

BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

NOVEMBER 11, 1927.

I.—GENERAL; PLANT; MACHINERY.

Simple face mask for dusty industrial processes.

L. P. LOCKHART (J. Ind. Hyg., 1927, 9, 421—423).

PATENTS.

Grinding, milling, and pulverising apparatus.

R. K. RAMSAY, and MAYHEW, RAMSAY, & Co., LTD. (E.P. 277,185, 14.10.26).—In a pulveriser of the swing-hammer type with a perforated base to the grinding chamber, a current of air is drawn from atmosphere through the mill by a fan, and the air, after depositing the ground material in a separator, is not returned to the mill, but exhausted to atmosphere.

B. M. VENABLES.

Grinding mills. R. LISTER & CIE., and F. V. LISTER (E.P. 276,594, 22.4.27).—A fine-grinding or colloid mill is constructed with the space between the rotor and stator gradually decreasing at first from the inlet outwards and then with a parallel zone.

B. M. VENABLES.

Crushers. ALLIS-CHALMERS MANUF. Co., Assees. of R. C. NEWHOUSE (E.P. 269,866, 15.3.27. U.S., 24.4.26).—Several crushers having unbalanced moving parts, e.g., gyratory crushers, are geared together so that the whole is in balance.

B. M. VENABLES.

Apparatus for heating substances in a finely-divided state. J. TRAUTMANN (E.P. 262,791, 8.12.26. Ger., 8.12.25).—The powdered material is blown into a stream of hot gas and the mixture passes at least once upwards and once downwards through concentric passages in succession before the powder is allowed to separate out. The apparatus may be arranged to work under pressure.

B. M. VENABLES.

Process of transforming pulverulent substances into uniform small pieces for reaction with gases.

I. G. FARBERIND. A.-G. (E.P. 269,209, 11.4.27. Ger., 10.4.26).—The dry powder is spread in a layer 1—2 cm. thick upon a conveyor belt, and on to it is scattered liquid in the form of individual drops, precautions being taken to prevent drops running together. Each drop of liquid will gather up powder into the form of a nearly spherical pellet, and the pellets are separated from excess powder by screening, then dried, and placed in the reaction vessel, where they will offer but little resistance to the flow of gases, but provide a large active surface.

B. M. VENABLES.

Production of dispersion of solids in liquids and apparatus therefor. W. H. WHATMOUGH (E.P. [A, B] 276,400—1, 22.4.26, and [C, D] 276,727—8, 29.5.26).—(A) The apparatus may conveniently be used after a colloid mill of known type in order to produce

more concentrated dispersions by breaking down the non-colloidal globules that will pass through other types of mill. The paste (or fluid) is subjected to a wiping action between a cylindrical or conical rotating surface and fixed surfaces lined with yielding material such as plush. Temperature may be controlled if desired. In (B) is described an adaptation of an existing type of roller mill to effect the process described in (A). (C) In a mill having both surfaces in the form of flat discs, one disc is rotated and the same or the other is given a reciprocating straight-line or arcuate motion. (D) Both discs rotate about non-coincident axes.

B. M. VENABLES.

Method of thickening [filtering] mixtures. A. L. GENTER, Assr. to GENTER THICKENER Co. (U.S.P. 1,642,673, 20.9.27. Appl., 16.7.25).—The hot mixture, in contact with a filtering medium, forms two filtrate columns united at their lower ends. Suction is applied to one column to promote the filtration, and the density of the liquid in that column is reduced to raise its level above that of the liquid in the other column.

H. HOLMES.

Filtering machines. E. L. SMITH. From W. T. CHATFIELD (E.P. 276,820, 19.8.26).—A filter especially suitable in the treatment of gold slimes etc. is constructed of a 5-sided box, the 6th or open end being provided with flanges by which the box can be bolted to a fixed end-plate with a movable frame interposed. A number of filter leaves are constructed around tubular supports attached to the fixed end-plate, and the movable frame is made up into a grid with more or less flexible cross-slats which will scrape the surfaces of the filter leaves. For filtering, the apparatus is bolted up and the prefilter supplied under pressure through the fixed end to the interior of the box. After filtering and washing, the bolts are unfastened and the box is run back on wheels and rails; at first it runs back alone, but in the latter part of its motion drags the frame with it and scrapes the filter cakes off.

B. M. VENABLES.

Heating of liquids. A. J. LAMBERT, and LAMBERT HEATER & ENGINEERING Co., LTD. (E.P. 276,807, 27.7.26).—A heating vessel—which may be made in sizes suitable for a domestic kettle upwards—is provided with a "bottom" that is cupped very steeply upwards, so that the upper bend is nearly at the liquid level, and the liquid is substantially all contained in the jacket between the "bottom" and the sides of the outer vessel. The surface of the "bottom," may be corrugated and may have attached to it, but spaced from it, on the fire side, rectangular or other shaped thin box-like structures containing liquid which circulates into the main body through pipe-like connexions. B. M. VENABLES.



Apparatus for concentrating or solidifying liquids, pastes, etc. G. H. WARBURTON (E.P. 276,475, 5.7.26).—The paste is passed over several rollers in succession and removed from the last by a knife or scraper. The last roller is heated by internal steam, which is produced and reproduced in a heating coil adjacent to the apparatus, and circulated by a pump driven by the apparatus.

B. M. VENABLES.

Gas and air washing apparatus. PNEUMATIC CONVEYANCE & EXTRACTION, LTD., and S. N. CHEW (E.P. 277,112, 10.6.26).—The gas to be washed passes under a screen of flexible material, such as tarpaulin, which is attached to wooden or other bars floating on the surface of the washing liquid, and from the bars depend strips or sheets of metal broadside on and in staggered relation to the flow of gas. On its passage between the strips the gas produces waves and splashing, keeping all the surfaces wet and washing off the collected mud, which settles in the bottom.

B. M. VENABLES.

Indicating or controlling devices operating in the presence of impurities or other additions in gases or liquids. DEUTS. GASGLÜHLICHT-AUER-GES.M.B.H. (E.P. 254,299, 17.6.26. Ger., 27.6.25).—A brick is made of a substance that will crumble when acted on by the gas, vapour, or liquid which is to be detected, the crumbling of the brick serving to operate a warning or controlling device. For example, the presence of benzol in a current of gas or stream of liquid such as alcohol may be detected by a pellet of rubber.

B. M. VENABLES.

Process and apparatus for mixing gases. E. FALKENTHAL (U.S.P. 1,643,065, 20.9.27. Appl., 18.12.24. Ger., 23.4.21).—A vessel provided with gas inlet and outlet pipes is divided by a central partition formed of thin grids spaced to constitute a mixing chamber, each grid being provided with a large number of regular openings. Opposed streams of the gases are passed slowly into the mixing chamber through the grids. The smallest diameters of the openings are about ten times the thickness of the grid, and their edges are sharp to promote a whirling motion of the gases behind each opening.

H. HOLMES.

Carrying out exothermic reactions. L'AIR LIQUIDE SOC. ANON. POUR L'ÉTUDE ET L'EXPLOIT. DES PROC. G. CLAUDE, Assees. of SOC. CHIM. DE LA GRANDE PAROISSE (E.P. 268,722, 26.10.26. Fr., 1.4.26).—In a catalyser for carrying out exothermic reactions, such as the combination of nitrogen and hydrogen, the incoming gases are conveyed through the catalyst (out of contact with it) to the hottest part, then brought back to the cooler part, and finally back to the hotter part, and emerge into the catalyst. By this means the catalyst is maintained at a more uniform temperature and the gases are finally delivered into the catalyser at a temperature high enough to maintain the reaction. Part of the incoming gases (or other gases) may be passed through a narrow space between the catalyst and the containing pressure-resisting vessel to protect the latter.

B. M. VENABLES.

Heating, melting, evaporating, or cooling vessel or the like. P. HADAMOVSKY (E.P. 265,597, 3.2.27. Ger., 3.2.26).—A heating or cooling element is constructed, e.g., by casting iron round wrought-iron pipe coils and giving the cast iron surface a corrugated form, so

that all points of the surface in contact with the liquid are equidistant from the source of heat or cold.

B. M. VENABLES.

Tunnel kiln. J. KELLEHER, ASST. to HARPER ELECTRIC FURNACE CORP. (U.S.P. 1,643,775, 27.9.27. Appl., 29.8.25).—Two streams of gas, substantially filling separate portions of the tunnel, enter the tunnel under pressure, and are withdrawn at adjacent points at substantially the same pressure below atmospheric, so that the gases are in contact near their points of withdrawal.

J. S. G. THOMAS.

Apparatus for preventing damage by gases evolved in mordanting, electrolysis, or in the production of chemical products. SOC. ANON. DE PERFECTIONNEMENTS ELECTROLYTIQUES (F.P. 617,551, 15.6.26).—Air, blown through the gap between cover plates arranged at different heights on the surface of the vessel, carries the evolved gases to a hood.

J. S. G. THOMAS.

Refrigeration. CARRIER ENGINEERING CO., LTD., and W. H. CARRIER (E.P. 276,887, 21.2.27).—Methylene chloride, d^{15} 1.33, b.p. 39.5–40.5°/760 mm., is subjected to compression, condensation, and evaporation in a refrigerating cycle, the pressure never being much above atmospheric and preferably always below it. The quantity of liquid in circulation is sufficient to leave some unevaporated, the total circulating liquid being returned by a pump separate from the compressor, which deals with the vapour which alone passes through the condenser. The evaporating surfaces are unsubmerged, and are covered by sprays above them.

B. M. VENABLES.

Colour-estimating apparatus. TINTOMETER, LTD., F. E. LOVIBOND, and G. S. FAWCETT (E.P. 277,166, 3.9.26).—A tintometer is arranged for the simultaneous viewing of a standard white background through one of a series of standard colour-screens, and of a pastille or other sample of material through a blank aperture, both background and pellet being illuminated by the same source of artificial light. The pastille may be of material that changes its colour when exposed to ultraviolet light, and is exposed to the same rays as a clinical patient, so that the dosage can be measured by the change of colour.

B. M. VENABLES.

[Porcelain] suction filters. STAATLICHE PORZELLAN-MANUF. (E.P. 264,838, 18.1.27. Ger., 19.1.26).—See G.P. 433,376; B., 1927, 189.

Method and agent for drying gases. W. MÜLLER, ASST. to I. G. FARBEIND. A.-G. (U.S.P. 1,644,439, 4.10.27. Appl., 30.3.27. Ger., 7.6.26).—See E.P. 272,173; B., 1927, 736.

Apparatus for effecting chemical tests and controlling chemical reactions. H. S. HATFIELD (U.S.P. 1,643,243, 20.9.27. Appl., 9.10.26. U.K., 14.10.25).—See E.P. 264,237; B., 1927, 207.

Apparatus for screening fine coal or other materials. W. H. BARKER (E.P. 277,392, 11.3.26).

Devices for intimately mixing, churning, or agitating liquids. R. RUBEN, LTD., and R. RUBEN (E.P. 277,564, 10.3.27).

[Circulating devices for] absorption refrigerating machines. A. J. E. MUNTERS (E.P. 255,035, 15.6.26).

II.—FUEL; GAS; DESTRUCTIVE DISTILLATION; MINERAL OILS.

Influence of the ash constituents in the carbonisation and gasification of coal. Gas Fellowship 1927 Rept. (I) J. A. SUTCLIFFE and J. W. COBB, (II) W. R. BRANSON and J. W. COBB, (III) F. J. DENT and J. W. COBB (Fuel, 1927, 6, 449—472; cf. B., 1926, 1001—2; 1927, 592).—A further study has been made of the reactivity of the special cokes made by the carbonisation at 1000° of coal, containing originally 1% of ash, to which small amounts (up to 5%) of various oxides have been added. (I) *Gasification in steam*. Nitrogen saturated with steam was passed over a column of coke (10 g., $\frac{1}{8}$ — $\frac{1}{4}$ in. size) at 1000°, the steaming rate being approximately 10 litres/hr., and the products were collected and determined. The percentages of steam decomposed by the "pure" coke and by cokes produced by the addition of 1% of ferric oxide, sodium oxide (as carbonate), and calcium oxide (as carbonate) to the coal were 62.7, 86.3, 88.4, and 74.8, respectively. No exceptional effects were produced by the addition of two oxides together. Similar increases in reactivity were observed on the addition of the same oxides to a coal containing 4.5% of ash; this had a higher original reactivity than the low-ash coal, however, and the increases were smaller. A similar increased activity towards steam was shown by these cokes at temperatures between 1000° and 600°. The reactivity of the sodium carbonate coke towards steam did not appear to decrease to any marked extent as gasification proceeded. (II) *Gasification in carbon dioxide*. Carbon dioxide at the rate of 6 litres/hr. was passed over the column of coke (10 g.) maintained at 850°, and the resulting gases were analysed. The addition of sodium carbonate to the coal produced a great increase in the reactivity of the coke as measured by the percentage of carbon dioxide reduced, but this reactivity fell off rapidly with time. The iron oxide coke was initially more active than the lime coke, but fell to a value between that for the latter and that for "pure" coke. The differences in reactivity observed at 850° become very much less marked when the determinations are carried out at higher temperatures. The increased activity due to the addition of 1% of an oxide to the coal is generally slightly more than half that due to the addition of 5%. Greatly enhanced reactivities are also produced by direct impregnation of the coke with sodium carbonate. Subsequent passage of hydrogen over the iron oxide coke at 850° restored the initial reactivity; neither the "pure" coke nor the sodium carbonate coke was affected by this treatment. (III) *Gasification in air and oxygen*. An oxygen-nitrogen mixture containing 2% of oxygen was passed over the surface of a piece of coke, 1—2 cm.² in area, held in position in a tube maintained at 800°. The activity, as measured by the rate of combination with oxygen, varied very little for the various cokes, and appeared to be determined mainly by the rate of diffusion of oxygen to the surface of the coke. There are, however, wide differences in the behaviour of the cokes towards oxygen at temperatures within the range 400—700°. The iron oxide coke appears to be definitely more reactive than the "pure" coke. The sodium carbonate cokes behave

abnormally, exhibiting a slow rate of combination with oxygen below 600°, and a marked increase in the rate when the temperature has passed that point. There is no connexion between the reactivities of coke towards oxygen at low temperatures and at high temperatures. Experiments on the readiness with which cokes heat up were carried out by passing a stream of air through a column of coke initially at 700°, and determining the temperature attained as a function of the time. The results indicate that in industrial operations where high temperatures are required in a bed of fuel, a coke with a low reactivity towards carbon dioxide will be more suitable than one with a high reactivity. A. B. MANNING.

Ash content of lignites. F. FISCHER and W. FUCHS (Brennstoff-Chem., 1927, 8, 291—293).—Cassel lignite, which has been exhaustively extracted with alcohol and benzene, exhibits base-exchanging properties. The lignite contains the calcium salt of a humic acid in which, when washed with a solution of sodium, potassium, or ferric chloride, the calcium is partly or completely replaced by the corresponding metal. The calcium can be returned to the lignite by treating with a solution of calcium chloride the sample which has been washed with sodium chloride. Lignite which has been treated with hydrochloric acid takes up calcium from a solution of calcium acetate, acetic acid being found in the solution. Conversely, treatment with hydrochloric acid sets free the humic acid in the lignite and renders it much more soluble in organic solvents.

W. T. K. BRAUNHOLTZ.

Volumetric method for the determination of the ash content and the calorific value of coal. P. N. LATEGAN (Fuel, 1927, 6, 447—448).—The ash content and the calorific value of coals deposited under similar conditions in a particular area are linear functions of the sp. gr. of the coal. When the constants of these functions are known the values of the ash content and calorific value of another coal from the same area can be deduced, with an error usually not exceeding 1%, from a determination of the sp. gr., for which the use of the Taffanel voluménomètre is recommended.

A. B. MANNING.

Determination of the reducing power of coke. G. AGDE and H. SCHMITT (Stahl u. Eisen, 1927, 47, 1477—1481).—The apparatus comprises a source of carbon dioxide free from air and moisture, a flowmeter for measuring the rate of flow of the gas through the apparatus, drying tubes, a wire-wound electric furnace with vertical tube and regulating rheostat, a gas reservoir for collecting the issuing gases, and the usual burettes for gas analysis. The tube of the furnace is packed with grains of coke 3—4 mm. in diameter (the volume of coke used in comparative tests being kept constant) and heated at 200° for 2—3 hrs. while a current of carbon dioxide is passed through the entire apparatus with the exception of the gas burettes, so as to expel all traces of air and completely to dry the coke. The temperature is now raised to 900—1000° and the gas stream regulated to a definite rate, which is kept constant throughout a series of tests. Heating is continued for 2—3 hrs. and samples of the issuing gases are taken every 10 min. and analysed for carbon monoxide and dioxide; the

ratio $100(\text{CO}/\text{CO}_2)$ is the reducing power of the coke, the mean value of all the tests being taken. By increasing the temperature of the coke very slowly after the drying operation and observing the point at which carbon monoxide commences to be present in the issuing gases the so-called "reduction point" of the coke may be found. A. R. POWELL.

Reducing power of coke. G. AGDE and H. SCHMITT (*Z. angew. Chem.*, 1927, **40**, 1007—1008, 1027—1032; see preceding abstract).—Experiments with synthetic coke made by carbonising a mixture of soot and pitch at various temperatures and with a coke made from a high-grade bituminous coal show that the chemical composition and physical nature, both of which depend on the temperature of formation and rate of heating, have a great influence on the reducing power. In general, the lower the temperature at which the coke is made the higher is the reducing power, owing to the greater proportion of adsorbed gases in low-temperature coke. A. R. POWELL.

Sulphur in gas coke. R. FORRIÈRES (*J. Usines à Gaz*; through *Gas J.*, 1927, **180**, 42).—The sulphide sulphur in gas coke may exceed by as much as 42% the amount corresponding to the sulphate and pyrites in the original coal. This is due to interaction between the organic sulphur in the coal and iron present as oxide or other compound not containing sulphur. A further similar conversion of organic sulphur into sulphide sulphur can occur during subsequent prolonged heating of the coke. The addition of carbon dioxide to the water used for quenching coke does not increase the desulphurisation which occurs during the operation. Experiments on desulphurisation by the addition of sodium carbonate etc. to the coal, or by quenching the coke with water containing small quantities of hydrochloric acid, were inconclusive. A. B. MANNING.

Growth of fungi on coals. II. F. FISCHER and W. FUCHS (*Brennstoff-Chem.*, 1927, **8**, 293—295).—Various types of fungi (*Penicillium*, *Aspergillus*, *Mucor*) can exist on a variety of coals. It is not essential to supply a nutrient medium, nor does air appear to be absolutely necessary to the growth of the fungi, which occur on lignite, semi-coke, and coal with diminishing readiness. Fungoid growth has also been observed on a raw Rhenish lignite. W. T. K. BRAUNHOLTZ.

Recovery of ammonia and sulphur from coal distillation gases by the Burkheiser process. W. BURKHEISER (*Gas- u. Wasserfach*, 1927, **70**, 943—945).—Theoretically and practically the absorption of ammonia and sulphur dioxide in the Burkheiser process is found to be quite feasible, irregularities occurring only when hydrogen sulphide is not previously completely removed from the gas. Further large-scale tests are required to determine whether the process as a whole is practicable, e.g., whether carbon dioxide causes any side reactions in the saturating and regenerating stages. The ammonium sulphite, which is obtained as white crystals, loses no ammonia when stored, but is almost completely oxidised, after some days, to ammonium sulphate. W. T. K. BRAUNHOLTZ.

Determination of naphthalene in gas. J. BONTE (*Bull. Soc. chim. Belg.*, **36**, 485—490).—An apparatus

consisting of two concentric glass tubes is inserted into the flow of gas, the inner end of the outer tube being stoppered, whilst that of the inner tube is perforated. The gas enters through the side of the outer tube, is filtered in the annular space (which is packed with glass wool), and passes out through the inner tube to a condenser and finally to a vessel where its temperature is reduced to 0° . The deposited naphthalene is separated from the condensed water, dissolved in a known volume of warm acetic acid, cooled to 17° , and water added until the first traces of naphthalene are precipitated. A graph is given showing the relation between the volume of water required to produce precipitation and the quantity of naphthalene in solution.

H. D. GREENWOOD.

Determination of small quantities of carbon monoxide. D. STAVORINUS (*Het Gas*, 1927, **47**, 162—168; *Chem. Zentr.*, 1927, **I**, 2259).—Colorimetric, titrimetric, and gravimetric methods of determining small quantities of carbon monoxide, especially by the use of ammonium chloropalladate, with or without addition of gold chloride, and also by means of iodine pentoxide, are critically discussed; even with great care none is completely reliable. The hæmoglobin method only is free from objection. A. B. MANNING.

Corrosion of silica retorts [in gas manufacture]. G. LE B. DIAMOND (*Gas J.*, 1927, **179**, 105—107).—Jointing materials for silica retorts are not sufficiently adhesive, and from the manner in which the retorts are built up the jointing material underneath the bottom tile is peculiarly liable to fall out. This seems to occur invariably with the base-tile joint on the combustion chamber side of the retort. The horizontal section of the joint remains unaffected until it becomes fissured transversely by the longitudinal expansion and contraction of the retort. Under these circumstances producer gas leaks through the joint and deposits therein dust and fluxes, with the result that the whole zone around the joint becomes affected. To avoid this it is suggested that the base tile of the retort should be free from joints, especially on the combustion chamber side. The fact that the vertical cracks in the crown of the retort do not suffer similarly to those in the base appears to be due to the protective action of the carbon deposited in the joints from the coal gas. S. PEXTON.

Lubricating oils from coal. H. NIELSEN and S. BAKER (*Brennstoff-Chem.*, 1927, **8**, 289—291).—The higher fraction of the tar (45% of the water-free tar, b.p. above 370°) obtained by the low-temperature carbonisation, by the "L. & N." process, of Shirebrook pseudo-cannel coal yields, after treatment with sodium hydroxide and dilute sulphuric acid, separation of paraffin, and re-distillation, a lubricating oil having lubricating properties not inferior to those of a good mineral lubricating oil. W. T. K. BRAUNHOLTZ.

Determination of water in oils. H. PFLUG (*Chem.-Ztg.*, 1927, **51**, 717—718).—A modification of Oertel's method (cf. B., 1920, 824 A) is described in which 25 g. of the oil are mixed with 10 g. of a mixture of 2 pts. of anhydrous magnesium sulphate and 1 pt. of quartz powder in a heat-insulated apparatus of stated dimensions, and the rise of temperature is observed. For rises

of temperature up to 13° the radiation losses are practically uniform, and the percentages of water in oils of mean sp. heat 0.5 g.-cal./g. may be calculated from the observed rise of temperature by means of a constant factor 0.6. When using an apparatus of different dimensions or when examining oils with appreciably different sp. heats, other factors are applicable. In the case of oils with a moisture content greater than 8%, which give a rise of temperature of more than 13°, a preliminary dilution with a known quantity of water-free oil is necessary. F. R. ENNOS.

Peat and peat wax from Chatham Islands (Bull. Imp. Inst., 25, 243–250).—The dried peat contained 25% of wax extractable with benzene and similar solvents, as compared with 6–8% from German peats and about 12% from lignite. The wax resembled crude montan wax from German lignite, but could not be readily bleached. The crude wax might form a substitute for black montan wax, and the residue, after extraction, a useful fuel. H. D. GREENWOOD.

Carburisation of iron. BRAMLEY and LAWTON. **Coke for blast-furnace work.** GILL.—See X.

Water in alcohol-benzene mixtures. PETERS.—See XX.

Water contaminated with coal gas. REGENSTEIN.—See XXIII.

PATENTS.

Testing blast-furnace coke. EISEN- U. STAHLWERK HOESCH A.-G. and W. WOLF (G.P. 441,444, 6.2.26).—The coke is placed in a container tapered at the lower end and closed by a spring shutter. The coke is compressed by a piston working in the container, the shutter opening easily under the pressure and allowing the coke to pass without damaging it. A. B. MANNING.

