

BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

JANUARY 6, 1928.

I.—GENERAL; PLANT; MACHINERY.

Determination of the wettability of a solid by a liquid. Relation of adhesion tension to stability of colour varnish and lacquer systems. F. E. BARTELL and H. J. OSTERHOF (Ind. Eng. Chem., 1927, 19, 1277—1280).—A method for determining the degree of wetting of a solid by a liquid is based on the measurement of the pressure of displacement of one liquid by another, *e.g.*, of water as it is driven from carbon black by organic liquids and of an organic liquid as it is driven from silica by water. For each system the adhesion tension, *i.e.*, the measure of the attraction of a solid for a liquid, has been calculated. This can be expressed in absolute units, and allows the relative capabilities of wetting of a solid by a series of liquids to be determined. Thus the relative stability of suspensions of the solid in the different liquids can be predicted. Other factors being equal, a suspension will be most stable in that liquid which shows the highest adhesion tension for the solid. When the suspension is present in a system of two immiscible liquids it will tend to go to that liquid which will give the higher adhesion tension with the solid; if in a mixture of two miscible liquids, the liquid which gives the higher adhesion tension with the solid will tend to displace the other liquid, and will finally give an adsorbed layer round the solid. The application of adhesion tension determinations is discussed, and examples showing the relation of adhesion tension to the stability of suspensions in colour varnish and lacquer systems are given. S. S. WOOLF.

Adhesives and adhesion: gums, resins, and waxes between polished metal surfaces. J. W. MCBAIN and W. B. LEE (J. Physical Chem., 1927, 31, 1674—1680; B., 1926, 291, 557).—Preliminary measurements show that joint strength increases with the thinness of the adhesive layer, especially when the thinnest possible films are considered. The effect of thickness becomes unimportant when the layer is more than 0.1 in. thick. The curves showing the effect of thickness of adhesive on joint strength in the cases of aluminium and nickel with a commercial shellac adhesive have a form similar to that obtained by Crow (B., 1924, 427) for lead-tin solder between copper surfaces. Data are given showing the adhesive power both in tension and in shear of various gums, waxes, and resins for the metals nickel, steel, cast iron, copper, brass, aluminium, tin, and lead. Waxes show failure mainly within the wax itself, and pitch is indicated as a cheap ingredient for use in adhesives. In general, the parallelism existing for joint strength between smooth metal surfaces and the mechanical and intrinsic properties of the metals

concerned is confirmed. Joint strength in shear is usually the same as in tension. L. S. THEOBALD.

Mill grinding. E. E. SPARROW (Amer. Paint & Varnish Manufs.' Assoc., Nov., 1927, Circ. No. 319, 551—560).—Optimum conditions for stone mill grinding are discussed, attention being given to speed and setting of mill, style and method of dressing stones, etc.

Strache-Kling explosion calorimeter, Löffler type. H. STRACHE and H. LÖFFLER (Gas- u. Wasserfach, 1927, 70, 1073—1077).—A glass, double-walled, explosion vessel is connected by a capillary to a pipette, the volume of which bears a known relation to that of the former, pipettes of several different sizes being supplied with the instrument. The gas to be examined is drawn, by means of a levelling tube, into the explosion vessel, air being drawn in after it to fill the latter. The mixture is exploded by a spark from an induction coil connected to the dry battery of a pocket lamp, and the temperature inside the explosion vessel is read before and after explosion by a thermometer so placed that its bulb hangs at the centre of the vessel. The rise in temperature, multiplied by a factor for the pipette used, gives the calorific value of the gas, which must be corrected for temperature and pressure. The calorimeter is generally applicable, and examples are given of determinations using hydrogen, carbon monoxide, methane, illuminating gas, and a mixture of 52.0% H₂, 37.8% CO, and 4.7% CH₄. Provided the correct volume of air to ensure complete combustion is mixed with the gas, the results are accurate to within 0.5%. The apparatus ("Caloroscope"), mounted in a wooden case, is simple, self-contained, strong, and easily portable, and a determination can be made in 1½ min.

Simplified refractometer for sugar and oils. F. LÖWE (Z. Ver. deut. Zucker-Ind., 1927, 690—695).—The latest Zeiss refractometer for sugar and oil work is described. Although similar in principle to the ordinary Abbé type, it is more compact in appearance, the scale and prisms being enclosed in a capsule-shaped casing fixed to the top of a standard on a very solid base. It has a double scale showing values for n_D (1.330—1.540) and corresponding weight-percentages of sugar solutions. The prisms have water jackets, and there is provision for taking readings by reflected light, *e.g.*, in the case of very dark liquids. J. H. LANE.

PATENTS.

Furnace. H. BANGERT (U.S.P. 1,649,648, 15.11.27. Appl., 9.6.26).—Below the top and extending from the charging towards the discharging end of a continuous

heating furnace is a wall, above which is a fuel-gas inlet adjacent to the charging end; extending longitudinally through the wall are passageways for supplying heated auxiliary air to the fuel gas adjacent to the other end of the furnace.

M. E. NOTTAGE.

Drying kiln. J. B. WELCH (U.S.P. 1,648,089, 8.11.27. Appl., 6.3.26).—Material to be dried is subjected to progressively decreasing humidity and increasing temperature as it travels through the kiln. Steam is passed through a short pipe at the dry end and thence through two pipes extending the full length of the kiln.

H. HOLMES.

Heat exchanger. J. E. KOBERNIK, ASSR. to NEWTON PROCESS MANUF. CO. (U.S.P. 1,648,646, 8.11.27. Appl., 22.6.26).—The main shell is provided with headers comprising three stationary chambers in one end and two movable chambers in the other end. Sets of tubes connect each of two stationary chambers to the corresponding movable chambers, and other tubes connect the movable chambers to the third stationary chamber. The shell space around the tubes is provided with an inlet and an outlet.

H. HOLMES.

Apparatus for rapidly heating to high temperatures small quantities of vaporisable solid material.

CHEM. FABR. DR. H. STOLTZENBERG (G.P. 443,125, 14.11.25).—The flame from a lamp of the "Primus" type is directed inside a refractory fireclay cylinder enclosed in a perforated iron jacket and covered with an asbestos plate through a hole in the centre of which projects the lower half of a large quartz test-tube. Inside the latter is a second, somewhat longer, tube perforated at the lower end. Both tubes are closed with a common metal attachment provided with an annular ring in which the outer tube terminates and with a stopcock which closes the inner tube. In the movable portion of the stopcock is a slot for the reception of the material preferably in tabular form to be vaporised. Organic substances thus introduced may be rapidly vaporised at 700–1000° without carbonising; the vapours passing from the inner to the outer tube are decomposed, and the issuing gases may be suitably collected.

A. R. POWELL.

Drum for drying materials. J. CUYPERS (U.S.P. 1,648,542, 8.11.27. Appl., 16.7.26. Ger., 20.7.25).—A rotary drying drum is provided with carriers for the material extending parallel to its axis. Each carrier comprises three radial arms 120° apart with flanges extending from them in the direction of rotation.

H. HOLMES.

Drum dryer with built-in cells. M. KIRCH (G.P. 442,545, 17.6.24).—The pyramidal or truncated-conical draining surfaces of the scoops are inclined to the drum axis at an angle which is either equal to or greater than the angle of repose of the material to be dried. The cellular screens are arranged either in close succession or in groups.

J. S. G. THOMAS.

Pulveriser. C. M. STONER, ASSR. to WOLF CO. (U.S.P. 1,648,747, 8.11.27. Appl., 30.1.26).—A crusher roll consists of a shaft to which is secured a series of driving discs with spindles extending between them, and another driving disc provided with a series of spindles which, in turn, carry a tension disc.

M. E. NOTTAGE.

Pulverising apparatus. L. V. ANDREWS, ASSR. to RILEY STOKER CORP. (U.S.P. 1,646,720, 25.10.27. Appl., 18.5.26).—A pulveriser comprising revolving beaters is provided with means, such as smaller beaters rotating within a perforated conical sleeve, to deflect hard particles out of the main pulverising chamber.

B. M. VENABLES.

Pulveriser. H. A. KIMBER (U.S.P. 1,646,752, 25.10.27. Appl., 20.8.26).—In a pulveriser comprising a substantially circular chamber containing several sets of beaters, a set or sets of stationary baffles are provided between the sets of beaters shaped so as to cause material flung by one set of beaters to rebound into the path of another set.

B. M. VENABLES.

Rotary pulveriser. W. H. HARTMAN, ASSR. to BONNOT CO. (U.S.P. 1,647,730, 1.11.27. Appl., 12.1.27).—Rotating hammers are mounted in a cylinder provided with an inlet for the material, and a grinding surface within the cylinder is provided with passages for discharge of ground material. A breaker block within the cylinder deflects heavy particles against a door communicating with a trap external to the cylinder and adapted to open only when such particles are thrown against it.

H. HOLMES.

Disintegrating mill. A. LEGGEMANN (U.S.P. 1,647,183, 1.11.27. Appl., 26.2.27. Ger., 31.1.27).—Rotary beaters pass between bars of a grate forming the walls of a hopper for the materials. The ends projecting into the hopper co-operate with a rigid abutment located above its lower end and spaced from the lower ends of the bars.

H. HOLMES.

Dry-pan grinding apparatus. W. L. HANLEY, JUN. (U.S.P. 1,648,176, 8.11.27. Appl., 14.10.24).—A stationary rim formed of separate sections having overlapping parts is arranged slightly above a horizontal rotatable pan and forms a discharge aperture between its lower edge and the pan. Each section has outwardly extending brackets rigidly secured to it, and devices provided with screw-threaded adjusting means for engaging these brackets enable the rim sections to be adjusted independently and retained against accidental movement.

J. S. G. THOMAS.

Crusher and pulveriser. H. J. SHELTON (U.S.P. 1,648,625, 8.11.27. Appl., 11.2.27).—A housing encloses a pulverising chamber provided with rotary hammers and a pocket opening into the chamber at a point above the path of the hammer tips. The pocket collects foreign objects from the material in the chamber, and its wall, contiguous with the upper wall of the chamber, has passages for the return to the chamber of any reduced material collected.

H. HOLMES.

Dewatering apparatus for pulp. J. STEPHANSEN (U.S.P. 1,650,100, 22.11.27. Appl., 4.5.26. Norw., 4.4.25).—A rotatable perforated drum forms one side wall of a pulp container, and an endless felt or sieve passes partly through the container and partly around the drum. Means are provided for preventing passage of fluid through the perforations at that part of the periphery of the drum which is not in contact with the felt.

J. S. G. THOMAS.

Continuous filter. A. C. DAMAN (U.S.P. 1,650,434, 22.11.27. Appl., 11.7.25).—In the separation of solution

from pulp, the latter, contained in a tank, is conveyed to the inside of a drum having an internal, cylindrical, filtering surface and rotating, partly submerged, in the tank.

H. ROYAL-DAWSON.

Separator. L. E. BROWN (U.S.P. 1,648,607, 8.11.27. Appl., 13.11.26).—A conical separating chamber is provided with a supply connexion, and with a series of superposed rotary members arranged beneath the normal level of the liquid. Means are provided for withdrawing clarified liquid from beneath each member at a point near the centre of the chamber and for removing foreign matter accumulating on the surface of the liquid as well as that precipitated.

H. HOLMES.

Rotary screening apparatus. J. WATT and T. A. POOLY (E.P. 278,939, 12.2.27).—A form of apparatus where a number (usually four) of cylindrical screens are grouped and rotate round a common shaft. Provision may be made for a longitudinal bumping movement to be also applied to the screens.

B. M. VENABLES.

Rotary separators. PNEUMATIC CONVEYANCE & EXTRACTION, LTD., and W. A. SMITH (E.P. 278,900, 8.11.26).—An apparatus for separating material that is being pneumatically conveyed comprises a receiving hopper in which the large material drops directly out and above which rotate one or more discs provided with upstanding angle-irons or vanes which remove the remainder of the solid matter by centrifugal action.

B. M. VENABLES.

Mixing apparatus. N. C. JOHNSON (U.S.P. 1,646,540, 25.10.27. Appl., 31.3.26).—A batch of ingredients is mixed with compacting and attrition between the particles by subjecting it, while confined by the wall of a container, to centrifugal force such as will produce a flow of the mass at high velocity. A portion of the batch is intercepted and retarded to form a wedge. This diverts the mass while still compacting it, and causes it to flow into position for further compacting under the centrifugal action. The cycle is repeated until the batch is thoroughly mixed.

H. HOLMES.

Mixing device. R. BOWEN, Assr. to SUPER COAL PROCESS Co. (U.S.P. 1,646,386, 25.10.27. Appl., 24.2.25).—A mixer for heterogeneous material which may be viscous comprises upper and lower hoppers and a mixing chamber between, the latter having a tiltable piece in the bottom forming a large opening into the lower hopper, and both hoppers having valve-controlled outlets. The mixing device comprises blades which produce both vertical and horizontal movement in the material.

B. M. VENABLES.

Manufacture of filtering material. H. BLUMENBERG, JUN. (U.S.P. 1,649,386, 15.11.27. Appl., 14.4.27).—The material consists of a fluffy porous cellular material intimately mixed with lead oxide.

H. ROYAL-DAWSON.

Production of anti-freezing solutions. G. A. SCHULTHEISS (U.S.P. 1,649,261, 15.11.27. Appl., 10.1.27).—Crushed or ground vegetable matter containing fats or oils is treated with calcium chloride solution.

