.S.P. 1,647,279, 1.11.27. Appl., 31.12.21. Renewed 29.3.27).—Zinc ore mixed with a reducing agent is delivered on to a sloping embankment in a reverberatory furnace, down which it passes in a thin layer to the hearth. The zinc present is completely volatilised before the material reaches the hearth, and is oxidised in the combustion space above the furnace. T. S. WHEELER.

Metallurgical method [preparation of thorium etc.]. J. W. MARDEN, Assr. to WESTINGHOUSE LAMP CO. (U.S.P. 1,646,734, 25.10.27. Appl., 21.8.22).—Thorium, uranium, zirconium, titanium, vanadium, tantalum, or tungsten chloride is heated in a closed vessel out of contact with oxygen at a red heat for 1 hr. with calcium chloride and sodium to yield a mixture of the corresponding metal, sodium chloride, and calcium oxide, which is treated with alcohol to remove residual sodium, and with dilute acetic acid. Iron is extracted magnetically, and the residue is finally washed with alcoholic hydrogen chloride solution to leave the pure metal corresponding to the halide treated, e.g., thorium. T. S. WHEELER.

[Solder for] tungsten welding. C. W. BALKE, Assr. to FANSTEEL PRODUCTS CO., INC. (U.S.P. 1,651,662, 6.12.27. Appl., 24.11.26).—A solder for floating tungsten contact discs on nickel breaker arms contains, approximately, 60% Ag, 15% Cu, 5% Ni, and 20% Zn.

F. G. CROSSE.

[Brazing] solder. J. L. JONES, Assr. to WESTINGHOUSE ELECTRIC & MANUF. CO. (U.S.P. 1,651,709, 6.12.27. Appl., 30.6.21).—An alloy consisting of 6–10% P and the remainder copper is claimed.

F. G. CROSSE.

Recovery of platinum metals from ores. W. GÜNTHER (G.P. 444,219, 8.5.25).—The ore is treated with carbonyl chloride under pressure to convert the platinum metals into carbonyl derivatives of their chlorides, which may be recovered by leaching the treated ore with suitable solvents or by heating it under diminished pressure to volatilise these compounds.

A. R. POWELL.

Borating of Dumet wire. R. D. HALL, Assr. to WESTINGHOUSE LAMP CO. (U.S.P. 1,647,620, 1.11.27. Appl., 20.2.26).—The process of E.P. 4235 of 1914 (B., 1915, 347) is modified in that the wire while hot is maintained out of contact with oxygen.

T. S. WHEELER.

Decomposition of chromium ores and production of electrodeposited chromium. E. LIEBREICH (G.P. 443,200, 17.7.24; cf. B.P. 243,046; B., 1926, 96).—Chromium ores are oxidised at the ordinary temperature or by heating to obtain chromium chromate, and solutions of this compound are used for chromium plating baths, the simultaneous presence of iron being without deleterious action.

A. R. POWELL.

Manufacture of a flotation agent. B. L. GEORGE (U.S.P. 1,647,793, 1.11.27. Appl., 2.2.25).—Coal-tar oil is treated at 100–120° with sodium hydroxide (0.25%) and sulphur (0.5%) to render it of value as a flotation agent for ores.

T. S. WHEELER.

Flotation method and apparatus [for concentration of ores]. D. L. FORRESTER (U.S.P. 1,646,019, 18.10.27. Appl., 29.7.25).—A pulp of the ore is aerated by large air bubbles discharged into it well below the surface, co-acting currents of the pulp being directed against the bubbles near their point of entry. The pulp

is caused to circulate through a zone of violent agitation, produced by the air, and a quiescent zone. Both zones are under normal atmospheric pressure and isolated from each other, the flow from the first to the second being confined to a restricted horizontal path beneath the surface of the pulp. Mineral-bearing froth is removed from the quiescent zone. H. HOLMES.

Gold separator. S. NILES (U.S.P. 1,646,309, 18.10.27. Appl., 2.7.25).—A hopper is mounted over a tank with its lower end forming a casing which terminates close to the tank floor. The lower end of a helical conveyor extending through the hopper and the casing carries spreader blades extending between, and fitting against, the end of the casing and the tank floor. Small openings are provided between the blades to enable a small amount of material to be fed from the lower end of the casing to a point beneath the blades.

H. HOLMES.

Treatment of metal articles. M. BENTLEY, Assr. to PACKARD MOTOR CAR Co. (U.S.P. 1,647,851, 1.11.27. Appl., 13.7.23).—The forging to receive a Babbitt-metal bearing is first washed to remove dirt, then coated on the surface with basic iron phosphate, the bearing portion machined, and finally dipped in a tinning bath before making the casting.

H. ROYAL-DAWSON.

Smelting furnace. F. W. CORSALLI (U.S.P. 1,647,608, 1.11.27. Appl., 9.8.21. Ger., 19.9.13).—A smelting furnace comprises a flame-producing apparatus arranged to direct flame into the main part of the furnace and to heat an auxiliary part, a slag chamber to receive slag and waste flame, heat-accumulating chambers connected to the slag chamber and heated by waste flame, and means for directing the waste flame continuously in one direction in order to maintain the slag in the liquid state in the slag chamber. J. S. G. THOMAS.

Lithium-containing bearing metals. G. WELTER, Assr. to ALLIED PROCESS CORP. (U.S.P. 1,652,077, 6.12.27. Appl., 6.3.25. Ger., 12.3.24).—See B.P. 230,827; B., 1925, 767.

Lead-alkali metal-containing bearing metal alloys. G. WELTER, Assr. to ALLIED PROCESS CORP. (U.S.P. 1,652,078, 6.12.27. Appl., 13.7.25. Ger., 24.7.24).—See B.P. 237,583; B., 1925, 854.

Manufacture of very hard metallic alloys. H. LOHMANN (U.S.P. 1,652,027, 6.12.27. Appl., 26.8.21. Ger., 7.12.18).—See B.P. 157,774; B., 1922, 470 A.

Froth flotation apparatus (G.P. 443,616).—See I.

XI.—ELECTROTECHNICS.

Operation and regulation of electric furnaces studied diagrammatically. P. BERGEON (Rev. Mét., 1927, 24, 683—694).—Mathematical. Diagrams and formulæ are given illustrating the dependence of the power factor on the electrical conditions and method of operating an electric furnace operated from a transformer. The results obtained suggest a new method of regulating arc furnaces by suitable manipulation of the electrodes which is especially advantageous when the voltage of the primary is adjustable and the furnace has a relatively high inductance. A. R. POWELL.

PATENTS.

Magnetic [dust] core. Insulation of magnetic material. V. E. LEGG, Assr. to BELL TELEPHONE LABORATORIES, INC. (U.S.P. 1,647,737—8, 1.11.27. Appl., [A] 3.1.27, [B] 5.1.27).—(A) A finely-divided mixture of nickel-iron alloy and lead sesquioxide (5%) is formed and pressed, and then heated at 500° to improve the magnetic qualities of the alloy and produce lead monoxide together with an insulating layer of oxide on the alloy particles. (B) The powdered alloy, after being heated in air to form a surface layer of oxide and mixed with quartz powder, is formed and pressed, so that quartz enters the pores of the oxide layer and improves the insulation of the alloy particles. T. S. WHEELER.

Chemical treatment of dielectric material [mineral oil, turpentine, etc.] in an alternating electric field. SIEMENS & HALSKE A.-G., Asses. of H. GERDIEN (G.P. 444,108, 25.5.21).—The material is brought in contact with inert gases while it flows over porous electrodes also constructed of dielectric material.

L. A. COLES.

[Preparation of tungsten filaments for electric] incandescence lamps. G. R. FONDA, Assr. to GEN. ELECTRIC Co. (U.S.P. 1,648,679, 8.11.27. Appl., 18.1.21).—A mixture of finely-powdered tungsten and less than 1% by wt. of boron is consolidated and heat-treated, and the metal mechanically rendered ductile. The resulting metal is finer grained, of lower vapour pressure, and exhibits less sagging at high temperatures than tungsten unmixed with boron. J. S. G. THOMAS.

Incandescence electric lamp. J. H. DE BOER, Assr. to GEN. ELECTRIC Co. (U.S.P. 1,648,677, 8.11.27. Appl., 2.11.26. Holl., 12.12.25).—A tungsten filament is sealed in a bulb containing a salt of hydrofluoboric acid to reduce absorption of light by vaporised tungsten.

J. S. G. THOMAS.

Thermocouple. O. HERMANN, Assr. to THERMO-ELECTRIC BATTERY Co. (U.S.P. 1,648,231, 8.11.27. Appl., 9.11.25. Renewed 28.8.26).—In a thermocouple, the positive element consists of an alloy containing 44—46% Ni, 1—3% Co, and 53% Cu, and the negative element of an alloy containing 83—83.5% Ni and 16.5—17% Mo.

F. G. CROSSE.

Production of a high vacuum in vessels [electric lamps]. D. S. GUSTIN, Assr. to WESTINGHOUSE LAMP Co. (U.S.P. 1,647,618, 1.11.27. Appl., 6.9.22).—A vessel to be evacuated is filled with a vapour only, in which a physical change is effected by passing an electric discharge between external and internal electrodes.