Preparing a material for use as pulverised fuel. F. SEIDENSCHNUR (E.P. 276,455, 8.6.26).—In order to produce a pulverised fuel with a high efficiency of combustion without having recourse to very fine grinding operations, the bituminous constituents of coal, lignite, etc. are removed by treatment with hot gases free from oxygen by processes previously described (cf. B., 1921, 803 A; 1925, 700), leaving a coke rich in volatile combustible constituents which need only be comparatively coarsely ground. C. O. HARVEY.

Liquid fuels. A. LAURENT (F.P. 615,749—50, 7.5.26. Belg., (A) 21.11.25, (B) 27.11.25).—Small quantities of (A) unsaturated cyclic hydrocarbons, *e.g.*, turpentine, cumene, eugenol, etc., or (B) ozone, or ozonides, which may be in solution in liquid hydrocarbons, are added to the fuel (mineral oils, benzene, alcohol, etc.) before or during combustion, producing thereby a considerable increase in calorific value. A. B. MANNING.

Motor fuel. J. D. RIEDEL A.-G. (G.P. 441,455, 27.5.25).—The mixture of alcohols produced by the hydration, in a known manner, of the hydrocarbons formed by cracking acid resins and pitch residues from the distillation of aliphatic substances is used as a motor fuel, either alone or admixed with other fuels. A. B. MANNING.

Red-coloured motor fuel. L. J. P. GUIAUD (F.P. 617,225, 9.6.26).—A solution of 7.7 g. of naphthalene in

92.3 g. of benzene is treated with alkanna root and filtered. The filtrate is added to ordinary motor fuels in the proportion of 30 c.c. to 50 litres. A. B. MANNING.

Composite motor spirit. PETROLEUM CHEMICAL CORP., Assees. of C. K. REIMAN (E.P. 253,131, 3.6.26. U.S., 4.6.25).—A motor fuel of high anti-knock properties is composed of a mixture of commercial gasoline, with 15–50% by vol. of the synthetic naphtha resulting from fractionation treatment of the product of cracking a petroleum distillate in the vapour phase, described in E.P. 273,781 (cf. B., 1927, 645). The naphtha is refined to polymerise the most reactive unsaturated hydrocarbons only, and usually contains less than 10% of aromatic hydrocarbons, with polymerides of amylene, butylene, and hexylene, boiling below 225°.

R. C. ODAMS.

Manufacture of carbon black. C. A. BARBOUR, JUN. (U.S.P. 1,643,736, 27.9.27. Appl., 1.3.26).—Hydrocarbons are burnt in a retort under a partial vacuum with sufficient air to form a substantial amount of free carbon, which is separated and collected while in the retort; the waste gases are then withdrawn.

W. G. CAREY.

[Producer gas] furnaces. H. J. TOOGOOD, and R. DEMPSTER & SONS, LTD. (E.P. 276,410, 17.5.26).—A gas producer which is supplied (as usual) with air and steam over substantially the whole area of the grate is supplied with streams of returned waste gases round the edge of the grate, to form a protective gas layer along the walls. The waste gas may be returned by a fan.

B. M. VENABLES.

Purification of gases from producers. L. A. E. BRODEUR (F.P. 617,361, 10.6.26).—The gases are passed through a liquid and afterwards thoroughly cooled, the water vapour which then condenses serving to maintain the filter mass in a moist condition. A. B. MANNING.

Separation of tar from gases. NOLZE G.M.B.H. GASREINIGUNG U. KÜHLERBAU, KAISERSLAUTERN (G.P. 441,493, 8.3.24).—The gas is cooled by tar directly after having been washed by the same tar warmed at least to the dew-point of the gas. A. B. MANNING.

Apparatus for carbonising and distilling lignite, coal, bituminous shale, etc. CHARBONNAGES ET AGGLOMÉRÉS DU BASSIN DE LA TAVE (F.P. 616,401, 20.3.26).—The material is charged into a retort through a double hopper, volatile products are withdrawn through tubes centrally disposed in each of the distillation tubes, and residues are removed by means of a screw conveyor. L. A. COLES.

Mineral oil distillation. RED RIVER REFINING Co., INC., Assees. of J. E. SCHULZE (E.P. 257,250, 7.8.26. U.S., 24.8.25).—The high-vacuum process for the distillation of mineral oils claimed in E.P. 195,090 (B., 1925, 701) is applied to the production of high-grade, narrow-cut lubricating oils, particularly from crudes of high sulphur content. The distillation may take place in the presence of a neutralising agent such as lime, and under a pressure not exceeding 25 mm. (preferably below 5 mm.) of mercury. The lubricating oil vapours are condensed at a temperature just below their liquefaction point, and the uncondensed impurities taken off through a separate conduit. R. C. ODAMS.

Process of obtaining light hydrocarbons from hydroxylated, carboxylated, and like oxygenated organic compounds. J.-M. F. D. FLORENTIN, A. J. KLING, and C. MATIGNON (E.P. 263,082, 26.5.26. Fr., 17.12.25).—Light saturated hydrocarbons are obtained by treating oxygenated compounds (*e.g.*, saponifiable oils, Autun shale oil) in the continuous liquid phase and at temperatures of 350–480° with hydrogen under pressures of 45 kg./cm.² and over, in the presence of thoria as a catalyst. C. O. HARVEY.

Process and apparatus for the cracking of oils. S. SEELIG (E.P. 269,499, 11.3.27. Ger., 16.4.26. Addn. to E.P. 268,323; B., 1927, 805).—The original process is modified in that the oil is led through the helical tube and used as a cooling medium before entering the distillation apparatus. The helical tube is provided with an external baffle plate to increase its efficiency. R. C. ODAMS.

Method and apparatus for treating [cracking] hydrocarbons. C. P. TOLMAN (U.S.P. 1,643,036, 20.9.27. Appl., 26.8.26).—Hydrocarbon compounds are vaporised without substantial cracking taking place, and the vapours cracked by mixing with superheated mercury vapour. R. C. ODAMS.

Purification of hydrocarbons obtained by cracking processes. W. CARPMAEL. From I. G. FARBENIND. A.-G. (E.P. 276,427, 26.5.26).—Benzines which remain water-white and odourless and which do not resinify are produced without loss of valuable aromatic and unsaturated hydrocarbons by refluxing cracked distillates for 30 min. with 2% of ferric chloride containing water (*e.g.*, the product obtained by melting the crystalline chloride). C. O. HARVEY.

Treatment of gases produced in cracking hydrocarbons. SOC. ANON. D'EXPLOSIFS ET DE PROD. CHIM., Assees. of L. BLANCHET (E.P. 251,652, 30.4.26. Fr., 1.5.25).—The gases pass through successive operations of compression, cooling, etc. as follows:—(a) Cooling to about 5° under pressures of 2–5 kg. to effect condensation of the pentanes and amylens; (b) condensation of the butanes and butylenes by cooling to about 0° under pressures of 10–20 kg.; (c) further cooling or absorption of propylene and ethylene by sulphuric acid or by hypochlorous acid to form the corresponding monochlorohydrins; and (d) chlorination of the residual gases to produce monochlorinated derivatives. The separated amylens, pentanes, butylenes, and butanes are treated with hydrochloric acid and with chlorine to produce as far as possible only the monochlorinated derivatives, which may be converted by treatment with sodium acetate or by hydrolysis respectively into acetates or alcohols. C. O. HARVEY.

Obtaining light hydrocarbons from animal or vegetable oils by the simultaneous action of heat, hydrogen under pressure, and a dehydrating catalyst. J.-M. F. D. FLORENTIN, A. J. KLING, and C. MATIGNON (E.P. 276,007, 26.5.26. Fr., 17.12.25).—Light hydrocarbons are obtained from animal or vegetable oils by treating the oil in the continuous liquid phase at 350–480° with hydrogen at a pressure of at least 45 kg./cm.² in the presence of a dehydrating catalyst, *e.g.*, thoria, alumina, clay, or silica. R. C. ODAMS.

Separation of paraffin wax from oils containing it. N. V. BATAAFSCHE PETROLEUM MAATSCHAPPIJ, and J. F. P. SCHÖNFELD (Dutch P. 14,653, 24.3.24. Conv., 16.1.25).—The oil and water are sprayed through separate atomisers so arranged that the sprays intermix, the temperature of the oil spray being about 3–10° higher than the setting point of the oil. L. A. COLES.

Manufacture of a medium for treating oils. H. SCHLOSSTEIN (U.S.P. 1,638,643—4, 9.8.27. Appl., [A] 25.2.27; [B] 21.4.27).—(A) Bentonite clay mixed with magnesium chloride solution is treated with chlorine and sodium hydroxide, and the product, which contains aluminium and magnesium hypochlorites, is dried at the lowest possible temperature. (B) Bentonite clay mixed with magnesium hydroxide and calcium chloride solution is treated with chlorine. T. S. WHEELER.

Continuous treatment of minerals containing bitumen or petroleum. R. AMBLARD (F.P. 616,533, 14.10.25).—The material is charged continuously into a retort heated at such a temperature that a portion of the combustible content burns in a counter-current of air circulating through the retort. L. A. COLES.

Preparation of bituminous emulsions. H. E. POTTS. From MINERAL A.-G. BRIG (E.P. 276,543, 3.12.26).—Bituminous emulsions suitable for road-making etc. are prepared by pouring molten bitumen etc. into a hot aqueous emulsion obtained by heating a glyceride (*e.g.*, bone fat) with excess of an aqueous alkali carbonate solution (preferably potassium carbonate). C. O. HARVEY.

Plastic [bituminous] composition. C. S. REEVE, Assr. to BARRETT Co. (U.S.P. 1,643,520—1, 27.9.27. Appl., 24.1.22).—(A) A mixture of coal-tar pitch and oil shale is heated at 340–350° for 5–10 hrs. (B) Oil shale is heated with coal-tar oil at 310–320° for 10–15 hrs. W. G. CAREY.

[Treatment of fuel] alcohol, alcohol-containing mixtures, and similar liquids. W. OSTWALD, Assr. to BENZOL-VERBAND G.M.B.H. (U.S.P. 1,644,267, 4.10.27. Appl., 10.12.25. Ger., 4.9.25).—See E.P. 257,881; B., 1927, 245.

Manufacture of air gas from inflammable volatile liquids. H. FOERSTERLING (E.P. 277,206, 5.3.26).—See U.S.P. 1,628,135; B., 1927, 625.

Method of distilling solid fuel. F. E. HOBSON (E.P. 277,214—5, 10.1.27).—See U.S.P. 1,614,028; B., 1927, 290.

Bituminous emulsion. J. A. MONTGOMERIE (U.S.P. 1,643,675, 27.9.27. Appl., 13.6.24. U.K., 8.12.23).—See E.P. 226,032; B., 1925, 91.

Resolution of water-in-oil emulsions. E. E. AYRES, JUN., Assr. to SHARPLES SPECIALTY Co. (U.S.P. 1,646,339, 18.10.27. Appl., 2.4.21).—See E.P. 195,876; B., 1923, 541 A.

Process of refining mineral oils. T. HELLTHALER, Assr. to H. S. RIEBECK MONTAN U. ÖLWERKE A.-G. (U.S.P. 1,643,272, 20.9.27. Appl., 1.8.25. Ger., 28.1.25).—See G.P. 426,157; B., 1926, 574.

Doors for closing retorts etc. LOW-TEMPERATURE CARBONISATION, LTD., and J. F. PARKER (E.P. 277,078, 7.6.26).

[Vapour outlet pipe and seal in] retorts for the distillation of coal and solid carbonaceous substances. Means for discharging retorts etc. LOW-TEMPERATURE CARBONISATION, LTD., and C. H. PARKER (E.P. 277,079 and 277,080, 7.6.26).

By-products from ammoniacal liquors (E.P. 276,393).—See III.

III.—TAR AND TAR PRODUCTS.

Benzol poisoning as an industrial hazard. L. GREENBURG (U.S. Public Health Rep., 1926, Reprint No. 1906. 63 pp.).

Naphthalene in gas. BONTE. Lubricating oil from coal. NIELSEN and BAKER.—See II.

PATENTS.

Recovery of pyridine, phenols, oils, and other by-products from gas liquor and like ammoniacal liquors. S. M. SHADBOLT, and CHEMICAL ENGINEERING & WILTON'S PATENT FURNACE CO., LTD. (E.P. 276,393, 1.12.26).—Gas and similar liquors are rendered harmless and fit for discharge into rivers etc. and valuable by-products are obtained by a process involving the addition of solvent oils such as benzene, paraffin, naphtha, creosote, etc. to the liquor prior to or during its distillation. The solvent oils are also added to the saturator in which the ammoniacal vapours are absorbed, and the vapours leaving the saturator also undergo treatment.

C. O. HARVEY.

Bituminous compositions (U.S.P. 1,643,520—1).—See II.

Treatment of wood (G.P. 438,944).—See IX.

IV.—DYESTUFFS AND INTERMEDIATES.

Oxidation of organic dyestuffs and of cellulose on exposure to light. V. SCHARVIN and A. PAKSCHWER (Z. angew. Chem., 1927, 40, 1008—1010).—Pieces of porous porcelain dipped in solutions of various dyestuffs, *e.g.*, Methylene Blue, Crystal Violet, Congo Red, and Eosin, were sealed in an atmosphere of oxygen, nitrous oxide, or nitric oxide and exposed to the action of sunlight for four months. Considerable bleaching action had occurred in most cases, and in all cases carbon dioxide was found in the tube. Similar tests with cellulose (cotton wool) in oxygen showed the presence of carbon dioxide and oxycellulose in the tube after exposure for 30 hrs. to the light from a mercury vapour lamp.

A. R. POWELL.

Detecting colours on wool. HIRST and KING.—See VI.

Fog formation by dyestuffs. LÜPPO-CRAMER.—See XXI.

PATENTS.

Manufacture of azo dyes. I. G. FARBENIND. A.-G. Assees. of FARBW. VORM. MEISTER, LUCIUS, & BRÜNING (E.P. 256,272, 3.8.26. Ger., 1.8.25).—2:3-Hydroxynaphthoic amide or arylamides (other than those derived from diaminodiarlys; cf. E.P. 218,568; B., 1924, 824) are coupled in substance or on the fibre with diazotised esters of 4-nitroanthranilic acid; *e.g.*, Naphthol AS with the methyl ester gives a bluish-red pigment, suitable for paper.

C. HOLLINS.

Manufacture of finely-divided azo colouring matter [dyes] or lakes thereof. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (E.P. 277,275, 12.4.26).—Azo dyes in finely-divided condition are obtained when the coupling is conducted in presence of a sulphonated alkylated aromatic hydrocarbon (*e.g.*, isopropyl-naphthalenesulphonic acid) with or without the further addition of Turkey-red oil or other sulphonated oil. C. HOLLINS.

Manufacture of finely-divided solid materials. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (E.P. 277,048, 12.4.26).—Finely-divided solid mineral or synthetic materials (excluding indigoid vat dyes) are obtained by dry grinding in the presence of aromatic sulphonic acids containing hydrocarbon side-chains or alkylated amino-groups, *e.g.*, isopropyl- and butyl-naphthalenesulphonic acids, sulphonated phenol- or naphthalene-formaldehyde condensation products, dimethylmetanilic acid, diamyl-naphthylaminesulphonic acid, etc. Turkey-red oil etc. may also be added. The process is especially suitable for lake printing colours.

C. HOLLINS.

Manufacture of benzanthrone derivatives. BRIT. DYESTUFFS CORP., LTD., J. BADDILEY, A. SHEPHERDSON, and S. THORNLEY (E.P. 276,766, 19.6.25).—Benzantronesulphonic acid, obtained by direct sulphonation of benzanthrone with, *e.g.*, 100% sulphuric acid or oleum, in presence or absence of catalysts, such as mercury, boric acid, etc., is fused with alkali to give a reddish-blue vat dye.

C. HOLLINS.

New black and grey vat dyestuffs [of the dibenzanthrone series]. BRIT. DYESTUFFS CORP., LTD., and S. THORNLEY (E.P. 276,767, 19.6.26).—The products of alkaline fusion of benzantronesulphonic acid obtained according to E.P. 276,766 (preceding abstract) are condensed with hydroxylamine in concentrated sulphuric acid in presence or absence of ferrous sulphate, giving bluish-grey to black vat dyes.

C. HOLLINS.

Manufacture of new vat dyes [of the dibenzanthrone series]. BRIT. DYESTUFFS CORP., LTD., J. BADDILEY, A. SHEPHERDSON, and S. THORNLEY (E.P. 276,768, 21.6.26).—The vat dyes of E.P. 276,766 (see above) are alkylated with or without a previous oxidation, or oxidation and reduction, to form vat dyes with deeper shade and superior fastness. Direct methylation gives a blue; oxidation and reduction give a green, loose to alkali, which is converted by methylation into a fast bluish-green.

C. HOLLINS.

Process for preparing benzanthrone derivatives [dye for wool and acetate silk]. I. G. FARBENIND. A.-G., Assees. of FARBW. VORM. MEISTER, LUCIUS, & BRÜNING (E.P. 254,294, 15.6.26. Ger., 27.6.25).—3-Nitrobenzanthrone when boiled with sodium bisulphite solution is converted into a sulphonic acid of 3-amino-benzanthrone. The product dyes wool, silk, and acetate silk in bright red shades.

C. HOLLINS.

Production of grey to black vat dyes [of the dibenzanthrone series]. L. B. HOLLIDAY & CO., LTD., and C. SHAW (E.P. 277,125, 15.6.26).—Grey to black vat dyes are obtained by chromic acid oxidation of dibenzanthrone or of the oxidation products obtained by previous treatment with nitric and sulphuric acids, or with manganese dioxide and sulphuric acid.

C. HOLLINS.

Manufacture of [thioindigoid] vat dyes. I. G. FARBENIND. A.-G., Assecs. of FARBW. VORM. MEISTER, LUCIUS, & BRÜNING (E.P. 260,940, 25.5.26. Ger., 7.11.25. Addn. to E.P. 251,996; B., 1927, 809).—The thioindigoid vat dyes of the earlier patent are halogenated, *e.g.*, by chlorosulphonic acid, whereby the shade becomes bluer and the fastness to kier-boiling is increased.

C. HOLLINS.

Manufacture of anthraquinone derivatives. I. G. FARBENIND. A.-G., R. E. SCHMIDT, and R. BERLINER (E.P. 277,109 and 277,110, 10.6.26. Addn. [A] to E.P. 244,462 and [B] to E.P. 244,463; B., 1927, 674).—(A) The two series of products from 4-substituted 1-aminoanthraquinones and formaldehyde in acid media, described in the prior patent, are obtained more readily by using sulphuric acid in presence of a metallic reducing agent (copper, zinc, aluminium), the change from the known, unstable primary products to the new, stable products being thereby facilitated. (B) For the oxidation, nitric or nitrous acid is preferred to the oxidants mentioned in the prior patent.

C. HOLLINS.

Preparation of 2-chloroquinizarin. NEWPORT CO. (E.P. 260,544, 1.5.26. U.S., 2.11.25).—3:4-Dichlorophenol is condensed with phthalic anhydride in presence of sulphuric and boric acids at about 200°, and the resulting boric ester is hydrolysed to give 2-chloroquinizarin, m.p. 235–236°.

C. HOLLINS.

Manufacture of dyes [related to indulines and nigrosines]. H. T. BUCHERER (E.P. 252,745, 31.5.26. Ger., 29.5.25).—Black dyes are obtained by heating an aromatic nitro-compound with an arylamine in sulphuric acid in the proportion of 1 nitro-group to 2 amino-groups; *e.g.*, nitrobenzene with aniline or α - or β -aminoanthraquinone; nitrobenzene with 1:5- or 2:6-diaminoanthraquinone (1 mol.); dinitroanthraquinone with aniline (4 mols.), α - or β -aminoanthraquinone (4 mols.), or diaminoanthraquinone (2 mols.).

C. HOLLINS.

Naphthylaminoalkylamines. W. DUISBERG, W. HENTRICH, L. ZEH, and J. HUISMANN, Assrs. to GRASELLI DYESTUFF CORP. (U.S.P. 1,633,929, 28.6.27. Appl., 17.4.25. Ger., 21.5.24).—See E.P. 249,717; B., 1926, 433.

Catalytic reduction of organic nitro-compounds. M. KAHN and R. MAYER, Assrs. to GRASELLI DYESTUFF CORP. (U.S.P. 1,639,186, 16.8.27. Appl., 14.8.26. Ger., 29.9.24).—See E.P. 260,186; B., 1927, 8.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Influence of plasticising on the mechanical-elastic properties of artificial and natural plastic substances. III. Cellulose materials. O. MANFRED and J. OBRIST (Kolloid-Z., 1927, 43, 41–46. Cf. A., 1927, 514; B., 1927, 563).—Investigation of a number of cellulose materials, including various samples of celluloid and of cellulose acetate (cellon, rhodoid, etc.) confirms the results previously obtained with artificial horn and synthetic resins (*loc. cit.*). It is found that the elastic properties of plastic substances are, apart from factors such as the temperature, the nature of the starting material, etc., functions of the work of plasticising, *i.e.*, the total mechanical and chemical work required to bring

about the changes of disaggregation and re-aggregation leading to the formation of the plastic mass. With decreasing work of plasticising, the elasticity modulus rises. The technical methods for bringing cellulose or its ester into a plastic state are discussed from the point of view of the mechanical and chemical disaggregation and re-aggregation, with special reference to the action of plasticising agents.

L. L. BIRCUMSHAW.

Determination of wood gum in celluloses. H. BUBECK (Papier-Fabr., 1927, 25, 617–620).—Reliable results for the determination of wood gum (*i.e.*, the portion soluble in 5% sodium hydroxide and precipitated on neutralisation of the extract with acid) are only obtained if the cellulose is reduced to a fine state of division and a constant temperature is maintained during the extraction. If the extract is neutralised and precipitation is carried out with alcohol, the latter must not be diluted with water, since, for example, higher values are given for precipitation with 96% than with 88% alcohol. Provided the cellulose is in the form of wadding, and the temperature is constant at 15°, extraction is completed in 1–2 hrs. instead of 2–3 days, whilst the laborious operations of collecting and weighing the precipitate are avoided by the use of an oxidation method for the determination of the dissolved material. In the procedure recommended, 5 g. of cellulose are treated with 100 c.c. of 5 vol.-% sodium hydroxide at 18° for 1–2 hrs., the mixture is filtered, 25 c.c. are withdrawn from the filtrate, oxidised with excess of 1.5*N*-chromic acid containing sulphuric acid, and an aliquot part of this reaction mixture, after suitable dilution, is titrated by the usual iodometric method. 1 c.c. of the chromic acid solution corresponds to 10.13 mg. of wood gum. The differences between the results given by this method and by the neutral (precipitation) method are characteristic of the degree of bleaching of the material, unbleached cellulose showing the highest, highly bleached the lowest, and weakly bleached intermediate values.

B. P. RIDGE.

Stretching processes for [viscose] artificial silk. DURÉ (Kunstseide, 1927, 9, 459–460).—The dyeing and physical properties of wet, freshly coagulated viscose silk may be advantageously modified by stretching previously to the usual processes of washing, desulphurisation, bleaching, and drying. Wet viscose silk can be stretched 1.5 times in length without breakage at a rate of less than 50 m./min., but preferably at 40 m./min., by winding from one drum to another revolving at a higher speed. Stretched, wet, freshly coagulated viscose silk suffers a shrinkage during the subsequent processes of purification and drying which diminishes with increase of stretching; it also has a decreased elasticity, but the decrease is negligible when the stretching is less than 1.4 times. Stretched silk has an increased tensile strength, particularly when the stretching is within the limits 1.25–1.40 times. The most satisfactory results are obtained by stretching 1.4 times.