H. ROYAL-DAWSON.

Hardness-testing machine. H. M. GERMAN (U.S.P. 1,646,195, 18.10.27. Appl., 29.5.26).—A member is brought into engagement with the material to be tested and a predetermined relative movement between

them is effected gradually under a predetermined constant pressure exerted by a weight. The member is thus caused to penetrate the material, to an extent determined by the hardness, whereupon the member is returned to its original position.

H. HOLMES.

Apparatus for determination of viscosity of fluids. W. J. ALBERSHEIM and H. S. KONHEIM (E.P. 263,781, 8.12.26. U.S., 23.12.25).—The liquid (*e.g.*, lubricating oil) is pumped through a turbine or other engine which drives a braked governor, whereby its speed is held constant and therefore the flow of oil is constant. The oil continues through a narrow-bore tube or constriction to a tank not under pressure, and the pressure between the turbine and the constriction is registered, this pressure being a measure of the viscosity of the oil.

B. M. VENABLES.

Colour-testing device for translucent fluids. E. KADDATZ (U.S.P. 1,647,569, 1.11.27. Appl., 28.1.26).—A column of predetermined thickness of the sample under test in a transparent container is mounted against a sharply contrasted coloured background and compared with a band bearing colours corresponding to varying grades of opacity of the liquid.

H. HOLMES.

Indicating or controlling devices operating in the presence of impurities or other additions to gases or liquids. DEUTS. GASGLÜHLICHT-AUER-GES. M.B.H., K. WOLLIN, and E. SMOLCZYK (E.P. 278,927, 17.1.27. Addn. to E.P. 254,299; B., 1927, 832).—The destructible pellet of the original patent is supported on fingers of fusible metal, by which means degrees of heat will also be indicated.

B. M. VENABLES.

Filter. T. F. SEITZ and G. H. SEITZ, JUN., Assrs. to SEITZ-WERKE G.M.B.H. (U.S.P. 1,650,543, 22.11.27. Appl., 18.3.26. Ger., 25.3.25).—See B.P. 249,857; B., 1926, 807.

Centrifugal separating apparatus. F. GRIMBLE, M. N. CAIRD, and E. COOMBS (U.S.P. 1,649,346, 15.11.27. Appl., 18.11.26. U.K., 20.10.25).—See B.P. 269,218; B., 1927, 433.

Absorption refrigerating apparatus. ELECTROLUX, LTD., Asses. of B. C. VON PLATEN and C. G. MUNTERS (B.P. 259,240, 2.10.26. U.S., 2.10.25.).

Apparatus [container] for use in the purification of substances by means of radio-active materials. M. DICKINSON (B.P. 280,324, 15.9.26).

Chemical fire extinguisher. S. F. BARCLAY and MATHER & PLATT, LTD. (B.P. 280,388, 13.12.26).

Production of fire-extinguishing foam. EXCELSIOR FEUERLÖSCHGERÄTE A.-G. and H. BURMEISTER, Asses. of MINIMAX A.-G. (B.P. 256,245, 28.7.26. Ger., 30.7.25).

II.—FUEL; GAS; TAR; MINERAL OILS.

Microstructure of New Zealand lignites. W. P. EVANS (New Zealand J. Sci. Tech., 1927, 9, 137—158; cf. B., 1927, 690).—Etched surfaces and thin sections of Steventon lignite have been examined microscopically, both in the unaltered state and as modified by a dolerite intrusion. To the eye the coal sometimes appears uniform, sometimes definitely banded, the smaller bands often consisting of a single flattened stemlet. The

microstructure shows it to have been formed chiefly from coniferous woods. Cuticle is found frequently, and spores occur definitely though comparatively rarely. They are mostly megaspores of comparatively small dimensions (120—410 μ in length). The dolerite intrusion has obliterated much of the observable organic structure, of which, however, traces can still be recognised. The resin constituents, though in small amount, are more evident in the altered than in the unaltered lignite. The secondary mineral matter in the unaltered lignite is fairly evenly distributed; silica occurring as cryptocrystalline chalcedony and in unbanded colloidal masses accounts for much of the ash. The even distribution is disturbed in the altered lignite, which is finely fissured, the fissures containing mineral matter derived from the dolerite or from the subsequent infiltration of clays. Sulphur has been transferred from the organic to the inorganic compounds by the action of the dolerite intrusion. The coal-forming deposit consisted chiefly of transported material, and was laid down under water.

A. B. MANNING.

Lignites of Ribolla. M. G. LEVI and C. PADOVANI [with A. AMATI, F. BURRAI, C. SINIRAMED, G. GRIFFI, and E. SALMOIRAGHI] (*Annali Chim. Appl.*, 1927, 17, 491—512).—When lumpy and fine residual lignite from the pits at Ribolla, in the province of Grosseto, were distilled at 500° in a laboratory Fischer rotating furnace, they yielded 76.5% of semi-coke, 7.5% of tar, 5.4% of combined water, and 62 litres of gas (giving 6800 kg.-cal. per cub. m.) per kg. The lignite contains much nitrogen but only little sulphur, and has a calorific value exceeding 5500 kg.-cal. on the dry material. The semi-coke obtained is non-agglomerating and retains the form of the original lignite, its ash being 30% and its calorific value 5400 kg.-cal.; it retains about 90% of the total nitrogen. The tar contains 2—3% of paraffin, small proportions of phenols, 17% of light products (b.p. to 200°), and 40% of oils of b.p. 200—300°. When submitted to hydrogenation by the Bergius process, the lignite, the residue left when it is semi-distilled at 250°, the semi-coke, and the tar give poor yields of oil.

T. H. POPE.

Behaviour and economics of gas-works and coke-oven cokes when used for firing a central-heating boiler. W. LEDER (*Gas- u. Wasserfach*, 1927, 70, 1045—1047).—A comparison of the mean figures of a large number of analyses of German gas-works and coke-oven cokes used for central-heating boilers shows no appreciable difference between them in moisture or ash content or in calorific value. A practical test in a central-heating boiler, using a gas-works and coke-oven coke of about the same analysis, also showed no difference in their heating efficiency. The price is thus the deciding factor in estimating their relative value.

W. T. K. BRAUNHOLTZ.

Determination of melting points of ash in coal. D. J. W. KREULEN (*Chem. Weekblad*, 1927, 24, 599—602).—The general rule that the m.p. of the ash becomes higher as the ash content increases, and therefore with the fineness of the coals, is confirmed, but exceptions are noted. The use of dextrin for the preparation of the cone is not recommended. Addition of pulverised coke

from the coal itself may raise the softening point of the ash cone by as much as 175°. For standard determinations, the cone should be prepared by mixing the finely-powdered ash with distilled water and pressing in a mould; very uniform temperatures are found in this way. If the m.p. is above 1250°, no difficulty should be found with steady firing; this is regarded as the critical point.

S. I. LEVY.

Deflocculation of carbon black by saponin, acacia, gelatin, and casein. R. M. CHAPIN (*Ind. Eng. Chem.*, 1927, 19, 1275—1277).—An extension of previous work (cf. B., 1927, 117). The carbon black test has been used to study the deflocculating powers of commercial samples of saponin, acacia, gelatin, and casein compared with that of potassium palmitate. Both "naked" and "oiled" black have been used, and the effects of variation in the conditions and of the presence of octyl alcohol have been examined. Potassium palmitate and saponin deflocculated "naked" black more powerfully than they did the "oiled" black. Casein in alkaline solution, and probably also in acid solution, acacia in the presence of octyl alcohol, and especially gelatin deflocculated "oiled" black more powerfully than they did the "naked" black. Against "naked" black saponin seemed more powerful in neutral solution, and even the addition of sodium chloride was detrimental, whilst the powers of acacia and particularly gelatin were enhanced by the presence of acid. Octyl alcohol appeared slightly beneficial to soap and strongly so to acacia, whereas in all other cases it was distinctly detrimental, especially to gelatin.

E. H. SHARPLES.

Colour standards for bone-black revivification tests. R. BAUS (*Ind. Eng. Chem.*, 1927, 19, 1296).—For judging the efficiency of carbonisation in the kiln, 60 g. (measured) of the revived char are boiled for 2 min. with 75 c.c. of caustic soda solution (*d* 1.036) in a 250 c.c. covered copper beaker and filtered. The colour of the filtrate is compared with a series of standards prepared by adding to 35 c.c. portions of 0.5% acetic acid, 0.25, 0.50, 1.0, and 2.0 c.c. of a 0.04% solution of Bromothymol Blue. The standards, representing "over-burnt," "well-burnt," "mediocre," and "poor" chars, respectively, are stable for several weeks if tightly corked and sealed with paraffin.

E. H. SHARPLES.

Reaction products obtained by the decomposition of paraffin at 450° ("cracking") and by its decomposition in the presence of hydrogen at high pressures ("berginisation"). H. I. WATERMAN and J. N. J. PERQUIN (*Rec. trav. chim.*, 1927, 46, 813—836; cf. B., 1926, 307).—The products obtained by application of the two processes under almost identical conditions show great similarity, fractions of practically the same b.p. being obtained in each case. The cracking products are characterised in contrast to berginisation products by their higher bromine numbers and refractive dispersions and by their lower aniline indices and stability. It is suggested that cracking takes place first in berginisation, and is followed by the hydrogenation of the unsaturated hydrocarbons. The hexane, heptane, and octane fractions from cracking contain about twice as much olefine as the corresponding fractions from berginisation. In cracking there are indications of

fractions with b.p. between those of the normal hydrocarbons which have a high refractive dispersion and low unsaturation and aniline point values. They are possibly of an aromatic character. The refractive dispersions and the bromine values of mixture of *n*-hexane and Δ^{β} -hexene follow a straight-line law.

G. A. C. GOUGH.

Composition of water-gas at low temperatures. W. REINDERS (Z. physikal. Chem., 1927, 130, 405—414). The composition of water-gas from 200° to 1000° has been calculated from the constants of the equilibria $\text{CO}_2 + \text{H}_2 \rightleftharpoons \text{CO} + \text{H}_2\text{O}$, $2\text{CO} \rightleftharpoons \text{C} + \text{CO}_2$, and $\text{C} + 2\text{H}_2 \rightleftharpoons \text{CH}_4$, by means of the equation $p_{\text{CO}} + p_{\text{CO}_2} + p_{\text{H}_2} + p_{\text{CH}_4} + p_{\text{H}_2\text{O}} = 1$. At temperatures below 400°, the ideal water-gas consists of a mixture of equal parts of carbon dioxide and methane, together with water vapour. It is shown how the formation of methane in nature can be explained by a reaction between carbon and water. The possibility of the formation of higher hydrocarbons at low temperatures is discussed.

L. L. BIRCUMSHAW.

Fuel for motor transport. IV. Power alcohol from grasses, straws, and waste vegetable materials (Dept. Sci. Ind. Res., Fuel Res., 1927, 26 pp.).—From a study of the hydrolysis of wheat straw and other waste vegetable materials to sugars, and the fermentation of the latter to give power alcohol, the conditions were determined which were most satisfactory for technical application of the process. The straw etc. was soaked for 4 hrs. in a 2.0—2.5% sulphuric acid solution, and the damp material, from which excess acid had been removed by draining and then washing with cold water, was steamed for 6 hrs. This converted the hemicelluloses completely into pentoses, which were extracted with sterile water. After adding lime to neutralise the acid, the extract was fermented by *B. acetohylicus*, thereby yielding about 33% (calculated on the pentoses) of an alcohol-acetone mixture containing about 7% of acetone. The steaming process sufficed for the destruction of the normal microflora of the raw material, so dispensing with the necessity for a separate sterilisation of the mash. The yields of alcohol-acetone mixture varied from 10 to 22.5 gals. per ton when the process was carried out on a semi-technical scale, using raw materials such as tropical and semi-tropical grasses, straws, rice husks, etc. from different parts of the Empire. Estimates are given of the costs of production. The present position of the use of suction-gas producers on motor lorries is briefly summarised.

A. B. MANNING.

Shale oil. I. Genesis of oil shale in relation to petroleum and other fuels. II. Gases from oil shale. R. H. MCKEE and P. D. V. MANNING (Oil Bull., 1927, 13, 65—69, 175—181, 291—301, 489—493, 729—737, 837—843).—The chemical and geological evidence is reviewed, and the origin of kerogen and oil is discussed. A modified gas-analysis apparatus is described; 85% phosphoric acid is employed in the determination of ammonia. Kerogen is regarded as losing carbon dioxide from its carboxyl groups before soluble bitumen or oil is formed; it contains no hydrocarbons as such. Nitrogen is evolved as ammonia in two stages. Kerogen is placed in the series of carbonaceous substances from which coal is formed; on pyro-

lysis it yields bitumen, soluble bitumen, and oil, with evolution of gas accompanying each stage. Kerogen is believed to be essentially the resinous residues from a past vegetation.

CHEMICAL ABSTRACTS.

Action of antidetonators on the adiabatic inflammability of hydrocarbons. M. AUBERT, A. PIGNOT, and J. VILLEY (Compt. rend., 1927, 185, 1111—1113).—The addition of lead tetraethyl in increasing amounts (up to 10%) to cyclohexane raises the characteristic adiabatic inflammability curve slightly, to an extent which depends roughly on the concentration, and is almost negligible when this is small. *n*-Heptane and *n*-hexane behave similarly, but large concentrations produce a slight reduction in the inflammability value. The results, which are analogous to those previously obtained (B., 1926, 260), indicate an absence of parallelism between the effects of "anti-knock" compounds on the detonation limit and on the adiabatic inflammability, and support the theory that liquid droplets play an essential part in the determination of anti-knock effects.