J. S. G. THOMAS.

Apparatus for measuring ionic concentration. E. MISLOWITZER (U.S.P. 1,648,739, 8.11.27. Appl., 7.11.25. Ger., 31.1.25).—Apparatus for measuring ionic concentration comprises outer and inner vessels for holding liquid each provided with an electrode and a ground annular surface. An engaging top part includes inner and outer coaxial cylinders closed at the upper ends to form an inverted annular container and having ground annular surfaces at the lower ends of both cylinders, and is adapted for the insertion of an electrode and for filling purposes. J. S. G. THOMAS.

Conducting [electric] currents. K. H. KINGDON and I. LANGMUIR, Assrs. to GEN. ELECTRIC CO. (U.S.P. 1,648,183, 8.11.27. Appl., 21.12.22).—Contact is made between a positively charged electrode and the vapour of a substance which is chemically inert towards the electrode and has a lower electron affinity. The electrode is heated above a critical temperature and the positive ions generated are removed by an applied potential.

J. S. G. THOMAS.

Electrolytic rectifier. W. MORRISON (U.S.P. 1,647,649 and 1,647,650, 1.11.27. Appl., 15.10.25).—A filming electrode of niobium or tantalum and a non-filming electrode of lead, platinum, or carbon in a solution of (A) zirconium sulphate, or (B) a rare-earth metal sulphate, are employed.

T. S. WHEELER.

Magnesium (F.P. 618,875). **Chromium** (G.P. 443,200).—See X.

Purification of sugar juices (B.P. 280,321).—See XVII.

XII.—FATS; OILS; WAXES.

Bromine-iodine value of butter and other edible fats. W. VAUBEL (Z. Unters. Lebensm., 1927, 54, 275—279).—Primary bromine-iodine values correspond closely with iodine values; secondary and tertiary values are higher. Saponified summer butter has a decidedly lower bromine-iodine value than have unsaponified samples. The reverse is the case with the majority of winter butters. Values for winter butters are generally lower than those for summer butters. The bromine-iodine value for butters includes bromine absorbed by unaltered fatty acids present, by molecules formed by the union of two fatty acid molecules in a tetramethylene form of combination, by acids of the linoleic type, and by trimethylamine and formaldehyde produced by the decomposition of choline. The quantity of choline present is indicated by the difference between the bromine-iodine value of saponified and unsaponified samples.

A. G. POLLARD.

Origin and detection of rancidity in fats and oils. J. PRITZKER and R. JUNGKUNZ (Z. Unters. Lebensm., 1927, 54, 242—252).—Earlier work of the authors (B., 1926, 1020) is discussed in conjunction with that of Powick (cf. A., 1923, ii, 191; B., 1924, 302). The mechanism of the Kreis test for rancidity is further explored.

A. G. POLLARD.

Determination of butter fat and coconut oil. M. KLOSTERMANN and H. QUAST (Z. Unters. Lebensm., 1927, 54, 297—302).—The method of Bertram, Bos, and Verhagen (cf. B., 1926, 499) is lengthy and requires a large sample (25 g.) for each determination. The following simplified method is adopted. A 5 g. sample of fat is saponified with 3 g. of caustic potash solution (1:1) and 8 g. of glycerin. The soap is dissolved in water, and the solution diluted to 100 c.c., warmed to 80°, and the magnesium soap precipitated by means of 25 c.c. of a cold magnesium sulphate solution (150 g./litre). After filtration a portion of the filtrate is treated with excess of silver nitrate (25 c.c. of 0.1N-solution) and the excess determined by Volhard's method. The silver used up represents one half the "A" number. The filtrate from the silver thiocyanate

precipitate is treated with 10% caustic potash solution until precipitation of iron begins, when 1 g. of oxalic acid is added and the liquid distilled. The number of c.c. of 0.1N-potassium hydroxide solution required to neutralise the distillate is half the "B" number. Results thus obtained accord with Reichert-Meissl and Polenske values. The effects of caproic, caprylic, capric, lauric, and myristic acids on the process are determined and discussed.

A. G. POLLARD.

Almond, apricot kernel, and peach kernel oils. J. PRITZKER and R. JUNGKUNZ (Z. Unters. Lebensm., 1927, 54, 233—242).—The difficulty of identifying peach and apricot oils as adulterants of almond oil is emphasised. Complete analyses of pure and commercial samples of the three oils are recorded. Bellier's test gives a negative result with pure almond oil. The Kreis reaction for peach kernel oil is characteristic of apricot kernel oil and not of peach oil. A 5% admixture of apricot oil in almond oil can be identified by this means. The Maben reaction is negative for all three oils. Commercial samples of each of the specified oils show analytical figures intermediate between those of the pure oils. Most apricot oil appears commercially as "peach oil," which in a pure condition is not a commercial commodity.

A. G. POLLARD.

Margarine manufacture. SCHEUNERT.—See XIX.

PATENTS.

Treatment of articles with soaps. I. G. FARBENIND. A.-G. (B.P. 253,105, 31.5.26. Ger., 2.6.25).—The separation of fatty acids or insoluble salts, when soaps are used with water containing acid or calcium or magnesium salts, or with salt water, is prevented by addition of sulphite-cellulose waste liquor or a hydro-aromatic or aromatic sulphonic acid of high-wetting power. *E.g.*, diisopropyl-naphthalenesulphonic acid is added to an acid dye bath containing soap or to a slightly acid fulling bath.

C. HOLLINS.

Soap preparations and treatment of articles therewith. I. G. FARBENIND. A.-G. (B.P. 280,110, 31.5.26. Addn. to B.P. 253,105, preceding).—The wetting-out agent is here incorporated with the soap prior to use. Purifying agents (borax) or organic solvents (glycerol, benzene, alcohols), and also sulphite-cellulose waste liquor may be added to the mixture.

C. HOLLINS.

Separation of tall oil into its constituents. R. ROLL (G.P. 443,960, 17.6.23).—The oil is saponified in solution in an organic solvent, and the resin soaps formed at first are separated from the fatty acid soaps formed later.

L. A. COLES.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Solubility of lake pigments in cellulose varnishes. H. WAGNER and J. KESSELRING (Farben-Ztg., 1927, 33, 619—621).—The difference in "fastness" of various lake pigments to oil paints and cellulose lacquers is discussed, special attention being given to "bleeding" and to change of colour of mixed pigments. Tables are given summarising information on these points and on the solubility of typical lake pigments in various solvents, diluents, plasticisers, etc.

S. S. WOOLF.

Testing of finished lacquers. J. D. JENKINS and P. R. CROLL (Ind. Eng. Chem., 1927, 19, 1356—1358).—Two classes of tests on lacquer films are described. The accelerated exposure tests, which consist of a cycle of exposure to ultra-violet light, water, and refrigeration, are useful for comparative purposes, but cannot be correlated with normal exposure tests. The tests of physical properties comprise the determination of elongation at rupture, contraction on drying, and ease of sanding. F. R. ENNOS.

Malayan varnish resins. T. H. BARRY (J. Roy. Soc. Arts, 1927, 76, 106—128).

PATENTS.

Production of low-viscosity lacquer and film. E. M. FLAHERTY, Assn. to E. I. DUPONT DE NEMOURS & Co. (Re-issue 16,803, 29.11.27, of U.S.P. 1,629,999, 24.5.27).—See B., 1927, 563.

Indicator for reactions in liquid media (G.P. 443,454).—See I.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Reactions of aniline and its homologues in accelerating vulcanisation. T. KIMISHIMA (Mem. Coll. Eng. Kyushu, 1927, 4, 193—250).—The reaction products of sulphur with aniline, methylaniline, dimethylaniline, and *p*-toluidine are shown to consist essentially of disulphide compounds and hydrogen sulphide. Aniline, for instance, at 160—170°, gives *o*-diaminodiphenyl disulphide and a resinous polysulphide, with smaller proportions of *o*-diaminodiphenyl sulphide and *p*-diaminodiphenyl disulphide. The disulphides are accelerators of vulcanisation, particularly in an atmosphere of hydrogen sulphide, their conversion into the corresponding mercaptan and re-formation by sulphur probably being involved in their method of action. The relative effectiveness of aniline and its homologues is naturally influenced by the properties of the disulphides formed, but the main factor is the quantity of disulphide or polysulphide produced. Any monosulphide formed is relatively ineffective, whilst certain of the products, e.g., methylaminophenyl mercaptan, may even have a retarding action. The thermal changes during the vulcanisation of a mixture of rubber (92½) and sulphur (7½) with a small proportion of various organic accelerators were followed by the method of Williams and Beaver (B., 1923, 412 A), and it is shown that by working at 175° the extent of self-heating provides an index as to the degree of acceleration. From their favourable influence on the tensile strength of the products it is possible that *p*-diaminodiphenyl disulphide and 2 : 2'-dimethyl-5 : 5'-diaminodiphenyl disulphide may prove of industrial value. D. F. TWISS.

Relative action of vulcanisation accelerators in vulcanite mixings. R. DITMAR (Chem.-Ztg., 1927, 51, 901—902).—Examination of the behaviour of a series of accelerators in a vulcanite mixing shows that with litharge as activator, the relative results are generally different from those obtained with zinc oxide. The latter activator also tends to cause a volume increase during vulcanisation. With lithopone the relative

results are different from those with either zinc oxide or litharge.