A. J. HALL.

Nature of paper formation. G. PORRVIK (Papier-Fabr., 1927, 25, 589–596).—The splitting up of wood during grinding takes place in three different ways, *viz.*, (1) the brushing out of the fibres lengthwise, (2) trans-

verse breaking up into short pieces, and (3) wearing away with the formation of mucilage. With ordinary pressure in the hollander the first type predominates, with high pressure the second, with no pressure the third, whilst the ball mill gives a mixture of these. By suitably altering the degree of grinding, as high values for strength etc. can be obtained for a highly bleached sulphite cellulose as for a strong-fibred material. The disadvantage of an overcooked or overbleached product lies not so much in the weakness of the fibres as in the fact that it reaches the required degree of grinding too easily and swells and forms clods too readily. The final degree of grinding depends partly on the original and partly on the acquired composition of the material. Up to 30% loss of strength may result through drying on the machine, air-drying being less harmful, whilst the permissible temperature depends upon the nature of the material. This loss of strength is considered to be due to the fact that the material is composed of fibres and mucilage, the drying hardening the latter to an almost irreversible form. This hardening is overcome by subsequent bleaching, an increase of 8% in strength and a decrease of 10% in the necessary time of grinding being recorded for a treated sample. The addition of sodium hydroxide during grinding shortens the time required, but decreases the strength (compared with that when no addition is made); if the time of treatment is prolonged, however, the strength of the material increases. Inferior results are given for the addition of hydrochloric acid. The increase in the strength of paper produced by a suitably long, as opposed to a short, time of grinding is attributed to the fact that, although the fibres are shortened, the felting capacity of the material is increased. Strength also depends upon the flexibility of the fibres. In a series of samples, the strongest paper was found to have the shortest fibre lengths but the greatest flexibility of fibre. B. P. RIDGE.

Lignocell paper. VON POSSANNER (Papier-Fabr., 1927, 25, 601—603).—Lignocell paper may be produced by only slight modification of the apparatus used for normal steamed mechanical pulp. Its natural colour is very light, and it may therefore be dyed light shades and used for many purposes for which the dark-coloured, steamed, mechanical pulp is unsuitable. Lignocell does not behave like cellulose, but as a true wood pulp, and shows all the characteristic properties and staining tests of the latter. For the working-up of the half-stuff no severe hollandering is necessary as the material has only to be opened and mixed; beating is therefore essential. In spite of its agglutinous nature it behaves well on the paper machines, and owing to its good fibre felting qualities greater working velocities are possible than in the production of ordinary wood cellulose papers. Results of tests show the strength of lignocell paper to lie between those of ordinary log-wood paper and cellulose packing paper, whilst as its volume/weight ratio is large it is specially suitable for the production of voluminous papers. B. P. RIDGE.

Oxidation of cellulose. SCHARWIN and PAKSCHWER.—See IV.

Cellulose in soil. WAKSMAN.—See XVI.

PATENTS.

Process for treating green or dry stalks of ramie and other vegetable fibres. SOC. CIVILE DES PROC. MASSE (E.P. 266,344, 15.2.27. Fr., 22.2.26).—The fibres are boiled in alkali lye (d 1.04) in an autoclave, passed through a soap bath, dried, and are then treated repeatedly in a bath of rice starch, potato flour, or the starch of other amylaceous plants, again dried, and beaten lightly to detach the excess of starch.

W. G. CAREY.

Manufacture of pulp from fibrous material. F. K. FISH, JUN. (U.S.P. 1,632,467, 14.6.27. Appl., 15.7.25; cf. E.P. 255,030; B., 1927, 474).—A sulphite wood-pulp digester is provided with an auxiliary tank into which the pressure is suddenly relieved at intervals, thus promoting disintegration of material.

T. S. WHEELER.

Fabric cement. N. C. AMEN, ASST. to H. H. RANDOLPH (U.S.P. 1,643,437, 27.9.27. Appl., 10.7.24).—See E.P. 258,698; B., 1927, 9.

Extracting pure cellulose from bagasse of sugar cane. E. C. H. VALET (E.P. 277,163, 25.8.26).—See U.S.P. 1,630,147; B., 1927, 552.

Apparatus for conditioning textile fibres. W. W. GROVES. From BORNE SCRYMSEY Co. (E.P. 277,213, 5.1.27).

Ring spinning device for spinning continuously-fed textile fibres. G. B. ELLIS. From SOC. POUR LA FABR. DE LA SOIE "RHODIASETA" (E.P. 277,151, 29.7.26).

Drying, calendering, and like machines. S. MILNE (E.P. 277,181, 9.10.26).

Solubilising carbohydrate ethers (E.P. 277,111).—See XX.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Fastness to light of dyestuffs on woollen and worsted fabrics. V. Effect of ultra-violet radiation on the fading of dyed fabrics. L. HILL. VI. Transmission of sunlight through glass and its effect on fading of dyestuffs. I. O. GRIFFITH and R. G. C. JENKINS (J. Soc. Dyers and Col., 1927, 43, 296—302, 297—299).—V. The amount of fading produced by exposing worsted fabrics dyed with Indigo Carmine X, Ponceau RG, and Neolan Green B to light from a mercury vapour lamp was chiefly dependent on the proportion of ultra-violet light emitted, the fading being greater for light of smaller wave-length. Vitaglass transmits most of the light in sunlight which produces fading. Fading occurs more rapidly in the presence of moisture.

VI. The transmissivities of light through English and foreign window plate glass such as would be used for shop windows displaying coloured textile materials are similar, 90—95% of the visible spectrum, a small proportion of the ultra-violet (3500—3000Å.), and scarcely any of the far ultra-violet (3000—2900Å.) being transmitted. Vitaglass transmits the entire spectrum with but a small loss of intensity, its transmissivities for light of 7000—3250Å. and 2900Å. being 90 and 72.5% respectively. Polished quartz has transmissivities of 90 and 84% for light of 7000—2200Å. and

2000 Å. respectively. Vitaglass is considered satisfactory for covering and protecting dyed fabrics during fading tests.

A. J. HALL.

Effect of light on [indigo]-coloured cotton fabric.

I. (Miss) E. HIBBERT (J. Soc. Dyers and Col., 1927, 43, 292—294).—Plain calico and similar fabrics dyed with Brilliant Copper Blue, Chlorazol Sky Blue, and Benzopurpurin 4B had nearly the same copper numbers (3.6—3.8) after exposure to 669 hrs. of bright sunshine. Since complete destruction of the dyes occurred long before the copper number of the fabric reached 3.6, it is concluded that the fading of dyed cotton is not due to the reducing action of the cellulose under the influence of light (cf. Harrison, B., 1914, 689). Certain dyes retard or accelerate the tendering of cotton under the influence of light. *E.g.*, cotton fabrics dyed with Duranthrene Yellow, Cibanone Yellow, and Indigo, and having an original tensile strength of 48 lb., had tensile strengths of 27, 16, and 22 lb., respectively, after exposure for 120 hrs. in a Fadeometer. Isatin was obtained in a pure crystalline state by extraction with water and ether of calico dyed with indigo and exposed to light. Chromium hydroxide in cotton materials dyed with Chrome Green had a marked protective effect against the action of sunlight.

A. J. HALL.

Dyes not fast to ironing. R. HALLER (Kolloid-Z., 1927, 43, 47—50; cf. B., 1926, 402).—The theory previously advanced (*loc. cit.*), that the behaviour of dyes which are not fast when brought into contact with heated metal is due to the multidispersity of the dyes, has been further tested. It has been found possible to separate strong solutions of a number of dyes, including Congo Red A, Diamine Blue 3R, Azo Blue, Congo Corinth, Bordeaux Extra, etc., into two fractions by exhaustive dialysis. In each case a blue precipitate was obtained, dissolving fairly easily in water on addition of electrolytes, and a red filtrate. Samples of fabric were dyed in the respective filtrates and precipitate solutions, and the tints so obtained were compared by means of a Zeiss step-photometer. The behaviour of the dyed fabrics when brought into contact with heated metal was also investigated colorimetrically. The results are somewhat complex, but support the view that the phase of low degree of dispersion has a strong tendency to pass over into that of higher degree of dispersion.

L. L. BIRCUMSHAW.

Stretching artificial silk. DURÉ.—See V.

Photographic images on cellulose acetate film. HALL and HILL.—See XXI.

PATENTS.

Treatment of [immunised] cotton and viscose silk fibres preparatory to dyeing. P. KARRER (E.P. 263,169, 15.12.26. Addn. to E.P. 249,842; B., 1927, 71).—The preparation of amidated cotton and viscose silk having an affinity for acid dyes, as described in the chief patent, is modified so that instead of treating the esterified (immunised) fibres for a short time at high temperatures with solutions of the bases mentioned, the esterified fibres in their wet state are directly treated with ammonia gas or vapours of suitable amines. Amidation may also be effected with pyridine, piperidine, quinoline, or other heterocyclic base. *E.g.*, cotton partially esteri-

fied with benzenesulphonic acid groups is exposed to ammonia gas at 90°, whereby it acquires a marked affinity for acid dyes (cf. Karrer and Wehrli, B., 1926, 659).

A. J. HALL.

Dyeing of [immunised] cotton materials. SANDOZ CHEMICAL CO., LTD., and A. E. WOODHEAD (E.P. 274,276, 19.7.26. Addn. to E.P. 246,609; B., 1926, 270).—The dyes and methods of dyeing described in the chief patent are also suitable for dyeing cotton immunised by the methods described in G.P. 346,883, E.P. 195,619, 224,502, and 241,854 (B., 1922, 214 A; 1924, 128; 1925, 352; 1926, 270).

A. J. HALL.

Vat dyeing. J. W. LEITCH & CO., LTD., A. E. EVEREST, and J. A. WALLWORK (E.P. 274,550, 19.4.26).—Textile materials containing fibres such as wool and cellulose acetate silk, which are deleteriously affected by the caustic alkalis usually present in vat dye liquors, are dyed with vat dyes from dye solutions prepared with a hyposulphite, an alkali salt of a fatty acid having a high mol. wt., *e.g.*, stearic acid, and ammonia or soda ash. The method is suitable for dyeing with anthraquinone, and especially indigoid vat dyes, and since no caustic alkali is present the dyeing may be effected at comparatively high temperatures, *e.g.*, 50—60°. A satisfactory dye liquor for dyeing indigo is prepared at 70—80° with 100 g. of stearine soap, 10 litres of water, 100 g. of 20% indigo paste, 500 c.c. of ammonia solution (*d* 0.88), and 50 g. of sodium hyposulphite. Two-colour effects are obtained by using vat dyes having affinities for particular fibres. *E.g.*, Algol Black RO dyes cotton and viscose silk satisfactorily, but only stains wool and cellulose acetate silk; Leucole Yellow G and Algol Brilliant Violet R dye cotton, wool, and viscose silk, but only feebly stains cellulose acetate silk.

A. J. HALL.

Dyeing and printing of vat colours. J. S. WILSON, J. THOMAS, and SCOTTISH DYES, LTD. (E.P. 274,178, 12.4.26).—Two-coloured effects are obtained by suitably discharging fabrics dyed with mixtures of vat dyes containing those usually dyed from a hot, strongly alkaline dye liquor, and those dyed from a cold, weakly alkaline liquor, the former class of vat dye being much less readily discharged than the latter by means of Leucotrope and reducing agents such as sodium formaldehyde-sulphoxylate. In preparing the ground shade before discharging, the two classes of dyes are dyed together regardless of their usually different methods of application. *E.g.*, yellow effects on an orange ground are obtained by dyeing cotton fabric with a mixture of Caledon Yellow G and Caledon Red FF at 35°, then printing with a discharge paste containing 23 pts. of 25% British gum thickening, 4 pts. of zinc oxide, 5 pts. of Leucotrope W, 12 pts. of sodium formaldehyde-sulphoxylate, 1 pt. of anthraquinone, and 5 pts. of caustic soda, drying, steaming, and then passing through a boiling 0.1% solution of caustic soda. Suitable hot-dyeing strong caustic vat dyes include Caledon Blue R, Caledon Brilliant RR, Caledon Jade Green, and Caledon Gold-Orange G, and cold-dyeing weak caustic colours include Caledon Red FF, Caledon Blue 3 RK, Caledon Olive R, Caledon Yellow 3 G, and Caledon Brilliant Violet R.

A. J. HALL.

Dyeing artificial [regenerated cellulose] silk. BRIT. DYESTUFFS CORP., LTD., J. BADDILEY, P. CHORLEY, and C. BUTLER (E.P. 276,757, 7.6.26. Addn. to E.P. 276,450; B., 1927, 812).—Level shades on viscose silks are obtained by using secondary disazo dyes of the type: aminosalicylic acids or homologues \rightarrow usual middle components \rightarrow sulphonated naphthols, naphthylamines, or *N*-derivatives of the latter. The shades are blue to violet, brown, and black. C. HOLLINS.

Wetting-out agents or emulsifiers, and their use in the textile and other industries. BRIT. DYESTUFFS CORP., LTD., J. BADDILEY, and E. CHAPMAN (E.P. 274,611, 3.6.26).—Wetting-out agents are prepared by sulphonation of the condensation products of a raw or purified mineral oil (*e.g.*, certain fractions of such oils obtained during purification or cracking) with a suitable aliphatic, alicyclic, or aralkyl alcohol; alternatively, the mineral oil may be sulphonated before condensation. The sulphonated products may be left in the form of the free acid, or converted into sodium salts by liming-out in the usual manner. The products show strong wetting-out properties even at a dilution below 0.5%. Various applications of these processes are shown by 12 examples. A. J. HALL.

Apparatus for dyeing felt or other hats. G. CHARLES (E.P. 276,893, 4.3.27).

Aralkylated ethers (E.P. 277,098).—See XX.

Decoration of fabrics (G.P. 441,150).—See XXI.

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

Determination of sulphide, thiosulphate, and sulphur in insoluble carbonates, especially in commercial barium carbonate. H. BRINTZINGER and F. RODIS (Z. anal. Chem., 1927, 71, 434–441).—Barium carbonate, obtained by saturating with carbon dioxide the aqueous extract of the mass produced by heating barytes with coal dust, almost invariably contains adsorbed barium sulphide together with its oxidation products, barium thiosulphate and free sulphur. For the determination of sulphide 10 g. are dissolved in 100 c.c. of 2*N*-sulphuric acid and the evolved hydrogen sulphide is collected in cadmium acetate-acetic acid solution and determined iodometrically as usual. The insoluble residue consists of barium sulphate containing the free sulphur originally present and that produced by the decomposition of the thiosulphate; the sulphur is determined by digesting the mass for 20 min. on the water-bath with 50 c.c. of 0.01*N*-permanganate, which oxidises it to sulphuric acid, and titrating the excess permanganate with oxalic acid. The sum of the thiosulphate and sulphide present is obtained by treating 10 g. of the carbonate with 50 c.c. of 0.01*N*-iodine and sufficient hydrochloric acid to dissolve the barium compounds, and determining the excess of iodine with thiosulphate. From the data obtained the composition of the material is readily calculated if the total soluble barium is determined acidimetrically as usual. A. R. POWELL.

Manufacture of ferric aluminium [sulphate] by the Argentine Sanitary Works and Water Supply. M. L. NEGRI and A. A. BADO (J. Amer. Water Works'

Assoc., 1927, 18, 287–299).—Ferric aluminium sulphate for use as coagulant at the Recoleta Plant is manufactured from the Pampeano loess which is found in large quantities under the vegetal cover in the province of Buenos Aires. The loess, which is essentially a double silicate of iron and aluminium, contains about 17% Al_2O_3 and 7% Fe_2O_3 . Sulphuric acid (70% H_2SO_4) is heated by means of steam to 100°, and the mineral is gradually added, the mixture meanwhile being well stirred by compressed air. When the mass is homogeneous, the stirring is stopped and the heating continued until 110° is reached. Steam injection is then discontinued, and the mass is kept for 20 hrs. The extraction of the ferric aluminium sulphate is subsequently effected by separate washings with cold water, settlement, and decantation. After further settlement to deposit fine clay in suspension, the liquid is used direct for water treatment or concentrated to *d* 1.84. The compact green mass which solidifies from the concentrated liquor on cooling contains about 17% of mixed oxides. W. T. LOCKETT.

Ammonia and sulphur from gas. BURKHEISER.—See II.

PATENTS.

Production of complex hydrofluoric acids. A. F. MEYERHOFER (E.P. 250,211, 19.3.26. Ger., 1.4.25).—Complex fluorides are decomposed without agitation by heat, under pressure, in the presence of catalysts and of hydrogen or gaseous hydrogen compounds, excluding solid carbonaceous fuels. A mixture which evolves hydrogen or gaseous hydrogen compounds and which yields by-products may be used, *e.g.*, ammonia to form nitrides, steam to form oxides, volatile acids to form salts; further, the use of a gas, such as furnace gas, having reducing properties, or of certain oxidising mixtures such as air, or of various other gaseous mixtures, is claimed. Salts, *e.g.*, alkali chlorides, may be added to the fluorides to combine the hydrofluoric acid with the alkali and to obtain as a by-product an acid which does not contain fluorine. W. G. CAREY.

Concentration of sludge acid. A. A. VINEYARD (U.S.P. 1,636,724, 26.7.27. Appl., 27.11.25; cf. U.S.P. 1,596,907; B., 1926, 914).—The method described in the patent cited is applied to the concentration of sludge acid. T. S. WHEELER.

Manufacture of alkaline potassium compounds. W. SIEGEL (U.S.P. 1,636,710, 26.7.27. Appl., 21.10.25. Ger., 12.7.24).—Potassium fluosilicate is treated with potassium hydroxide solution, *d* 1.125, and the silica separating is collected on a filter. The filtrate is treated with calcium oxide to yield a solution of potassium hydroxide, a part of which is returned to the process, and a precipitate of calcium fluoride, which is heated with dilute sulphuric acid and silica under pressure to give a solution of hydrofluosilicic acid. This is treated with potassium chloride solution to precipitate potassium fluosilicate. T. S. WHEELER.

Converting a cyanide compound [calcium cyanide] into ammonia. G. H. BUCHANAN and J. L. OSBORNE, Assrs. to AMER. CYANAMID CO. (U.S.P. 1,638,522, 9.8.27. Appl., 18.12.23).—Crude calcium cyanide is heated with water under a pressure of 4 atm.

Most of the ammonia produced is removed at this pressure, and the remainder is expelled from solution by treatment with steam. T. S. WHEELER.

Treatment of lithium-containing silicates by means of neutral alkali salts. METALLBANK U. METALLURGISCHE GES. A.-G. (E.P. 269,878, 31.3.27. Ger., 22.4.26).—Water-soluble lithium compounds are obtained from silicates containing lithium with the use of less alkali salt than heretofore if definite temperature limits of 700–950° are maintained in a mechanical roasting furnace, rotary drum furnace, or Dwight–Lloyd furnace. W. G. CAREY.

Manufacture of precipitated zeolites. H. KRIEGSHEIM and W. VAUGHAN, ASSTS. to PERMUTIT CO. (U.S.P. 1,642,880, 20.9.27. Appl., 17.8.25).—A gel of normal structure, produced by the action of a solution of sodium aluminate on a solution of sodium silicate, is partly dried without preliminary separation of contained water, and is then washed and dried. H. HOLMES.

Manufacture of base-exchange silicates. P. N. ENGEL (E.P. 277,082, 7.6.26).—A non-alkaline salt of an amphoteric hydroxide, *e.g.*, aluminium sulphate, is treated with an acid, and a solution of an alkali silicate, *e.g.*, sodium silicate, is added. The proportion of acid is such that the molecular ratios in the product are one of alkali metal oxide and one of amphoteric metal oxide to 10 or more of silica, and the mixture is made alkaline to phenolphthalein by varying the amount of the amphoteric compound. The resulting gel is dried at below 100° (preferably 80°), the soluble compounds are dissolved out, and the dried gel is subjected to steam treatment to resolve it into particles. W. G. CAREY.

Manufacture of carbon dioxide. S. E. ELKIN, ASSR. to P. E. HAYNES (Can. P. 264,697, 14.9.25).—Charcoal, with the addition of calcium carbonate to regulate the temperature, is burnt in a current of pure oxygen, the highly-compressed gases thus obtained are cooled to liquefy the carbon dioxide, and the remaining gas is allowed to expand and thus cool further quantities of the gas mixture. A. R. POWELL.

Centrifugal apparatus [for separation of gases]. SYNTHETIC AMMONIA & NITRATES, LTD., and H. A. HUMPHREY (E.P. 276,557, 15.1.27).—A centrifugal rotor which may be run at peripheral speeds of the order of 600 m./sec. comprises two conical discs fitting base to base on a common shaft, leaving a space between which is divided by partitions to ensure proper whirling of the material. The thickness of the metal increases towards the axis. The feed mixture is introduced at one end and the lighter constituent withdrawn at the other end of the hollow shaft. The heavier constituent is exhausted through passages in the rim so great that the outlets are substantially tangential, and the kinetic energy of the issuing product helps to drive the rotor. The centrifugal force developed is so great that a partial separation of permanent gases may be effected, but the apparatus is very efficient if the temperature is lowered below the critical temperature of one constituent, the pressure due to centrifugal force, combined if necessary with some initial pressure, being sufficient to liquefy that constituent. The latent heat evolved passes through the walls of the rotor to the issuing heavy product,

which, after cooling by expansion through the outlet nozzles, is brought back in a comparatively stationary state over the outside of the rotor, between it and the fixed casing. This latent heat also serves to prevent freezing of, *e.g.*, carbon dioxide, which can be removed from air with an efficiency approaching 100%.

B. M. VENABLES.

Manufacture of fluorides. F. SANDER, ASSR. to I. G. FARBEIND. A.-G. (U.S.P. 1,642,896, 20.9.27. Appl., 8.6.25. Ger., 10.6.24).—See E.P. 257,981; B., 1926, 979.

Manufacture of ferric sulphate. B. HART (U.S.P. 1,644,250, 4.10.27. Appl., 18.10.26. U.K., 12.6.26).—See E.P. 273,883; B., 1927, 653.

Conversion of lead chloride into lead carbonate. S. C. SMITH (U.S.P. 1,643,261, 20.9.27. Appl., 14.5.24. U.K., 30.1.24).—See E.P. 272,053; B., 1927, 555.

Exothermic reactions (E.P. 268,722).—See I.

Copper from sulphate solution (U.S.P. 1,643,922).—See X.

Electrolysis of alkali chlorides (E.P. 267,560 and 269,513). **Electrolysis of water** (E.P. 254,268).—See XI.

VIII.—GLASS; CERAMICS.

Mechanical manufacture of window glass. M. BABILLE (Chim. et Ind., 1927, 18, 371–380).

Colouring agents in glasses and glazes. (Sir) H. JACKSON (Proc. Roy. Inst., 1927, 25, 230–241).

Corrosion of silica retorts. DIAMOND.—See II.

Fading of dyes (HILL, also GRIFFITH and JENKINS).—See VI.

PATENTS.

Production of ceramic masses. DEUTS. TON- & STEINZEUG-WERKE A.-G., ASSEES. of T. KÜRTEN (G.P. 441,944, 15.11.25).—The addition of powdered ferro-silicon to ordinary ceramic masses improves the mechanical properties and the resistance to temperature changes of fired articles made from the mixture.

A. R. POWELL.

Refractory, acid-proof, and other ceramically bonded products. SCHEIDHAUER & GIESSENG A.-G. (E.P. 264,192, 11.1.27. Ger., 11.1.26. Addn. to E.P. 263,194; B., 1927, 702).—A colloidal solution of substances of the same nature as the non-plastic material used to make the products is mixed with the latter as binding material, so that a non-castable mass is obtained which is moulded by beating, stamping, pressing, or other strong mechanical treatment to ensure close contact, after which the products are dried and burnt.

W. G. CAREY.

Manufacture of glass or glass-like objects. E. HOPE, ASSR. to F. W. ATACK (U.S.P. 1,644,131, 4.10.27. Appl., 26.12.25. U.K., 26.1.25).—See E.P. 254,668; B., 1926, 747.

IX.—BUILDING MATERIALS.

Diffusion of water-soluble substances in impregnated wood. R. NOWOTNY (Z. angew. Chem., 1927, 40, 1060–1062).—Graphical representations of the results of experiments made by W. F. Sherefesev (Forest

Serv. Circ. 132, 1908) on woods soaked in zinc chloride solution show that, contrary to the conclusions of this author, there is a slow but distinct diffusion of zinc chloride after removal of the wood from the solution. When hemlock spruce-fir was steeped under pressure, the zinc chloride solution penetrated, in a longitudinal direction only, to a distance of 1 ft., but no further. In the case of American larch, penetration took place in gradually diminishing amounts to distances of 3 ft. and more. After keeping duplicate halves of the wood samples for periods of $3\frac{1}{2}$ and $4\frac{1}{2}$ months, sections within 1 ft. of the steeped end showed a lower zinc chloride content, whilst those further removed from this end were found to contain more zinc chloride than before, the salt tending in course of time to distribute itself uniformly through the wood.