J. GRANT.

Gas calorimeter. STRACHE and LÖFFLER.—See I. **Determination of constituents of gaseous mixtures.** WILMET.—See VII. **Sucrose and adsorbent carbons.** VAŠÁTKO.—See XVII. **Safety explosives.** NAOÚM.—See XXII.

PATENTS.

Vertical retort. J. TRAUTMANN (G.P. 442,608, 13.4.26. Addn. to G.P. 430,365; B., 1927, 468).—One or more concentric rings or segments are placed between the conical heating and sliding surfaces in the apparatus described previously, to prevent congestion of the space between the surfaces by the material under treatment.

L. A. COLES.

Distillation retort. F. RICHTER (G.P. 442,772, 27.6.23).—Helical flues are built in the walls of a vertical retort, ample wall space being left between each coil, and the cross-section of the flues being such that they are easily cleaned.

L. A. COLES.

Retort for low-temperature carbonisation. COMP. DES MINES DE BRUAY (F.P. 618,464, 3.7.26).—An inclined rotating retort contains metal rollers to facilitate conduction of heat and to prevent caking of the charge.

L. A. COLES.

Oil-gas producer. O. MISCH (G.P. 442,421, 21.7.25).—Oil or tar is distilled in an externally heated retort filled with coke which, charged with oil or tar residues, is discharged at the lower end of the apparatus and is burnt to supply the necessary heat, or is used for the production of gas, part of which is burnt and the remainder is used for flushing out the retort.

L. A. COLES.

Water-gas producer. M. H. HERENG (F.P. 618,552, 12.11.25).—A moving grate conveys glowing coal through a tunnel over apparatus which supplies the necessary air and superheated steam.

L. A. COLES.

Treatment of fuel. COMP. DES MINES DE BRUAY (F.P. 617,522, 14.6.26).—Agglomerated or briquetted fuel encased in granular material, such as sand or kieselguhr, is subjected to low-temperature carbonisation to produce semi-coke, which is used as smokeless fuel.

L. A. COLES.

Improvement of fuel. F. GROLEAS and D. ARNAUTOVITCH-D'ALBANY (F.P. 615,967, 3.10.25).—The fuel is sprayed with a mixture of an alkali nitrate and acetic acid, which may also contain sodium chloride and citric acid. L. A. COLES.

Manufacture of gas. WOODALL-DUCKHAM (1920), LTD., E. W. SMITH, and T. C. FINLAYSON (B.P. 278,486, 25.8.26).—In a system of continuous vertical retorts in which one or more retorts are used for the manufacture of water-gas (cf. B.P. 253,702; B., 1926, 699) the liquor in the common collecting main is divided in compartments each corresponding with a separate retort. There are also two independent liquor circulation systems to each compartment according to the gas made. Where there are two collecting mains common to all the retorts the washing liquor is supplied separately to each main.

A. C. MONKHOUSE.

Recovery of sodium thiocyanate [from gas liquors]. R. E. HALL, Assr. to KOPPERS Co. (U.S.P. 1,648,224, 8.11.27. Appl., 4.4.22).—The mother-liquors from gas purification are evaporated to dryness, the residue being then treated with a selective solvent, *e.g.* alcohol, which extracts the thiocyanate without dissolving alkali sulphates and carbonates. The solution after passing through a charcoal filter is evaporated.

H. ROYAL-DAWSON.

Steam distillation of coal etc. SYNTHETIC AMMONIA & NITRATES LTD., and R. E. SLADE (B.P. 278,577, 21.2.27).—The fuel is distilled in steam and the products of distillation are cooled to a temperature above the dew-point by spraying with water or oil in a packed scrubbing tower (cf. B.P. 276,522; B., 1927, 868). Tar and oils are deposited in a dry condition and can, if required, be fractionally condensed. The dirty steam is used for the generation of steam in a boiler or heat-exchanger, which steam after compression and superheating is used for further distillations.

A. C. MONKHOUSE.

Calcining of coke [for electrodes]. ALUMINUM Co. OF AMERICA, Assees. of V. C. DOERSCHUK and F. C. FRARY (B.P. 269,849, 6.1.27. U.S., 22.4.26).—Coke such as the by-product from the refining of crude petroleum is fed into a continuous vertical retort of oval or rectangular cross-section which is heated electrically at a point half way down the retort by electrodes arranged on the major axis at right angles to the flow of coke. The coke is cooled by passing up from the bottom of the retort a portion of the carbonisation gases which have been washed and cooled.

A. C. MONKHOUSE.

Distillation of fuel by a current of hot gases. METALBANK & METALLURGISCHE GES. A.-G. (G.P. 442,838, 2.12.25).—The use of two or more superposed distillation zones arranged parallel to the apparatus for charging the gas and fuel into the retort renders possible the economical distillation of small fuel. L. A. COLES.

Apparatus for carbonisation of wood. M. DAVÈNE (F.P. 617,814, 14.10.25).—The apparatus consists of a container fitted with partition walls arranged so as to form three concentric retorts with double walls between which hot gases circulate. L. A. COLES.

Manufacture of active carbon. SOC. POUR L'EXPLOIT. DES PROC. E. URBAIN (B.P. 255,871, 21.7.26. Fr.,

25.7.25).—In order to pulverise active carbon without loss of activity the material is crushed in a neutral liquid having a high surface tension, *e.g.*, water, oils, or hydrocarbons. The carbon can be subsequently washed and dried under diminished pressure. A. C. MONKHOUSE.

Apparatus for crushing and mixing pitch. PRÉPARATION IND. DES COMBUSTIBLES (B.P. 271,903, 28.5.27. Fr., 29.5.26).—The pitch passes through a single-cylinder crusher to a Carr grinder which has scrapers to remove the pitch into the foot of an elevator. This elevator is connected to the suction side of the grinder, which causes a current of air to be drawn through the grinder. From the elevator the pitch is discharged into the mixer, which consists of a rotating plate with openings closed at the bottom by pistons in order to discharge the pitch. The height of the piston controls the amount of material discharged, which is removed by a scraper in a continuous stream. A. C. MONKHOUSE.

Manufacture of gasoline. F. E. GILMORE, Assr. to F. AHLBURG and W. K. WHITE (U.S.P. 1,649,345, 15.11.27. Appl., 5.8.24).—Vapours containing recoverable gasoline are led into the bottom of a vertical chamber and rise through a series of baffles to the outlet pipe at the top. The vapours are drawn off through a check valve by a compressor, condensed under pressure, and collected in an accumulator tank. Residual gas leaves the system at the top of this tank through a discharge pipe fitted with a valve controlled by the temperature of the chamber. The condensate is returned to the top of the chamber and flows downwards over the baffles in counter-current to the ascending vapours. The recovered gasoline collects at the bottom of the chamber.

R. C. ODAMS.

Recovery of gasoline. E. C. HERTEL and T. DE C. TIFFT, Assrs. to SINCLAIR OIL & GAS Co. (U.S.P. 1,648,585, 8.11.27. Appl., 5.7.24).—Gasoline, absorbed in a liquid medium, is separated therefrom by distillation under pressure, the heated liquid passing to vertical columns wherein the pressure is reduced by virtue of the hydrostatic head of the liquid in the column, and the residual liquid passing in counter-current flow to (and in direct contact with) the resulting vapours. C. O. HARVEY.

Treatment of lubricating oils. ALFA-LAVAL Co., LTD. From N. E. FUNK (B.P. 279,636, 29.10.26).—Acid oxidation products are removed from used lubricating oil by washing the oil with the necessary quantity of water in a U-shaped circulating tank. Air is excluded during the process. The washed oil is freed from water, acid extract, and sludge by treatment in a centrifuge and subsequent filtration through a colloidal filter. The process may be continuous or intermittent, and the apparatus may be directly connected to the oil reservoir in the oil-circulating system of a turbine or other machine. R. C. ODAMS.

Treatment of acid sludge or acid resin obtained from the refining of mineral oils. J. JUBB. From J. PICKERING (B.P. 279,613, 4.10.26).—Acid sludge is dissolved in an organic solvent (*e.g.*, acetone) miscible with water or aqueous solutions, at a temperature at least 5° below the b.p. of the solvent. The resulting solution is treated with water, with continual stirring, and the temperature raised to a point slightly above

the b.p. of the solvent, the amount of water to be added being dependent on the acid content of the sludge and the required concentration of the aqueous extract. The solvent is driven off, and passes to a condenser, where it is recovered; the aqueous acid solution is drawn off from the bottom of the containing vessel and concentrated, and the residual sludge is heated at a slightly higher temperature (5–15° above the b.p. of the solvent), treated with a dilute solution of sodium chloride or carbonate with continuous agitation, and the temperature further raised to about 80°, more of the organic solvent being thus removed. The washing liquid is drawn off and the neutral sludge freed from last traces of solvent by heating it at 125°. The recovered solvent is used for dissolving a fresh charge of acid sludge. The solvent is not recovered from the wash liquid, but the latter is used again until the concentration of dissolved solvent is sufficiently high, when the liquid may be concentrated or used for directly treating acid sludge. R. C. ODAMS.

Distillation of hydrocarbon oils. F. A. HOWARD, Assr. to STANDARD DEVELOPMENT Co. (U.S.P. 1,649,532, 15.11.27. Appl., 12.8.20).—Pyrogenetic distillation of oil is effected by passing a stream of the oil upwards through a heating zone into a main supply maintained under pressure. Steam (3–7%) is injected into the oil at a point between the heating zone and the main supply. R. C. ODAMS.

Destructive distillation of hydrocarbons. C. W. TURNER (U.S.P. 1,647,026, 25.10.27. Appl., 25.7.23).—A heated mixture of oil and steam, formed in a large vertical chamber, is caused to flow in a restricted stream to the bottom of another similar chamber, whereby expansion occurs and the mixture passes to the top of the second chamber and thence successively to two more similar chambers heated at a high temperature (about 1094°). The evolved vapours are fractionated. C. O. HARVEY.

Distillation of oils. R. E. HUMPHREYS, Assr. to STANDARD OIL Co. (U.S.P. 1,647,629, 1.11.27. Appl., 31.3.22).—By distilling under pressure a hydrocarbon oil having an initial b.p. above the b.p. range of gasoline, a distillate containing gasoline and heavier fractions is obtained and is fractionated, the heavier fractions being again distilled under a pressure of over 300 lb./sq. in. C. O. HARVEY.

Continuous cracking and fractionation of hydrocarbons. A. C. SPENCER, Assr. to STANDARD DEVELOPMENT Co. (U.S.P. 1,648,967, 15.11.27. Appl., 3.7.23).—A continuous stream of the oil to be treated is heated to cracking temperature and allowed to vaporise. The vapours are fractionally condensed as gasoline, kerosene, and a fraction heavier than kerosene. The last-named fraction is first removed and the others are separated by introducing the remaining vapours into a system of progressively-cooled zones at about its middle point. R. C. ODAMS.

Treatment of cracked hydrocarbon distillation products. H. BLUMENBERG, JUN. (U.S.P. 1,649,384, 15.11.27. Appl., 14.2.27).—The colour and odour of cracked gasoline are removed by treatment with aluminium chlorosulphate. H. ROYAL-DAWSON.

Treatment of hydrocarbon oils for use in internal-combustion engines. R. HENSE (F.P. 618,302, 9.3.26).—The oil (100 pts.) is scrubbed successively with nitric acid and sulphuric acid, and, after washing with water, is mixed with 8000 pts. of petroleum, 1500 pts. of heavy benzene, 400 pts. of light benzene, and 5 pts. of ammonium nitrate, and the mixture is distilled. L. A. COLES.

Recovery of readily volatile hydrocarbons from gases obtained in cracking and hydrogenating processes. P. WÜRTH (F.P. 616,582, 9.10.25).—Benzene is recovered by compressing the gases and then allowing them to expand. L. A. COLES.

Purification of light oils. A. RIEBECK'SCHE MONTANWERKE A.-G. (G.P. 442,597, 31.10.24).—Light oils recovered from gases obtained in the distillation of lignite and coal are treated successively with a halogen or a substance yielding a halogen, and an alkali, and are then fractionated by distillation. L. A. COLES.

Determination of the water content of insulating oils. SIEMENS-SCHUCKERTWERKE G.M.B.H., Asses. of W. ESTORFF and W. NAGEL (G.P. 442,946, 20.2.24).—The water is determined by measuring the volume of hydrogen generated on treating the oil with an alkali metal, a suitable quantity of a solvent being added to remove condensation products formed on the surface of the metal. L. A. COLES.

Treatment of clays to adapt them for decolorising and deodorising oils. J. S. POTTER, Assr. to S. W. SHATTUCK CHEMICAL Co. (U.S.P. 1,649,366, 15.11.27. Appl., 15.8.25).—The clay is mixed with sulphuric acid and heated to decompose the greater part of the sulphates, and, after further heating to get rid of acid fumes, the substances soluble in hydrochloric acid are removed. H. ROYAL-DAWSON.

Coal pulverising machine. C. E. BLYTH, Assr. to A. HERBERT, LTD. (U.S.P. 1,649,148, 15.11.27. Appl., 13.4.26. U.K., 16.5.25).—See B.P. 255,187; B., 1926, 733.

Gas producer. W. CLIMIE (U.S.P. 1,650,187–8, 22.11.27. Appl., [A] 15.6.22, [B] 24.11.24. U.K., [A] 15.6.21).—See B.P. 184,323; B., 1922, 740 A.