D. F. TWISS.

Conversion of rubber into thermoplastic products with properties similar to gutta-percha, balata, and shellac. I. Preparation and general properties. H. L. FISHER. **II. Chemistry of the reaction.** H. L. FISHER and E. M. MCCOLM (Ind. Eng. Chem., 1927, 19, 1325—1328, 1328—1333).—Tough thermoplastic products resembling gutta-percha can be obtained by heating a sheeted mixture of rubber with approximately 10% of an organic sulphonic acid or sulphonyl chloride, e.g., *p*-toluenesulphonic acid or *p*-toluenesulphonyl chloride at 125—135° for several hours; if the mixture is heated in bulk the product more closely resembles shellac. If heated with 7½% of *p*-phenolsulphonic acid, rubber yields a gutta-like material soluble in benzene and a good adhesive, which is the basis of the Vulcalock process. Sulphuric acid (5%) converts rubber into products of the gutta-type, but not of the soluble shellac type. The general name "thermoprene" with a qualifying suffix is applied to these products, which appear to have the same empirical composition as rubber. The chemical unsaturation of the shellac-like product towards sulphur, Wijs' reagent, or oxidation is only 55—60% of that of rubber. The purified hydrocarbon is colourless, soluble in the ordinary rubber solvents, and more stable than rubber towards heat. D. F. TWISS.

Colloid chemistry of rubber latices. II. Surface tension measurements with latex of *Hevea brasiliensis*. E. A. HAUSER and P. SCHOLZ (Kautschuk, 1927, 332—333).—The results of surface tension measurements for fresh *Hevea* latex, by means of a torsion balance, are compared with those for various soaps at equivalent dilutions. Fresh latex contains some substance with a marked depressive influence on surface tension, its effect being almost as great as that of a normal soap. The value of the surface tension attains a minimum when the latex is diluted to $\frac{1}{6}$ th of its original concentration. The surface tension of ammonia-preserved latex gradually decreases with storage. After coagulation of latex, the substance which depresses surface tension is found in the serum. D. F. TWISS.

Rubber mixings. W. ESCH (Kautschuk, 1927, 337—345).—A consideration of typical mixings for various purposes and a discussion of the choice of ingredients.

D. F. TWISS.

Rubber mixings. W. B. WIEGAND (Kautschuk, 1927, 334—336).—The present position with respect to the use of carbon black in rubber and in other directions is reviewed. For mixings containing a high proportion of carbon black it is preferable to choose a vulcanisation accelerator of moderate activity, e.g., one of the aldehyde-ammonia type. D. F. TWISS.

PATENTS.

Vulcanising of rubber. N. A. SHEPARD and S. KRALL, Assns. to FIRESTONE TYRE & RUBBER Co. (U.S.P. 1,647,754, 1.11.27. Appl., 20.6.23. Renewed 5.2.26).—The reaction products of thiocarbamide or thiocarbimides and aldehyde-ammonia compounds are of value as accelerators. T. S. WHEELER.

Production of a [vulcanised] rubber product. S. G. LUTHER (U.S.P. 1,647,184, 1.11.27. Appl., 19.2.27).

—A mixture of a soluble, *e.g.*, sodium, and of an insoluble, *e.g.*, zinc, soap is of value as an accelerator.

T. S. WHEELER.

Treatment of [rubber] latex. J. MCGAVACK, Assr. to NAUGATUCK CHEMICAL CO. (U.S.P. 1,647,805, 1.11.27. Appl., 24.3.26).—Latex is treated with pectin, and the concentrated rubber layer which separates is, after addition of a sodium soap, heated at 80° for 2 hrs. to reduce the viscosity.

T. S. WHEELER.

Manufacture of stabilised [rubber] latex. RUBBER LATEX RES. CORP., Assees. of M. R. DAY (B.P. 279,336, 7.5.27. U.S., 3.1.27).—Rubber latex is stabilised by the addition of from 1% to 10% of blood or of components of blood, especially the hæmoglobin.

D. F. TWISS.

Protective linings for [petrol] tanks. SOC. ELECTRO-MECANIQUE D'APPAREILLAGE POUR L'ESSENCE (B.P. 279,291, 28.1.27. Belg., 31.12.26).—For the automatic sealing of shot-holes in the petrol tanks of aircraft the well-known rubber jacket is replaced by one of guayule (or a mixture of this with ordinary rubber), which is less sensitive to temperature changes and is more rapidly attacked by petrol.

D. F. TWISS.

Protection of rubber articles against ageing. SOC. ITAL. PIRELLI (B.P. 260,001, 18.10.26. Italy, 17.10.25).—The residue obtained from latex serum by evaporation, preferably under reduced pressure, is mixed with rubber as an antidote against bad ageing. The proportion introduced is equal to, or greater than, that corresponding with the amount associated with the rubber when in the latex. The quebrachitol has no useful effect in this direction and may be removed, together with the proteins, from the concentrated serum.

D. F. TWISS.

Providing metal, wood, and like surfaces with a hard rubber-containing coating. R. M. WITCOMBE (B.P. 258,573, 6.9.26. Austral., 18.9.25).—A vulcanisable rubber solution containing asphaltum or similar material is applied once or repeatedly to the surface. The whole is then subjected to dry heat between 120° and 260°. Gradual heating gives a surface with a fine smooth finish, whereas with rapid heating a matt surface is obtained.

D. F. TWISS.

Compounded rubber. F. G. BREYER and C. W. FARBER, Assrs. to NEW JERSEY ZINC CO. (U.S.P. 1,649,782, 15.11.27. Appl., 27.7.21).—The dried mixture of zinc sulphide and barium sulphate obtained by coprecipitation, but not subsequently calcined, is an effective reinforcing ingredient for rubber.

D. F. TWISS.

Concentration of fluids [latex etc.]. W. A. GIBBONS and M. G. SHEPARD, Assrs. to GEN. RUBBER CO. (U.S.P. 1,651,764, 6.12.27. Appl., 11.7.23).—See B.P. 218,544; B., 1924, 757.

Manufacture of porous bodies, diaphragms, filters, etc. of ebonite. M. WILDERMANN (U.S.P. 1,651,567, 6.12.27. Appl., 22.4.22. Ger., 1.4.22).—See B.P. 200,577; B., 1923, 899 A.

Manufacture or utilisation of india-rubber. L. C. BATEMAN (B.P. 279,531, 26.6.26).

XV.—LEATHER; GLUE.

Curried upper leathers. Wear of kips, splits, etc., and influence of various dressings. A. COLIN-RUSS (J. Soc. Leather Trades' Chem., 1927, 11, 336—349).—Currying should produce a flexible leather without greasy feel or exudation of greasy matter under mere mechanical action. The currying grease should help the leather to withstand wearing conditions and the leather should be incorporated with the largest possible quantity of it. Analyses of more and less affected parts of worn damaged heavy boots made from curried leathers showed that during wear the acid value of the grease decreased, much fat had been lost, the water-soluble matter diminished, the p_H value of the latter increased, its colour darkened, and the insoluble mineral matter increased. These results show that products possessing potentially high acid values, *e.g.*, true oils and fats, should not be used in currying, owing to their liability to hydrolyse. Their omission from currying mixtures is impracticable owing to their high affinity for the leather fibres. Further tests on original and worn, curried, heavy boot upper leathers showed that the saponification value of the fat content in worn leathers is less than in the original, and the percentage of unsaponifiable matter is greater in the worn leather. An American split of 16% fat content (85% unsaponifiable matter) was the only leather which was undamaged and satisfactory after wear. Two typical stuffing mixtures, *A* and *B* (*A* containing 40% of cod oil, 30% of "superior" hard grease, and 30% of "inferior" hard grease, and *B* consisting of 3.6% of cod oil, 32.2% of hard grease, 32.2% of "stearine," 28.5% of paraffin wax, and 3.5% of mineral oil), gave the following acid value, saponification value, and unsaponifiable matter, respectively:—(*A*) 22.0, 119.5, 38.4%; (*B*) 40.3, 51.1, 61.25%. Leathers curried with *A* were blackened by iron during wear. The acid value of the "stearine" used in currying is sometimes high (88). Experiments showed that leather cannot be impregnated with rubber, but by mixing a solution of gutta-percha in carbon tetrachloride with oils and fats, and allowing the solvent to evaporate, a product is obtained which can be stuffed into leather, imparting more body and waterproofness. In stuffing leather, all fatty materials of high acid values should be excluded, a minimum amount of true oils and fats and as much unsaponifiable matter as possible should be included. An ideal currying grease would contain about 85% of unsaponifiable matter obtained by the use of mineral greases, wool fat, petroleum jelly, paraffin wax, or beeswax. Tallow or hydrogenated whale oil is of use as a softener and to increase the affinity for the leather. Castor, cod, and linseed oils may also be used for the purpose, but are inferior.

D. WOODROFFE.

PATENT.

Dyeing of furs (B.P. 279,942).—See VI.

XVI.—AGRICULTURE.

Composition of natural organic materials and their decomposition in soil. II. Influence of age of plant on rapidity and nature of its decomposition. S. A. WAKSMAN and F. G. TENNEY (Soil Sci., 1927,

24, 317—333; cf. B., 1927, 951).—The composition of rye plants at different stages of growth and their decomposition in sand and in soil by micro-organisms have been investigated. Young plants contain a much higher percentage of nitrogen than more mature plants, and decompose more rapidly, decomposition being accompanied by liberation of nitrogen in an available form. When the nitrogen content of the plant is about 1.7% it is just sufficient to cover the requirements of the micro-organisms which are active in the decomposition during the first four weeks. If there is more than 1.7% N, the excess is rapidly liberated in an available form, whereas if there is less, an additional source of nitrogen will be required for complete decomposition of the material. Soluble substances are the first to be decomposed, followed by pentosans and cellulose. Plant proteins are readily decomposed and microbial proteins synthesised in their place. Lignins are most resistant and tend to accumulate. C. T. GIMINGHAM.