F. R. ENNOS.

Blast-furnace slag as ballast. H. BURCHARTZ and G. SAENGER (Stahl u. Eisen, 1927, 47, 1663—1664).—The composition of slag from iron blast furnaces in Germany varies within the following percentage limits: 30.8—35.6% SiO_2 , 9.1—12.0% Al_2O_3 , 0.3—0.8% FeO , 1.3—3.5% MnO , 35.9—43.4% CaO , 3.7—10.2% MgO , 0.1—0.3% SO_3 , 1.1—1.8% S, and 0—0.34% P_2O_5 . It has d 3.0, apparent sp. gr. 1.14—2.95, and absorbs 1.1—2.8% of its weight of water. Its resistance to frost and to shattering during use as railway ballast is equal to that of granite, but slightly poorer than that of basalt. During the first year on the track it tends to accelerate the rusting of iron, but subsequently becomes inert.

A. R. POWELL.

Physical chemistry and the problem of roads. G. BAUME (Bull. Soc. chim. Belg., 1927, 36, 469—484).—A discussion of the surface treatment of roads.

Action of cement and gypsum on light metals. MEYER and PUKALL.—See X.

PATENTS.

Composite building and insulating materials. G. ARNESEN and P. A. BECH (E.P. 269,845, 19.11.26. Norw., 26.4.26).—Sawdust or wood chips, cement, calcium oxychloride, and active silica are mixed together in a dry condition, and water is subsequently added.

W. G. CAREY.

Treatment of woods impregnated with tar oil. SIEMENS-SCHUCKERTWERKE G.M.B.H., Assees. of A. VAUPEL (G.P. 438,944, 11.10.25).—The tar oil with which the wood of telegraph poles etc. is impregnated is removed from a surface layer of 0.5—1 mm. depth by treatment with a suitable solvent or by steaming. This surface layer is then re-impregnated with a sodium silicate-magnesite mixture, collodion, or similar preparation. This prevents escape of tar oil from the interior and forms a weatherproof outer layer, which at the same time is harmless to workers handling the wood.

A. B. MANNING.

Manufacture of hydraulic cement. H. S. SPACKMAN (U.S.P. 1,643,137, 20.9.27. Appl., 17.12.24).—See E.P. 244,756; B., 1927, 367.

Manufacture of cementitious material. H. S. SPACKMAN (U.S.P. 1,643,136, 20.9.27. Appl., 22.9.23).—See E.P. 222,151; B., 1925, 503.

Preparing a material suitable for use in the manufacture of moulded articles. S. J. HAYDE,

Assr. to AMER. AGGREGATE CO. (Re-issue 16,750, 27.9.27, of U.S.P. 1,255,878, 12.2.18).—See B., 1918, 243 A.

Granulating molten [blast-furnace] slag [for cement]. F. SPIES (E.P. 277,154, 4.8.26).

Bituminous emulsions (E.P. 276,543).—See II.

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

Corrosion of iron in tap water. J. TILLMANS, P. HIRSCH, and W. WEINTRAUD (Gas- u. Wasserfach, 1927, 70, 845—849, 877—884, 898—904, 919—925).—In the absence of oxygen the rate of corrosion of iron in water increases with decrease of p_{H} , but in the presence of oxygen the rate is independent of the p_{H} . As there is a copious deposition of a protective film of rust in alkaline water and no deposition in acid water, it follows that oxygen acts as an accelerator of corrosion in alkaline water. The first action of water on iron is accompanied by the formation of ferrous ions which retard further action; oxygen causes these to be converted into ferric hydroxide in alkaline solutions, and thus their retarding influence is eliminated. In air-free water the rate of corrosion of iron is governed by the rate of discharge of the hydrogen ions first formed, which is relatively slow; oxygen acts as a depolariser in this action. The reaction $\text{O}_2 + 2\text{H}_2\text{O} = 4\text{OH}' + 4(\oplus)$ is subject to less retardation than that in which molecular hydrogen is evolved, and hence the influence of the latter action on the rate of corrosion is removed; this theory explains the absence of hydrogen evolution when iron corrodes in water containing oxygen. As, however, the oxygen ionisation reaction is dependent on the p_{H} , it cannot be the governing factor in the mechanism of corrosion; this is most likely to be the rate of diffusion of oxygen to the metal surface and the rate at which ferrous ions are formed, the former being independent of the p_{H} and the latter only indirectly dependent, being governed by the difference between the oxygen ionisation potential and the solution potential of the iron. With high concentrations of oxygen the metal becomes passive; the oxygen concentration necessary to produce this state is lower the higher the p_{H} , and lower in moving water than in still water. The presence of small quantities of electrolytes increases the rate of corrosion by assisting in flocculating the colloidal products of corrosion and by increasing the conductivity of the solution and so enhancing the action of local elements. Free carbon dioxide acts as an accelerator on the corrosion as it tends to prevent the formation of protective films; its action may be eliminated and the formation of a protective film accelerated by passing the water through a layer of marble chips. Aerated water so treated rapidly forms a tenacious film of ferric hydroxide and finely-crystallised calcium carbonate on the inner surface of an iron pipe, which is thereby efficiently protected from further attack. On this account soft waters should be neutralised with limestone or marble in preference to sodium carbonate or hydroxide, the use of which tends to accelerate corrosion and inhibit the formation of film.

A. R. POWELL.

Third report on the relative corrodibilities of various commercial forms of iron and steel.

J. N. FRIEND (Iron Steel Inst. Carnegie Schol. Mem., 1927, 16, 131—151; cf. B., 1923, 1179 A).—The results of corrosion tests on bars of different steels and irons which had been submerged in the Bristol Channel for four years showed that there is no class of ferrous material which is markedly better than others in all respects when subjected to a long-period corrosion test. Taking the average corrosion loss of wrought irons as 100, average figures for other specimens were: polished stainless steels 54, nickel-chrome steels 69, cast irons 112, carbon steels 126, Armco iron (one specimen) 152, steel (0.15% Cu, one specimen) 99. No substantial difference in pitting occurred between wrought iron and carbon steel, and stainless steel withstood the action of sea water well except where in contact with the wooden frames. Removal of the skin of cast iron by machining did not influence the rate of corrosion, but galvanising greatly prolonged the life of a single specimen of Armco iron which lost less than 50% of the amount lost by an unprotected bar. C. A. KING.

Gaseous cementation of iron and steel. III. Influence of hydrocarbons on the carburisation of iron and steel. A. BRAMLEY and G. LAWTON (Iron Steel Inst. Carnegie Schol. Mem., 1927, 16, 35—100).—In the carburisation of Armco iron in a current of carbon monoxide carrying hydrocarbon gases, *e.g.*, toluene, xylene, paraffinoid vapours, cementation was more uneven than when carbon monoxide alone was used, possibly due to irregular decomposition of the hydrocarbon in the heated zone of the furnace. Cementation by the same gases carried by an inert gas, *e.g.*, nitrogen, was even more irregular. Depth of penetration was not much affected by the rate of the gases through the furnace, but increased according to a linear law as the temperature increased; as the period was increased in geometrical proportion the penetration increased similarly, but with a different common ratio. No indication of any migration of carbon in the carburised zone during cooling, as required by Giolitti's liquation theory, could be observed. Without exception the specimens increased in diameter and decreased in length as a result of cementation, the change in length averaging 0.0319 cm. Every deposit of carbon on the metal showed a distinct reaction for iron indicating that iron must be volatile at the temperatures (900—1100°) at which cementation was conducted. C. A. KING.

Case carburisation of steels by means of salt baths of low cyanide concentration. H. B. NORTHRUP (Trans. Amer. Soc. Steel Treat., 1927, 12, 470—478).—Three steels of the low-carbon, nickel, and nickel-chromium types, respectively, were treated in a cyanide bath containing 23% NaCN for from 1 to 6 hrs. at 900°. Analyses of successive depths of 0.005 in. showed that the order of maximum carbon concentration, which was attained in 3 hrs. and did not exceed 0.625% C., was carbon steel, nickel-chromium steel, and nickel steel. The density of the carburised sections and maximum hardness readings were in an inverse ratio to the rapidity of carbon absorption. T. H. BURNHAM.

Structure and strength of cast iron. G. NEUMANN (Stahl u. Eisen, 47, 1606—1609).—The tensile strength, hardness, and microstructure of grey cast iron as cast,

after annealing at 850° and quenching in oil, and after quenching and annealing at 600—650° have been examined. The results confirm Bardenheuer's observations (B., 1927, 526) that the distribution of the graphite plays a far greater part in determining the mechanical properties than does any other micro-constituent. The nature of the ground mass has an effect only on the hardness, its effect on the tensile strength being masked by the action of the graphite. The highest tensile strength is obtained with the minimum amount of graphite, provided it is evenly distributed throughout the metal in the form of fine flakes. A. R. POWELL.

Influence of grain size on the mechanical properties of steel, especially on the notched-bar test. H. HANEMANN and R. HINZMANN (Stahl u. Eisen, 1927, 47, 1651—1661).—The tensile strength and hardness of a plain carbon steel (0.12% C, 0.26% Si, 0.64% Mn) and of a hardened nickel-chromium steel (0.23% C, 0.26% Si, 0.38% Mn, 0.67% Cr, and 2.90% Ni) varied only slightly for grain sizes between 600 and 13,000 μ^2 and between 90 and 25,000 μ^2 , respectively. The impact test values for notched bars, however, are considerably altered by varying the grain size, although no definite relation between the two can be ascertained. For small test pieces the curve falls rapidly with increase of grain size to a constant value for medium-sized grains, then decreases rapidly above 4500 μ^2 . For large test pieces the impact strength is a minimum for large and small grains and a maximum for medium sized grains. If the specimen is polished before testing, a fairly well-defined "area of flow" is discernible on the polished surface after impact; the work done in breaking the specimen divided by the area of flow is called the "work constant" of the metal. The "work velocity" is the quotient $50A_2/A_1$, where A_1 and A_2 are the work consumed in breaking a small and a large test-piece respectively. Both the "work constant" and "work velocity" are shown to be specific properties of a metal the values of which are dependent on the grain size. Beyond a certain grain size, which varies for every metal, the value of these functions falls suddenly indicating a serious deterioration in the valuable properties of the metal. A. R. POWELL.

Effect of temperature on the mechanical and microscopic properties of steel. G. C. PRIESTER and O. E. HARDER (Trans. Amer. Soc. Steel Treat., 1927, 12, 436—445).—Tensile tests were carried out on a quenched steel (0.29% C) at high temperatures, and also after tempering at ordinary temperatures. The ratio of proportional limit to tensile strength was constant at about 50% for the high-temperature tests, but somewhat higher for the tempered specimens tested at room temperature. The reduction of area showed a rapid increase from 300° to 500° for the former conditions as compared with 200° to 400° for the quenched and tempered specimens. The microstructure showed no change up to 200°, but broke down considerably at 300°, whilst the tensile strength showed a minimum between 100° and 200° and a maximum at 300°, and the proportional limit a minimum at 100° and a maximum between 200° and 300°. T. H. BURNHAM.

Transverse and other tests on cast-iron test-bars. C. H. ADAMSON and G. S. BELL (Iron Steel Inst.

Carnegie Schol. Mem., 1927, 16, 1—34).—Comparing actual transverse breaking stresses of cast-iron bars with calculated figures, the latter were not sufficiently accurate for practical requirements nor could the formulæ used be modified to make them more reliable. Calculated results on round bars were less than the actual results obtained, though nearer approximation was obtained with the larger diameters used. C. A. KING.

Strain in steel. Nature and detection of certain phenomena observed in permanently deformed steel. E. W. FELL (Iron Steel Inst. Carnegie Schol. Mem., 1927, 16, 101—129).—Etchings of the surfaces of steel strained by impact and static Brinell impressions, impact of various forms of bullets, etc. have been obtained. The marked surface strains around Brinell indentations in Armco iron and mild steel were not observed with high-carbon steel and non-ferrous metals. The clearest strain-etchings figure were obtained when the temperature of straining was 200—400°; no results were observed on mild steel quenched above 700°.

C. A. KING.

Effect of cold-work on the structure and hardness of single iron crystals and the changes produced by subsequent annealing. L. B. PFEL (Iron Steel Inst. Carnegie Schol. Mem., 1927, 16, 153—210).—From the results of deforming cubes of iron consisting in most cases of single crystals, by means of slow compression, the structure developed depends on the direction of the cold-work in relation to the orientation of the crystal, and the hardness is the same in all directions. Deformation alone does not appear to produce twinning. Lowering of the recrystallising temperature is dependent on the severity of the work applied, recrystallisation generally beginning at the grain boundaries of a banded structure, though there was no evidence of granulation or disintegration before recrystallisation. In a crystal aggregate the boundaries have a negligible effect in causing hardening; single crystals have the same hardness as the aggregate, and the Brinell impressions, which tend to become circular on a cold-worked specimen, may return to irregular shapes on the recrystallised crystal. The effect of low-temperature annealing on cold-worked iron is to cause a hardening which may be expressed as an increase in the value of n , but no change in a in Meyer's law: $P = ad^n$. C. A. KING.

Effect of varying ash in the coke on blast-furnace working. C. S. GILL (Gas World, 1927, 87, Coking Sect., 127—128).—A series of tests on a day's run of the blast furnace using coke with varying ash content showed that the higher the ash in the coke the higher is the sulphur in the pig iron; thus with 10% of ash the iron contained 0.03% S and with 14.5% of ash, 0.2% S. More prolonged tests indicated that by using a coke with 9% of ash instead of one with 12%, the coke consumption per ton of pig iron was reduced by 1.25 cwt., the output of pig iron increased by 25%, and a more regular grade of iron was produced. A. R. POWELL.

Fundamental laws of magnetic viscosity. Influence of ageing and annealing. C. LAPP (Rev. Mét., 1927, 24, 496—508).—Electrolytic iron exhibits the phenomenon of magnetic viscosity common to ferromagnetic substances. The viscosity is diminished

by prolonged ageing at 130—180°, but at the expense of the magnetic properties of the metal; annealing at 300—500° has the inverse effect. A. R. POWELL.

Determination of cobalt and other alloyed elements in cobalt metal, cobalt steel, and high-speed tool alloys. E. SCHIFFER (Stahl u. Eisen, 1927, 47, 1569—1571).—The determination of cobalt in the commercial metal is most satisfactorily effected by electrolysis in the usual way after removing heavy metals and iron; the deposited cobalt is subsequently tested for nickel by the dimethylglyoxime method. Equally good results are obtained by determining the impurities and taking the cobalt by difference provided that oxygen, sulphur, and included water-soluble salts are tested for. Cobalt steel with a low content of cobalt is dissolved in hydrochloric acid with the help of an oxidising agent, the iron precipitated with zinc oxide twice or as basic acetate, and the cobalt determined by means of α -nitroso- β -naphthol in the first case or by electrolysis; for rapid control work the cyanometric method gives sufficiently accurate results. For the separation of iron from cobalt in a high-cobalt steel the ether process is most satisfactory; the aqueous layer is evaporated with nitric acid to convert the metals into nitrates and the solution boiled with nitric acid and potassium chlorate to remove manganese and oxidise chromium to chromate, cobalt being subsequently separated by addition of potassium hydroxide and finally determined by electrolysis. Stellite and similar tool alloys are preferably dissolved by fusion with peroxide in a porcelain crucible; the solution is used for the determination of tungsten, molybdenum, chromium, and vanadium, and the insoluble residue for the determination of nickel, cobalt, and manganese by electrolysis. A. R. POWELL.

Presence of iodine in iron and iron slags. G. LUNDE and T. VON FELLEBERG (Z. anorg. Chem., 1927, 165, 225—248).—Colorimetric methods are described for the accurate determination of minute quantities of iodine in silicate slags, iron, and steel. All common varieties of iron and steel contain iodine in quantities varying from about 0.1—1.10 mg./kg., the average being about 0.1—0.15 mg./kg. The average iodine content of a large variety of natural minerals, including a number of volcanic origin, is between 0.2—0.3 mg./kg. H. F. GILLBE.

Critical temperatures in the annealing of brass wire. F. OSTERMANN (Z. Metallk., 1927, 19, 349—351).—After annealing brass wire containing 62—64% Cu in the immediate neighbourhood of the boundary between the α and $\alpha + \beta$ regions both the tensile strength and ductility are considerably reduced and the metal tends to become brittle. This phenomenon is especially marked after a double annealing at 650°, and is due to incomplete absorption of the β crystals into α , the unabsorbed portion of the brittle β segregating along the grain boundaries of the α crystals. The most satisfactory structure of brass containing 63% Cu is obtained by annealing at 600° and cooling slowly or by annealing at 700° and quenching; in any case a second annealing operation should be avoided. A. R. POWELL.

Detection of internal stress in [brass] rods and

tubes. G. SACHS (Z. Metallk., 1927, 19, 352—357).—The method depends on the changes of shape undergone by the specimen when a small layer is trimmed off the outside. A mathematical expression is deduced from theoretical considerations connecting these changes with the internal stress in the metal. A. R. POWELL.

Aluminium alloy "Aldrey." FUCHS (Z. Metallk., 1927, 19, 361—362).—The alloy "Aldrey," which has been developed for use in the manufacture of aluminium transmission lines, consists of aluminium containing 0.4% Mg, 0.5—0.6% Si, and 0.3% Fe. It has d 2.70, a tensile strength of 35 kg./mm.², an elongation of 6.5%, an elastic limit of 25 kg./mm.², a modulus of elasticity of 6500 kg./mm.², an electrical conductivity of 31.5 m./ohm-mm.², and a temperature coefficient of 0.0036. The necessary heat and mechanical treatment to obtain these properties comprises rolling or forging the casting, annealing within the temperature range of homogeneous solid solution, quenching in water, rolling or drawing into sheet or wire, and tempering at 140—160°. The alloy has as good a resistance to corrosion as commercial aluminium as measured by the Mylius' oxidising salt bath test. Transmission lines of this alloy after exposure to the atmosphere for two years had almost as good mechanical properties as when first prepared, showing practically complete absence of corrosion. A. R. POWELL.

Segregation phenomena in aluminium-copper alloys. W. CLAUS and B. DANGO (Z. Metallk., 1927, 19, 358—360).—Cylinders of No. 12 alloy (92% Al, 8% Cu) cast from 680° in sand moulds were examined chemically and microscopically for evidence of segregation. In all cases the middle and outside portions contained slightly more copper than the portions midway between these zones, and usually the middle zone was somewhat richer in copper than the outside skin. This small amount of segregation was insufficient deleteriously to affect the mechanical properties of the alloy, but is interesting as being the first case in which both normal and inverse segregation occur in the same casting. A. R. POWELL.

Action of cement and gypsum on light metals. J. MEYER and K. PUKALL (Chem.-Ztg., 1927, 51, 757—758).—Aluminium slowly reacts with a paste of cement or gypsum and water, but a protective coating of colloidal silicate or hydroxide forms after a time and further reaction is exceedingly slow. Magnesium under the same conditions reacts very slowly, but considerable corrosion ensues during the course of several weeks. Magnesium-aluminium alloys with a high aluminium content corrode much more slowly than either metal, but still are unsuitable for use in contact with either cement or gypsum. Calcium and its alloys with magnesium or aluminium are fairly rapidly attacked by either substance with the evolution of hydrogen. A. R. POWELL.

Type metal and lead-tin alloys. A. TRAVERS and HOUOT (Rev. Mét., 1927, 24, 541—554).—The hardness of type-metal alloys containing lead, tin, and antimony increases with the tin content, the casting temperature, and the rate of cooling, the antimony content appearing to have little effect. Cast alloys may be hardened by heating at 180° for some time and cooling rapidly, but

such alloys become completely annealed after keeping for seven months at the ordinary temperature. Lead containing 0—1% Sn when cast in iron moulds appears to have undergone some hardening process; after annealing at 200° the metal cannot be hardened again by heat-treatment in the solid state. The hardness of lead-tin alloys increases to a maximum with 16% Sn, and all alloys containing a preponderating amount of tin can be hardened by heat treatment in the solid state. Dilatometric curves of commercial lead show two small deviations possibly associated with allotropic changes. When pure tin is heated for prolonged periods at 500—800° the calorimetric curves subsequently obtained show a point of inflexion at 171—172° which may be due to the change from rhombohedral to tetragonal tin; no such point occurs if the metal has not been overheated. A. R. POWELL.

Chromium-plating steel articles. H. VON WARTENBERG (Chem.-Ztg., 1927, 51, 729).—The brittleness induced by occluded hydrogen in chromium-plated steel may be removed by heating in air at 100—200° for 60—15 min. according to the temperature. A. R. POWELL.

Blast-furnace slag as ballast. BURCHARTZ and SAENGER.—See IX.

Induction furnace for small charges. STEINHAUS and KUSSMANN. **Chromium plating.** WATTS.—See XI.

PATENTS.

Recovery of iron from ferruginous sands, iron-ore dust, and pulverised ores. E. FLEISCHER (F.P. 617,079, 4.6.26. Ger., 8.6.25).—The ferruginous material is mixed with one third of its weight of carbon and with the necessary lime and alumina for fluxing purposes, the mixture is briquetted, and the briquettes are heated in a stream of producer gas and air in insufficient quantity to reoxidise the reduced iron. The spent gases are passed through a mass of bituminous coal to produce coke and a gas suitable for use in basic open-hearth furnaces. A. R. POWELL.

Reduction of iron ores. COAST RANGE STEEL, LTD., Assees. of J. L. AVIS (Can. P. 263,193, 10.2.23).—A mixture of the powdered ore, containing less than 1.5% of titania, coal, limestone, and kieseluhr, with alkali hydroxide as binding material, is briquetted and the briquettes are smelted in the usual way. A. R. POWELL.

Carburising [case-hardening] iron. C. ROCHE and A. DELLA PORTA (F.P. 615,325, 22.9.25).—Iron articles are case-hardened in a molten bath comprising a mixture of 70% of sodium cyanide with 30% of potassium cyanide to which are added 1% of sodium and ammonium chlorides and 0.5% of sodium and potassium. A. R. POWELL.

Welding rods for arc or gas welding [of steel]. F. SCHULZ (F.P. 617,237, 9.6.26. Ger., 10.6.25 and 15.2.26).—The rods consist of a special steel containing at least one of the following elements: nickel, cobalt, manganese, molybdenum, vanadium, titanium, and zirconium. The welds obtained are free from occluded gas and from brittleness. A. R. POWELL.

Colouring steel brown. E. PREYNAT (F.P. 616,849, 18.5.26).—The finished steel articles are freed from grease

and dipped into a strong solution of sodium hydroxide and carbonate containing lead carbonate, oxide, or dioxide, and heated at 135–160°. A. R. POWELL.

Rail steel. J. K. SMITH, Assr. to C. H. WILLS (U.S.P. 1,643,321, 27.9.27. Appl., 22.6.26).—The alloy used in the manufacture of non-heat-treated steel rails contains 0.35–0.75% C, 0.5–1.1% Mn, 0.25–1.25% Cu, 0.07–1% Mo, together with the usual amounts of silicon, sulphur, and phosphorus. F. G. CROSSE.

Steel alloy. L. M. BROWN (U.S.P. 1,643,054, 20.9.27. Appl., 14.2.27).—The alloy contains 0.4–1.0% C, 0.5–1.5% Mn, 1.5–2.5% Si, and 0.5–1% (Mo + V) of which at least 0.15% is molybdenum or vanadium. F. G. CROSSE.

Purification of cement copper. A. WYPOREK (G.P. 441,740, 28.3.25).—Crude cement copper is digested with an excess of hydrochloric acid over that required to dissolve the basic salts present, and the solution is diluted with twice its volume of water and treated with clean scrap iron to reduce any dissolved cuprous chloride. The precipitate is collected, washed with hot water to remove chlorides, dried, and smelted. A. R. POWELL.