Coke-oven doors. C. STILL (B.P. 267,881, 20.10.26. Ger., 22.3.26).

Refractories for retorts (B.P. 279,201).—See VIII.

Leather oil (B.P. 255,908).—See XV.

III.—ORGANIC INTERMEDIATES.

Calcium citrate. MELIS.—See VII. **Dehydration of alcoholic liquids.** BRUN.—See XVIII.

PATENTS.

Manufacture of carbon disulphide. J. and A. KOMLOS and E. F. ENGELKE, Asses. of A. VON VAJDAFFY (B.P. 265,994, 11.2.27. Ger., 16.2.26).—Hydrocarbons, particularly acetylene, are allowed to react with sulphur at 380–450°, or with inorganic sulphides, e.g., iron pyrites, alone or with free sulphur at temperatures above 500° to produce carbon disulphide. Spent gas-purifying materials may be used as a source of sulphur, and the hydrogen sulphide evolved in the reaction

is absorbed by gas-purifying material to be returned to the process as a source of sulphur. W. G. CAREY.

Manufacture of organic acids. I. G. FARBENIND. A.-G., Assees. of G. and R. WIETZEL (G.P. 442,125, 10.6.23. Cf. B.P. 254,819; B., 1926, 721).—The following is additional. The reactions proceed also at ordinary pressure, but more slowly; e.g., methyl alcohol vapour and carbon monoxide exposed to ultra-violet rays or led over barium and potassium carbonates at 500° give methyl formate and high-molecular products. Methyl formate and other low-boiling esters are obtained with a titanic acid catalyst at 140° under 500 atm. pressure. C. HOLLINS.

Reduction of aromatic nitro-compounds [production of iron oxide pigment]. W. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 279,283, 21.4.26).—When more than the usual 6 pts. of hydrogen chloride are used in the reduction of 100 pts. of nitrobenzene (e.g., 18 pts.) the iron oxide by-product is obtained as a deep black, very finely-divided powder, having increased value as a pigment. C. HOLLINS.

Manufacture of intermediate products for dyes. SOC. CHEM. IND. IN BASLE (GES. F. CHEM. IND. IN BASEL) (B.P. 260,623, 30.10.26. Switz., 31.10.25).—A halide of a naphthylthioglycollic acid is halogenated; e.g., *β*-naphthylthioglycollyl chloride, prepared from the acid and phosphorus pentachloride in chlorobenzene, is treated, without isolation, with sulphuryl chloride in presence of ferric chloride at 0–5°, to give 1-chloro-*β*-naphthylthioglycollyl chloride. C. HOLLINS.

Process of chlorination employing contact material having large surface. RHENANIA-KUNHEIM VER. CHEM. FABR. A.-G., Assees. of H. FRITZWEILER, B. C. STUER, and W. GROB (G.P. 443,020, 5.4.24).—Natural hydrated metallic oxides which have been dehydrated by heating at a dull red heat and, if desired, under reduced pressure, are employed as contact material. J. S. G. THOMAS.

Stable mixture yielding salts of halogenosulphonamides. H. GÜNZLER and G. WESENBERG, Asssts. to WINTHROP CHEMICAL CO., INC. (U.S.P. 1,650,124, 22.11.27. Appl., 8.9.25. Ger., 18.10.24).—See B.P. 241,579; B., 1926, 565.

Dehydration of alcohol (B.P. 268,728 and F.P. 615,732). **Butyl alcohol and acetone** (B.P. 278,307).—See XVIII.

IV.—DYESTUFFS.

PATENTS.

Manufacture of new azo dyes. O. Y. IMRAY. From I. G. FARBENIND. A.-G. (B.P. 279,146, 20.5.26).—2:3-Hydroxynaphthoic arylamides are coupled in substance, on the fibre, or on a substrate, with diazotised amines of the type, $\begin{matrix} (1) \text{NH}_2 \\ (2) \text{R} \end{matrix} > \text{Ar}-\text{R}^1$ (5), where Ar is any tervalent benzene residue, and of R and R¹ one represents an alkylsulphonyl, aralkylsulphonyl, arylsulphonyl, acyl, carbonamide, or sulphonamide group, whilst the other represents a halogen, alkyl, aryl, ether, or thioether group. Amines of the type, $\begin{matrix} (1) \text{NH}_2 \\ (3) \text{NHR} \cdot \text{CO} \end{matrix} > \text{C}_6\text{H}_3 \cdot \text{OR}^1$, are excluded. Special fastness to bowking is claimed. Examples are 3-amino-4-

methoxydiphenyl sulphone \rightarrow 2:3-hydroxynaphthoic *o*-phenetidine (red); 3-amino-4-methyldiphenyl sulphone \rightarrow 2:3-hydroxynaphthoic α - or β -naphthylamide (bluish red); 3-amino-4-phenoxybenzophenone \rightarrow 2:3-hydroxynaphthoic α -naphthylamide (wine-red); 3:3'-diamino-4:4'-dimethoxydiphenyl sulphone \rightarrow 2:3-hydroxynaphthoic *m*-chloroanilide (claret); *o*-toluidine-4-sulphonmethylamide \rightarrow 2:3-hydroxynaphthoic α -naphthylamide (bluish-red) or *o*-phenetidine (red); 3-amino-4-methylbenz-*o*-chloroanilide \rightarrow 2:3-hydroxynaphthoic anilide (bluish-red); 4-chloro-3-aminobenzanilide \rightarrow 2:3-hydroxynaphthoic β -naphthylamide or 4-chloro-*o*-anisidine (yellowish-red). A table of 96 other couplings is given. The preparation of 3-amino-4-methoxy- and 3-amino-4-phenoxy-benzophenones from 4-chloro-3-nitrobenzophenone; of 2-amino-4-tolyl ethyl and benzyl sulphones from *o*-nitrotoluene-*p*-sulphinic acid; of 4-chloro-3-aminodiphenyl sulphone from 4-chloro-3-nitrobenzenesulphonyl chloride; of 3-amino-4-ethoxydiphenyl sulphone from 4-chloro-3-nitrodiphenyl sulphone; and of *o*-phenetidine-4-sulphondimethylamide from 4-chloro-3-nitrobenzenesulphonyl chloride, is described. C. HOLLINS.

Manufacture of a yellow azo dye [for acetate silk]. I. G. FARBENIND. A.-G. (B.P. 270,352, 3.5.27. Ger., 3.5.26).—*p*-Nitrodiazobenzene is coupled with 4-nitro-*m*-phenylenediamine. The product gives non-phototropic fast golden-yellow shades on acetate silk. C. HOLLINS.

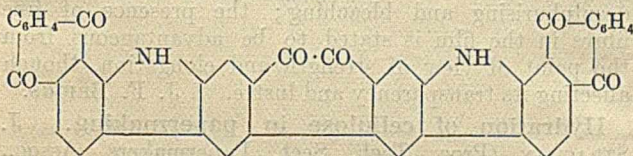
Manufacture of monodiazo compounds of 1:4-diaminoanthraquinonemono- or di-sulphonic acids. I. G. FARBENIND. A.-G. (B.P. 264,879, 24.1.27. Ger., 25.1.26).—Diazotisation of 1:4-diaminoanthraquinone-2-sulphonic acid or its derivatives (e.g., the 2:6 or 2:7-disulphonic acid) even in presence of excess of nitrous acid gives only a diazo (not a tetrazo) compound. The diazo compound may be converted into a chloro-compound by Sandmeyer's method, and thus provides an alternative route to dyes of the Alizarin Direct Blue A type. C. HOLLINS.

Manufacture of thiazole derivatives of 1:4-naphthaquinone. I. G. FARBENIND. A.-G., Assees. of A.-G. F. ANILIN-FABR. (B.P. 262,141, 29.11.26. Ger., 28.11.25).—2-Amino-3-thiol-1:4-naphthaquinone, prepared by the action of sodium sulphide on the 3-chloro-compound, is condensed with an aldehyde to give an intermediate product which is very rapidly converted by atmospheric oxygen into a naphthathiazole. The intermediate and the final products may be vatted with alkaline hyposulphite and give the same shades on cotton. Benzaldehyde yields an intermediate compound, decomp. 225–230°, and a final thiazole, m.p. 243°, which dye cotton a greenish-yellow, fast to chlorine and soap. α -Naphthaldehyde (reddish-yellow), *ar*-tetrahydro- α -naphthaldehyde (greenish-yellow), *p*-aminobenzaldehyde (violet), *p*-dimethylaminobenzaldehyde (reddish-blue), *o*-chloro-*p*-dimethylaminobenzaldehyde (violet-red), and half-molecular proportions of glyoxal (pale yellow) or terephthalaldehyde (yellow) give similar vat dyes. Sulphonated aldehydes yield acid wool colours. For the preparation of *ar*-tetrahydro- α -naphthaldehyde, 1-amino-methyl-5:6:7:8-tetrahydronaphthalene (B.P. 249,883;

B., 1927, 572) is condensed with 1-chloro-4-nitrobenzene-2-sulphonic acid and the product is oxidised with chromic acid.
C. HOLLINS.

Production of stable preparations of vat dyes. I. G. FARBENIND. A.-G., K. F. MAENNCHEN, and F. HÜMMERICH (B.P. 278,890, 21.10.26. Addn. to B.P. 259,999; B., 1927, 869).—A mixture of dry, powdered caustic alkali and starch is used in place of the alkali-starch of the prior patent. Any absorption of moisture from the air at once leads to the formation of the innocuous alkali-starch compound.
C. HOLLINS.

Manufacture of new vat dyes of the anthraquinone series. W. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 279,003, 12.5.26).—A monobenzoyldiaminoanthraquinone containing a free α -amino-group is condensed with a halogenated phenanthraquinone in presence of an acid condensing agent (aluminium chloride, chlorosulphonic acid, sulphuric acid) at low temperature (15–45°). The secondary amine first formed undergoes further condensation to a carbazole derivative, this conversion being greatly facilitated by the presence of the benzamido-group. 2:7-Dibromophenanthraquinone gives with 1-amino-5-benzamidoanthraquinone a yellowish-brown, with 1-amino-4-benzamidoanthraquinone a reddish-brown, vat dye, the products being probably dibenzamido-derivatives of the carbazole:



C. HOLLINS.

Manufacture of vat dyes of the anthraquinone series. W. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 278,771, 12.5.26).—1-Aminoanthraquinone is condensed with a halogenated phenanthraquinone (2:7-dibromophenanthraquinone) as in B.P. 9888 of 1909 (B., 1910, 414), and the copper-red vat dye so obtained is treated at 150–180° with aluminium chloride in pyridine to form a reddish-brown vat dye having probably a carbazole structure (formula in preceding abstract).
C. HOLLINS.

Manufacture and use of vat dyes of the benzanthrone series. BRIT. DYESTUFFS CORP., LTD., A. SHEPHERDSON, and S. THORNLEY (B.P. 279,205, 26.8.26).—Benzanthrone and its non-sulphonated derivatives (except dibenzanthrone) are condensed with hydroxylamine in presence of sulphuric acid and ferrous sulphate. Fusion with alkali converts the products into grey to black vat dyes. Examples are benzanthrone and methylbenzanthrone.
C. HOLLINS.

Dyes and dyeing [vat dye of the dibenzanthrone series]. R. F. THOMSON, J. THOMAS, and SCOTTISH DYES, LTD. (B.P. 278,834, 4.8.26).—The very pure dibenzanthrone obtained from dibenzanthronyl by the methods of B.P. 251,313 or 278,112 (B., 1926, 576; 1927, 903) is halogenated to give reddish-blue vat dyes having good fastness properties. Dichloro-, trichloro-, tetrachloro-, and dibromo-dibenzanthrones are described.
C. HOLLINS.

Manufacture of dyes and intermediates [dibenzanthronyls]. R. F. THOMSON, J. THOMAS, and SCOTTISH DYES, LTD. (B.P. 278,496, 22.4.26; cf. B.P. 251,313; B., 1926, 576).—The method of the prior patent for the oxidation of benzanthrone to dibenzanthronyl and hydroxybenzanthrone is extended to substituted benzanthrone. 9-Chlorobenzanthrone, m.p. 183–185° (Scholl, Seer, and Daimer, A., 1922, i, 258), gives 9:9'-dichloro-4:4'-dibenzanthronyl, m.p. above 300°. The condensation of 2-chloroanthraquinone with glycerol yields a mixture of 4-chlorobenzanthrone, m.p. 189–190.5° (which cannot be oxidised to a dibenzanthronyl), and two isomerides, m.p. 130–134° and 148–150°, respectively, in which the 4-position is free, and which therefore give on oxidation *dichlorodibenzanthronyls*; they are presumably the 5- and 10-chlorobenzanthrones. Two isomeric chlorobenzanthrones, m.p. 180.5–181.5° and 154–160°, respectively, are obtained from 1-chloroanthraquinone; these yield *dichlorodibenzanthronyls* on oxidation. 9-Methylbenzanthrone (Scholl and Seer, A., 1913, i, 57) is converted into 9:9'-*dimethyl-4:4'-dibenzanthronyl*, but purified 4-methylbenzanthrone, m.p. 202° (prepared from 2-methylanthraquinone), does not react. By crystallisation from nitrobenzene and extraction of the more soluble products with benzene, isomeric methylbenzanthrone, which are oxidisable to *dimethyldibenzanthronyls*, are obtained from the condensation product of 2-methylanthraquinone with glycerol. The hydroxylated benzanthrone obtained in all these examples may be alkylated and converted into vat dyes by alkaline fusion.
C. HOLLINS.