Effect of tree products on bacteriological activities in soil. II. Forest soils. W. M. GIBBS and H. W. BATCHELOR (Soil Sci., 1927, 24, 351—363; cf. B., 1922, 511 A).—Azotobacter occurred in about 25% of the forest soils examined. In most of the samples inoculated with azotobacter, the organism remained present for at least 18 months, but only five out of twenty-four soils tested fixed definite amounts of nitrogen when inoculated and supplied with mannitol. Leaves and pine needles exerted a retarding influence on fixation of nitrogen by azotobacter in solution; sawdust had little effect. All the soils tested showed ability to accumulate ammonia, but nitrification was poor. Addition of calcium carbonate improved nitrification in 50% of the soils. C. T. GIMINGHAM.

Biological measurement of available soil potassium. D. E. HALEY and F. J. HOLBEN (Soil Sci., 1927, 24, 345—350).—In a preliminary experiment, a close correlation was found between the amounts of potassium in the aerial parts of buck-wheat plants grown to maturity in sand to which known weights of soils were added and the amounts of potassium extractable from the media by 0.2N-hydrochloric acid. C. T. GIMINGHAM.

Effect of hydrogen-ion concentration on the absorption of calcium by a colloidal clay. R. BRADFIELD and E. W. COWAN (Soil Sci., 1927, 24, 365—372; cf. B., 1924, 721).—The interactions between calcium hydroxide and a colloidal clay at p_H values between 2.0 and 12.0 have been investigated by analyses of the colloid-free supernatant liquids. In the acid region more bases are liberated than absorbed, whereas the reverse is the case in the alkaline region. The absorption curve is steepest at p_H values above 10.0. There was no evidence of saturation with calcium hydroxide at the highest p_H value obtainable with a saturated solution. Measured at the same p_H value, the amount of calcium absorbed by the clay appeared to be independent of the concentration of calcium added. Potentiometric titration with sodium or barium hydroxide of samples of colloidal clay freed from exchangeable bases by electro-dialysis gave absorption curves made up of two rather distinct portions. In the first portion,

covering the acid range, the exchangeable hydrogen was neutralised; in the second, covering the alkaline range, a decomposition of the exchange complex with the formation of simpler silicates and aluminates took place. C. T. GIMINGHAM.

Measurement of physical characteristics of soils. L. H. STAUFFER (Soil Sci., 1927, 24, 373—379).—The cohesion of soils in the wet state may be measured by forcing the soil through a glass tube of known diameter held in a vertical position, and weighing a number of the segments of the soil column which fall from the end of the tube. The average weight of the segments divided by the cross-sectional area of the tube gives the mean force which, acting across a cross-section of 1 sq. cm., is just sufficient to overcome the internal cohesive forces in the soil. The curve relating clay content and cohesion is almost a straight line. An indirect method of measuring the cohesive properties of dry soil conglomerates by means of the modulus of rupture is also described. Cylinders of moist soil are allowed to stand on end until dry, and are then tested as simple beams with a concentrated load at mid-span. The relationship between clay content and modulus of rupture is linear. Shrinkage may be measured on the same cylinders of soil. C. T. GIMINGHAM.

Factors influencing the composition of cabbage and their relation to the quality of sauerkraut. W. H. PETERSON, H. B. PARMELE, and E. B. FRED (Soil Sci., 1927, 24, 299—307; cf. B., 1926, 252).—Late cabbage makes better quality sauerkraut than early cabbage. Storage of the cabbage at low temperatures or slight freezing has little or no effect on the quality, but storage at high temperatures or severe freezing results in a sauerkraut of poor quality. The inorganic constituents, the nitrogen compounds, and the carbohydrates of cabbage are influenced by the type of soil on which it is grown. Detailed figures are given showing the effect of various conditions on the composition of cabbage. C. T. GIMINGHAM.

Decomposition studies of lucerne and sweet clover roots and straw. T. L. MARTIN (Soil Sci., 1927, 24, 309—316).—Comparative experiments on the rates of decay in soil of lucerne roots (1.6% N), sweet clover roots (0.87% N), and straw (0.42% N) indicate that the lucerne decays most rapidly and the straw least rapidly. The rates of decay were measured by determinations of the amount of carbon dioxide evolved, the accumulation of nitrates, formation of humus (by Waksman's method, cf. B., 1926, 958), and by counts of the fungi present at weekly intervals. C. T. GIMINGHAM.

Behaviour of arsenic acid in regard to the absorbing power of soil. C. ANTONIANI (Atti R. Accad. Lincei, 1927, [vi], 6, 107—112).—As regards its absorption by soil, arsenic acid behaves similarly to phosphoric acid, but is absorbed to a less extent. The anion PO_4 is displaced by AsO_4 in solutions of arsenic acid, but not in those of arsenates. C. T. GIMINGHAM.

Deflocculation and plasmolysis of the coating on soil particles. J. DUMONT and B. GANOSSIS

T. H. POPE.

(Compt. rend., 1927, 185, 1300—1302).—Specimens of a sandy soil, previously dried and sifted, were placed in glass containers to a depth of 16 cm., and the velocity with which distilled water and various 0.1*N*-saline solutions drained through the soil was measured, thus showing the amount of flocculation or deflocculation in the soil caused by the action of the liquids on the limono-colloidal coating of the sandy particles. Distilled water gave constant drainage figures after 48 hrs.; ammonium and sodium carbonate solutions caused deplasmolysis, all drainage ceasing after a few days; potassium carbonate at first leached out much of the humic colloids, the drainage almost ceasing on the third day, but thereafter a steady increase towards the initial value occurred. Calcium chloride solution was applied to the soil rendered impermeable by sodium chloride and soon restored its permeability.

B. W. ANDERSON.

PATENTS.

Diminishing or preventing loss of carbohydrates in root-crops when stored. CHEM. FABR. AUF ACTIEN (VORM. E. SCHERING) (B.P. 266,695, 9.2.27. Ger., 26.2.26).—The comminuted material is treated with a narcotic such as chloroform, ethylene bromide, toluene, ethylene, carbon dioxide, or generator gas, with which such substances as hydrocyanic acid, sulphur dioxide, or ammonia may be mixed. *E.g.*, sliced chicory roots treated in an airtight container with 0.1% of their weight of chloroform retain their content of inulin for months.

C. T. GIMINGHAM.

Manufacture of mixed fertilisers. I. G. FARBENIND. A.-G. (B.P. 256,972 and 280,447, 11.8.26. Ger., [A] 14.8.25).—(A) A hot concentrated solution of ammonium nitrate is mixed with diammonium phosphate and, if desired, with a potassium or calcium salt, and the mixture solidified by cooling or spraying. (B) The hot solution of ammonium nitrate is mixed with a potassium or calcium salt and, after solidification, diammonium phosphate is added, either in the solid form or as a hot concentrated solution.

C. T. GIMINGHAM.

XVII.—SUGARS; STARCHES; GUMS.

Undetermined chemical losses of sugar in the refining process. I—VI. M. I. NAKHMANOVICH (Nauch. Zapiski [Russia], 1927, 4, 267—274, 291—298, 323—334, 339—354, 358—366, 396—416).—If high temperatures are employed for only 6—8 min. in clarification, only 0.02—0.03% of sugar is lost. When liquors of 99.3—99.6 purity are boiled in a vacuum with steam at 3—4 atm., the reducing effect and coloration are increased; boiling of slightly acid (0.4 c.c. *N* per litre) high-purity liquors containing up to 0.05—0.06% of invert sugar for 60—75 min. causes negligible inversion. Rise of temperature in passing the fillmass from the pan causes increase in the reducing substances. For 0.07—0.4% (dry) of invert sugar, the total chemical loss of white sugar in boiling is 0.04—0.08%. Less pure liquors lose more sugar. Increase in coloration develops at the heating surfaces. In the moulds, for a slightly acid fillmass of reducing effect 0.24—0.28% of invert sugar, passed from the apparatus at 101—102.5°, the accumulation of invert sugar comprised 0.07% of the dry matter, or 0.09% of the dissolved granulated sugar.

For a fillmass containing 0.48—0.80% of invert sugar, the increase in reducing substances was 0.1% (dry) or 0.13% (dissolved sugar). On the whitening tables the invert sugar in the fillmass increased by 15%. Boiling of syrups increased the invert sugar content by 20%.

CHEMICAL ABSTRACTS.