Cementation of copper, nickel, or their alloys. ÉTABL. DE DION-BOUÏTON, Soc. ANON. (F.P. 616,121, 12.5.26).—The metal is heated for 6 hrs. at 750° in a mixture of finely-divided aluminium (80 pts.) and copper or nickel (20 pts.) together with some ammonium chloride. The resulting layer of aluminium bronze has a high tensile strength and is very resistant to oxidising action. A. R. POWELL.

Deoxidation of copper and its alloys. SIEMENS & HALSKE A.-G., Assees. of G. MASING (G.P. 441,930, 25.3.23).—Molten copper is treated with a deoxidising agent, such as phosphorus, which is soluble in the liquid metal, then with a second substance, *e.g.*, calcium, which is also soluble in the molten metal, but which forms a compound with the excess of the deoxidising agent, which is difficultly soluble in molten copper and which forms no solid solution or alloy with solid copper. A. R. POWELL.

Precipitating copper from sulphate solution. N. C. CHRISTENSEN (U.S.P. 1,643,922, 27.9.27. Appl., 10.3.24).—The sulphate solution is treated with metallic lead, the coating of lead sulphate formed upon the lead being continuously removed by mechanical means; the mixture of copper and lead sulphate is afterwards separated by the action of a differential solvent. M. E. NOTTAGE.

Treatment of scrap containing gunmetal and white metal in order to separate the latter. J. SPENCE, C. E. COURTENAY, and H. A. COURTENAY (E.P. 276,730, 31.5.26).—The scrap metal is placed on a wire-gauze tray supported in a dome-shaped chamber, heated by means of hot furnace gases. The metal is heated at a temperature above the m.p. of the white metal, and the tray is then vibrated so that the molten metal drains off through the bottom into a suitable receptacle. M. E. NOTTAGE.

Recovery of nickel from silicate ores. T. TATEBE (F.P. 617,033, 3.6.26).—Finely-powdered garnierite is reduced with carbon or in a current of hydrogen or carbon monoxide at 500–800°, and the product is leached with

ammoniacal ammonium carbonate solution, preferably in the presence of an oxidising agent such as manganese dioxide or a chlorate. The filtered solution is either directly electrolysed for nickel or treated in such a way as to precipitate nickel hydroxide or carbonate which is reduced to metal in the usual way. A. R. POWELL.

[Nickel-molybdenum-chromium] alloy. T. D. KELLY (E.P. 277,170, 10.9.26).—A malleable alloy melted under the protection of a flux consisting of a mixture of calcium or magnesium chlorides and carbon contains 33.3–90 pts. of nickel, 5–33.3 pts. of molybdenum, and 5–33.3 pts. of chromium. C. A. KING.

Non-magnetic alloy of high electrical resistance. Y. KAMISHIMA (E.P. 276,874, 3.1.27).—The alloy contains 9–12% Ni, 15–20% Cr, 0.3–2% Mn, and remainder chiefly iron; it must contain no silicon, and the carbon content should be as low as possible. M. E. NOTTAGE.

Manufacture of chemically pure aluminium. DEUTS. VERSUCHSANSTALT FÜR LUFTFAHRT, E.V. (E.P. 276,911, 6.4.27. Ger., 2.12.26).—In the electrolytic purification of aluminium, precious metals (*e.g.*, gold, platinum, etc.) of high sp. gr. which are not taken up in solid solution by aluminium are added to aluminium of 99.8–99.9% purity for the purpose of increasing the density of the anode layer, thereby making this the lowermost layer, whilst the purified aluminium forms the uppermost and cathode layer. M. E. NOTTAGE.

Metallurgy of readily oxidisable metals, *e.g.*, magnesium. G. MICHEL (E.P. 271,088, 11.5.27. Fr., 11.5.26).—During melting, casting, or other use of easily oxidisable metals, *e.g.*, magnesium, the metal is protected from oxidation by supplying an atmosphere of sulphur dioxide over the surface of the molten metal. C. A. KING.

Lead alloys. H. YOSHIKAWA (E.P. 277,199, 22.11.26).—A lead alloy contains less than 10% of a metal immiscible with lead and less than 4% Bi, or preferably less than 2% Cu (1% Ni) and less than 1% Bi. C. A. KING.

[Lead-antimony-copper] alloy. C. A. GEATTY (U.S.P. 1,644,425, 4.10.27. Appl., 14.4.25).—An alloy for lining brake bands etc. consists of 95% Pb, 3% Sb, and 2% Cu. F. G. CROSSE.

Process of purifying cadmium. H. HOWARD, Assr. to GRASSELLI CHEMICAL Co. (U.S.P. 1,644,431, 4.10.27. Appl., 24.4.22).—Cadmium sponge containing zinc as impurity is purified by boiling with a solution of caustic soda (*d* 1.45). F. G. CROSSE.

Concentration of tin minerals. W. O. SNELLING (U.S.P. 1,638,279, 9.8.27. Appl., 31.10.25).—Cassiterite concentrate is treated electrolytically or with zinc and hydrochloric acid to form on the particles a surface layer of tin, and thus to permit of their ready separation by flotation or by passage over amalgamated plates. T. S. WHEELER.

Treatment of tin ores. H. L. SULMAN and H. F. K. PICARD (E.P. 276,743, 2.6. and 13.12.26 and 24.2.27).—Low-grade tin concentrates containing iron, copper, tungsten, etc. are mixed with bituminous coal and the mixture is formed into briquettes which are coked at

600—700° in a cast iron retort lined with acid-resisting enamel. Hydrogen chloride is then passed through the mass to convert the tin into stannous chloride which is collected in a vessel heated at 130°, the excess hydrogen chloride being subsequently collected separately. The stannous chloride remaining in the retort may be substantially recovered by blowing in a limited quantity of steam which converts the chlorides of iron and copper into oxides. In the first treatment 80% of the tin is recovered and a further 15% in the second treatment. The stannous chloride may be converted into metal by electrolysis or other suitable process. A. R. POWELL.

Coating metals with metal. E. C. R. MARKS. From AMER. MACHINE & FOUNDRY Co. (E.P. 276,390, 23.3.26).—Metal to be coated is passed continuously through a chamber in which the vapour of the coating metal is produced and maintained under relatively low pressure, *e.g.*, 10 in. of mercury, and high electric potential, *e.g.*, 2000 volts. The atmosphere should be perfectly dry. An air blast is directed towards the coated metal as it leaves the chamber, and a similar blast, preferably carrying sand for cleaning purposes, may impinge on the metal before entering. C. A. KING.

Production of aluminium coatings on metals. METALLISATOR BERLIN, A.-G. (G.P. 441,964, 16.11.24).—The articles are coated with a mixture of aluminium or magnesium powder, powdered silicon, or a silicon compound, and an inorganic binder. After drying, the articles are heated to cause the aluminium to alloy with the base metal, in which operation the presence of silicon acts as an accelerator. A. R. POWELL.

Provision of protective layers on reflecting bodies. "METALLIQUE" and "DURAL" (E.P. 249,122, 10.3.26. Czecho-Slov., 11.3.25).—A protective layer of water-glass, with the addition of about 25% of caustic potash liquor is applied to mirrors, specula, etc. between the reflecting layer and the metallic coating which is applied by the metal-spraying process. W. G. CAREY.

Process of reacting [oxidising] metals with gases. H. R. CARVETH, ASSR. to ROESSLER & HASSLACHER CHEMICAL Co. (U.S.P. 1,638,471, 9.8.27. Appl., 9.3.23).—The metal, *e.g.*, zinc, is mixed with its oxide (20 pts.), and the powdered mass is treated with air at a temperature between the m.p. of the metal and that of the oxide. T. S. WHEELER.

Reduction process using circulating gases. E. EDWIN, ASSR. to A./S. NORSK STAAL ELEKTRISK-GAS-REDUKTION (U.S.P. 1,638,684, 9.8.27. Appl., 15.10.25. Norw., 27.9.22; cf. F.P. 596,714; B., 1926, 231).—The efficiency of processes involving the reduction of iron ore by circulating producer gas is increased by treating a portion of the gas with steam at 400° to form carbon dioxide and hydrogen, removing carbon dioxide with water under pressure, and returning hydrogen to the circulation system. T. S. WHEELER.

Process for decomposing insoluble minerals. G. BERGE, ASSR. to H. SPURRIER (U.S.P. 1,642,667, 20.9.27. Appl., 4.12.25).—The mineral is treated with boric acid at a temperature sufficient to convert certain of its basic constituents into borates. The latter are then treated with dilute nitric acid to produce the nitrates and free boric acid. H. HOLMES.

Apparatus for determining hardness [of metals] by means of a spherical impression. L. SCHOPPER (G.P. 441,832, 2.5.25).—In an apparatus for determining the hardness of metals on the Brinell principle the carrier for the pressure arm and the pressure gauge comprises a closed framework of one piece of metal inside which the gauge is screwed. A. R. POWELL.

Moulding sand. W. STOLL (G.P. 440,402, 26.9.25).—Moulding sand for the production of non-porous castings comprises a mixture of 92% of powdered pumice, 3% of silica, and 5% of powdered sugar. A. R. POWELL.

Chromium plating machine. W. S. EATON (E.P. 276,921, 2.5.27).—A chromium plating machine comprises adjacent insulated tanks containing, respectively, a cleaning and a plating bath, permitting convenient transfer from one tank to another, a housing having a closed top, and an opening at the front provided with closing means, anodes carried by a bus bar, and a suction device communicating with the housing. J. S. G. THOMAS.

Manufacture of edge tools and special composition of steel for same. A. E. G. T. VON VEGESACK (U.S.P. 1,644,097, 4.10.27. Appl., 2.8.26. Swed., 26.9.25).—See E.P. 268,616; B., 1927, 448.

Coating iron or its alloys with metals. A. STRASSER (E.P. 255,417, 28.4.26. Ger., 17.7.25).—See E.P. 607,381; B., 1927, 194.

Purifying or refining metals and alloys. D. R. TULLIS (U.S.P. 1,636,881, 26.7.27. Appl., 9.11.26. U.K., 11.11.25).—See E.P. 272,336; B., 1927, 606.

Production of high-grade silicon-iron. V. B. BROWNE (E.P. 277,537, 10.1.27).—See U.S.P. 1,570,229; B., 1926, 282.

Hermetically closing the annealing chambers of annealing furnaces. SIEMENS-SCHUCKERTWERKE G.M.B.H. (E.P. 263,162, 15.12.26. Ger., 18.12.25).

Apparatus for producing oxyacetylene mixtures for use in spraying metals and other fusible material. W. CARPMAEL. From SOC. ITAL. PER LA METALLIZZAZIONE (E.P. 277,186, 14.10.26).

[Rotary transporter for plant used in] the detinning of tinned iron scrap etc. M. A. ADAM (E.P. 277,127, 16.6.26).

Apparatus for pickling tubes, bars, etc. WELLMAN SEAVER ROLLING MILL Co., LTD., and S. SMITH (E.P. 276,732, 1.6.26).

Separation of ores (E.P. 277,210).—See XI.

XI.—ELECTROTECHNICS.

High-frequency [induction] furnaces for small charges. W. STEINHAUS and A. KUSSMANN (Z. Metallk., 1927, 19, 346—348).—The current supply for a small (5 kw.-hr.) induction furnace is obtained by transforming up the ordinary A.C. supply to 6000 volts by means of a suitable transformer in the primary circuit of which is arranged an ammeter, choking coil, and cut-out switch. The high-tension current thus obtained is shunted through three oil condensers in parallel, and converted to high frequency by means of a spark gap device consisting of a rotating aluminium disc, 25 cm.

in diam. and 4.5 mm. thick, on both sides of which are arranged twelve equally spaced projections which allow the passage of current to two stationary electrodes as the disc rotates. The projections consist of copper blocks tapering to small discs 4.5 mm. in diam., and the stationary electrodes are somewhat similar in shape, but are hollow inside for water-cooling. The best results are obtained with 3000—3500 revolutions of the disc per min. The heating coil of the furnace consists of 27 turns of flat, water-cooled copper tube, has an internal diameter of 6 cm., and is 15 cm. high. Temperatures up to 1800° can be readily obtained with suitable charges. A. R. POWELL.

Anodes for chromium plating. O. P. WATTS (Amer. Electrochem. Soc., Sept., 1927. Advance copy. 9 pp.).—Small-scale experiments have been made to test the effect of using various anode materials, including chromium, lead, iron, steel, and various chromium and silicon alloys, in a chromium plating bath. Under the conditions of experiment lead anodes were most satisfactory in that good cathode deposits were obtained at high efficiency. Iron and steel were found to possess several disadvantages resulting from accumulation of iron salts in the solution. Iron-silicon alloys may be slightly more satisfactory. H. J. T. ELLINGHAM.

Electrolytic preparation of *p*-aminophenol. D. CAESER (Amer. Electrochem. Soc., Sept., 1927. Advance copy. 13 pp.).—Experiments have been made to determine the most suitable electrode materials for use in the electrolytic preparation of *p*-aminophenol using a cell in which the catholyte, contained in a porous cup, is a solution of 20 g. of nitrobenzene in 150 g. of concentrated sulphuric acid to which a few drops of water have been added, whilst the anolyte is 96% sulphuric acid. Platinum, carbon, cobalt, and copper gauze were tried as cathode materials, and platinum, lead, carbon, duriron, ferro-chromium, and lead coated with manganese dioxide as anode materials. Of those giving satisfactory results, a copper gauze cathode and a duriron anode are considered most suitable for technical use. Operating at 70—80° with this combination, the maximum yield of *p*-aminophenol (41—42%) is obtained when the cathodic current density is between 3.8 and 5.1 amp./dm.² With 4 amp./dm.² the current efficiency was 39.3%, the bath voltage being about 4 volts. Further possibilities of improvement and the technical advantages of the electrolytic method are discussed. H. J. T. ELLINGHAM.

Electrodialysis in biochemistry. Technical processes. J. REITSTÖTTER (Kolloid-Z., 1927, 43, 35—41; cf. Dhéré, A., 1927, 423).—A bibliography is given of the patent literature dealing with electrodialysis, and examples are drawn from the literature to demonstrate the fact that the process of electrodialysis was known and applied to the elucidation of technical problems some years before the mechanism of the process was understood. Special reference is made to the work of Schwerin, who, it is shown, recognised the nature of the process in 1900, although the term "electrodialysis" was only used much later by Pauli's school. A detailed description is given of the apparatus used by Schwerin for the extraction and purification of syrups, which satisfies Dhéré's conception of electrodialysis.

L. L. BIRCUMSHAW.

Magnetic viscosity. LAPP. Aluminium alloy "Aldrey." FUCHS.—See X.

Electrodeposition of rubber. SHEPPARD.—See XIV.

PATENTS.

Apparatus for electrolysing solutions of alkali chlorides. E. KREBS (E.P. 267,560, 14.3.27. Ger., 15.3.26).—An electrolysing unit consisting of a cathode, diaphragm, anode, and cell top is arranged in an open trough or channel extending along the upper edges of all four sides of the container, and acting as a water or other liquid seal. A flange projecting from the electrolysing unit rests on the bottom of the trough and supports the unit. J. S. G. THOMAS.

Cell with mercury cathode for the decomposition of alkali chlorides. F. GERLACH (E.P. 269,513, 30.3.27. Ger., 17.4.26. Cf. F.P. 596,918; B., 1926, 284).—An electrolytic cell for the decomposition of alkali chlorides comprises a mercury cathode, an amalgam-formation chamber lined with polishable stone or similar material, e.g., granite, and in which the distance apart of the electrodes may be made very small without risk of a short-circuit occurring, and a separate amalgam-decomposition chamber situated at a lower level. Transfer of mercury from the second chamber to the first is effected without shock by means of a worm having a horizontal disc which distributes the mercury below the surface of a covering liquid. J. S. G. THOMAS.

Electrolytic cell [for electrolysis of water]. A. T. STUART (E.P. 254,268, 13.4.26. Can., 27.6.25).—A sheet-metal electrode of one polarity is placed between two sheet-metal electrodes of the opposite polarity so that its major surface lies in the same direction as the current across the spaces between the electrodes. [Statutory Ref. to E.P. 215,355.] J. S. G. THOMAS.

Apparatus for the electromagnetic separation of ores. A. DAVIES (E.P. 277,210, 8.6.26).—In an electromagnetic separator of the kind described in E.P. 105,354 (B., 1917, 600), the point or points of the upper lifting magnets are formed so as to produce an interrupted attraction on the material to be treated.

J. S. G. THOMAS.

Electrical precipitation and separation of suspended matter in gases and non-conducting liquids. METALLBANK U. METALLURGISCHE GES. A.-G. (G.P. 441,912, 29.4.25).—An apparatus for removing suspended matter from gases and non-conducting liquids comprises a vessel carrying longitudinal, unsymmetrical discharge electrodes unsymmetrically arranged between pairs of precipitation electrodes. A. R. POWELL.

Apparatus for treating gases and vapours with the silent electric discharge. I. G. FARBERIND. A.-G., Assees. of W. J. MÜLLER and O. NITZSCHKE (G.P. 442,412, 30.9.25).—The inner tube is loose within the outer tube, so that the distance between the two tubes can be adjusted below by prominences or cones on the inner or outer tubes, and above by depressions on the outer tube or prominences on the inner tube or other distance pieces. A number of tubes are arranged in a watertight manner in a chamber serving as cooler, and gas or vapour is led into the tubes above the water level and, after treatment, passes to a collecting funnel.

J. S. G. THOMAS.

Electric furnace. F. A. J. FITZGERALD, Assr. to HARPER ELECTRIC FURNACE CORP. (U.S.P. 1,643,808, 27.9.27. Appl., 1.6.25).—An electric furnace comprises a resistor extending through and radiating heat downwards in a chamber arranged in the upper part of a casing, means for conveying articles to be treated in the lower part of the casing, and a heat-distributing structure for heating articles on this conveyor.

J. S. G. THOMAS.

Electric furnace. A. D. KEENE, Assr. to WESTINGHOUSE ELECTRIC & MANUF. CO. (U.S.P. 1,643,774, 27.9.27. Appl., 10.2.25).—An electric resistor is supported by, and in spaced relation with, a muffle enclosed within a furnace chamber surrounded by refractory walls.

J. S. G. THOMAS.

Electric furnace. I. RENNERFELT (E.P. 276,823, 24.8.26).—The flat contacting faces of the refractory sections of the furnace are arranged at right angles to the longitudinal axis of the furnace chamber, and each section carries one or more metallic heating elements in the form of ribbon, wire, or coil which, in part, are arranged round the longitudinal axis close along the inner wall of the section, the ends being brought out at right angles to the axis.

J. S. G. THOMAS.

Electric accumulator. K. NEMETH and A. SZANTO (E.P. 276,797, 20.7.26).—The cathode is made of a sieve-like alloy of zinc, nickel, and copper, *e.g.*, of Argentan, amalgamated and covered with zinc. Sulphuric acid free from zinc is used as electrolyte.

J. S. G. THOMAS.

Dry cell. A. HEIL (F.P. 615,578, 4.5.26. Ger., 15.2.26).—The carbon electrode is surrounded to two thirds or three quarters of its height by a depolariser consisting of a mixture of natural or artificial manganese dioxide, graphite, and lampblack, or a mixture of the last two with finely-powdered ammonium chloride. Carton paper is arranged between the zinc cylinder and the other components of the cell.

J. S. G. THOMAS.

Electrolytic coppering of the outer carbon face of lamellar dry batteries having a carbon electrode. ČESKÁ ZBRJOVKA AKC. SPOL. V. PRAZE (Swiss P. 118,083, 17.10.25. Czecho-Slov., 15.11.24).—A cell comprising electrolyte between plane zinc and carbon electrodes is filled, sealed, and placed vertically in the coppering bath so that a current flows between the carbon electrode and an auxiliary electrode immersed in the bath.

J. S. G. THOMAS.

Manufacture of incandescence filaments. COMP. DES LAMPES (F.P. 614,553, 15.4.26. U.S., 17.4.25).—Tungstic oxide, mixed with small proportions of aqueous solutions of water-glass and potassium chloride or similar substances containing an alkali metal and silicon, is treated with hydrochloric acid, reduced with hydrogen, and the resulting product worked up into filaments having large overlapping and coalescing crystals. When formed into helices of very small diameter, such filaments do not sag and are very resistant to shocks.

J. S. G. THOMAS.

Material introduced into electric incandescence lamps and similar glass vessels [to prevent blackening]. PATENT-TREUHAND GES. FÜR ELEKTRISCHE GLÜH-LAMPEN M.B.H. (G.P. 441,865, 8.11.25).—A compound

of phosphorus oxide with the oxide of any metalloid. *E.g.*, boron phosphate is introduced into the vessel and combines with any water vapour which may be present or formed.

J. S. G. THOMAS.

Electron discharge device. BRIT. THOMSON-HOUSTON CO., LTD., Assees. of I. LANGMUIR (E.P. 267,504, 5.3.27. U.S., 10.3.26).—In an electron discharge device, means are provided for trapping positive ions in the space surrounding the cathode and for producing an electric or magnetic field for varying the electron current thereby freed from space-charge limitation.

J. S. G. THOMAS.

Thermionic valve. EDISON SWAN ELECTRIC CO., LTD., L. H. SOUNDY, and T. W. PRICE (E.P. 276,703, 28.4.26).—Unequal emission of electrons from different parts of a filamentary cathode heated by an electric current is reduced by coating a very small fraction, *e.g.*, less than one tenth of the length of the cathode, with a substance, *e.g.*, a paste of calcium and strontium oxides, having high electron emission properties.

J. S. G. THOMAS.

Electrical deposition of organic materials [*e.g.*, rubber, cellulose, etc.]. KODAK, LTD., Assees. of S. E. SHEPPARD and C. L. BEAL (E.P. 251,271, 20.4.26. U.S., 22.4.25).—See U.S.P. 1,589,326; B., 1926, 793.

Gas-filled incandescence lamp and getter therefor. D. S. GUSTIN, Assr. to WESTINGHOUSE LAMP CO. (U.S.P. 1,643,810, 27.9.27. Appl., 16.5.23).—See Swiss P. 114,997; B., 1927, 257.

Apparatus for analysis (E.P. 252,206).—See I.

Non-magnetic alloy (E.P. 276,874). **Coating metals** (E.P. 276,390).—See X.

Rubber goods (E.P. 269,505).—See XIV.

XII.—FATS; OILS; WAXES.

Addition of bromine to butter and margarine fat. A. SCHNECK (Milch. Zentr., 1927, 56, 181—183).—Hehner's method for the determination of the bromine absorption of butter and margarine fats gives results which, when multiplied by the factor 1.5879, are in good agreement with the iodine values obtained by the Hübl method. The drying of the bromo-compound to constant weight should be continued until two consecutive weighings differ by no more than 0.5 mg., which for fat portions of about 1.3 g. is equivalent to 1 unit in the first decimal place of the iodine value. The increase of refractive index on bromination of these fats is proportional to the weight of bromine added, and hence the iodine value may be calculated from the difference in the refractive indices of the fat and of its completely brominated derivative. Using a Zeiss butyrometer reading to 0.1 scale divisions, the limit of accuracy for the iodine value is 2 units in the first decimal place.

F. R. ENNOS.

Determination of the acetyl value [of fats]. F. CRONER (Z. angew. Chem., 1927, 40, 1013—1014).—About 2 g. of the acetylated product is dissolved in 5 c.c. of neutralised alcohol and titrated in the cold with 0.5*N*-alcoholic potassium hydroxide; a further 25 c.c. of the same solution are added and the mixture is heated for 30 min. on the water-bath until the substance

is completely saponified. After evaporating off the alcohol the residue is dissolved in water and the solution transferred to a long-necked Kjeldahl flask fitted with a bulb trap. An excess of sulphuric acid is added and the liberated acetic acid distilled with steam into an Erlenmeyer flask previously rinsed with neutralised alcohol. When 600–700 c.c. have been collected the distillate is titrated with 0.1*N*-potassium hydroxide using phenolphthalein as indicator. The use of the Kjeldahl flask and trap avoids errors due to sulphuric acid spray being carried over with the distillate.