Manufacture of azo dyes. W. NEELMEIER and T. NOCKEN, ASSRS. to GRASELLI DYESTUFF CORP. (U.S.P. 1,650,090, 22.11.27. Appl., 7.5.26. Ger., 12.5.25).—See B.P. 252,182; B., 1927, 808.

Colour bases for varnishes (B.P. 278,765).—See XIII.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Determination of the amount of weighting in piece-weighted silk crêpe-de-chine fabrics. W. WELTZIEN and P. FOWINKEL (Textilber., 1927, 8, 157–158).—The methods usually employed are compared and criticised, the most satisfactory being that in which the weighted silk is extracted with cold 7% or warm 1.5% hydrofluoric acid and the loss of weight taken as a measure of the weighting substances present. When the degree of weighting is determined by the "nitrogen" method, the pure silk in the weighted crêpe fabric should be considered to contain 17.7% N, and to have suffered a loss of 30% in weight (not the usual 24%) during the previous operations of degumming and creping.
A. J. HALL.

Determination of the amount of weighting of silk crêpe-de-chine fabrics. W. ALTERHOFF (Textilber., 1927, 8, 367–368).—In a method for determining the amount of inorganic weighting in coloured (black excepted) silk materials, which is accurate and rapid, 1 g. of the silk crêpe-de-chine fabric is treated for ½ hr. at 60–70° with a solution containing 5–6 g. of oxalic acid per 100 c.c., then washed three times with hot water, similarly treated with a 2% solution of oxalic

acid, washed once, passed twice (20 min. each time) through a 2.5% solution of sodium carbonate at 60–70°, rinsed with cold water, air-dried, and weighed; the amount of weighting is measured by the loss of weight.

A. J. HALL.

Self-recording strength tester [for fibres]. F. RÜHLEMANN (Papier-Fabr., 1927, 25, 577–581).—The apparatus described is used for determining the breaking load, extension, and elasticity of fibres much more fragile than the ordinary textile fibres, and of stretching lengths between 0.5 and 15 mm. The fibre is mounted in a frame made from cinematograph film and suspended between one end of a balance beam and a fixed clamp in the base board. A loading pan is attached to a spring balance on the other end of the beam, and, after melting through the sides of the frame, the fibre is submitted to continuous loading, without shock, by the automatic raising of a burette, to the lower end of which a flexible tube is attached and through which water is delivered at a constant rate to the loading pan, thus maintaining a constant and regulated loading velocity. The quantity of water necessary to break the fibre gives the breaking load. The whole process of loading and extension is observed on an opaque camera screen through a specially constructed microscope, and on replacing the screen by a suitable box provided with a slit, past which film or photographic paper is slowly drawn, photographic records are obtained. The diagrams thus automatically produced show not only the loading process and the break, but also the extension and elasticity of the material examined. Further advantages of the apparatus are that stopping of the loading is effected instantaneously, and that elasticity may be measured during either loading or unloading of the fibre.

B. P. RIDGE.

Experimental yarn-sizing plant and some results obtained therewith. G. F. NEW (J. Text. Inst., 1927, 18, 303–310 T).—The size is mixed in a water-jacketed copper vessel, water from the jacket being pumped continuously through both the hollow sizing rollers and the jacket of the size box in order to maintain a constant temperature throughout the operation. The small-scale machine is so designed that all variables are adjustable, and can be maintained at any constant value. Above a certain temperature limit, which varies for different starches, and is usually well below 100°, no great difference is found in the character of the size produced by cooking at various temperatures, whilst the duration of cooking within the range $\frac{1}{4}$ –6 hrs. has but little effect. Concentration of the starch has an effect such that the protective power of the resulting size, as measured by wear tests on the yarn, is generally proportional to this concentration. Admixture with the size of oils and fats produces a decrease, and of glycerin an increase, in protective power, but if the oils and fats are applied to the surface of dry, sized yarn, a marked improvement is observed. Of the materials examined, paraffin wax and stearine have the greatest effect.

B. P. RIDGE.

Viscose. IV. The viscose film (cellophane). M. NUMA (J. Cellulose Inst., Tokyo, 1927, 3, 235–249).—In the preparation of films from ripened viscose the

permanence of the qualities of the film is perfectly satisfactory if a cellulose of high quality is used, but with low-quality wood pulp a marked degradation of the film may take place after a year. Under the conditions adopted the toughest films were obtained when the sulphurised viscose product was dissolved in caustic soda of 7% concentration. The quantity of ash, ranging between 0.2 and 1.0%, had no influence on the mechanical properties of the film. Within a certain limit of moisture content the tensile strength and elongation increase regularly with the thickness of the film, but with higher moisture the increase in elongation is no longer proportional to the increase in thickness. Increase in moisture decreases the tensile strength and increases elongation, but there is no definite relation. Above 12% of moisture these effects are strongly marked. Generally, if the film is comparatively thin, the influence due to a variation of 1–2% in moisture is negligible. The moisture content of a film of medium softness is 9–12% and independent of the thickness; a soft film has higher tensile strength and lower elongation than a harsh one, apart from the moisture content. The mechanical properties of the film depend chiefly on the physical properties rather than on the chemical properties of the pulp, although the colloidal condition plays a part. The higher the intensity of colour of the pulp in cuprammonium solution, the better are the mechanical properties. It is advantageous to dry the film before desulphurising and bleaching; the presence of free fibres in the film is stated to be advantageous from the point of view of strength and elongation, though affecting its transparency and lustre.

J. F. BRIGGS.

Hydration of cellulose in papermaking. J. STRACHAN (Proc. Tech. Sect. Papermakers' Assoc., 1926, 6, 139–167).—From a study of the behaviour of highly-compressed blocks of vulcanised rag paper, as representing in many ways the behaviour of individual fibres, evidence is adduced in support of the theory that the hydration of cellulose during beating is a purely physical phenomenon, cellulose exhibiting all the properties of an elastic gel whilst differing from other elastic gels in that it is porous and contains considerable quantities of adsorbed gases. Results are given showing the effect of pressure, vacuum, specific external surface, temperature, and dissolved substances on the velocity of imbibition of water by cellulose. Pressure has a greater accelerating action than vacuum, but the rate of increase of imbibition falls very considerably for pressures above 75 lb./sq. in.; increase in temperature causes dehydration, but in a negligible degree below 40°. Increase in specific external surface increases the velocity of imbibition proportionately, even when the increased surface is due in part to swelling of the fibres, as is the case after prolonged immersion; it is this increase in specific external surface, chiefly by fibrillation, that is responsible in a large degree for the hydration effect of beating. Alum, though showing initially an accelerating action, later retards imbibition; caustic soda accelerates or retards imbibition depending on the concentration; sulphuric acid is a more satisfactory accelerator, particularly at a concentration of 0.00125 molar. The Schopper-Riegler tester is unsatisfactory as an indicator of the degree of hydration of pulp, a more reliable method

being to determine the quantity of water retained by the pulp under a definite standard pressure.

D. J. NORMAN.

Mechanical [paper] pulp and its physical property of wetness. J. H. MOWAT (Proc. Tech. Sect. Papermakers' Assoc., 1926, 6, 197—204).—The importance of grinding temperature on the character and wetness of mechanical pulp and the equal importance, from the papermaker's point of view, of a knowledge of the degree of wetness are emphasised. Experiments have established that mechanical pulp after immersion in water for some days shows increased wetness. The addition of 1% of yeast (on the weight of fibre) to a 5% suspension of mechanical pulp caused after 18 hrs. at 18—21° an increase in wetness of 136%, dropping after 53 hrs. to a net increase of 91%. D. J. NORMAN.

Fuel for motor transport. IV. Power alcohol from grasses, etc.—See II.

PATENTS.

Washing or cleaning of wool. E. C. DUHAMEL, and COMP. GÉN. DES IND. TEXTILES (B.P. 273,755, 3.5.26. Fr., 4.5.25. Addn. to B.P. 256,635; B., 1926, 975).—The process of the original patent is modified in that the wool travels continuously or intermittently through one or more bowls with periodical stops for cleaning purposes. Provision is made for a continuous supply of fresh liquor, such as water or weak suint liquor, and for maintaining one or more baths of suint liquor of substantially high and constant concentration sufficiently clean for washing purposes by a purification treatment (other than settling), or by suitably pre-treating the wool. The process is applicable to wool-bearing skins and, in certain circumstances, to live sheep.

D. J. NORMAN.

Retting of flax and other fibres. BRIT. DYESTUFFS CORP., LTD., C. HOLLINS, and E. CHAPMAN (B.P. 279,583, 24.8.26).—Penetration of the fibre is assisted and fermentation begins more rapidly if, in the retting of flax, wetting-out or dispersing agents, namely, sulphonic acids of formaldehyde-phenol condensation products, alkylnaphthalenesulphonic acids, sulphonated *iso*-propylated mineral oil fractions, ligninsulphonic acid, naphthenic acids, taurocholic acid, sulphonated higher aliphatic acids, etc. are added to the retting bath.

C. HOLLINS.

Material for treating vegetable fibres for use in the manufacture of paper. L., R., and G. SCHNEEBERGER (F.P. 617,826, 30.10.25).—The bleaching properties of the fibres are improved by softening them with a soap prepared from casein and resin, mixed with kieselguhr.

L. A. COLES.

Treatment of sulphate- and soda-pulp. R. COLLINS (U.S.P. 1,648,111, 8.11.27. Appl., 10.1.27).—The major portion of the spent cooking liquor is separated from the pulp in an undiluted form by drainage, and treated for recovery. The remainder of the liquor is removed by washing and the diluted liquor thus obtained is concentrated.

D. J. NORMAN.

Recovery of high-percentage acetic acid from solutions of acetylcellulose in acetic acid. VER. F. CHEM. IND. A.-G. (B.P. 268,778, 28.3.27. Ger., 1.4.26).—Concentrated acetic acid (90—95%) is recovered from

solutions of cellulose acetate in acetic acid, either before or after partial hydrolysis of the cellulose acetate to the stage of solubility in acetone, by subjecting the solution, initially at 90—100°, to distillation (without application of external heat) until the temperature falls to 50°. The solution may again be heated to 90—100° and the process repeated. Each of these treatments removes about 20% of the acetic acid without impairing the homogeneity of the solution, its spinning properties, or the character of the coagulated products.

D. J. NORMAN.

Manufacture of artificial cork. H. WADE. From ARMSTRONG CORK CO. (B.P. 279,190, 6.8.26).—Artificial cork blocks suitable for insulating purposes, particularly cold storage, are made by compressing cork particles in a mould and forcing through the compressed mass hot gases, *e.g.*, hot air or steam or a mixture thereof, at 220—310°, to promote an exothermic reaction of an oxidising character whereby the cork particles become agglomerated into a compact mass. Suitable apparatus is described. [Statutory ref. to B.P. 26,074 of 1907.]

D. J. NORMAN.

Manufacture of paper. A. E. BARNARD and R. G. CASWELL, Assrs. to W. B. PRATT, INC. (U.S.P. 1,648,838, 8.11.27. Appl., 30.7.23).—Paper of increased bursting strength is obtained by beating cellulose pulp in the presence of ammonia.

D. J. NORMAN.

Treatment of paper. E. B. EDDY CO., LTD., Asses. of H. SCHERBAK and A. LUTZ (Can. P. 264,999, 6.12.24).—Paper impregnated with glue solution is dried and treated with formaldehyde.

L. A. COLES.

Manufacture of composition paper or pulp board. J. H. MITCHELL (U.S.P. 1,648,237, 8.11.27. Appl., 4.3.27).—The board consists of sugar-cane bagasse fibres bound together by fibres obtained from the bagasse of sisal leaves.

D. J. NORMAN.

Loosening of vegetable fibres. J. BILLWILLER (U.S.P. 1,649,281, 15.11.27. Appl., 11.9.22. Switz., 13.7.22).—See B.P. 206,570; B., 1924, 90.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Bleaching of "back-greys" [in printing] stained with indanthrene dyes. M. M. TSCHILIKIN (Textilber., 1927, 8, 280—281).—Back-greys, after use for printing indanthrene dyes, become stained in colours very resistant to bleaching when afterwards subjected to a kier boil. Thus, Helindone Orange R yields a pinkish-orange stain; Thioindigo Red B a violet. The staining is due to dissolution of the loose dye on the back-grey in the alkaline kier liquor, which has a reducing action, so that dyeing of the back-grey in a pale shade then occurs. Staining is prevented, so that the back-greys may be satisfactorily bleached, by adding Leucotrope W to the kier liquor and first maintaining this for 15 min. at 50—100° and ordinary pressure. Alternatively stained back-greys may be decolorised by boiling for 15 min. at 100° in a liquor containing 5 g. of caustic soda and 0.03 g. of Leucotrope W per litre.

A. J. HALL.

PATENTS.

Production of Aniline Black on textile fibres. CALICO PRINTERS' ASSOC., LTD., L. A. LANTZ, and

R. WATSON (B.P. 279,164, 20.7.26).—Cotton fabrics are impregnated with the usual substances (*e.g.*, aniline, hydrochloric acid, sodium chloride, and an alkali ferrocyanide) for "prussiate" Aniline Black, dried, and subjected first to a dry heat of 110—180° for 5—45 sec., then heated in the presence of steam for 15—60 sec. at 100—180°, washed, and dried. The dry heat treatment promotes the formation of an Aniline Black which is ungreenable without the usual after-chroming treatment.