Examination of the early stages of the hydrolysis of starch by dilute acids. R. G. FARGHER and M. E. PROBERT (J. Text. Inst., 1927, 18, 559—571 *T*).—The rates of hydrolysis of a commercial Japanese farina and of high-grade potato, wheat, maize, and rice starches in the presence of various concentrations of acid, and at temperatures of 40° and above, were followed by means of a modification of Braidy's method for determining copper numbers. For any given conditions of treatment there is an initial stage during which the starch undergoes conversion into soluble starch. During this period the rate of formation of reducing substances gradually increases, subsequently proceeding at a constant rate, dependent on the temperature and the concentration of acid used, in accordance with the relation $N_{Cu} = k(T - t)$, where N_{Cu} is the copper number of the product, T the time of reaction, and t the time required for the complete conversion of the starch into its soluble modification. The latter factor (t) diminishes with rising temperature, is practically eliminated by any pre-treatment of the starch which causes liquefaction, and is ascribed, therefore, to the reactions accompanying the solubilisation of the starch. Measurements using hydrochloric and sulphuric acids of various concentrations at 40°, 50°, and 60° show that the rate of reaction is directly proportional to the concentration of the acid, whilst, as in the case of cotton, the two acids have approximately the same effect in equimolar concentration. Measurements of the time required for complete liquefaction, of the rate at which copper-reducing substances are formed subsequently, and of the speed of dissolution of the hemicelluloses, using 0.2*N*-sulphuric acid, show that for a rise in temperature of 10° the rate of attack of starch is increased approximately four-fold, and as the corresponding figure for cotton is 2.3, the rate of attack of starch with rising temperature increases much more rapidly than that of cellulose. Within limits, therefore, more efficient removal of starch is anticipated at higher temperatures and for shorter periods of treatment than are normally used in the grey-souring of cotton. Potato, maize, wheat, and rice starches differ significantly (but not greatly) in their behaviour towards 0.2*N*-sulphuric acid at 50°, the differences gradually disappearing as the temperature is raised, until at 80° the rates of hydrolysis of rice and potato starches, which show the maximum difference at 50°, become practically identical. The velocity coefficients obtained do not place these starches in the order of their hemicellulose contents.

B. P. RIDGE.

Sugar content of melons. LUTOCHIN.—See XIX.

Determination of aldose sugars. HINTON and MACARA.—See XIX.

PATENTS.

Separation of impurities from molasses and sugar juices by electrolysis. J. DE BRIEY (B.P. 280,321, 13.9.26).—Molasses or sugar juices, diluted or

undiluted, are passed through an inner series of compartments separated by vegetable parchment membrane partitions from an outer series through which purified water is flowing. In the first phase the liquid to be treated is connected with the cathode and the water with the anode, whereby the acids are eliminated and the alkalinity is increased. In the second phase the liquid is brought into contact with the anode and the water with the cathode in order to remove alkalis. Finally the liquid passes continuously between compartments of water constituting cathode and anode for the simultaneous elimination of both acids and salts. Formation of emulsions is prevented by blowing air, steam, or gas through the liquid.

F. R. ENNOS.

Preparation from starch of esters of higher fatty acids, soluble in hydrocarbons of the aromatic series. P. BERTHON, ASSR. to SOC. DE STEARINERIE ET SAVONNERIE DE LYON (U.S.P. 1,651,366, 6.12.27. Appl., 6.3.23. Fr., 21.12.23).—See B.P. 208,685; B., 1924, 191.

XVIII.—FERMENTATION INDUSTRIES.

Importance in brewing of the ethereal oils from different types of hops. H. LÜERS (Woch. Brau., 1927, 44, 588—590).—The ethereal oils obtained by steam distillation from different varieties of hops vary markedly in quality and amount. When the extraction is effected at ordinary pressure, Californian hops give the lowest yield of raw oil. Slightly more is obtained from Kent hops, whilst those from Saaz and Hallertau contain the greatest quantities. On fractionating the raw oils, the low-b.p. fraction from the Californian hop oil exceeds that from the other oils, whilst the Saaz and Hallertau hop oils contain the less volatile constituents in greatest amount. The high- and low-b.p. fractions from the Kent hop oil are intermediate in amount. When extraction is effected at 2 atm. pressure, the colour of the raw oils is no longer yellow, but green. The yield of oil from the Californian hops is increased, whilst the quantities obtained from Saaz and Hallertau hops are greatly diminished. There is no difference in the aroma of the beers brewed from the same malt and the different varieties of hops, and since the variations in the nature of the oils are not repeated in the beer, it follows that the oils must have been almost wholly volatilised during the boiling of the wort in the copper. The flavours of the resulting beers differ slightly in the amount of bitterness. Saaz hops give an excellent flavoured beer, Californian hops a moderately bitter flavour, and Hallertau hops an excessive bitterness. These differences may be partly due to secondary derivatives produced by the chemical changes undergone by the hop oils during the boiling of the wort.

C. RANKEN.

Nitrogenous organic and ammoniacal nutrients in the aeration process of yeast manufacture. H. CLAASSEN (Chem.-Ztg., 1927, 51, 942—943).—The statement by Wohl that the substitution of organic nitrogen by ammoniacal nitrogen as nutrient in the aeration process of yeast manufacture can be made without prejudicing the yield and quality of the yeast, holds good only for nutrient solutions where the amount of nitrogenous pabulum is no more than sufficient for

the needs of the yeast. In brewing practice, where the fermentation liquid contains from 3 to 4 times the optimal quantity of nitrogen, the replacement of organic by inorganic nitrogen is followed by less reproduction and a lower quality of yeast. The added ammonium salts hinder the assimilation of the organic nitrogen, and much of that valuable nutrient is wasted. In nutrient solutions, with a surplus of organic nitrogen and no ammoniacal nitrogen, greater reproduction takes place and the nitrogen content of the yeast is lower. By replacing the organic by inorganic nitrogen, the reproduction is progressively diminished and the nitrogen content of the yeast gradually increases. When 50% of the organic nitrogen is replaced, the reproduction is 14% lower and the nitrogen content of the yeast shows an approximate increase of 2%.

C. RANKEN.

Errors in malt analysis due to the want of standardisation of the degree of fineness of the malt meal. E. F. ROTHENBACH (Woch. Brau., 1927, 44, 601).—Variations between duplicate determinations of the extract of a malt may be due to differences in the degree of fineness to which the malt has been ground. The sieves which are used to adjust the Seck grist mill and the fine-meal mill are not standardised, and may deliver with a standard malt varying quantities of malt flour into the three finest fractions. With a sieve made to the specification of the Pfungstadt Brewery, 39.7% of the grist from the Seck mill passed through the three finest sieves in the form of malt flour, whereas with a second set of sieves the same grist yielded 45.2% of flour. With the grist from the fine-meal mill the same two sets of sieves gave 90.1% and 94.6% of fine flour. As the Seck and fine-meal mills are adjusted by means of the sieves to yield on grinding a standard malt, grists of which, 40% and 90%, respectively, pass into the three finest fractions, variations in the screening by the sieves will be repeated in the setting of the mills, with the resulting introduction of errors.

C. RANKEN.

Use of luminescent phenomena in the examination of grape and fruit wines. F. M. LITTERSCHEID (Z. Unters. Lebensm., 1927, 54, 294—296).—The coloured fluorescence observed in fruit wines illuminated by the filtered light of a quartz lamp can be used as a basis for the examination of wines. The extent to which luminescence can be prevented by previous shaking of the wine with animal charcoal, coupled with the power of amyl alcohol to extract the colouring matter of wine, would appear to render possible the classification of wines as to nature and origin.

A. G. POLLARD.

Deterioration of brandy during storage. S. GOY and A. KOEHLER (Z. Unters. Lebensm., 1927, 54, 270—275).—Loss of alcohol from spirit stored in tightly bunged oak casks is small, in ash casks it is considerable, whilst in casks with ill-fitting or open bungs it is very rapid. The importance of testing spirit immediately before selling to users is emphasised. Differences between alcohol determinations made by direct density measurements and by the distillation method are negligible.

A. G. POLLARD.

Correction of the hardness of brewing water by lactic acid. H. LÜERS (Woch. Brau., 1927, 44, 385—387).—The neutralisation by lactic acid of a brewing

water containing soluble carbonates improves the quality of the beer brewed from it. The actual and potential acidities of the mash and wort are increased to a degree more favourable for enzymic action, as is shown by the augmented amount of maltose in the wort. The total and "formol" nitrogen in the wort are also higher, but the phosphorus content is lower. On boiling and hopping in the copper, the flocculation is superior and the extract slightly greater. The finished beer brewed from the water neutralised by lactic acid, compared with that manufactured from the water subjected merely to preheating, is paler in colour, more brilliant, has a milder flavour with a non-lasting hop bitterness, a greater capacity for foam production, and an improved head retention.

C. RANKEN.

Alcohol. CARRIÈRE, also SCHLUMBERGER.—See V.

XIX.—FOODS.

Determination of aldose sugars by means of chloramine-T, with special reference to the analysis of milk products. C. L. HINTON and T. MACARA (Analyst, 1927, 52, 668—688).—The quantitative oxidation of aldose sugars may be satisfactorily brought about by means of chloramine-T in conjunction with potassium iodide, but oxidation requires about $1\frac{1}{2}$ hrs. at ordinary temperature. Addition of small amounts of sodium hydroxide had no effect on the oxidations; chloramine-T alone had no oxidising action on dextrose or lactose; sucrose was oxidised less, and levulose more, than by alkaline iodine under conditions giving full oxidation of the aldose sugar. In the case of clarified milk serum, if this was made slightly alkaline no action of chloramine-T on oxidisable substances occurred other than the slight one on levulose; complete oxidation of lactose took place with an error not exceeding 0.4% of the total lactose. Lactose in milk serum was determined by washing 25 c.c. of fresh milk into a flask with about 100 c.c. of water and adding 10 c.c. of phosphotungstic acid reagent. After making up to 200 c.c., shaking, allowing to settle, and filtering, 25 c.c. portions of serum are neutralised with 0.1N-sodium hydroxide, a further 3 c.c. of alkali are added, followed by 20 c.c. of 10% potassium iodide and 50 c.c. of 0.05N-chloramine. After being kept at 17—18° for $1\frac{1}{2}$ hrs., 10 c.c. of 2N-hydrochloric acid are added to each flask and the liberated iodine is titrated with thiosulphate solution. A blank experiment is also made and the difference between the titrations calculated to grams of iodine; this value divided by 0.705 gives the amount of lactose in 25 c.c. of serum. To determine sucrose, two chloramine oxidations are necessary, the first as above for lactose. For inversion, 25 c.c. of the original serum, 15 c.c. of water, and 5 c.c. of 6.34N-hydrochloric acid are heated at 60° for 12 min., cooled, and 5 c.c. of 6.34N-sodium hydroxide are added; the solution is neutralised to litmus by 0.5N-sodium hydroxide, cooled, and made up to 100 c.c. 25 c.c. portions are then treated as before with 3 c.c. of 0.1N-sodium hydroxide, iodide, and chloramine, and finally titrated with thio-sulphate solution. The difference from the blank titration is calculated as grams of iodine equivalent to the chloramine consumed by the lactose and the inverted

sucrose. Sucrose factors corresponding to varying amounts of chloramine consumed before and after inversion are tabulated, and results obtained by the chloramine and polarimetric methods are compared.