A. R. POWELL.

Colorimetric determination of minute quantities of dissolved phosphorus in oil. C. STICH (Z. angew. Chem., 1927, 40, 1014).—A standard phosphorus solution is prepared by dissolving 0.1 g. of yellow phosphorus in 100 g. of a fatty oil containing 2% of ether or 1% of terpene and further diluting 10 g. of this solution with 90 g. of the oil so that the standard solution contains 0.1 mg. of phosphorus per g. A series of standard tubes is then prepared containing 0.1–1 g. of the oil, diluted to 10 c.c. with a mixture of ether, absolute alcohol, and acetone in the volume ratio of 40:20:5; to every tube are added 10 drops of a saturated solution of silver nitrate in acetone, which produces a brown colour the intensity of which is proportional to the phosphorus content. The standard solutions so prepared are stable for long periods if protected from moisture and air, provided that the reagents used are absolutely anhydrous. To carry out a determination on an unknown oil, 1 g. is diluted to 10 c.c. with the ether-alcohol mixture, silver nitrate in acetone is added, and the colour compared after 10–15 min. with the series of standards.

A. R. POWELL.

Water in oils. PFLUG.—See II.

PATENTS.

Stable saponin solution of good cleansing action. A. CHRISTEN (Swiss P. 117,310, 26.8.25).—The stability and cleansing power of a saponin solution are improved by stirring in 1.5–2% of free acid and a little potassium nitrate in the cold.

S. S. WOOLF.

Deodorisation, clarification, and neutralisation of vegetable oils. E. FORAY (Addn. No. 31,289, 17.10.25, to F.P. 601,919; B., 1926, 987).—After neutralisation with an amount of alkaline solution determined by preliminary titration, the oil is filtered, washed, and subsequently decolorised and deodorised by carbon, according to the earlier patent.

S. S. WOOLF.

Manufacture of a finely-divided dry soap product. R. L. HOLLIDAY, ASST. to INDUSTRIAL SPRAY-DRYING CORP. (Re-issue 16,749, 27.9.27, of U.S.P. 1,621,506, 22.3.27).—See B., 1927, 339.

Light hydrocarbons from oils (E.P. 263,082 and 276,007). **Bituminous emulsions** (E.P. 276,543).—See II.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Paint tests on wood. H. A. GARDNER (Amer. Paint and Varnish Manufs.' Assoc., Aug., 1927, Circ. No. 315, 439–446).—A preliminary account of exposure tests now proceeding in Florida and Washington, physical pro-

perties of the paints under test being tabulated. The effect of introducing heavy-bodied oil or varnish into paints for exterior use in order to prevent chalking etc. is being studied.

S. S. WOOLF.

Are there resinogenic and resinophoric groups? H. WOLFF (Z. angew. Chem., 1927, 40, 1010–1011).—A discussion of the nature of resins and of the possibility of the existence of resinophoric groups and resinogenic groups. As the chemical composition and physical characteristics of resins vary to a considerable extent it appears to be impossible to postulate the existence of any one group common to all resins or to any class of resins. On the other hand there are many groups which are capable of reacting in such a manner as to produce colloidal substances of high mol. wt., and these may perhaps be considered as resinogenic groups.

A. R. POWELL.

Durability of resins and plasticisers in lacquers. H. A. GARDNER and A. W. VAN HEUCKEROTH (Amer. Paint & Varnish Manufs.' Assoc., Aug., 1927, Circ. No. 316, 447–468).—Exposure tests on 18 resin solutions alone, extended with oil, or incorporated with a standard lacquer base, clear and pigmented, are detailed. The conditions of the films at time of failure are described or, in suitable cases, reproduced by photomicrographs. Exposure tests on a parallel series of lacquers containing 21 different plasticisers are also described, the mechanical properties of stripped films of these lacquers after 24 hrs., 48 hrs., and 1 week being tabulated. Further tests were carried out on a lacquer containing shellac (for which a special lacquer formulation was necessary).

S. S. WOOLF.

PATENTS.

Liquid coating composition. E. C. R. MARKS. From BAKELITE CORP. (E.P. 276,417, 20.5.26).—A phenol-formaldehyde resin in the initial stage of condensation is dissolved in an aqueous alkaline solvent, and, as hardening agent and diluent, a liquid aldehyde having a higher mol. wt. and lower reactivity than formaldehyde (e.g., furfuraldehyde) is added.

S. S. WOOLF.

Moulding phenolic condensation products. H. C. HEIDE. From PRODUCTS PROTECTION CORP. (E.P. 276,440–1, [A, B] 28.5.26).—(A) After desiccation, phenol-aldehyde condensation products in the initial stage are heated throughout at a temperature slightly below that of transition to the intermediate stage. They are then introduced into heated moulds, subjected to suitable pressure and temperature to effect the final condensation, and allowed to cool gradually, the homogeneity etc. of the product being improved. (B) The "curing" process is carried out by submerging the moulding in a liquid dielectric of greater viscosity than water, e.g., "cumar," chlorinated naphthalenes, etc., and subjecting liquid and moulding to heat and pressure in suitable apparatus.

S. S. WOOLF.

Manufacture of artificial resins. J. Y. JOHNSON. From I. G. FARBERIND. A.-G. (E.P. 276,518, 4.10.26).—Artificial resins obtained by the condensation of mixtures of cyclic ketones or of mixtures of these with aromatic or hydroaromatic hydroxy-compounds in the presence of condensing agents, may be used as such

or in conjunction with other artificial or natural resins, cellulose esters, rubber, etc. S. S. WOOLF.

Solutions of cellulose esters [for use as lacquers].

J. G. DAVIDSON, Asst. to CARBON & CARBIDE CHEMICALS CORP. (U.S.P. 1,644,417—1,644,420, 4.10.27. Appl., [A] 13.6.24, [B] 20.7.25, [C] 5.8.25, [D] 16.8.27).—See E.P. 238,485; B., 1925, 857.

Method of improving aldehyde resins. W. O. HERRMANN, H. DEUTSCH, and W. HAEHNEL, Assrs. to CONSORTIUM FÜR ELEKTROCHEM. IND. M.B.H. (U.S.P. 1,643,496, 27.9.27. Appl., 26.7.23. Ger., 8.7.22).—See E.P. 201,916; B., 1925, 45.

Manufacture of condensation products from phenols and formaldehydes. E. J. P. C. DE JARNY (U.S.P. 1,643,447, 27.9.27. Appl., 6.4.26. Fr., 16.4.25).—E.P. 265,033; B., 1927, 259.

Dispersing solids in liquids (E.P. 276,400—1 and 276,727—8).—See I.

Condensation products of aldehydes with ketones (E.P. 264,830).—See XX.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Electrodeposition of rubber. S. E. SHEPPARD (Amer. Electrochem. Soc., Sept., 1927. Advance copy. 35 pp.; cf. B., 1925, 681).—The relevant properties of rubber latex and the general principles of cataphoresis are reviewed. The particles in rubber latex have a diameter of about 2μ , carry a negative charge corresponding to a contact potential of -0.035 volt, and have a mobility of about 2.7×10^{-4} cm./sec. under unit potential gradient, a value comparable with those for particles in most suspensions and emulsions. The relation $n \propto c/\kappa$, where n is the amount of rubber transported towards the anode per unit of current, c the concentration of rubber in the latex, and κ the total conductivity of the latter (cf. Laing, A., 1923, i, 937), is obeyed approximately, but not exactly. At the anode simultaneous discharge of hydroxyl ions, which may lead to oxidation or production of a porous structure due to oxygen evolution, can be avoided (1) by dissolving in the latex depolarisers such as pyrogallol or substances furnishing ions such as the hydrosulphide, polysulphide, or thiosulphate ions which are more easily discharged than hydroxyl ions and yield desirable products (cf. B., 1926, 639), or (2) by using attackable anodes, such as zinc, which form oxides which are desirable constituents of the deposit. Hollow carbon anodes have the advantage that they can be made porous, so that anodic gases can be pumped off or depolarisers passed under suitable pressure through the anode (cf. B., 1926, 598). The freshly-deposited rubber is evidently semi-permeable, for continuous deposition of thick layers is possible; the mechanism of this process is discussed. Moreover, if the anode is surrounded at some distance by a porous diaphragm, rubber is deposited on the diaphragm, a process in which the action of anodic products on the rubber is avoided, and one which can be applied to the impregnation or coating of fabrics (B., 1924, 104; 1925, 46). Substances such as sulphur and various fillers, pigments, and softeners, which can be obtained in the form of negatively-charged suspensions, form a stable "mix" with the

latex, and are electrodeposited with the rubber in approximately the same proportions as in the mix (cf. B., 1925, 681). These "wet mixes" are easy to prepare and handle, and give homogeneous deposits, for the small differences between the mobilities of the different kinds of particles seem to be reduced in such mixtures, particularly when the total concentration is high. Szegevari's theory of the mechanism of the deposition and the influence of other anodic processes on it is discussed. With a latex containing 7 g. of rubber per 100 c.c., 1 faraday deposits about 1500 g. of rubber. There is no necessary limit to the thickness which can be deposited, but practically it is limited by the question of drying and by secondary changes in the surface layers. The amount of water in the solidified layer may be from 25 to 50%, depending on the conditions of deposition. The electric gradient in the deposit affects the texture, and a "natural" graining effect may be produced. The throwing power is not very high, but higher than would be expected from the low conductivity of the bath, and is generally sufficient to deal with surfaces of irregular shape. Rubber produced by electrodeposition may be vulcanised readily, and permits the use of "super-accelerators" which cannot be used in milled stock, since they act so rapidly as to produce scorching. Owing to the absence of milling, the tensile strength and elasticity of electrodeposited rubber are extremely high, and in the absence of "ageing" compounds it is superior to ordinary milled rubber in ageing properties; ageing compounds are easily introduced and utilised. Hygroscopic substances are readily washed out of the deposit, so that good insulating properties can be secured.

H. J. T. ELLINGHAM.

Variation of Ceylon estate grades of rubber. REP. LONDON COMM. CEYLON RUBBER RES. SCHEME (Bull. Imp. Inst., 1927, 25, 218—242).—Examination of 39 samples of Ceylon plantation rubber indicates that machine-dried blanket crêpe rubber is most plastic and least variable in this feature. Smoked sheet is generally fairly soft, but more variable, whereas air-dried crêpe is frequently tougher than the other two. There is a distinct relationship between plasticity and rate of vulcanisation, softer rubbers generally having a low rate of vulcanisation, whilst tougher rubbers are more rapid; this relationship is probably connected with maturation of the rubber in the interval between coagulation and completion of drying. When mixed with sulphur, the machine-dried crêpe rubber gives the highest degree of uniformity in rate of vulcanisation; in the additional presence of zinc oxide and an organic accelerator, none of the three varieties of rubber shows any important variation in vulcanising or mechanical properties. From a comparison of plasticity measurements made by the parallel plate method and the extrusion method, respectively, it is shown that the latter is more sensitive, and so more useful for exact investigations.

D. F. TWISS.

PATENTS.

Caoutchouc-latex compositions. A. BIDDLE (E.P. 277,194, 10.11.26).—Casein as such or in the form of material containing casein, e.g., skimmed milk, is introduced in substantial proportion into rubber latex. The mixture may be precipitated by the addition of acid.

D. F. TWISS.

Manufacture of rubber goods from rubber dispersions by electrophoretic means. ANODE RUBBER Co., LTD. (E.P. 269,505, 21.3.27. Ger., 14.4.26).—In order to prevent the liberation of gases at the cathode during the electrophoretic deposition of rubber from rubber dispersions, an oxidising depolarising agent is provided; the cathode, for example, may be of lead coated with lead dioxide. Hollow articles such as air-tubes may be produced on the inner surface of a subdivided annular anode which acts as the container, the cathode consisting of an annular lead-covered iron tube with a surface coating of lead dioxide. D. F. TWISS.

[Accelerators for the] vulcanisation of rubber. W. SCOTT, Assr. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 1,638,220, 9.8.27. Appl., 23.4.24).—A primary arylamine, e.g., aniline (1 mol.), is heated at about 80° with acetaldehyde or a higher homologue (1.5 mols.), and the condensation product is treated with 40% formaldehyde solution. T. S. WHEELER.

Production of rubber mixtures. METALLBANK U. METALLURGISCHE GES. A.-G., Assees. of F. MILDNER (G.P. 441,383, 9.7.25).—The latex is worked up to a paste with a solvent or swelling agent, softening agents being added if desired, and fillers and vulcanisers are added dry to the paste. L. A. COLES.

Protection of metal (E.P. 276,705).—See X.

XV.—LEATHER; GLUE.

Theory of tanning. Y. H. LI (J. Amer. Leather Chem. Assoc., 1927, 22, 380—444).—Tanning tests with naphthalene and triphenylcarbinol derivatives, phenols, and benzene derivatives containing no hydroxyl groups show that the hydroxyl group is the primary tanning group for certain classes of compounds, e.g., naphthalene and triphenylcarbinol derivatives. This group is present in the original compound in the naphthalene derivatives, but may be formed during tannage with triphenylcarbinol derivatives. The hydroxyl group must be in the α -position for the naphthalene derivatives to possess tanning properties, and in the form of a carbinol group in triphenylmethane derivatives, which agrees with Mathur's findings on the tanning properties of fatty acids (B., 1927, 284). The tanning properties of α -naphthol derivatives may be modified by the entering groups, especially acid and basic groups, but are not entirely nullified by them. Tanning with certain aromatic hydroxy-compounds is essentially a chemical reaction between the hydroxyl group of the naphthol and the hide substance, with the elimination of water. The reaction may be more complete so that all the hydrogen atoms in the amino-group are replaced by tanning materials. D. WOODROFFE.

Treatment of red gum or marri kino (*Eucalyptus calophylla*) for the preparation of tannin extract. (Austral. Council for Sci. & Ind. Res., 1927, Circ. No. 9, 14 pp. Cf. Salt, B., 1922, 67 A).—Samples of marri kino (*Eucalyptus calophylla*) contained tans 28.1—71.8%, soluble non-tans 4.8—11.1%, insoluble matter 8.6—20.1%, and water 10.0—54.5%. The colour was reddish and the p_H of the liquors 3.4—3.6. Autoclaving rendered a portion of marri kino insoluble at the expense of the tannin content. Autoclave treatment of marri kino

with solutions of acid sodium sulphites at 110° for $\frac{1}{2}$ hr. showed that 81% of the kino was solubilised with 8% of sodium metabisulphite, but the tans/non-tans ratio fell from 6.3 to 2.7 and good colour was obtained. Autoclaving at higher temperatures did not materially influence the composition. Autoclaving marri kino with normal sulphites yields more soluble matter but of darker colour. Similar experiments have shown that mixtures of from 1:3 to 1:6 normal and acid sodium sulphites are good solubilising agents on marri kino, and the colour is favourable. A marri kino extract prepared with 8% of a 1:4 mixture of normal and acid sodium sulphites had the following composition:—tans 61.5, soluble non-tans 26.8, insoluble matter 1.3, moisture 10.4, and ash 6.1%. Liquors prepared from this extract showed p_H 4.2 and the colour at 0.5% tannin content was 11.2 red units and 43.3 yellow units. It compares favourably with quebracho extract in respect of total solubles and tannin content, but contains too much insoluble matter. The tans/non-tans ratio is unfavourably low. Readily soluble products can be obtained by sulphiting marri kino at ordinary atmospheric pressures. D. WOODROFFE.

Fisetin; the cause of the fluorescein reaction with quebracho extract. Fluorescein and fluorescence reactions of quebracho, tizerah, mimosa, and urunday extracts. O. GERNGROSS and H. HÜBNER (Collegium, 1927, 426—431).—When quebracho, tizerah, mimosa, and urunday extracts are respectively fused with phthalic anhydride and zinc chloride, they show a strong fluorescein reaction, attributed to fisetin. Not only quebracho, tizerah, and mimosa extracts, but also urunday extract shows a strong yellow fluorescence when nitrocellulose (11% N) is dipped in 1:1000 solutions of these various extracts and examined in filtered ultra-violet light. This is due to fisetin. Ordinary cotton wool treated with a solution of urunday extract shows a lilac fluorescence in ultra-violet light owing to the presence of a lilac fluorescing substance not absorbed by the nitrocellulose. Fisetin is proved to be the cause of the fluorescein reaction with quebracho extract, since 1 mg. of fisetin gives the reaction whereas it fails with 1 mg. of quebracho extract, and, further, a sample of unsulphited liquid quebracho extract, from which the fisetin has been removed by extraction with ether, fails to show the reaction. The difficulty of removing the fisetin from quebracho extract indicates that it is present in a combined form. D. WOODROFFE.

Hide powder. W. R. ATKIN and F. C. THOMPSON (J. Soc. Leather Trades' Chem., 1927, 11, 300—308).—Hide powder is collagen modified by liming which has opened up $-CO\cdot NH-$ linkages forming free carboxyl and amino-groups. The amphoteric properties of hide powder between p_H 2 and 9 are due to lysine, arginine, aspartic and glutamic acids. It is shown that the titration curve of B.12 hide powder corresponds to 26 free amino-groups; gelatin has 30. The isoelectric points of B.12 and gelatin are p_H 5.5 and 4.7, respectively. The isoelectric points of different hide powders can vary according to the numbers of free amino- and carboxyl groups present, which latter depend on the previous liming. The "opening up" of $-CO\cdot NH-$

linkages has been measured for a series of hide powders by determining the number of c.c. of 0.05*N*-hydrochloric acid and 0.05*N*-caustic soda required when titrated between p_H 4.0 and 8.5. A comparison of these figures with those for the "relative specific surface" shows that the latter diminishes as the collagen molecule is more opened up. High relative specific surface figures correspond with low non-tannin results, which thus coincide with fewer free amino- and carboxyl groups. B.14 powder contains more free groups than B.13 and consequently requires more alkali per gram to bring it from p_H 6.66 to p_H 8.5. To obviate such differences, the use of unlimed hide from which the grain has been removed is suggested. Bennett's figures for the alkalinity of B.11 (cf. B., 1927, 52) are at variance with those of the Hide Powder Committee; the authors do not agree that the alkaline impurities are organic, and state also that the alkali does not remain in the powder and reduce non-tannin residue. D. WOODROFFE.

Determination of quebracho extract in other vegetable tanning extracts. O. GERNGROSS and H. HÜBNER (Collegium, 1927, 431–433).—The yellow fluorescence shown by cotton wool treated with solutions of quebracho extract and viewed in filtered ultra-violet light is visible at a dilution of 1 pt. per million. Solutions of the tanning extract under examination are prepared of different strengths, and the dilution at which the yellow quebracho fluorescence still appears is determined by the expression: % quebracho = dilution \times 100/10⁶. By using a similar method of determination, 15–17% of fisetin was observed in a solid quebracho extract. D. WOODROFFE.

Determination of the activity of bating materials by Lenk's method. L. JABLONSKI and W. EGGERT (Collegium, 1927, 483–485).—2.5 g. of "cutrilin" and "oropon," respectively, were shaken with 200 c.c. of water, filtered, 10 c.c. of the filtrate added to 50 c.c. of a 10% solution of commercial (69.18%) gelatin, and kept for 1 hr. at 40°. The digestion was stopped by adding 10 c.c. of *N*-hydrochloric acid, the solution suitably diluted for gelatinisation, as determined by a preliminary test, and *N*-sodium hydroxide added to give p_H 7–7.5. The gelatin content was then determined by the time required for setting (cf. B., 1927, 86). The results, contrary to Lenk's observations, showed no difference between "cutrilin," a bacterial bate, and "oropon," a tryptic bate. The authors have compared the activities of these two bates respectively at different p_H values and for different periods of time, and the results differ from those obtained by Lenk (cf. B., 1927, 284). The Lenk method is merely a comparison of the proteolytic activities under the conditions of the experiment, and takes no account of any other properties. D. WOODROFFE.

Tanning materials of the British Empire (Bull. Imp. Inst., 1927, 25, 250–286).

PATENTS.

Process of tanning animal hides. CHEM. WERKE "HERKULES" G.M.B.H. (G.P. 439,551, 5.9.22).—The effluents of vegetable tanning processes are treated with alkalis or acid such as 5% sodium hydroxide, ammonia, sodium carbonate, bisulphite, or borax, respectively,

filtered, diluted to contain 5–10% of dry residue, 2% of aniline is added, treated with 0.5% formaldehyde solution, and used for tanning hides, which it penetrates in 5–10 days. Alternatively, the hides may or may not be treated with a 2% aqueous solution of aniline oil, then given 2 days in a 0.5–1.0% solution of formaldehyde followed by 3 days in effluent liquors, which yields a white empty leather. D. WOODROFFE.

Process of tanning. PLAUSONS FORSCHUNGSINST. G.M.B.H. (G.P. 440,037, 31.1.24).—Ground products containing tannin, e.g., quebracho wood, are ground in colloid mills or similar mechanism with water containing a dispersive agent, a material which speeds up the tannage or some product which improves the leather, and, without allowing the solids to settle out, the product is used as a tan liquor. Chromium and silica compounds, e.g., kaolin, kieselsguhr, or suitable oils, fats, or albumins, respectively, may be incorporated with the above mixture to produce modifications in the tanning properties. These various products reduce the time of tannage and produce a more homogeneous waterproof leather than can be obtained by the usual extract tannages (cf. E.P. 219,347; B., 1924, 841).

D. WOODROFFE.

Process of tanning hides. S. SCHAPRINGER (G.P. 439,521, 16.7.25).—Hides are treated for 1–2 hrs. with dilute solutions of organic non-tans, e.g., pyrocatechol, resorcinol, quinol, pyrogallol, phloroglucinol, protocatechuic acid, gallic acid, or weak tannins, e.g., catechin, naphthols, quinones, kino tannin, catech, and moringa, with or without the addition of tannin extracts, and then the tannage is completed in strong tannin extract liquors, e.g., a mixture of chestnut, oakwood, and sulphited quebracho extracts (d 1.075) for 40–50 hrs., or a chestnut and mimosa bark extract liquor (d 1.057). This method is suitable for sole leather. D. WOODROFFE.

Process for tanning with metallic salts and salts of silicic acid. RÖHM & HAAS, A.-G. (E.P. 270,267, 7.4.27. Ger., 30.4.26).—Tanning liquors containing metallic salts (e.g., chrome or potash alum) and salts of silicic acid are stabilised by adding acids or their salts of greater valency than two, e.g., stannic acid, phosphoric acid, either alone or with uni- or bi-valent organic acids, e.g., acetic, oxalic, or lactic acid.

D. WOODROFFE.

Manufacture of a leather substitute. RESPRO, INC., and R. K. ABBOTT (E.P. 276,392, 7.4.26).—A reticulated, cement-impregnated sheet of unwoven fibres of loose or open texture is spread with one or more coats of a film-forming dressing, e.g., nitrocellulose or soap-wax-shellac emulsion, containing a solvent which will act as a wetting agent towards the cement or will penetrate the sheet material and enclose the cement-coated fibres at and near the surface. The dressing of the required consistency may contain a liquid miscible with the cement in the sheet material and a colloidal material, e.g., pigment. The surface-dressed sheet is subjected to pressure. Fibres impregnated with rubber cement may be similarly treated. D. WOODROFFE.

Manufacture of a translucent article. A. EGGMAN and A. PEREA (U.S.P. 1,644,115, 4.10.27. Appl., 17.5.24. Fr., 12.6.23).—See E.P. 217,580; B., 1925, 683.

XVI.—AGRICULTURE.

Nitrification in soils. II. H. N. BATHAM (Soil Sci., 1927, 24, 187—203; cf. B., 1926, 70).—Nitrification tests in soil with monoaminodicarboxylic and diamino-carboxylic acids and with some heterocyclic compounds are reported. Arginine nitrifies more readily than aspartic or glutamic acid. Xanthine and uric acid are easily nitrified. Brucine and strychnine show very low nitrification values; nicotine is more readily nitrified than any of the other compounds tested, with the exception of ammonium sulphate. C. T. GIMINGHAM.