A. J. HALL.

Dyeing of textile materials. C. B. WHITE, Assr. to VIVATEX PROCESSES, INC. (U.S.P. 1,648,433, 8.11.27. Appl., 16.4.24).—Textile materials are coloured by impregnation with a metallic sulphide, and further rendered resistant to acid substances which may be formed subsequently by the action of air or other influences on the sulphide, by depositing within the materials an insoluble basic compound incapable of forming a sulphide in the presence of water.

A. J. HALL.

Dyeing and printing of acetylcellulose. H. HOZ, W. BERNOULLI, and A. LINK, Assrs. to J. R. GEIGY, Soc. ANON. (U.S.P. 1,650,275, 22.11.27. Appl., 22.7.25. Ger., 31.3.23).—See B.P. 231,897; B., 1925, 588.

Dyeing of furs (U.S.P. 1,649,502).—See XV.

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

Oxidation of sodium amalgam by means of oxygen. A. FELDMANN (Giorn. Chim. Ind. Appl., 1927, 9, 455—456).—When sodium amalgam is vigorously shaken with pure oxygen in absence of water in a glass vessel the mass becomes pasty and heated. If alcohol also is present, acetaldehyde is formed, the alkali partially resinifying the aldehyde. Attempts to prepare peroxidised compounds from boric acid and baryta in this way proved unsuccessful. In an autoclave under a pressure of 10 atm., the reaction between sodium amalgam and oxygen yields sodium peroxide quantitatively. The industrial conversion of this into hydrogen peroxide has not yet been found possible.

T. H. POPE.

Oxides of iron, especially ferrous oxide. H. GROEBLER and P. OBERHOFFER (Stahl u. Eisen, 1927, 47, 1984—1988).—The purest preparation of ferrous oxide obtained by heating ferric oxide in a stream of carbon monoxide and carbon dioxide at 800° contained 99% FeO when only small quantities (1 g.) of material were used. By heating at 900° the preparation contained about 15% of metallic iron, about two thirds of which could be removed by treating the mixture with iodine solution; the residual ferrous oxide contained only 95% FeO. The m.p. of ferrous oxide, as determined by extrapolation from the results obtained with various impure specimens, is 1377°. Röntgenographic examination of oxides of iron prepared by reduction of ferric oxide at 800° shows that the limit of solubility of ferrous oxide in ferrosferric oxide is 5%; with more than 61% FeO the lattice structure of ferrosferric oxide is entirely replaced by that of ferrous oxide, which therefore appears to hold 39% Fe₃O₄ in solid solution. Ferrous oxide retains only traces of iron in solid solution.

A. R. POWELL.

Chemical utilisation of gypsum. G. GALLO (Giorn. Chim. Ind. Appl., 1927, 9, 405—410).—The only two successful processes for the chemical utilisation of gypsum consist (1) in the manufacture of sulphuric acid by the contact process from the sulphur dioxide obtained when a mixture of gypsum, silica, alumina, and coal is heated in a revolving cement furnace, the residual clinker being used for making cement, and (2) in passing ammonia and carbon dioxide into an aqueous suspension of powdered gypsum, the resultant products being calcium carbonate and ammonium sulphate. The author finds that, in presence of water, hemihydrated calcium sulphate and magnesium carbonate in about equimolecular proportions react at the ordinary temperature, a solution containing about 50 g. of magnesium sulphate per litre being obtained after 45 days. With dihydrated calcium sulphate the reaction is slower, and the resulting magnesium sulphate solution contains only 30—35 g. of the salt per litre. Other uses for magnesium sulphate are being sought. T. H. POPE.

Use of gypsum in the manufacture of ammonium sulphate. P. BAUD (Compt. rend., 1927, 185, 1138—1141).—The dried and sieved native gypsum (400 g.) containing 73.37% CaSO₄, 4.32% CaCO₃, and traces of alumina, iron, magnesia, and silica, is mixed with 70 g. of clay (SiO₂ 72.20%, Al₂O₃ 13.05%), 350 c.c. of commercial ammonia (32% NH₃), and 600 c.c. of water in an autoclave, the mixture being well stirred and a current of carbon dioxide bubbled through. The maximum yield of ammonium sulphate (96.6%) is obtained after 40 min. treatment at the initial and final temperatures of 70° and 48°, respectively, under a pressure of 750 g. The ammonia is recoverable from the mother-liquor, and the filtered paste when heated at 1550—1600° gives a useful clinker (SiO₂ 23.59%, CaO 66.77%, Al₂O₃ 4.28%, with traces of titanium, magnesium, and iron). This procedure ensures the complete reaction of the gypsum. J. GRANT.

Economic production of calcium citrate in a highly pure state. B. MELIS (Giorn. Chim. Ind. Appl., 1927, 9, 457—464).—The following process yields a perfectly crystalline calcium citrate with no free lime and no so-called brown extractive matters and containing 3% of organic salts, including soluble non-titratable citrate, and 70—72% of citric acid (theory, 73.6%). The lime used is first purified to remove the numerous undecomposed granules of oxide which are the cause of the resinoid condensation of the sugars of the agro and of the separation of the brown extractives. The lime is slaked in three communicating vessels at different levels, the coarser particles being allowed to settle. The agro is neutralised by the finer lime suspension, which is added gradually, the neutralisation being completed at boiling temperature and with continual stirring, so that long contact of the lime with the sugars present and precipitation of calcium salts other than the citrate are avoided. Preliminary filtration of the agro is unnecessary, the fine colloidal detritus present promoting the formation of finely crystalline citrate which is readily attacked by sulphuric acid. T. H. POPE.

Nitrogen fixation by the high-tension arc. P. G.

COLIN and H. V. TARTAR (*J. Physical Chem.*, 1927, 31, 1539—1558; cf. *B.*, 1926, 485).—The effect of reduced pressure on the yield of fixed nitrogen with a constant velocity of gas molecules through the high-tension arc, together with the equilibria obtained in an arc under varying conditions, are studied on a laboratory scale. Under reduced pressure there is a decrease both in the concentration of nitric oxide and in the yield of fixed nitrogen per kw.-hr. The maximum equilibrium concentration of nitric oxide obtained over a wide range of pressure was dependent on the current passing, and the effect of variation in the velocity of the gases on this concentration was small. High concentrations of nitric oxide can be produced in an uncooled high-tension arc, the maximal concentrations for air (8.8%), for invert air (12.2%), and for equal volumes of oxygen and nitrogen (13.1%) being obtained at 100 mm. pressure. Water-cooling of the emergent gases is unnecessary. Equilibrium runs with air at atmospheric pressure without circulation gave a maximum concentration of 5.1% of nitric oxide with a current of 10—12 milliamp. The law of mass action holds approximately for the reaction between oxygen and nitrogen in the high-tension arc at pressures greater than 0.5 atm. L. S. THEOBALD.

Determination of carbon monoxide with iodine pentoxide. J. TAUSZ and K. JUNGSMANN (*Gas- u. Wasserfach*, 1927, 70, 1049—1051).—The gas mixture is passed in a slow stream from a water-jacketed burette through a series of wash bottles containing, respectively, potassium hydroxide, fuming and concentrated sulphuric acids, solid potassium hydroxide, and phosphorus pentoxide, and over iodine pentoxide (3—4 g.) maintained at 195° by means of a Pregl heating jacket containing aniline and a few drops of spindle oil. The reaction products—iodine and carbon dioxide—pass through a tube containing beads moistened with 10% potassium iodide, and finally through a wash bottle with baryta. The potassium iodide tube is thoroughly washed out with chloroform and potassium iodide, and the free iodine is titrated with 0.01*N*-thiosulphate. The carbon dioxide may be determined gravimetrically by converting the precipitated barium carbonate into sulphate. It is essential to pre-heat the iodine pentoxide to 195°, as below this temperature iodic acid is not completely dehydrated. W. T. K. BRAUNHOLTZ.

Determination of the carbon monoxide content of burnt gases from gas-burning appliances. GASINSTITUT. (*Gas- u. Wasserfach*, 1927, 70, 1052).—The method of Tausz and Jungsmann (preceding) gives excellent results, but, owing to the small carbon monoxide content of the gases, it is necessary to use at least 500 c.c. for each determination.

W. T. K. BRAUNHOLTZ.

Determination of the constituents of a gaseous mixture containing hydrogen sulphide, carbon dioxide, hydrogen arsenide and phosphide, and acetylene. M. WILMET (*Compt. rend.*, 1927, 185, 1136—1138).—The hydrogen sulphide is first absorbed in a neutral solution of zinc acetate and the carbon dioxide then removed in potassium hydroxide. Arsine is then absorbed in a neutral 80% solution of cadmium acetate,

which will absorb 40 times its volume of the gas, and the phosphine and acetylene are finally determined by the reduction of a 30% solution of selenious anhydride, and by the alkaline potassium iodomercurate reagent of Lebeau and Damiens (*A.*, 1918, ii, 81), respectively. Absorption occurs rapidly, except for arsine and acetylene, when portions of the gas must be tested separately from time to time. J. GRANT.

Deterioration of steels. VANICK.—See X.
Chromium chloride solutions. STIASNY and GRIMM.—See XV.

PATENTS.

Manufacture of hydrocyanic acid. J. Y. JOHNSON. FROM I. G. FARBENIND. A.-G. (B.P. 279,530, 26.6.26).—Formamide vapour is completely converted into hydrocyanic acid and water without the production of carbon monoxide and ammonia by heating at 400—450° under diminished pressure, in the absence of other gases, with dehydrating catalysts, *e.g.*, natural or artificial zeolites, calcium chloride, or carbonates of the alkali metals.

W. G. CAREY.

Concentration of phosphoric acid by evaporation. E. L. LARISON, Assr. to ANACONDA COPPER MINING Co. (U.S.P. 1,648,137, 8.11.27. Appl., 30.1.26).—In the concentration of crude phosphoric acid solutions containing fluorides, corrosion of the apparatus is avoided by maintaining therein during the process a solution of the acid saturated with alkali fluosilicates; the deposited fluosilicate crust acts as a protective agent.

H. ROYAL-DAWSON.

Manufacture of potassium or potassium sodium cyanide from calcium cyanamide. DEUTSCHE GOLD- U. SILBER-SCHNEIDANSTALT VORM. ROESSLER (G.P. 443,455, 24.11.22. Addn. to G.P. 442,966; *B.*, 1927, 937).—Calcium cyanamide is fused with potassium chloride or with a mixture of sodium and potassium chlorides, the mass extracted with water, and the lime removed by addition of an alkali salt of an acid which forms an insoluble calcium salt.

A. R. POWELL.

Maintaining the stability of dibasic calcium hypochlorite. I. G. FARBENIND. A.-G. (B.P. 276,307, 10.6.27. *Ger.*, 18.8.26).—The stability of the compounds described in B.P. 188,662 (*B.*, 1923, 656 A), is maintained by keeping the hypochlorites in a "centrifuge-moist" state, *i.e.*, with a degree of moisture between 5 and 15%.

H. ROYAL-DAWSON.

Production of aluminium chloride. H. BLUMENBERG, JUN. (U.S.P. 1,649,383, 15.11.27. Appl., 31.8.26).—A mixture of aluminium sulphate and potassium chloride is heated in a closed chamber in the presence of a reducing agent to such temperature that aluminium chloride is formed without volatilising the potassium chloride; the vapours of aluminium chloride so formed are condensed.

H. ROYAL-DAWSON.

Desiccation [dehydration] of molten metal chlorides. W. MOSCHEL and P. SIEDLER, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,650,531, 22.11.27. Appl., 11.2.26. *Ger.*, 16.2.25).—The molten hydrated metal chloride is treated with calcium carbide.

H. ROYAL-DAWSON.

Production of barium silicofluoride. H. S. MCQUAID, Assr. to GRASSELLI CHEMICAL Co. (U.S.P.

1,648,143, 8.11.27. Appl., 22.11.26).—A non-alkaline barium compound is acted upon by sodium silicofluoride.

H. ROYAL-DAWSON.

Working-up of fluorides containing silicic acid.

RÜTGERSWERKE A.-G. (B.P. 271,816, 25.1.27. Ger., 31.5.26).—Fluorides containing silicic acid are decomposed with acid in wooden vessels yielding a mixture of hydrogen fluoride and silicon fluoride. If aluminium fluoride is required the mixture is treated with an aqueous suspension of aluminium hydroxide or kaolin, silicic acid being precipitated. Sodium fluoride and sodium fluosilicate are obtained by treating the mixture with an aqueous solution of soda or a sodium salt.

W. G. CAREY.

Mining of soluble boron compounds.

H. BLUMENBERG, JUN. (U.S.P. 1,649,385, 15.11.27. Appl., 16.2.27).—Steam and air are conducted to the bottom of a shaft to the deposit, whereby the water of condensation leaches out the soluble contents and the liquid formed is raised to the ground surface.

H. ROYAL-DAWSON.

Production of carbonic acid gas.

B. LUNDIN (B.P. 269,478, 24.11.26. Swed., 17.4.26).—Sodium bisulphate is dissolved in water contained in a gas generator, or a solution of the salt is introduced into the generator, and an equivalent amount of solid sodium bicarbonate is added at a suitable rate by a screw conveyor; the resulting sodium sulphate liquor is removed and crystallised as Glauber's salt.

W. G. CAREY.

Separation of phosphorus from gases containing phosphorus.

A. L. MOND. From I. G. FARBENIND. A.-G. (B.P. 279,710, 11.4.27).—Gases containing phosphorus are cooled below the dew point of phosphorus, and water or molten phosphorus as rapidly moving drops is projected into the fog of phosphorus by a centrifugal washer of the Theisen or Ströder type. Two or more washers may be arranged in series, the first being operated at a temperature above the m.p. of phosphorus, the others below that temperature.