D. G. HEWER.

Importance of the specific electrical conductivity of milk and a new method for its determination. V. GERBER (Z. Unters. Lebensm., 1927, 54, 257—270).—Work previously described (B., 1926, 845) is extended to include the examination of milks of different origin and treatment. From a large number of individual analyses it is concluded that the limiting values for the specific conductivity are $49.0\text{--}51.0 \times 10^{-4}$. Alterations and improvements in the original method are described.

A. G. POLLARD.

Composition and analysis of Danish butter. A. C. ANDERSON (World's Butter Rev., 1927, 1, No. 4, 21—22).—In preparing samples for analysis, the stirring method is more accurate than the shaking method. Salted Danish butter contains about 0.9% and unsalted about 0.08% of salt.

CHEMICAL ABSTRACTS.

Green colour in butter. A. A. RAMSAY, A. M. BROWN, and H. H. RANDELL (Agric. Gaz., N.S. Wales, 1927, 38, 475—480).—The development of green colour in butter was ascribed to decomposition of protein with formation of melanins. It appeared only when the herbage was infested with aphids.

CHEMICAL ABSTRACTS.

Vitamin content of technical soya-phosphatide preparations used in margarine factories. A. SCHEUNERT (Z. Unters. Lebensm., 1927, 54, 302—307).—Soya-phosphatide preparations contain only traces of vitamin-A and no antirachitic vitamin. By treatment with ultra-violet light active antirachitic properties can be developed.

A. G. POLLARD.

Composition and examination of milk pastry. A. GOTTFRIED (Z. Unters. Lebensm., 1927, 54, 279—281).—The use of whole milk or diluted milk in pastry mixing is detected by a determination of the alkalinity, lime, and phosphate in the ash. From a number of analyses the mean values for alkalinity (number of c.c. of N-NaOH per 20 g. of air-dry substance), calcium oxide (g.), and phosphate (g. of PO_4) were:—(a) for whole milk, 2.6, 0.101, 0.45; (b) for diluted milk, 1.2, 0.068, 0.43; and (c) without milk, 0.1, 0.048, 0.36.

A. G. POLLARD.

Panification with soya flour. I. D. COSTA (Annali Chim. Appl., 1927, 17, 524—530).—The percentage composition of wholemeal flour from the seeds of yellow *Soja hispida* and that of the flour obtained from seeds extracted with light petroleum (in brackets) were found to be: moisture 10.40 (10.80); protein (N \times 6) 37.98 (47.34); cellulose 5.05 (5.35); fat 18.32 (0.37); non-nitrogenous extractives 23.83 (30.16); ash 4.42 (5.98). Loaves were prepared from mixtures of 75% wheaten flour or the 82% flour now compulsory in Italy with one fourth or one ninth of its weight of soya flour from which the unpleasant flavouring materials were first removed. The bread proved heavy and unappetising, and, even with the smaller proportion of soya flour, not readily tolerated in cases of weak digestive powers.

T. H. POPE.

Wood's light for the detection in wheat flour of extraneous and harmful seeds and of extraneous mineral substances. G. CAPPELLI (*Annali Chim. Appl.*, 1927, 17, 513—519).—When wheaten flour containing 2% or more of pea meal is exposed to Wood's light, the particles of pea meal appear as bright orange-flesh-coloured spots against the violet-blue nacreous mass of the wheaten flour. When more than 10% of the pea flour is present, the orange-flesh-coloured fluorescence begins to predominate. This procedure fails to reveal marble, talc, silica, alumina, soil, gypsum, magnesia, copper sulphate, zinc sulphate, barium sulphate, or kaolin in wheaten flour, but in the 82—84% flour now obligatory in Italy it allows of the detection of 0.3% or more of zinc oxide. T. H. POPE.

Loss of mineral substances from potatoes during ordinary culinary preparation. R. BERG (*Z. Unters. Lebensm.*, 1927, 54, 314).—Losses of mineral matter during the boiling of peeled potatoes depend largely on the "mealy" or other consistency of the potato. Such losses are partly attributable to direct extraction of soluble material and partly to physical disintegration of the flesh of the potato, and may be sufficient seriously to affect the character of the potato as a base-carrying foodstuff (cf. Griebel and Miermeister, B., 1927, 236).

A. G. POLLARD.

Sugar content of water- and other melons. S. N. LUTOCHIN (*Z. Unters. Lebensm.*, 1927, 54, 281—289).—The total sugar content of melons varies considerably with the variety, and also among individual samples of the same variety. In most cases *lævulose* is present in the greatest proportion, followed in order by dextrose and sucrose, the mean values being respectively 52%, 33%, and 14% of the total sugars. The total yield of sugar per melon varies enormously. *Lævulose* and sucrose seem to be stored up principally during the ripening period. The nature of the soil affects the sugar content of melons growing therein. A. G. POLLARD.

Importance of water-melon syrups as foods. S. LUTOCHIN (*Z. Unters. Lebensm.*, 1927, 54, 290—291).—Analyses of water-melon syrups are recorded.

A. G. POLLARD.

Changes in the flesh and in the brine of salted fish. G. DRUCKER (*Z. Unters. Lebensm.*, 1927, 54, 253—257).—Various fish were pickled in common varieties of pickling salt. Variations in the amounts of calcium and magnesium in the salt produced only slight alterations in the taste of the fish. The quality of the product was mainly affected by the freshness of the original fish, the method of preparation, and the temperature and concentration of the brine used. The degradation of protein matter in the softer flesh of fish during pickling may proceed to a considerable extent without detracting from their good quality and without any rancidity being apparent. After pickling for 255 days, the concentration of nitrogen titratable with "formol" in the tissue fluids represented 81% of the total nitrogen. A. G. POLLARD.

Bottled cocoa beverages. J. B. WILSON and W. R. TURNER [with J. W. SALE] (*Amer. Food J.*, 1927, 22, 244—246).—An investigation of the persistence of hydrogen peroxide in bottled cocoa beverages; the

effect of the presence of yeast and bacteria is also examined. Hydrogen peroxide was present in all but one of the cocoa beverages. The potassium iodide and benzidine methods for the determination of hydrogen peroxide are preferred. CHEMICAL ABSTRACTS.

Metals for cooking utensils. SPRINKMEYER.—See X.

Bromine-iodine values of fats. VAUBEL. **Butter fat and coconut oil.** KLOSTERMANN and QUAST.—See XII.

PATENTS.

Heat-treatment of cheese. A. E. WHITE. From LAKESHIRE CHEESE CO. (B.P. 280,257, 5.7.26).—Finely-divided cheese is passed continuously through a treating vessel, where it is subjected momentarily to the direct action of steam which sterilises it and reduces it to a semi-liquid or plastic condition, but does not destroy its characteristic flavour. While still fluid it is impregnated with carbon dioxide gas, packed in the warm state, and allowed to cool. [Stat. ref. to B.P. 270,046.]

F. R. ENNOS.

Manufacture of fodder from sugar cane. A. E. KIENZLE (B.P. 280,284, 11.8.26).—After removal of the leaves, the sugar cane is cut into small pieces, dried in the sun or by artificial means, and ground to a fine powder while being heated at a temperature insufficient to caramelize the sugar. The milled product is graded according to fineness, and the medium quality, forming about 75—80% of the whole, is mixed with ground maize cobs etc. and used as a mixed fodder. F. R. ENNOS.

Manufacture of substances from sugar cane for use in the preparation of food and beverages. A. E. KIENZLE (B.P. 280,432, 11.8.26).—Sugar cane is cut into chips or discs etc., dried, and roasted until the sugar is more or less caramelised. The material is powdered and the coarse fibrous ingredients are removed by sifting, either before or after roasting, and the product is used as a colouring and flavouring ingredient for foods and beverages or as a coffee substitute.

F. R. ENNOS.

Alimentary industrial product consisting of the juices of oranges or lemons, with their pulps and free from their essences. A. T. MEZQUITA (B.P. 256,985, 12.8.26. Spain, 12.8.25).—The ripe, sound fruit is grated in order that the essence may be subsequently extracted from the separated rind, cut in halves, and squeezed to liberate the juice, pulp, seeds, and refuse. The mass is then strained first to remove the seeds and refuse, and again to separate the pulp from the juice, and the latter is subjected to a low temperature (about -10°) to freeze out the water, the frozen particles of which are separated centrifugally. The pulp is then added to the concentrated juice, and bottled with addition of a small quantity of a suitable preservative. Each bottle of juice and pulp is accompanied by another containing sufficient essence to impart the natural aroma thereto at the time of mixing. F. R. ENNOS.