Nitrate accumulation under a mulch. A. B. BEAUMONT, A. C. SESSIONS, and O. W. KELLY (Soil Sci., 1927, 24, 177—185).—In these experiments, the accumulation of nitrates was much greater in the soil of mulched plots than on that of adjoining cultivated plots. The mulch of waste hay and straw was applied twice yearly at the rate of 6—8 tons per acre for 4 years, and was left entirely undisturbed. Fruit trees were growing on the plots. The effect of the mulch on nitrate accumulation was the reverse of that obtained by Albrecht and Uhland (B., 1926, 25), but the conditions of mulching were different. C. T. GIMINGHAM.

Difficultly soluble phosphates [in soil]. E. UNGERER (Z. Pflanz. Düng., 1927, A9, 321—345; cf. B., 1927, 55).—Continuing his studies on the solubility relationships of the tertiary phosphates of magnesium, calcium, aluminium, and iron, the author has investigated the influence of the presence of various compounds of uni- and bi-valent metals, and of certain adsorbents, such as clay and animal charcoal, on their solubility. Magnesium and calcium phosphates are stable in solutions of neutral or weakly alkaline reaction, iron and aluminium phosphates in acid solutions. Magnesium phosphate does not exist in the soil as such. The solubility of calcium phosphate is increased by small changes in reaction and by the presence of neutral salts, alkali and alkaline-earth carbonates, and adsorbents. On the other hand, most of the substances tried caused a reduction of solubility of iron and aluminium phosphates; only alkali carbonates and alkali-permutite caused an increase. The figures are discussed in relation to the results of vegetation experiments with oats. C. T. GIMINGHAM.

Effect of frost on the "availability" of phosphoric acid and potassium [in the soil]. B. BÄRTZ (Z. Pflanz. Düng., 1927, A9, 346—363).—Neubauer's seedling method has been used to investigate the effect of freezing upon the available phosphoric acid and potassium in various types of soils. In the case of clay, loam, and chalk soils, freezing and thawing 20 times caused no significant increase of available nutrients; in a sandy soil there was a slight increase in the uptake of phosphoric acid by the plants; in a granite soil freezing brought about a definite increase in the amount of potassium taken up, but had no effect on phosphoric acid. The soil surface area, as measured by the hygroscopicity, is unaffected by freezing in clay, loam, and chalk soils, but an increase of area of 5.69% was observed in a sandy soil, and of 6.13% in a granite soil. It is considered that the increased availability of nutrients in the latter soils after freezing is due, not to any chemical

effect, but to the increased surface area resulting in better utilisation by the plant roots.

C. T. GIMINGHAM.

Relative tolerance of crop plants for aluminium. F. T. MCLEAN and B. E. GILBERT (Soil Sci., 1927, 24, 163—175).—Different plants, grown in water culture, vary widely in their sensitiveness to the presence of soluble aluminium in the culture solution. With some crops (e.g., barley, lettuce) growth is depressed by 2 pts. per million of aluminium, whereas with others (e.g., maize, turnips) 14 pts. per million or more are required to show a toxic effect. The earliest evidence of injury due to aluminium is shown in the roots, and the aluminium appears to accumulate in the cortex. Precipitation of aluminium by phosphates was avoided by growing the plants for alternate half-weekly periods in a complete nutrient solution, and in a solution lacking phosphate but containing aluminium sulphate. C. T. GIMINGHAM.

Relation of soil reaction to active aluminium. A. W. BLAIR and A. L. PRINCE (Soil Sci., 1927, 24, 205—215).—Addition of acids or acid-forming substances to a normal soil (p_H 6.28) decreases the p_H and increases the amount of active aluminium, i.e., that part of the aluminium of acid soils which produces a toxic effect on plants (cf. Burgess, B., 1923, 617A). When basic materials or superphosphate were added to a strongly acid soil (p_H 4.07), there was an increase in p_H and a decrease in the amount of active aluminium. Lime and basic slag decreased the active aluminium to a greater extent than superphosphate. In general, the effects produced were greater the larger the additions of acid or basic materials. The results are in agreement with those obtained in field experiments where ammonium sulphate has been used for a period of years. C. T. GIMINGHAM.

Preparation of a soil for practical suspension analysis. A. VON NOSTITZ (Proc. Internat. Soc. Soil Sci., 1926, 2, 305—308).—Thorough disintegration of the finer soil particles previous to mechanical analysis is achieved by drawing a rapid current of air through a suspension of the soil in a length of wide glass tubing. A. G. POLLARD.

Mechanical analysis of soils. I. M. KÖHN (Z. Pflanz. Düng., 1927, A9, 364—375).—The proportion of "fine-sand" (diam. 0.02—0.2 mm. on the Atterberg scale) is of special importance in certain forest soils. The difficulties of determining this fraction accurately, either by settling and decantation or by means of sieves are pointed out. The pipette method and the processes of Wiegner and Odén are not concerned with the coarser fractions. A suitable apparatus for determining this fraction by an elutriation method is described. C. T. GIMINGHAM.

The Mitscherlich method [for determining the fertiliser requirement of soils]. DENSCH and PFAFF (Z. Pflanz. Düng., 1927, 6B, 385—398).—Numerous culture experiments are described, designed to test the constancy of Mitscherlich's values when applied to a wide variety of plants, soils, fertilisers, and external conditions of growth. It is concluded that whilst the method does not permit of such close control over soil fertility as is desirable, it is probably superior to

other methods for general application. The time and extreme care necessary for the successful operation of the method, together with the cost of materials, limits its application as a routine process. A. G. POLLARD.

Cellulose and its decomposition in the soil by micro-organisms. S. A. WAKSMAN (Proc. Internat. Soc. Soil Sci., 1926, 2, 293—304).—In soils cellulose is decomposed mainly by fungi, and to a small extent by aerobic bacteria and actinomycetes (cf. Waksman and Skinner, B., 1926, 959). Phycomycetes cannot decompose cellulose. Aerobic bacteria capable of decomposing cellulose are found in large numbers only in bog soils. Under aerobic conditions 50—65% of the carbon of cellulose is eliminated as carbon dioxide and 25—35% is utilised by the organisms concerned. The production of carbon dioxide under anaerobic conditions is much reduced and there is a corresponding increase in the proportion of intermediate substances (organic acids etc.). The amount of cellulose decomposed bears a definite proportion to the amount of nitrogen required by the organisms for cell formation. For fungi the ratio is 30:35, becoming wider for the usual mixed flora of the soil. Cellulose is not directly a parent substance of soil humus. Its contribution is limited to that portion of its carbon assimilated by the organisms, and which ultimately is decomposed with the production of humus.

A. G. POLLARD.

Effect of protozoa and fungi on certain biochemical processes when inoculated into partially sterilised soil. C. E. SKINNER (Soil Sci., 1927, 24, 149—161).—Reinoculation of soil, partially sterilised by heating, with one of the common soil amoebæ (*Hartmannella hyalina*), caused a reduction in the number of bacteria and a slight depression in the amount of carbon dioxide evolved and in the accumulation of ammoniacal nitrogen. Two species of soil fungi, similarly tested, caused a greater depression of ammonia accumulation than that due to the amoeba, and an increased evolution of carbon dioxide, which was greater than the depression caused by the amoeba. The action of fungi must be taken into account in attempting to explain the phenomena of partial sterilisation of soil.

C. T. GIMINGHAM.

Fermentation characters of the root nodule bacteria of the leguminosæ. I. L. BALDWIN and E. B. FRED (Soil Sci., 1927, 24, 217—230).—The relative powers of 60 cultures of root nodule bacteria to produce acid by fermentation of various sugars and other compounds have been studied. The characters thus obtained are sufficiently definite to separate the organisms into groups which correspond with the cross-inoculation groups. In some groups, e.g., lucerne and clover strains, sub-divisions are found which correspond with those established by other workers by cultural and serological tests.

C. T. GIMINGHAM.

Bacteriological methods for the investigation of soil fertility. H. R. CHRISTENSEN and H. L. JENSEN (Proc. Internat. Soc. Soil Sci., 1926, 2, 309—323).—A classified summary of the trend of recent research in soil bacteriology.

A. G. POLLARD.

Determination of the content of toxic substance in insecticides. III. Determination of polysulphide

sulphur. J. BODNÁR and W. GERVAY (Z. anal. Chem., 1927, 71, 446—458).—The polysulphide sulphur content of solutions of sodium or calcium polysulphide may be determined by the following method without the necessity of determining the thiosulphate sulphur. To 25 c.c. of 0.1*N*-silver nitrate solution is added with agitation a quantity of the polysulphide solution containing about 0.1 g. of excess sulphur. The precipitate of silver sulphide and sulphur liberated by the decomposition of the polysulphides is collected, washed with hot water until neutral, and digested under reflux for 30 min. with 20 c.c. of 0.5*N*-sodium hydroxide and 3 c.c. of perhydrol in 100 c.c. of water, whereby the free sulphur is converted into sodium sulphate, leaving the silver sulphide unaffected. The latter is collected on a filter and the excess of alkali titrated with sulphuric acid. The method is not applicable to barium polysulphide, the excess sulphur in which is determined preferably by Schulek's method (B., 1925, 241). The work of earlier investigators is critically reviewed, and comparative results obtained by various gravimetric and volumetric methods are tabulated.

A. R. POWELL.

PATENTS.

Artificial drying of crops. B. J. OWEN (E.P. 275,015, 30.7.26. Addn. to E.P. 248,935; cf. B., 1926, 460).

Manufacture of phosphatic fertilisers. PRÉPARATION INDUSTRIELLE DES COMBUSTIBLES, and A. HOFFMANN (E.P. 269,199, 8.4.27. Fr., 8.4.26).—See F.P. 614,944; B., 1927, 663.

XVII.—SUGARS; STARCHES; GUMS.

PATENTS.

Extraction process and apparatus. W. F. HOLZHEUER (Re-issue 16,739, 20.9.27, of U.S.P. 1,587,646, 8.6.26).—See B., 1926, 718.

Molasses as a food (U.S.P. 1,643,666).—See XIX.

XVIII.—FERMENTATION INDUSTRIES.

Quinhydrone electrode method of hydrogen-ion concentration measurements. E. M. CROWTHER (J. Inst. Brewing, 1927, 33, 459—463).—A description of the methods employed, with special reference to the liquids concerned in brewing operations. S. J. GREGG.

Fermentation test for silver compounds. TAYLOR.—See XX.

PATENTS.

Prevention of haze in pasteurised beer. HEINEKENS' BIERBROUWERIJ MAATSCHAPPIJ (Dutch P. 14,494, 12.2.23. Conv., 15.10.25).—The fermenting worts are treated with a saccharomycetes rich in proteolytic enzymes, e.g., *Schizosaccharomyces Pombe* and *Octosporus*.

C. RANKEN.

Manufacture of concentrated grape juice. Soc. ÉTABL. BARBET (F.P. 615,942, 29.9.25).—Fermentation of the juice in the grape is checked in the cellar by the addition of antiseptics, which at the same time furnish the small amount of sulphur dioxide necessary for the clarification of the must. After twice pressing as quickly as possible, the combined juices are continuously concentrated in a multiple-effect evaporator. C. RANKEN.

Sulphuring of wine or other liquids in bottles. SEITZ-WERKE G.M.B.H. (F.P. 617,210, 8.6.26).—A fixed amount of sulphur dioxide is mixed with a small quantity of wine or water, and an accurately measured portion of the mixture introduced into the bottles. C. RANKEN.

Manufacture of yeast. INTERNAT. YEAST CO., LTD., Assees. of W. H. F. BUHRIG (E.P. 252,193, 14.5.26. U.S., 14.5.25).—In the process, which is of the continuous addition-withdrawal type, propagation of the yeast is initiated with aeration in a dilute nutrient solution in a fermenter and relatively concentrated yeast nutrient solution added in excess of the attenuation of the yeast. After a period the liquid containing yeast is withdrawn, at a rate equal to the rate of inflow, into an auxiliary fermenter, where it is aerated and its concentration adjusted to that initially present in the main fermenter. When a sufficient amount of liquid has accumulated, the liquid containing yeast is withdrawn and the yeast separated. C. RANKEN.

Propagation of yeast. A. K. BALLS (U.S.P. 1,642,192, 18.7.23).—A culture of *Saccharomyces disjunctus* is added to and allowed to propagate in a mash of crude West Indian cane molasses. C. RANKEN.

Manufacture of yeast extract free from bitterness. VER. DES SPIRITUS-FABRIKANTEN IN DEUTSCHLAND (G.P. 441,457, 27.9.23).—By treatment of living or dried beer yeast with a 2–5% solution of hydrochloric acid at 35–80°, the yeast is hydrolysed and the bitter principles present are destroyed. C. RANKEN.

Rectification of ethyl alcohol. SOC. ANON. DES DISTILLERIES DES DEUX-SÈVRES (F.P. 614,913, 19.11.25. Belg., 20.11.24).—The impure alcohol is directly rectified whereby a decanted portion containing the impurities (methyl alcohol, acetone, etc.) is distilled in an auxiliary column, and the resulting gas mixture condensed or washed with water. C. RANKEN.

Removing gelatin from films (F.P. 613,074).—See XXI.

XIX.—FOODS.

Determination of sodium chloride in [preserved] yolk of egg. H. ULEX (Chem.-Ztg., 1927, 51, 758–759).—Drying and igniting preserved liquid egg-yolk results in loss of chlorine even when sodium hydroxide is added before drying. Correct results may be obtained by boiling 5 g. of the yolk with 200 c.c. of water until coagulation ensues, diluting to 250 c.c., filtering off an aliquot part, evaporating to dryness with sodium carbonate and nitrate, igniting gently to destroy organic matter, dissolving the residue in water, and titrating with silver nitrate after acidifying with nitric acid. Alternatively, 4 g. of yolk are boiled for 2 min. in 100 c.c. of water, 50 c.c. of water, 20 c.c. of nitric acid (*d* 1.15), and 6 c.c. of 4% phosphotungstic acid are added in succession, the liquid is diluted to 200 c.c., 50 c.c. are filtered through a dry paper and treated with an excess of 0.1*N*-silver nitrate solution, and the excess silver is determined by titration with thiocyanate.

A. R. POWELL.

Loss of nutrients in the mechanical removal of water from potatoes. E. PAROW, A. STIRNUS, and W. EKHard (Z. Spiritusind., 1927, 50, 277–278).—The removal of water from potatoes by pressure depends on

the preliminary treatment to which they are subjected, e.g., fine or coarse grinding, freezing and subsequent thawing, cooking, mixing with crushed meal, or combinations of these. The amounts of proteins and salts removed at the same time are roughly proportional to the expressed water. The mechanical removal of water from potatoes results in a large loss of nutrients, that of the proteins being 30.5–49.7% and of the salts 39.5–67.2% of the amounts originally present.

F. R. ENNOS.

Sources of supply of vitamin-A and -D. O. ROSENHEIM and T. A. WEBSTER (Nature, 1927, 120, 440).—Alternative sources of the vitamins present in butter are considered. It should be possible to produce commercially margarine containing a constant amount of vitamin-A and -D by the incorporation, respectively, of the liver fats of the sheep, calf, and ox (which are 200–1000 times as potent as butter) and of an extremely small proportion of irradiated ergosterol.

A. A. ELDRIDGE.

Comparison between the acids in acid foods as determined by Wiegner's method, and the hydrogen-ion concentration. K. NEHRING (Z. angew. Chem., 1927, 40, 1058–1060).—The determination of the hydrogen-ion concentration of the aqueous extract is a good and rapid means of ascertaining the quality, and to a certain extent the composition of acid foods. Good quality foods have relatively low *p*_H values, and the acids present consist mainly of free lactic acid with a little acetic acid, combined acids and butyric acid being absent or present only in small amounts. Inferior varieties show higher values, the lactic acid is to a large extent replaced by butyric acid, and there is a substantial increase in the content of combined acids (acetic and butyric). For good and medium quality acid foods prepared by the cold process, the *p*_H values are less than 4.5 and between 4.5 and 4.8, respectively. When the *p*_H value exceeds 4.8 the food is bad and unfit for use. The *p*_H values observed are in good agreement with those calculated from the acids as determined by Wiegner's process, assuming the combined acids to be present as completely dissociated salts.

F. R. ENNOS.

PATENTS.

Manufacture of bread. C. B. HILL and G. L. TINTNER, Assrs. to NORTHWESTERN YEAST CO. (U.S.P. 1,643,011–2, 20.9.27. Appl., [A] 10.9.25, [B] 26.10.25).—Nutrients for yeast, e.g., sugar, malt extract, ammonium sulphate, calcium phosphate, and calcium sulphate, are mixed and kept for a sufficient length of time with (A) dry yeast in order to revivify it and thereby produce an active starter, which is compounded with a further predetermined portion of the yeast foods and used in the production of dough, or (B) with wet live yeast so that the yeast cells may multiply and become strengthened before being used in the dough in place of the usual dough requirements of the yeast, yeast foods, yeast activators, malt extract, and some of the sugar.

F. R. ENNOS.

[Gluten] food product. A. S. HOYT (U.S.P. 1,643,772, 27.9.27. Appl., 15.5.26).—Wet gluten gum, substantially freed from wheat oil and carbohydrates, including flour and starch, is cooked to a gruel and dried in thin, crisp flakes.

F. R. ENNOS.

Manufacture of chocolate and other confectionery. D. MCKINLAY (E.P. 276,860, 27.10.26).—In order to increase the vitamin content to a degree corresponding approximately with that of the ingredients in the raw state, manufactured confectionery is exposed to the action of ultra-violet rays by passing on an endless band under a quartz mercury-vapour lamp, the band being moved slowly or intermittently so as to present the confectionery to the action of the rays for a definite period, which can be varied according to the nature of the confectionery. F. R. ENNOS.

Process for artificially preparing natural mineral waters. O. WARBURG (E.P. 274,834, 22.6.27. Ger., 22.7.26. Cf. E.P. 259,612; B., 1927, 503).—In the manufacture of mineral waters which contain magnesium and calcium salts as well as alkali bicarbonates, sulphates, and free carbonic acid, the magnesium, mixed with the alkali bicarbonate, is added to water in the form of non-hygroscopic magnesium potassium chloride, made by heating the commercial salt to 130–140°, and the calcium, together with the alkali bisulphate, as calcium sulphate finely ground in a colloid mill. F. R. ENNOS.

Process and product of treating molasses. J. H. LEFTWICH (U.S.P. 1,643,666, 27.9.27. Appl., 31.5.24).—Low-grade or final by-product molasses is mixed with finely-divided decolorising carbon to improve the tinctorial characteristics, and the mixture is used as a stock food ingredient. F. R. ENNOS.

Manufacture of butter. S. KARPINSKY and J. S. ANDERSON (U.S.P. 1,644,254, 4.10.27. Appl., 16.1.24. Fr., 21.11.23).—See E.P. 214,567; B., 1924, 533.

Method of preparing foods. C. BIRDSEYE, ASST. to GEN. SEAFOODS CORP. (Re-issue 16,740, 20.9.27, of U.S.P. 1,608,832, 30.11.26).—See E.P. 257,222; B., 1927, 457.

Electric furnace [for baking bread etc.]. ÉTABL. SABLYET (E.P. 257,237, 22.7.26. Belg., 22.8.25).

Reducing, grinding, or refining apparatus for chocolate, cocoa, etc. F. G. FRYER (E.P. 277,177, 11.6.26).

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Determination of water in mixtures of benzene and alcohol. D. PETERS (Z. angew. Chem., 1927, 40, 1011–1013).—On adding an equal volume of light petroleum to a mixture of benzene and alcohol the mixture separates into two layers at a definite temperature, which depends on the water content of the alcohol used in making the mixture and on the benzene content of the mixture. The temperature of separation has been plotted against the benzene content for mixtures of benzene with alcohol samples of varying water content; in every case the curve is a straight line and the lines corresponding with varying contents of water are parallel to one another, so that, if the benzene content of a mixture is known, and the temperature of separation when mixed with an equal volume of petroleum is ascertained, the water content of the mixture may be found by reference to the graph. The benzene content of an unknown mixture is determined by shaking the

liquid with water and measuring the separated benzene; to a further 2 c.c. of the mixture are added 2 c.c. of petroleum, and the liquid is cooled slowly with stirring until separation into two layers occurs. In case separation occurs immediately on mixing, the liquid is warmed gently until it becomes homogeneous, then allowed to cool slowly until separation occurs. A. R. POWELL.

Determination of gallic acid in tannin-free gallic acid. M. HIRSCH (Chem.-Ztg., 1927, 51, 718–719).—A boiling aqueous solution containing 0.2 g. of the substance is precipitated with 10 c.c. of an acetic acid solution of bismuth nitrate (15 g. of bismuth nitrate and 30 g. of glacial acetic acid diluted with water to 250 c.c.). After remaining a short while on the steam bath, the precipitate is collected on a Gooch filter, washed with hot water till free from acid, then with alcohol and with ether, and dried at 45–50°. The precipitate of bismuth subgallate, $C_6H_2(OH)_3CO_2Bi(OH)_2$, contains 45.79% of crystallised gallic acid.

F. R. ENNOS.

Application of the U.S.P. X. yeast fermentation test to colloidal silver compounds. H. M. TAYLOR (J. Amer. Pharm. Assoc., 1927, 16, 820–824).—The yeast test, i.e., the inhibitory action of the silver compound upon a yeast-sucrose solution, has been tried on ten commercial silver preparations. It is useful only in differentiating between “mild” and “strong” samples and measures only the silver ion concentration, which is not directly related to the germicidal value of the preparation. The simpler and quicker method of Keelan (*ibid.*, 1926, 15, 277) is recommended in place of the yeast test for distinguishing between such preparations. The germicidal values of the above samples, as determined by the Squibb test, show that some preparations are extremely active against *Staphylococcus aureus* after 1 min. E. H. SHARPLES.

Optical identification of alkaloids. G. L. KEENAN (J. Amer. Pharm. Assoc., 1927, 16, 837–839).—The procedure used for the determination of the refractive indices of alkaloids by the immersion method is described, together with the method for the detection and differentiation of atropine, heroin, morphine, cocaine hydrochloride, and the sulphates of brucine, morphine, codeine, and quinine (cf. Wherry, A., 1918, ii, 339).

E. H. SHARPLES.

Occurrence of a number of varieties of *Eucalyptus dives* as determined by chemical analyses of the essential oils. A. R. PENFOLD and F. R. MORRISON (J. Proc. Roy. Soc. N.S. Wales, 1927, 61, 54–67).—From observations on the compositions of the essential oils from trees of this species it is concluded that, in addition to the species type, three varieties exist. These are indistinguishable morphologically, but yield distinctive oils. The type oil contains piperitone 40–50%, phellandrene 40%. Oils from the three varieties contain, respectively, piperitone 5–15%, phellandrene 60–80%, and piperitol; piperitone 10–20%, cineole 25–50%, with some phellandrene; and cineole 45–75%, piperitone under 5%, phellandrene absent or trace only.

S. I. LEVY.

Volatile oil of *Hypericum perforatum*. E. R. MILLER (J. Amer. Pharm. Assoc., 1927, 16, 824—

828).—Steam-distillation of the whole plant gives an average yield of 0.1146% of oil having d_{4}^{25} 0.8126, α_D -16.43° , n_D^{20} 1.45903, and containing α -pinene and probably one or more sesquiterpenes. A fraction (b.p. $140-142^\circ$, d_{4}^{20} 0.7135, $n_D^{18.5}$ 1.4048) probably consists of an aliphatic hydrocarbon not hitherto known to occur in an essential oil.

E. H. SHARPLES.

Monardella oil. E. R. MILLER (J. Amer. Pharm. Assoc. 1927, 16, 828).—Steam-distillation of the air-dried whole plant of *Monardella lanceolata*, Gray (Western pennyroyal), yields 1% of oil having d_{4}^{25} 0.9392, n_D^{18} 1.4908, α_D $+17.4^\circ$, and probably consisting principally of pulegone.

E. H. SHARPLES.

Colour reactions of the ethereal oils and of some of their constituents. L. EKKERT (Pharm. Zentr., 1927, 68, 577—583, 593—602).—The colour reactions of furfuraldehyde, sucrose, salicylaldehyde, vanillin, cinnamaldehyde, and piperonal with a very large number of the essential oils, and with many of the commoner constituents of the oils, in alcoholic solution and in the presence of varying quantities of concentrated sulphuric acid, are tabulated.

S. I. LEVY.

p-Aminophenol. CAESAR.—See XI.