W. G. CAREY.

Production of a gas of uniform sulphur dioxide content.

H. HOWARD, ASSR. to GRASSELLI CHEMICAL Co. (U.S.P. 1,650,358, 22.11.27. Appl., 28.8.24).—Gas containing sulphur dioxide is mixed with sulphur vapour in quantity inversely proportional to its sulphur dioxide content, and the mixture burnt.

M. E. NOTTAGE.

Delaying the ignition of hydrogen phosphide resulting from the action of water on calcium phosphide or other phosphide.

F. HEBLER (B.P. 279,751, 1.7.27).—The calcium phosphide is coated with a fused mass, e.g., potassium dichromate, pyrophosphate, borax, etc., in a rotating drum, or with water-free solutions of cellulose ester or other film-forming substances. The retardation is adjusted by a coating of greater or less solubility or permeability.

W. G. CAREY.

Apparatus for manufacture of lead oxide.

H. WARING, ASSR. to ASSOCIATED LEAD MANUFRRS., LTD. (U.S.P. 1,649,428, 15.11.27. Appl., 26.1.26. U.K., 30.1.25).—See B.P. 254,352; B., 1926, 744.

Recovery of thiocyanates (U.S.P. 1,648,224).—See II.

Carbon disulphide (B.P. 265,994).—See III.

Recovery of acetic acid (B.P. 268,778).—See V.

VIII.—GLASS; CERAMICS.

Analysis of soda-lime glass. G. E. F. LUNDELL and H. B. KNOWLES (J. Amer. Ceram. Soc., 1927, 10, 829—849).—Results of the analysis of a standard soda-lime glass distributed by the Bureau of Standards to thirteen analysts are summarised in tabular form. A general tendency towards high results, particularly with the alkaline earths and alkalis, was indicated. The accurate or "umpire" method of analysis of such a glass was then considered and detailed procedure laid down. Determinations so treated were loss on ignition, silica, iron oxide, alumina, titania, zirconia, lime, magnesia, soda, potash, manganese oxide, sulphur trioxide, arsenious and arsenic oxides, and chlorine. Fairly accurate shortened routine methods were also given.

A. COUSEN.

Changes in optical glasses. P. NICOLARDOT (Rev. gén. Colloid., 1927, 44, 592—598).—A detailed description is given of the "dimming test," used by Elsdon, Roberts, and Jones (B., 1919, 721 A) for determining the degree of adsorption of different glasses. The results obtained by this method for a number of glasses are in fair agreement with those obtained by the iodococin test.

L. L. BIRUMSHAW.

Extending the life of chemical glassware. J. T. LITTLETON JUN., and G. A. DASNEY (Ind. Eng. Chem., 1927, 19, 1271).—The production of strain, by subjection to extreme degrees of heat, is evidenced in a photograph of a Kjeldahl flask taken in polarised light. Three broken circles of light near the bottom of the flask show where the heat, by slightly softening the glass, had produced a permanent strain. Similar strains, later causing breakage under conditions of only moderate service, are produced by evaporating the contents of a flask to dryness over a flame, or by using an intense pointed flame under a flask containing a liquid. The danger of scratches on the inner surfaces of glass vessels is emphasised. During heating, the hotter, outer surface tends to stretch the inner surface, and the stresses at the sharp angle at the bottom of the scratch are increased, thus increasing the liability to fracture.

E. H. SHARPLES.

Constitution of clay-mud. H. CHATLEY (Inst. Civil Eng., 1927, No. 52, 3—15).—The characteristic physical properties of clay as compared with wet sand of similar composition—considerable tensile strength and apparent cohesion, also its impenetrability to water—are the consequence of the fineness of the particles which renders molecular forces important. The properties are best shown when there is a sufficiency of colloid particles to cover and cement the larger ones. Terzaghi's theory of clay structure is discussed. The author has investigated quantitatively the settlement of clay particles from a fresh-water suspension by addition of sea salt, a phenomenon due to the neutralisation of the charges on the colloid particles by the adsorption of oppositely charged ions. It was found that sea salt was three times as effective as pure sodium chloride in producing coagulation, this being due to the effect of bivalent calcium and magnesium ions. Alum is more than ten times as effective as salt. There is an optimum concentration of electrolyte for a given colloid concentration, as reversal of the charge takes place with an excess.

C. IRWIN.

PATENTS.

Manufacture of laminated glass. O. Y. IMRAY. From L. BARTELSTONE (B.P. 279,671, 21.12.26).—To the surfaces of a flexible sheet, such as celluloid or cellulose acetate, is applied a coating of pure vegetable oil having no solvent action on the film (*e.g.*, castor oil). The sheet is then sandwiched between two sheets of glass, the contact surfaces of which have been previously coated with a film of celluloid, adhesion being secured by applying a pressure exceeding 1 atm. for a short time while the temperature is substantially raised (*e.g.*, 150 lb./sq. in. for 8 min. and 110°). A. COUSEN.

Bleaching or decolorising of clay or other minerals. T. W. PARKER, and DARTMOOR CHINA CLAY Co., LTD. (B.P. 279,694, 28.2.27).—Clays or other minerals containing iron are decolorised by treatment with acid, either with or without a reducing agent, and with aqueous solutions of soluble salts. Such salts must neither be reducing agents nor their bases form coloured compounds with acidic radicals which are non-chromophoric; their acidic radicals also must not form insoluble iron compounds. Ammonium salts or salts of multivalent metals such as calcium, barium, or magnesium may be used, but aluminium salts (*e.g.*, the sulphate or an alum) are to be preferred. The salt may be added to the bleaching liquid before treatment or to the washing water subsequently used or first mixed with the clay suspension. A. COUSEN.

[Protection of] refractory bodies such as carbonising retorts. SOUTH METROPOLITAN GAS Co., and R. H. B. LAMPREY (B.P. 279,201, 21.8.26).—Those portions of a carbonising retort etc. which are exposed to the highest temperature are protected by a covering of highly aluminous material of plastic clay, calcined alumina, and grog formed into a plastic mass or as tiles. The surface is first painted with a mixture of the clay and sodium silicate to ensure adhesion.

W. G. CAREY.

Zirconia-faced refractory. P. G. WILLETTTS, ASS. to HARTFORD-EMPIRE Co. (U.S.P. 1,650,577, 22.11.27. Appl., 20.1.26).—A refractory body has a facing of substantially pure zirconium oxide which is partially interpenetrated by it and therefore united integrally with it.

M. E. NOTTAGE.

Manufacture of tiles. V. LEFEBURE (U.S.P. 1,650,080, 22.11.27. Appl., 4.3.27. U.K., 7.12.25).—See B.P. 268,857; B., 1927, 443.

Apparatus for annealing glassware. BRIT. HARTFORD-FAIRMONT SYNDICATE, LTD., ASSEES. of E. O. HILLER (B.P. 273,724, 29.6.27. U.S., 1.7.26).

IX.—BUILDING MATERIALS.

Air-seasoning and conditioning of timber. F. M. OLIPHANT (Dept. Sci. Ind. Res., Forest Prod. Res., 1927. Spec. Rep. No. 1. 26 pp.).—The drying and seasoning of wood are complicated by the heterogeneous cellular structure. Wet green wood may contain double the weight of water compared with that of the dry wood, as free water in the cell cavities and water absorbed by the cell walls, the latter moisture causing considerable lateral shrinkage on evaporation. This shrinkage is by no means uniform, due to the presence of bands known

as wood rays, which restrict contraction of the adjacent cell walls. Hence "checking" and warping (cupping and twisting) result from internal straining. End-checking of sawn logs can be diminished by coating the ends with paint or a resin preparation; sometimes paraffin wax is used on the ends of high-class furniture timber. Case-hardening is caused by quick surface-drying and may give rise to cupping, and a further defect known as collapse is probably due to the rapid removal of water in the cells without a corresponding penetration of air, the cell walls thereby being drawn together. When air-seasoning, advantage must be taken of drying air currents, while avoiding undue shrinkage and a heavy decay by fungi. Illustrations of various methods of piling are given. In addition to reducing weight, increasing stability, and reducing the liability to decay, the seasoning of wood increases all the strength values except toughness. The prevailing poor reputation of kiln-dried wood is due to excessive drying below the fibre saturation point, together with the use of too high temperatures at the commencement of the "run." C. A. KING.

PATENTS.

Manufacture of cement mortar, artificial stone, concrete, etc. C. PICKSTONE (B.P. 279,355, 16.6.27).—In the manufacture of cement mortar etc. from Portland cement and sand, crushed bricks, etc., 5—15% of fine slate powder replaces an equal amount of the inert material, the ingredients being mixed in the dry state and then with water to which has been added $\frac{1}{4}$ — $\frac{1}{2}$ % of sodium silicate. W. G. CAREY.

Building cement or plaster. C. E. KRAUS (B.P. 253,929, 17.6.26. U.S., 18.6.25).—Clay, preferably containing at least 12% Al, is causticised with caustic soda solution, roasted at a temperature below that which will drive off all water of crystallisation, mixed with an alkaline earth containing a large percentage of calcium compounds, *e.g.*, dolomitic limestone, digested as slurry with sulphuric acid, and treated with more alkaline earth. The whole mixture is roasted at 100—315° depending upon the setting ability desired in the final product. W. G. CAREY.

Preparation of road-building material. O. L. DILLON, JUN. (U.S.P. 1,648,166, 8.11.27. Appl., 27.5.27).—The mineral aggregates are moistened with an alkaline solution, dried, and heated before admixture with bitumen. H. ROYAL-DAWSON.

Manufacture of porous materials [from sugar-factory residues]. A. MENAGER (B.P. 280,116, 20.5.27).—Caked residue from sugar refineries is placed in a mixing receptacle and covered with the mortar etc. to be treated, with which is incorporated agar-agar or emulsions of resins, tar, bitumen, asphalt, etc. to give a protective film and, together with the albumin, casein, gums, etc. in the residue, to increase the number and maintain the permanency of the gas bubbles in the final product. Sufficient acid is then added to the residue to liberate its carbon dioxide, and the whole agitated to produce a homogeneous mass. F. R. ENNOS.

Rendering [cement] surfaces fluid-tight. J. A. H. ITER, ASS. to SOC. LE TEXTILON CENTRAL (U.S.P. 1,649,592, 15.11.27. Appl., 12.2.26. Fr., 18.2.25).—See B.P. 247,976; B., 1927, 190.

Abrasive cement. H. O. KEAY, Assr. to LAURENTIDE Co., LTD. (U.S.P. 1,650,133, 22.11.27. Appl., 11.8.25).—See B.P. 260,171; B., 1926, 1015.

Preservation of wood etc. K. H. WOLMAN, F. PETERS, and H. PFLUG (B.P. 263,757, 6.11.26. Ger., 2.1.26).—See U.S.P. 1,622,751; B., 1927, 678.

Method and means for preparing a wet mixture of fibre and cementitious material. J. S. HANCOCK and W. H. MACMENIGALL (B.P. 280,456, 30.5.27).

Superheating slag (B.P. 271,087).—See X.

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

Equilibria in the reduction, oxidation, and carburization of iron. IV. R. SCHENCK [with A. DAHM, F. FARR, G. FINCK, W. HEMPELMANN, N. JUSCHKEWITSCH, (Frl.) H. NIPPERT, F. TRAUMANN, J. BÖKMANN, T. DINGMANN, R. FRICKE, W. KESTING, W. PRATJE, and A. SAVELSBURG] (*Z. anorg. Chem.*, 1927, 167, 254—314; cf. A., 1927, 1030).—The composition of the mixture of carbon dioxide and carbon monoxide in equilibrium with metallic iron, and mixtures of ferrous oxide and different forms of carbon with or without the metal, has been determined at different temperatures. The composition of the gas phase when equilibrium is reached in the action of carbon monoxide on the metal corresponds with the equilibrium set up over oxoferrite and wüstite as solid phases, but when graphite or one of the other forms of carbon is present the concentration of carbon monoxide in the gas phase is rather greater. Small amounts of mercury cause an increase in the concentration of carbon monoxide in the equilibrium gas phase obtained starting from pure iron, probably because the amalgamation of the iron causes a reduction of the solubility of oxide in the metal, giving an oxoferrite poorer than normal in oxygen. It is found that in the equilibrium set up in the absorption of carbon monoxide by metallic iron the pressure of the gas phase at a given temperature is not constant, although its composition is, which points to the existence of a third solid phase, containing carbon, probably as a solid solution of carbide. Experiments in which cementite was heated in carbon monoxide show that this phase must also contain oxygen, and the name "oxoaustenite" is therefore suggested. In order to ascertain the relations between the three phases, mixtures of cementite with ferric oxide or ferrosferic oxide were heated at 600°, 650°, and 700°, the gas phase being removed and analysed when equilibrium had been attained, and this process repeated until no more gas was given off. At each temperature the curve connecting the pressure of the gas phase with the concentration of oxygen in the solid phase consists of two flat portions parallel to the concentration axis, and separated by a descending portion, and is terminated by another descending section. Until the commencement of the final stage, however, the composition of the gas phase remains unchanged, corresponding with the wüstite-oxoferrite equilibrium, the variations in the total pressure of the gas phase being due to the oxoaustenite. If the total reaction pressure is plotted against the composition of the gaseous phase, there is in each curve a middle portion parallel to the axis of pressure,

and corresponding with the wüstite-oxoferrite-oxoaustenite equilibrium, whilst the two extreme portions, which are concave to the axis of pressure, correspond with the bivariant equilibria set up with the solid phases wüstite and oxoaustenite, and oxoferrite and oxoaustenite, respectively. By means of the equilibrium curve for the system in which the solid phases are cementite and oxoaustenite, the field of existence of oxoaustenite can therefore be determined. Below 600°, four other univariant systems are also possible, viz., wüstite-cementite-oxoaustenite-gas, ferrosferic oxide-wüstite-cementite-gas, ferrosferic oxide-wüstite-oxoaustenite-gas, and ferrosferic oxide-cementite-oxoaustenite-gas. At 560°, wüstite disappears, and below this temperature only the last of these is therefore possible. Above 650°, the only bivariant systems, other than wüstite-oxoferrite-gas, which could be examined were oxoferrite-oxoaustenite-gas and cementite-oxoaustenite-gas, and data for these up to 800—900° have been obtained. An examination of the equilibrium set up between pure iron, or iron containing carbon, and carbon monoxide or a mixture of monoxide and dioxide at 800—1110°, makes it appear probable that Matsubara's supposed bivariant carburization equilibria (A., 1921, ii, 644) are actually tervariant oxoaustenite equilibria. The only case in which free carbon may exist in equilibrium in the solid phase in any of the equilibria examined seems to be when a mixture of amorphous carbon or finely-divided graphite with wüstite or an oxoferrite-wüstite mixture is heated at a temperature above 680°.