Manufacture of aerated waters, sparkling drinks, etc. BRIT. DYESTUFFS CORP., LTD., C. HOLLINS, and E. CHAPMAN (B.P. 280,302, 19.8.26).—Wetting-out or dispersing agents, viz., sulphonic acids of high mol. wt., particularly the *isopropylated* sulphonated mineral

oil fraction of B.P. 274,611 (B., 1927, 841), are added to aerated waters, flavouring syrups for soda-fountains, effervescent salines, etc. The treated substances give a more persistent froth, and the liquid retains its "sharpness" for a longer time. C. HOLLINS.

Manufacture of bread. H. A. KOHMANN, Assr. to FLEISCHMANN Co. (U.S.P. 1,651,717—8, 6.12.27. Appl., 29.6.26).—See B.P. 244,489; B., 1927, 376.

XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Ephedrine assay of Chinese *Ephedra*. C. T. FENG and B. E. READ (J. Amer. Pharm. Assoc., 1927, 16, 1034—1039).—A critical examination of the methods of ephedrine assay of Chinese Ma Huang has been made. The following methods of extraction, followed by treatment of the extract with alkali and chloroform, were used. The figures represent the amounts of total alkaloid calculated as ephedrine, and pure ephedrine (by biuret assay) respectively: hot acetic acid, 0.993%, 0.614%; hot hydrochloric acid, 1.32%, —; cold aqueous potassium carbonate, 1.12%, —; cold acetic acid, 0.302%, —; cold sulphuric acid, 0.283%, —; adsorption by fuller's earth from a water extract of the material extracted with hot acidified alcohol, 0.961%, 0.512%. The ammonia-chloroform method has been studied, and it is shown that, for complete liberation of the alkaloids, the addition of a very large excess of ammonia is necessary. A physiological method for confirming the chemical methods is outlined. E. H. SHARPLES.

Quantity of alkaloid in *Hyoscyamus* and a new method for its evaluation. H. R. WATKINS and S. PALKIN (J. Amer. Pharm. Assoc., 1927, 16, 1039—1044).—Total alkaloid in *Hyoscyamus niger* has been determined by soaking the powdered drug in a mixture of strong ammonia solution, alcohol, and ether for several hours, and then extracting with ether in a continuous extraction apparatus. After purification of the extract the alkaloid is extracted from aqueous solution by means of another automatic extractor (cf. B., 1925, 566) and determined by titration. This method yields from two to three times as much alkaloid as that obtained by the U.S.P. IX and X methods, and the alkaloid by physiological test shows the full hyoscyamine mydriatic power (cf. B., 1927, 399). E. H. SHARPLES.

Constituent of commercial ethyl ether. H. KING (Nature, 1927, 120, 843).—Commercial samples of ethyl ether, whether exposed to light or not, contained ethyl vinyl ether. A. A. ELDRIDGE.

Sterilisation of hexamethylenetetramine solutions. U. CAZZANI (Boll. Chim. farm., 1927, 66, 674—676).—Hexamethylenetetramine solutions to be used for endovenous injection should be freshly prepared with cold water, and should be either sterilised by heating at 60—70° or passing through a filter-candle, or prepared aseptically. At 120°, or even 100°, appreciable decomposition of the amine occurs. T. H. POPE.

Solubilities of drugs in glycerin. J. A. ROBORGH (Pharm. Weekblad, 1927, 64, 1205—1209).—Solubilities are recorded of some twenty medicinal compounds in glycerin of d 1.23 and 1.26, determinations being made at 20° both by shaking with excess of solute and by cooling a solution saturated at 80—90°. Supersatura-

tion is very general. Where water of crystallisation is present, the solute may be dehydrated by the solvent. Phenol, tannin, sodium arsenate, and sodium pyrophosphate had the highest solubilities of the substances examined, and theobromine, guaiacol carbonate, phenacetin, zinc valerate, and stearic acid the lowest.

S. I. LEVY.

Determination of aldehyde in essential oils, with particular reference to the determination of citronellal in Java citronella oil and citral in lemon oil. C. T. BENNETT and M. S. SALAMON (Analyst, 1927, 52, 693—695).—To 5 g. of hydroxylamine hydrochloride dissolved in 9 c.c. of hot water are added 80 c.c. of 90% alcohol (d 0.833) and 2 c.c. of Bromophenol Blue solution (1 g. with 3 c.c. of 0.05N-sodium hydroxide, and made up to 25 c.c. with water), and the whole is neutralised, if necessary, with 0.5N-alcoholic alkali, and made up to 100 c.c. with more 90% alcohol (rectified, not industrial, spirit should be used). 20 c.c. of the hydroxylamine hydrochloride are added to 2 g. of citronella oil, and the alcoholic alkali is run in until the sharp end-point is reached. The values thus obtained are lower than those by the Dupont and Labaune method, but are regarded as being more correct. The method was successfully applied to the determination of citral in lemon oil and to several other oils containing aldehyde. D. G. HEWER.

Production of essential oils from Irish-grown plants. II. Cultivation of *Mentha piperita*, and further experiments on the winning of lavender oil. J. REILLY and C. BOYLE (Econ. Proc. Roy. Dublin Soc., 1927, 2, 285—291).—The varieties and cultivation of *M. piperita* are discussed with a view to the economic production of oil of peppermint in Southern Ireland. Lavender oil, from English plants after cultivation for one year in Cork, had d 0.8968, n 1.4679, α $-5^{\circ} 20'$, acid value 0.7, and ester value 14. An oil from ordinary nursery lavender plants which had been growing in Cork for 7 years resembled spike lavender oil, and had d 0.890, n 1.4650, α $-7^{\circ} 30'$, acid value 2.4, and ester value 69 (cf. B., 1926, 462). E. H. SHARPLES.

Production of essential oils from Irish-grown plants. III. Oil of peppermint. J. REILLY and J. TAYLOR (Econ. Proc. Roy. Dublin Soc., 1927, 2, 292—297).—Seventy pounds of green herb from 300 Mitcham plants grown in Cork during 1926 gave a yield of about 0.2% of peppermint oil having d 0.903, n 1.4631, α -19.5° , menthol, total 66.2%, combined 3.27%, and solubility in 70% alcohol 1 in 2.3. Values for oil from "black" and "white" peppermint and for first and second crop Australian and Sicilian oils are given, and both these and reports from independent experts show that the oil from Irish-grown plants compares favourably with the best varieties of peppermint oil. Analytical figures showing the variations in nine types of peppermint oil are given and different methods of distillation are discussed. The yield of oil at different periods of the plant's growth has been examined. The season of flowering is the period of highest yield, and the largest amount of oil was obtained from leaves and flowering tops, and was of better quality than the oil from the stalks. E. H. SHARPLES.

Production of essential oils from Irish-grown plants. IV. Oil of camomile. J. REILLY and P. J. DRUMM (Econ. Proc. Roy. Dublin Soc., 1927, 2, 298—301).—Distillation of the hand-picked flowers from a small plot of *Anthemis nobilis* (single variety) grown in Cork gave a blue-coloured oil having d 0.919, n 1.4464, α +2° 15', acid value 2.0, and ester value 172. These figures are comparable with those of a camomile oil from Mitcham-grown plants. The cultivation of the plant and the properties of the oil are described.

E. H. SHARPLES.

PATENTS.

Manufacture of colourless melted [pharmaceutical] products. CHEM. FABR. AUF ACTIEN (VORM. E. SCHERING) (B.P. 272,875, 20.5.27. Ger., 18.6.26. Addn. to B.P. 255,434; B., 1926, 931).—Colourless products are obtained by melting 4-dimethylamino-1-phenyl-2:3-dimethyl-5-pyrazolone with soporifics in an inert atmosphere. Compounds are described in which 1 mol. and $\frac{1}{2}$ mol. of phenylethylbarbituric acid, respectively, (m.p. 130—133° and 100—129°); 1 mol. of trichloroethyl carbamate (m.p. 73—75°) and also $\frac{1}{2}$ mol., and 1 mol. of bromodiethylacetylcarbamide (m.p. 82—86°) are used.

B. FULLMAN.

Preparation of anti-diabetic material from pancreas. J. R. MURLIN (U.S.P. 1,646,553, 25.10.27. Appl., 27.3.24).—Fresh, finely-divided pancreas is heated with 0.2*N*-hydrochloric acid at 90°, and the liquid is filtered, adjusted to p_H 4.1, and refiltered. The filtrate is saturated with sodium chloride, and the precipitate formed is dissolved in 70% alcohol and reprecipitated by addition of butyl alcohol. It is administered *per os* mixed with citric acid to prevent destruction of the anti-diabetic principle by trypsin.