Fumigant. COTTON and ROARK.—See XXIII.

PATENTS.

Dissolving insoluble substances [e.g., camphor]. GES. FÜR PHYSIK.-CHEM. UNTERSUCHUNGEN (Swiss P., 117,768, 5.2.25).—Camphor is dissolved in a mixture of alcohol and oleic acid in such proportions that the solvent has no deleterious action on the specific properties of the camphor.

A. R. POWELL.

Preparation of methyl formate. M. MUGDAN and J. WIMMER, ASSRS. to CONSORTIUM FÜR ELEKTROCHEM. IND. (U.S.P. 1,642,689, 20.9.27. Appl., 22.1.26. Ger., 22.1.25).—Formaldehyde vapour is passed over finely-divided copper at $100-250^\circ$.

H. HOLMES.

Preparation of ethyl hydrogen sulphate. COMP. DE BETHUNE (E.P. 273,263, 26.5.27. Fr., 24.6.26).—Ethylene is passed through a series of absorption vessels, the later vessels being maintained at higher temperatures, each vessel being supplied independently with fresh sulphuric acid at such a rate as to keep the concentration of ethyl hydrogen sulphate in the vessel at its optimum concentration for absorption purposes (cf. E.P. 221,512; B., 1925, 299). The outflowing solutions of ethyl hydrogen sulphate in sulphuric acid are mixed together and worked up for alcohol in the usual way. The preliminary absorption at the lower temperature removes substances which would decompose at the higher temperatures.

C. HOLLINS.

Synthesising and separating higher alcohols. G. PATART (E.P. 250,563, 29.3.26. Fr., 9.4.25).—In the synthesis of higher alcohols by repeated passage of carbon monoxide and hydrogen under pressure over a heated catalyst, the reacted gases are first cooled under pressure to condense alcohols etc., and carbon dioxide is then removed by further cooling under pressure before returning the remaining gases to the heating tubes and reaction chambers. The cooling may be assisted or effected by partial expansion, and the liquefied carbon

dioxide is used to cool uncondensed gases. The catalysts are alkali or alkaline-earth chromates, manganates, molybdates, tungstates, uranates, vanadates, etc., mixed with an equivalent or less of a catalyst favouring the production of methyl alcohol, e.g., a mixture of 83 pts. of zinc oxide and 200 pts. of potassium chromate, or 10.5 pts. of manganese dioxide and 200 pts. of barium tungstate. The gas mixture, preferably water-gas containing 48 vols. of hydrogen to 42 vols. of carbon monoxide, which corresponds with the equation $14CO + 16H_2 = 2C_6H_{11} \cdot OH + 4CO_2 + 4H_2O$, passes at high pressure directly, or through a heat exchanger, to the catalyst at $320-400^\circ$, and thence through a series of four condensers cooled respectively by gas returning to the reaction vessels, by alcohols to be evaporated, by cold water, and by cooled gases. The uncondensed gas mixture, freed thus from water and alcohols, passes to a second series of condensers cooled respectively by cooled gases, by evaporated carbon dioxide, by brine at -20° to -35° , and by the liquid carbon dioxide evaporating at a determined lower pressure. The carbon dioxide in the mixture is thus liquefied, and cooled uncondensed gases are returned by way of the condenser jackets to the circuit. The reaction product collected below the first series of condensers is freed from dissolved gases by partial release of pressure to 1—2 atm., the liberated gases being scrubbed in brine and returned to the compressor. The higher alcohols are salted out from the aqueous product and evaporated in the jacket of the second condenser of the first series, the vapours passing to a rectifying plant. A suitable plant for carrying out all these operations is illustrated.

C. HOLLINS.

Manufacture of vinyl esters [acetate]. F. W. SKIRROW and O. W. HERZBERG, ASSRS. to CANADIAN ELECTRO PRODUCTS CO., LTD. (U.S.P. 1,638,713, 9.8.27. Appl., 8.11.20).—Glacial acetic acid is treated with acetylene in presence of mercuric sulphate at 80° , and the vinyl acetate and ethylidene diacetate formed are separated by fractional condensation. The diacetate is heated with sulphur dioxide at 150° to give a further yield of vinyl acetate.

T. S. WHEELER.

Manufacture of a polyolefine glycol ether. J. G. DAVIDSON, ASSR. to CARBIDE & CARBON CHEMICALS CORP. (U.S.P. 1,633,927, 28.6.27. Appl., 20.7.25).—Olefine oxides react with alcohols or with glycol monoethers under pressure at $70-250^\circ$ to give polyolefine glycol monoethers, e.g., β -hydroxy- β' -ethoxyethyl ether, b.p. 190° , is formed by the condensation of ethyl alcohol with ethylene oxide (2 mols.). These compounds are of value as solvents for cellulose esters (cf. B., 1926, 714).

T. S. WHEELER.

Substituting hydroxyl groups for the acid radicals in liquid esters of inorganic acids or for halogens in liquid derivatives of hydrocarbons. [Preparation of alcohols by hydrolysis of inorganic esters, organic halides, etc.] E. E. AYRES, JUN., and E. E. HAABESTAD (E.P. 241,889, 14.10.25. U.S., 21.10.24).—Inorganic esters, organic halides, mercaptans, etc. which are liquid at the temperature of reaction, are heated with an alkali and either an organic ester of the same alcohol or a sodium salt of an organic acid. If an

organic ester is used it is hydrolysed by the alkali, giving the desired alcohol and the sodium salt. The sodium salt is stated to react with the inorganic ester forming the organic ester, which is readily hydrolysed. This cycle of reactions is applied to the hydrolysis, *e.g.*, of chlorinated pentane by aqueous sodium hydroxide in presence of amyl oleate or sodium oleate (or common soap). The soap facilitates reaction by emulsifying the mixture. The process is carried out advantageously under pressure (*e.g.*, in a closed vessel at 150°), and the amyl alcohol is distilled off, after removal of sodium chloride solution, as the pressure is gradually released.

C. HOLLINS.

Converting difficultly soluble or insoluble colloidal carbohydrate ethers into new soluble products. W. CARPMAEL. From I. G. FARBENIND. A.-G. (E.P. 277,111, 10.6.26).—Carbohydrate ethers, particularly cellulose ethers, are converted into soluble modifications by treatment with a depolymerising agent, such as mineral acid, or zinc chloride and hydrochloric acid, with or without addition of swelling agents or solvents. Cellulose ethyl ether, when treated with a mixture of alcohol (3 vols.), water (3 vols.), and concentrated sulphuric acid (1.5 vols.), becomes readily soluble in benzene or benzene-alcohol, the solutions on evaporation giving films equal to those from known soluble cellulose ethers. Glacial acetic acid containing 0.1% of sulphuric acid has a similar effect.

C. HOLLINS.

Manufacture of nuclear aralkylated [naphthyl] alkyl ethers and their sulphonics acids [wetting-out agents]. W. CARPMAEL. From I. G. FARBENIND. A.-G. (E.P. 277,098, 8.6.26).— β -Naphthyl isomyl ether is heated at 140–160° with benzyl chloride and a metal catalyst (iron filings) until no more hydrogen chloride is evolved. The cooled mixture is sulphonated, giving an amorphous, soap-like product with excellent wetting-out properties. Other naphthyl ethers and other aralkyl halides (*e.g.*, methylbenzyl chlorides) may be used.

C. HOLLINS.

Manufacture of salts of 2-phenylquinoline-4-carboxylic acid. M. L. CROSSLEY and M. L. DOLT, Assrs. to CALCO CHEMICAL CO. (U.S.P. 1,638,832–4, 16.8.27. Appl., 9.6.25).—(A) *Lithium 2-phenylquinoline-4-carboxylate*, from aqueous lithium carbonate solution and the acid, crystallises with 6.5 and 1 mol. of water. (B) *Mercuric 2-phenylquinoline-4-carboxylate* and (C) *ferric 2-phenylquinoline-4-carboxylate* are prepared from the sodium salt and soluble mercuric or ferric salts.

T. S. WHEELER.

Manufacture of derivatives of amino-metal-mercaptosulphonic acids and salts thereof. CHEM. FABR. AUF ACTIEN (VORM. E. SCHERING) (E.P. 270,729, 4.5.27. Ger., 5.5.26).—Soluble sulphomethyl derivatives are obtained by the action of sodium formaldehyde-bisulphite on amino-metalmercaptosulphonates. Compounds obtained from sodium β -amino- α -aurothiolethane- α -sulphonate and 4-amino-2-argenthiolethylbenzene-1-sulphonate are described.

C. HOLLINS.

Manufacture of condensation products of aldehydes with ketones. I. G. FARBENIND. A.-G. (E.P. 264,830, 17.1.27. Ger., 19.1.26).—The alkaline condensation of aldehydes with ketones is conducted in the

absence of water, solid alkali or an alkali-metal compound of a β -keto-alcohol being used. From acetaldehyde and acetone in presence of the potassium compound of diacetone-alcohol (methyl β -hydroxyisobutyl ketone), methyl β -hydroxypropyl ketone ("hydracetylacetone") is obtained; from propaldehyde, acetone, and solid potassium hydroxide, methyl β -hydroxy-*n*-butyl ketone, b.p. 80–85°/10 mm.; and from butaldehyde, methyl ethyl ketone, and solid potassium hydroxide, ethyl β -hydroxy-*n*-amyl ketone, b.p. 95–96°/10 mm. In similar manner are obtained Δ^{γ} -pentadienyl methyl ketone (crotylideneacetone), phenyl propenyl ketone (b.p. 120–125°/10 mm.), cinnamyl methyl ketone (b.p. 155°/12 mm.), and 2-ethylidenecyclohexanone.

C. HOLLINS.

Sedative and hypnotic ureides [carbamides]. F. BOEDECKER (U.S.P. 1,633,392, 21.6.27. Appl., 9.9.26. Ger., 3.3.23).— α -Alkylacylcarbamides, in which one at least of the alkyl radicals is unsaturated, are of value as sedatives and hypnotics. *E.g.*, α -isopropyl- Δ^{γ} -pentenoyl chloride (isopropylallylacetate chloride) readily condenses with carbamide to α -isopropyl- Δ^{γ} -pentenoylcarbamide, m.p. 191°, the same product being obtained from α -isopropyl- Δ^{γ} -pentenoamide and cyanic acid, heated in carbon tetrachloride at 100° under pressure. Ethyl *sec*-butylmalonate when condensed with allyl bromide in presence of sodium ethoxide gives ethyl *sec*-butylallylmalonate, b.p. 145–148°/12 mm., which is hydrolysed to the corresponding acid, and when heated at 190° yields the monocarboxylic acid derivative, β -methyl- α -allylvaleric acid, b.p. 228–230°. This compound is treated with thionyl chloride at 100° to form β -methyl- α -allylvaleryl chloride, b.p. 60°/12 mm., which with carbamide gives β -methyl- α -allylvalerylcarbamide, m.p. 147–148°.

T. S. WHEELER.

Production of methane. F. KLATTE and J. SÖLL, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,643,663, 27.9.27. Appl., 30.11.25. Ger., 3.12.24).—See E.P. 244,076; B., 1927, 316.

Production of new ester mixtures. W. CLAASEN (U.S.P. 1,643,619, 27.9.27. Appl., 17.3.26. Ger., 14.4.25).—See E.P. 250,910; B., 1926, 769.

Manufacture of *dl*-nerolidol. L. RUZICKA, Assr. to M. NAEF & Co. (U.S.P. 1,644,546, 4.10.27. Appl., 19.3.24. Switz., 22.3.23).—See E.P. 213,250; B., 1925, 378.

Manufacture of calcium salts of inositolphosphoric acid. A. GAMS and M. GIRARD, Assrs. to SOC. CHEM. IND. IN BASLE (U.S.P. 1,644,246, 4.10.27. Appl., 1.12.25. U.K., 29.3.23).—See E.P. 218,014; B., 1924, 731.

Manufacture of solutions containing organic phosphorus and complex gold compounds. L. CASSELLA & Co., LTD. (E.P. 253,946, 21.6.26. Ger., 22.6.25).—See U.S.P. 1,635,169; B., 1927, 797.

Benzoxazolonearsine oxides [arsenoxides]. L. BENDA and O. SIEVERS, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,635,167, 12.7.27. Appl., 19.6.25. Ger., 25.6.24).—See E.P. 257,361; B., 1926, 932.

Benzoxazolonearsinic acids. L. BENDA and O. SIEVERS, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,635,168, 12.7.27. Appl., 27.7.25. Ger., 11.8.24).—See E.P. 261,133; B., 1927, 125.

Preparation of salts of alkaloids and acetaminohydroxyphenylarsenic acid [acetamidohydroxyphenylarsinates of quinine and quinidine]. F. BILLON, Assr. to ETABL. POULENC FRÈRES (U.S.P. 1,643,692, 27.9.27. Appl., 19.3.26. Fr., 28.3.25).—See E.P. 249,849; B., 1926, 769.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Production of photographic images on cellulose acetate film. A. J. HALL and R. A. HILL (J. Soc. Dyers and Col., 1927, 43, 291—292).—Cellulose acetate dyed with S.R.A. Blue III, IV, V, VII, Violet II, and Heliotrope I suffers a change of shade when subjected to the action of nitrous acid as used for the development of indigosol dyes (cf. Friedländer, B., 1926, 705), the original shade being restored by exposure to direct sunlight, but not to ordinary electric light. The restoration of colour is sufficiently rapid in the case of S.R.A. Blue III to allow the production of photographic images on cellulose acetate materials. *E.g.*, Celastoid (cellulose acetate film containing plasticising agents) dyed with S.R.A. Blue III in a 1.5% soap solution at 85° so that it also becomes partially delustrated and opaque, is immersed for 10—15 min. in a 10% solution of sodium nitrite and then in 7% sulphuric acid without previous rinsing whereby it becomes pale reddish-yellow. Subsequently it is exposed for 45 min. behind a photographic negative to light from a Fadeometer, and a clear blue print thus obtained. Such prints are much more permanent than an ordinary unfixed print on P.O.P., but become uniformly blue in colour on prolonged exposure to daylight. Similar results were obtained on Celastoid dyed with Thionol Sky Blue PX, this being bleached to white by means of sodium hyposulphite instead of nitrous acid, but the restoration of colour by exposure to sunlight is extremely rapid, and even occurs slowly in the dark. In all cases the most satisfactory results were obtained on cellulose acetate materials which had been previously delustrated by treatment with a hot solution of soap. A. J. HALL.

Fog formation by dyestuffs. LÜPPO-CRAMER (Z. wiss. Phot., 1927, 24, 408—415).—The position with regard to chemical fogging brought about by the presence of sensitising or desensitising dyestuffs in the gelatin-silver halide emulsion is reviewed. The composition of the developer and the nature of the dye are both important factors in determining whether fogging will or will not occur. The rôle of silver bromide-reducing agent adsorption complexes is discussed.

R. A. MORTON.

Theory and practice of the Carbro process. C. LIGHTON (Phot. J., 1927, 67, 362—373, 409—421).—Detailed theoretical and practical consideration is given to the function of each of the reagents in the Carbro baths. The importance of following the diffusion of the various reagents is emphasised. The flattening of Carbro prints with increase in the concentration of dichromate is mainly due to the fact that in the case of dilute dichromate the ferrocyanide has to diffuse a comparatively long way into the tissue before it is all oxidised, whilst with concentrated dichromate the corresponding diffusion is shorter, and the hardening

action is confined to a comparatively thin layer. Chromic acid has a similar but much more vigorous action than dichromate. The function of acid in the Carbro bath is to liberate chromic acid from the dichromate. The difficulty of satisfactorily reproducing the high-lights in Carbro is due to the varying dilution obtained with hand squeegeeing, and a mechanical squeegee is described which gave greater consistency in the rendering of high-lights. The use of a hardening agent such as formaldehyde is both unnecessary and undesirable. The only useful function of the second bath (hydrochloric and acetic acids, and formaldehyde) is to counteract the unequal rate at which the ferrocyanide bleaches the different parts of the silver image. The most satisfactory baths have the following composition:—First bath, chromic acid 0.04%, potassium dichromate 0.16%, potassium ferrocyanide 2.0%, potassium bromide 2.0%; second bath, chromic acid 0.04%, potassium dichromate 0.16%. The gradation curves of Carbros made under various conditions are discussed theoretically.

W. CLARK.

PATENTS.

Manufacture of photographic silver halide emulsions. I. G. FARBENIND. A.-G., Assees. of A.-G. FÜR ANILIN-FABR. (E.P. 258,237, 14.8.26. Ger., 14.9.25).—In a silver halide emulsion are incorporated decomposition products of animal or vegetable proteins, prepared by subjecting the protein to alkaline or enzymic hydrolysis together with partial oxidation. The course of hydrolysis and oxidation is observed by studying the change in refractive index, or by making test emulsions. The products may be added during the manufacture of the emulsion, or to one or more of the constituents of the emulsion, or to the prepared emulsion. High-speed emulsions may in this way be obtained from inactive gelatins.

W. CLARK.

Removal of gelatin from photographic films etc. A. C. ROERICH and E. MOREAU (F.P. 613,074, 7.7.25).—A bacterium, probably of the proteus group, found in putrid waters, is cultivated in the usual media in presence of gradually increasing quantities of silver salts. The culture is distributed in a very dilute aqueous solution containing ferrous sulphate, ammonium sulphate, sodium silicate, magnesium sulphate, sodium sulphate, potassium sulphate, sodium nitrate, calcium chloride, and sodium chloride, and the support to be degelatinised is treated with the mixture at 36°. The gelatin is liquefied in $\frac{1}{2}$ —3 hrs., and after sterilisation with formalin the support can be used again.

W. CLARK.

Blue-printing. E. H. GAY (F.P. 608,621, 3.4.25).—Blue-print or similar paper is treated with a solution of a salt, preferably ferric chloride, which liberates iodine from its salts, and containing also starch, gelatin, and tartaric acid. On exposure beneath a drawing, the unexposed parts retain their reactivity, and when moistened with a solution of potassium iodide, the drawing appears in blue-black lines.

W. CLARK.

Decoration of fabrics by the action of light. M. MICHELS (G.P. 441,150, 3.3.25. Cf. Swiss P. 109,722; B., 1926, 77).—Ferrocyanide or metal oxides forming a mordant are produced by reaction with the silver resulting from exposure of sensitive silver salts, and are

then dyed with basic or mordant dyes. *E.g.*, cotton fabrics are soaked in a solution of ferric ammonium citrate and silver nitrate, dried, exposed under a negative, washed with thiosulphate solution and water, bathed in a solution of potassium ferriocyanide, rinsed, treated with copper sulphate solution, and then dyed with Thio violet.

W. CLARK.

Pictures by the transfer process. R. VON ARX (U.S.P. 1,643,529, 27.9.27. Appl., 17.12.25. Ger., 24.12.24).—See E.P. 245,163; B., 1926, 997.

XXII.—EXPLOSIVES; MATCHES.

PATENT.

Explosive. A. C. SCOTT and MEXCO, LTD. (E.P. 276,715, 4.5.26 and 3.3.27).—Alkali salts with readily available oxygen are mixed with similar ammonium salts in presence of enough moisture to cause partial dissolution of one or both salts with subsequent formation of a joint mass. Ammonium nitrate and potassium chlorate are suitable salts. A solid fuel may be introduced into the mixture before interaction, or a liquid fuel, in which explosive nitro-compounds may be present, may be added after pulverisation of the joint mass. The latter may be pulverised to pass 16-mesh/in. but not 120-mesh/in. The space for fuel between the crystals may be reduced by pressure to a volume not exceeding 40% of the total volume, including voids, occupied by the crystals.

S. BINNING.

XXIII.—SANITATION; WATER PURIFICATION.

Salinity of the Lake Washington Ship Canal.

E. V. SMITH and T. G. THOMPSON (Univ. Washington Eng. Exp. Sta., 1927, Bull. 41, 33—41).—*Sampling*:—In one method of sampling a marine pump with about 50 ft. of $\frac{3}{4}$ -in. garden hose graduated in feet was utilised, but sampling with this apparatus was tedious. A second device comprised a reversing water-bottle (Eckman type) attached to a wire cable graduated in feet, which, when lowered to the desired depth, was caused (by means of a brass messenger and a spring) to make a half-turn to a position where it automatically enclosed a sample of water. The two methods give practically identical results. *Analysis*:—Halides, as chlorides, were determined by Mohr's method, the titrations with silver nitrate in the presence of potassium chromate being carried out in yellow light. Hydrogen sulphide when present was first removed by boiling. Neutralisation of acid solutions with alkali using Methyl Orange as indicator and then proceeding with the silver nitrate titration gave good results. The Mohr method is applicable to solutions within the range p_H 4.2 to that of sea water. For determination of the halides as chlorides in sea water the Mohr method is as accurate as the gravimetric process or the Volhard volumetric process as modified by Ditmar. The presence of the carbonate ion in sea water has no effect upon the Mohr determination. The phosphate ion is present in such minute quantities that it is insufficient to produce precipitation.

W. T. LOCKETT.

River water control. J. ZINK and F. HOLLANDT (Z. angew. Chem., 1927, 40, 1062—1064).—The partial cleansing of rivers from magnesium chloride pollution probably occurs through substitution of calcium for

magnesium by reaction with the zeolite-bearing clays of the river bed. Treatment of magnesium chloride solutions with clays and mixtures of clay and sand shows displacement of small quantities of magnesia from solution up to 2430 mg. for every 1 kg. originally present, with dissolution of an equivalent amount of lime. Repeated passage of the solution through the material is more effective than shaking them together and keeping for 24 hrs.

F. R. ENNOS.

Testing of water contaminated with coal gas. REGENSTEIN (Chem.-Ztg., 1927, 51, 737—738).—Minute quantities of phenol are detected by Millon's reagent, the water being treated with sodium chloride and tartaric acid, and the phenol then extracted in ether. Carbon monoxide, acetylene, and ethylene are detected by the reduction of permanganate solution or by reaction with chlorine water, whilst carbon monoxide is determined by absorption in palladium chloride or by the blood test, and acetylene by treatment with ammoniacal cuprous chloride. The usual tests are applied for hydrocyanic acid and thiocyanates.

H. D. GREENWOOD.

Dichloroethane-carbon tetrachloride mixture; a new non-burnable, non-explosive fumigant. R. T. COTTON and R. C. ROARK (J. Econ. Entomology, 1927, 20, 636—639).—A mixture of 3 pts. by vol. of *s*-dichloroethane and 1 pt. by vol. of carbon tetrachloride is very effective against stored-product pests, *e.g.*, clothes moth, furniture beetle, black carpet beetle, etc.; it is about 5 times as toxic as carbon tetrachloride, and is well adapted for general fumigation work in air-tight vaults. Tests indicate that it would be equally effective against the flour beetle, rice weevil, Indian meal moth, and the saw-tooth grain beetle. The mixture has no corrosive action on metals nor any bleaching or staining action on textiles of any sort, and when vaporised in a fumigating chamber is non-injurious to fabrics. Unless breathed in high concentrations and for a protracted period of time it is not dangerous to human life. For general fumigation work in gas-tight chambers a dosage of 14 lb. per 1000 cub. ft. with a 24-hr. exposure at a temperature of 18° is recommended; the fumigant is applied by pouring it into a shallow pan near the ceiling of the vault.

W. T. LOCKETT.

Ferric aluminium sulphate. NEGRI and BADO.—See VII.

PATENTS.

Varying the circulation of sludge in the purification of sewage. M. W. MILLS, J. F. BOLTON, J. BOLTON, and R. AMES (E.P. 276,483, 12.7.26).—In an activated sludge system, to vary at different times the quantity of sludge returned from the settling tanks to the aerating tank and thus vary the amount of sludge in circulation, a simple type of centrifugal pump, so constructed as to be variable as to capacity and easily regulated, is used to lift the sludge from the settling tanks. The pump comprises essentially a rotary device having vanes or blades rotating in a horizontal plane and an adjustable disc whereby the depth of the passages in the rotary impeller may be varied according to the amount of sludge required to be pumped.

W. T. LOCKETT.

Zeolites (U.S.P. 1,642,880). **Base-exchange silicates** (E.P. 277,082).—See VII.