T. S. WHEELER.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Nature of desensitisation. V. SIHVONEN (Z. wiss. Phot., 1927, 25, 1—9).—On the basis of Baur's theory of photolysis it is shown that desensitisation can be regarded as a special case of sensitisation, the important fact for this view being that desensitisation holds only for the blue light which is absorbed by the silver bromide and not for the wave-lengths absorbed by the dyes. The silver bromide is the light receiver and the dye is the substance acted on. The silver bromide is regarded as the sensitiser for the photolysis of the dyestuff, and gives up its light content to the surroundings; otherwise the light would act on the silver bromide itself, which would be decomposed. In order for these views to be correct, it follows that under the same conditions silver bromide with no desensitiser deposits more silver on exposure than silver bromide with desensitiser, and that for the difference in the amount of silver set free there must be an equivalent amount of dye reduced. To test the views silver bromide emulsions were exposed with anodic depolarisers (organic reducing agents) in presence and absence of dye, and the results of the experiments are given.

W. CLARK.

Photochemical nucleus destruction. LÜPPO-CRAMER (Z. wiss. Phot., 1927, 25, 25—28).—Densograph curves are given showing that in the case of pre-exposed

plates bathed in Phenosafranine and bromide, a bleaching effect is produced on subsequent exposure which, however, reverses at higher intensities giving a normal image again. In absence of bromide the density of image may even rise to a higher value than that of the original image. If the second exposure is made through a yellow filter, bleaching alone results, and no reversal is found. The second reversal in the bleach-out reaction is ascribed to the light penetrating deeply into the grains where the action of the desensitiser is not felt, so that the deeper lying parts of the grains are affected. With Pinakryptol Green and Yellow the second reversal does not occur, but merely a bleaching, either in unfiltered or blue light.

W. CLARK.

Intensification of the latent image. LÜPPO-CRAMER (Z. wiss. Phot., 1927, 25, 23—25; cf. B., 1927, 268).—In 1915 the author made experiments similar to those of Wightman and Quirk (*loc. cit.*), and came to similar conclusions (Phot. Korr., 1915, 135). The water effect observed by Wightman and Quirk has also been observed by the author (B., 1927, 714, 715).

W. CLARK.

PATENTS.

Light-sensitive films. U. DIEM-BERNET (F.P. 617,929, 19.6.26. Switz., 17.5.26).—Instead of gelatin, substances such as acetyl- or citryl-cellulose, cellophane, etc. are used. These materials are resistant to mechanical influences, and can be used without a support, and can therefore be exposed from either side. Several such films may be united together or with colour filters.

W. CLARK.

Manufacture of bodies of photographic desensitising action. I. G. FARBENIND. A.-G. (B.P. 262,816, 13.12.26. Ger., 11.12.25).—Desensitisers made by condensing a methylpyridine or methylquinoline base with an aldehyde of a negative character (cf. G.P. 396,402; B., 1924, 902) are not satisfactory because they are not sufficiently soluble, and their desensitising action is not very high. These faults are remedied by the introduction of certain groups at determined points in the molecular complex. Suitable desensitisers are produced by condensing together an alkyl sulphate of a *p*-alkyloxyquinoline with a *m*-nitrobenzaldehyde. The products have only a faint yellow colour.

W. CLARK.

Photographic emulsions. I. G. FARBENIND. A.-G. (B.P. 271,475, 17.5.27. Ger., 20.5.26).—Gelatins which are unsuitable for making emulsions on account of their fogging tendencies may be rendered useful for making clear, high-speed emulsions if glyoxaline or its derivatives are added to the gelatin or to the emulsion in the course of manufacture. Glyoxaline derivatives produced by the degradation of proteins may be used.

W. CLARK.

Decoration of fabrics by the reducing action of light on silver salts. M. MICHELS (G.P. 441,690, 4.5.26. Addn. to G.P. 441,150; B., 1927, 861).—Instead of a ferrocyanide or metal oxide mordant, a mordant suitable for all basic dyes is formed from complex copper compounds. The basic dyes form with the complex acids mordant dyes which form coloured lakes with cuprous ions. The resulting images are very stable and pure, and have great depth of colour.

W. CLARK.

Colour images, especially for multi-colour photography. D. LIERG, K. POKORNY, and L. ROSS (Austr. P. 105,594, 9.8.24. Cf. B.P. 245,470; B., 1926, 997).—A glass or film base is coated first with a rubber solution and then with gelatin hardened with formaldehyde. On this substratum is coated an emulsion containing a silver halide, tannin, and in some cases a further substance which forms a lake with certain dyes. The negative is printed on this layer from the glass or celluloid side, developed, and treated first with chromic acid solution and then with hot water. A gelatin-coated transfer paper is then rolled on and stripped after drying.

W. CLARK.

XXII.—EXPLOSIVES; MATCHES.

Evolution of gases from heated nitrocellulose powders. J. DESMAROUX (Mém. Poudres, 1927, 22, 245—258).—The nature of the gases which are evolved when nitrocellulose powders are heated at the temperatures employed in stability tests has been investigated. The temperatures employed were 108.5° and 75°. The gases evolved from powders maintained at these temperatures were collected at certain intervals and analysed for carbon monoxide and dioxide, nitrous oxide, and nitric oxide. At 108.5°, the chief constituents were carbon dioxide and nitric oxide; nitrous oxide was absent. During the heating of the powder the amount of nitric oxide evolved increases to a maximum and then decreases. The presence of a stabiliser in the powder increases the hours of heating which are necessary for the evolution of a certain volume of gas. Evidence is adduced showing that the reaction following heating at 75° differs from that at 108.5°.

S. BINNING.

Microscopical examination of B-powders. J. DESMAROUX (Mém. Poudres, 1927, 22, 259—284).—The form in which "C.P. 1" (guncotton) exists in B-powders has been investigated microscopically. Examination of C.P. 1 by itself showed that the structure of the cotton fibre is not altered during nitration, but is destroyed by pulping. "C.P." is shown to be a mechanical mixture of either completely soluble or completely insoluble fibres. By staining with Oxydiamine Black J.W.R. and Lyon Blue B, properly dehydrated powders can be distinguished from those poorly dehydrated, and also washed from unwashed powders. Directions are also given for the differential staining of C.P. 1 and C.P. 2 (soluble nitrocellulose).

S. BINNING.

PATENTS.

Propellant powder. C. H. KECK (U.S.P. 1,651,459, 6.12.27. Appl., 27.7.26).—The powder contains 85—99% of nitrocellulose and 15—1% of nitrated castor oil.

F. G. CROSSE.

Removal of diphenylamine from smokeless powder. D. C. BUTTS, Assr. to HERCULES POWDER Co. (U.S.P. 1,650,689, 29.11.27. Appl., 30.7.26).—The powder is treated with boiling isopropyl alcohol.

H. ROYAL-DAWSON.

XXIII.—SANITATION; WATER PURIFICATION.

Physico-chemical study of scale-formation and boiler-water conditioning. R. E. HALL, G. W.

SMITH, H. A. JACKSON, J. A. ROBB, H. S. KARCH, and E. A. HERTZELL (Min. Met. Invest., Carnegie Inst. Tech. Bur. Mines, Bull., 1927, 24, 239 pp.).—Boiler-water conditioning consists of the maintenance at the evaporating surfaces of ratios between the acidic radicals originally present and introduced, the numerical values of which depend on the characteristics of boiler operation and the chemical used. The behaviour of various added chemicals is discussed, together with conditions of corrosion. The solubilities of calcium sulphate and phosphate are recorded. The decomposition of soda ash is not lessened by the presence of organic matter. The corrosive action of magnesium salts is specific only above a critical concentration. Formulae applicable to control and prediction are given. CHEMICAL ABSTRACTS.

Sodium aluminate as an adjunct to alum for the coagulation of public water supplies. S. T. POWELL (Amer. J. Pub. Health, 1927, 17, 804—809).—When sodium aluminate is employed as an adjunct to alum, the filtered water contains less free carbon dioxide and alumina. Technical advantages are described. CHEMICAL ABSTRACTS.

Micro-determination of carbonate carbon [in lake water]. G. KEMMERER and L. T. HALLETT (Ind. Eng. Chem., 1927, 19, 1352—1354).—In the determination of carbon in residues obtained by evaporating lake waters, micro-combustions (A., 1927, 269) are made at 900—950° to decompose all the carbonates, and the carbonate carbon is then determined on 5—15 mg. portions of the residues by decomposition with hydrochloric acid in a specially designed apparatus, phosphorus pentoxide or dehydrite being used as the drying agent and ascarite as the carbon dioxide absorbent. For residues containing up to about 8½% of carbonate carbon, the average error on duplicate determinations was less than 0.1%.

F. R. ENNOS.

Germicidal efficiency of sodium hydroxide, sodium carbonate, and trisodium phosphate at the same hydrogen-ion concentration. M. LEVINE, E. E. PETERSON, and J. H. BUCHANAN (Ind. Eng. Chem., 1927, 19, 1338—1340).—In solutions of the same p_H value sodium carbonate was found to possess a greater germicidal power than trisodium phosphate, which was itself superior in this respect to sodium hydroxide. The times required by solutions of the carbonate, phosphate, and hydroxide, at 70°, and having p_H 11.35, to kill 99.9% of the bacteria the initial count of which was 1 million per 5 c.c. of solution were 120, 163, and over 220 min., respectively. For a given alkali the killing time decreased with increasing p_H value, but this value alone afforded no dependable index of the germicidal efficiencies of different alkalis. F. R. ENNOS.

Hardness of brewing water. LÜERS.—See XVIII.

PATENTS.

Preparation of a medium for the treatment of water [germicide]. H. REINBOLD (U.S.P. 1,646,596, 25.10.27. Appl., 10.8.25).—Anhydrous sodium hydroxide is treated with bentonite, and the product is saturated with chlorine.

T. S. WHEELER.