R. CUTHILL.

Equilibria in the reduction, oxidation, and carburization of iron. V. R. SCHENCK (*Z. anorg. Chem.*, 1927, 167, 315—328; cf. preceding abstract).—The data obtained for the composition of the gas phase in equilibria in the system iron-carbon-oxygen have been used to construct a space model, isothermal sections of which are reproduced.

R. CUTHILL.

Superficial hardening of steel. G. CHARPY (*Compt. rend.*, 1927, 185, 990—991).—Carburization of a steel, in which a superficial layer of cementite is produced, is distinguished from cementation, in which the carbon dissolves slowly in the iron in proportions increasing gradually with time. The optimum temperature of formation of carbides is 650°, since this strikes a balance between their rates of formation and decomposition, and the method is thus best applied to semi-hard steels, which at this temperature also acquire a maximum resilience. For pure iron and ordinary steels, gases containing large proportions of carbon dioxide, hydrocarbons, or cyanogen are recommended as carburising agents. For special steels, in which mixed carbides may be produced, hydrocarbons, cyanide or ferrocyanide baths, or molten potassium cyanide may be used.

J. GRANT.

Annealing of hardened steel, particularly at low temperatures. A. MERZ and C. PFANNENSCHMIDT (*Z. anorg. Chem.*, 1927, 167, 241—253).—The changes occurring when quenched steels are heated have been investigated by means of differential heating curves. With a sample of steel containing 1.62% C, and quenched from 1100°, irregularities in the heating curve corre-

sponding with the decomposition of martensite and of austenite were observed, the actual temperatures at which these effects commenced depending, however, to a considerable extent on the rate of heating. Previously cooling the sample in liquid air caused the martensite effect to increase and the austenite effect to decrease. A sample of the eutectoid composition showed both changes if quenched from 1100°, but only the austenite change if chilled from 700°. A steel with 0.45% C quenched from 1100° did not exhibit the martensite change unless previously cooled in liquid air. In explanation of these results, the existence of two forms of martensite is suggested, one form, decomposing above 100°, being produced by quenching from high temperatures or by cooling austenite in liquid air.

R. CUTHILL.

Deterioration of structural steels in the synthesis of ammonia. J. S. VANICK (Trans. Amer. Soc. Steel Treat., 1927, 12, 169—194).—Specimens of ten carbon, nickel, or chromium steels were exposed for 4 months to an $N_2:3H_2$ gas mixture containing 8.3% NH_3 at 500° and 1500 lb./in.² pressure. All were attacked and the tensile strength and ductility were lowered. The carbon steels were readily decarburised and fissured. Nickel steels were deeply penetrated, but showed high residual strength. Chromium steels deteriorated more rapidly with high than with low carbon. Tungsten and nickel improved the resistance of chromium steels. Tests were also made for 10 months on 14 chromium-vanadium steels containing 0.2—0.6% C, 0.04—14.4% Cr, 0.07—0.65% V. Low carbon content was necessary for high resistance. At least 2.25% Cr was necessary to confine the decarburisation and fissuring to a uniform penetration. A higher chromium content improved the resistance but not proportionately. Two stainless steels with 13.5 and 21.1% Cr, respectively, were also tested and showed the least depth of deterioration. High-nickel-chromium steels are said to be most resistant, though difficult to forge and machine, but definite data are not given. Heat-treatment effected little or no improvement on the partly successful steels. Vanadium added no appreciable improvement. Decarburisation, fissuring, and the presence of combined nitrogen in the zones of attack are thought to be chiefly due to the action of "activated" hydrogen. A sharp increase in combined nitrogen was found in chromium steels. An explanation is attempted by a cyclic reaction theory of nitride formation and decomposition.

T. H. BURNHAM.

Hair cracks in steel rails. J. H. WHITELEY (Trans. Amer. Soc. Steel Treat., 1927, 12, 208—220).—Rails which were subject to deep-seated hair cracks after the heads had been sorbitised by cooling in air jets were found during etching to evolve a rapid stream of gas bubbles containing at least 50% CO, showing that the metal contained minute cavities filled with gas under pressure. It is considered that severe stresses resulted therefrom which might be the cause of local incipient cracks, the propagation of which was aided by the presence of foreign matter at the grain boundaries. The carbon monoxide might have been formed by the reaction between iron oxide and carbon during rolling.

T. H. BURNHAM.

Roman damascene steel. B. NEUMANN (Arch. Eisenhüttenwesen, 1927, 1, 241—244; Stahl u. Eisen, 1927, 47, 1695—1696).—Micrographic examination of Roman double-edged swords showed them to have been made by hammer-welding layers of steel of varying carbon content in such a way as to twist the layers into a V or W shape; subsequently, the cutting edges alone were hardened by a case-hardening process of some kind. The general absence of martensite in the structure of ancient steel articles is discussed and a theory advanced to account for it.

A. R. POWELL.

Effects of chromium and nickel in cast iron. R. S. POISTER (Amer. Foundrymen's Assoc., 1927, No. 27—28. Advance copy. 21 pp.).—Addition of 0.5% Cr with 1—2% Si to cast iron increases its strength and hardness; with 12.5—18% Cr the iron can be heated for a long time without oxidation, but is hard and brittle unless the carbon content is low (2.5%). Chromium up to 0.4% increases the strength of cast iron by formation of carbide instead of coarse graphite. Addition of nickel and chromium together (2—3:1) is preferable.

CHEMICAL ABSTRACTS.

Nickel changes properties of grey cast iron. D. M. HOUSTON (Foundry, 1927, 55, 399—401).—Nickel functions similarly to silicon in relation to carbon; it does not materially precipitate graphite below the upper critical range, but restricts the breaking-up of combined carbon.

CHEMICAL ABSTRACTS.

Work performance and bending strength of high-speed steels. W. OERTEL (Stahl u. Eisen, 1927, 47, 2036—2038).—The addition of cobalt to high-speed tool steels containing 0.6—0.7% C, 4.2—4.5% Cr, 17.0—18.4% W, and 1.3—1.9% V increases the cutting power very considerably, the best results being obtained with a high vanadium content. Equally good results are obtained with tungsten steels containing 2.9% Co and 1.9% V as with similar steels with 5.5% Co and 1.7% V. The maximum hardness combined with good elastic properties is produced by hardening at 1100—1200°. The bending strength of the steels hardened at 1325° falls to a very low value after tempering at 200°, rises somewhat again at 300°, falls again at 400°, then rises rapidly with increase of tempering temperature to 600—625°, within which range the maximum elasticity is obtained.

A. R. POWELL.

Influence of cobalt, vanadium, and manganese on the properties of tool steels. R. SCHERER (Arch. Eisenhüttenw., 1927, 1, 325—329; Stahl u. Eisen, 1927, 47, 2035—2036).—By increasing the manganese content of eutectoidal tool steels the maximum hardness obtainable by heat-treatment, the temperature range within which this hardness is obtained, and the temperature at which the steel is overheated are all lowered. Addition of vanadium increases the hardness to a maximum with 0.5% V. More vanadium, however, decreases the overheating temperature and the insensitive range. In the vanadium-silicon steels the hardness decreases with an increase in the quantity of the alloying elements, whereas in cobalt steels the hardness is almost independent of the cobalt content. The relatively large change of volume which plain carbon eutectoidal steels undergo on hardening is increased

by the addition of manganese and decreased by addition of vanadium and of silicon. The magnitude of this change of volume is independent of the cobalt content, and is somewhat greater with cobalt steels than with silicon-vanadium steels. The cutting power of manganese steel increases rapidly with the manganese content, and that of cobalt steel with the cobalt content, but vanadium steel has a maximum cutting power with 0.4% V. Tests on various steels containing two or more of these alloying elements indicated that the best cutting power combined with the smallest change of volume on hardening and therefore the greatest ability to undergo repeated hardening treatments is obtained with the steel containing 0.9% C, 2.28% Co, and 0.43% V.

A. R. POWELL.

Cast-iron diagram of Maurer with varying rates of cooling. E. MAURER and P. HOLTZHAUSEN (Stahl u. Eisen, 1927, 47, 1805—1812, 1977—1984).—A series of cast irons containing 2.4—3.8% C, 0.8—1.0% Mn, 0.3% P, 0.1% S, and varying quantities of silicon were cast in chill moulds and in sand moulds heated at 250° and at 450° and, from an examination of the microstructure of the castings, the Maurer equilibrium diagrams for cast iron under the different casting conditions have been constructed (cf. B., 1924, 911). For chill-cast specimens the boundary of the pearlite field is displaced towards the right, the line meeting the axis of carbon content (1% C) at 2.7% Si instead of at 2.5% Si; at its upper end this line bends towards the right with more than 3.1% C. For specimens cast into hot moulds (450°), the boundaries of the pearlite field are displaced to the left, cutting the axis at 0.5% Si less than in the Maurer diagram, whereas for specimens cast into moulds at 250° the Maurer diagram holds good. The rates of cooling of the castings in sand moulds preheated at 250° and at 450° correspond with the rates of cooling of cylinders of 75 and 90 mm., respectively, under foundry conditions. From the results obtained with these, therefore, the diagram for castings having walls between 10 and 90 mm. thick has been constructed. The presence of graphite eutectic together with ordinary graphite in both sand and chill castings and the increasing coarseness of the constituents with slower rate of cooling show that the ordinary form of graphite is obtained by a secondary action. The bending strength and hardness of cast iron are reproduced in the form of tables, graphs, and space-model diagrams.

A. R. POWELL.

Cutting cast iron with a flame. I. C. FRITZ (Gas-u. Wasserfach, 1927, 70, 1048—1049).—Cast iron has hitherto presented difficulties to flame cutting, since it melts before it burns, and its oxide melts before the metal itself. This difficulty is overcome by a new type of oxy-acetylene burner, in which the oxygen is preheated by passing over nozzles placed behind the concentric heating and cutting nozzles, and which, by first burning the carbon in the cast iron, allows the remaining iron to be easily cut. For example, castings with walls up to 150 mm. thick can be cut in a short time, the cut having a width of 8—20 mm.

W. T. K. BRAUNHOLTZ.

Treatment of articles of ferrous alloys in solutions of complex phosphates as a protection against corrosion. J. COURNOT (Compt. rend., 1927,

185, 1041—1043).—Clean iron, or ferrous alloys, immersed in a bath of a boiling acid solution (3—4%) of iron and manganese phosphates, liberate a small quantity of hydrogen and then become coated with an adherent grey-black deposit of a secondary phosphate of iron, about 0.005 mm. thick. The bath, which should contain about 30 g. of salts per m.² of metal surface, produces no change in the physical or mechanical properties of the metal and no surface-hardening as in the case of cementation. The surface is a good base for any of the usual finishing agents (lacquers, enamels, etc.) and has a resistance to corrosion by air, fresh, sea, or carbonated waters, water vapour, vinegar, and 5% solutions of sodium carbonate, bicarbonate, or sulphite, equal to or higher than that produced by other protecting processes. On account of its close adherence to the metal it is also less vulnerable to localised corrosion.

J. GRANT.

Influence of an addition of chromium on the internal friction of reversible ferro-nickels. P. CHEVENARD (Compt. rend., 1927, 185, 1130—1132).—The addition of chromium to reversible ferro-nickels of the invar group extends the range of temperature in which the internal friction is relatively feeble. This effect, and its relation to the anomaly previously recorded (B., 1927, 279), are shown in a three-dimensional diagram.

J. GRANT.

Iron-chromium equilibrium diagram. P. OBERHOFFER and H. ESSER (Stahl u. Eisen, 1927, 47, 2021—2031).—The equilibria in the system iron-chromium have been determined by thermal analysis and Röntgenographic investigation of a series of alloys made from electrolytic iron and the purest chromium. The metals form a continuous series of solid solutions with a minimum m.p. at 1405° for the alloy with 14.5% Cr. The temperature of the A4 transformation decreases steadily with the addition of chromium at the rate of 26° for every 1% Cr up to 14% Cr. The A3 temperature falls to a minimum of 840° (heating) and 812° (cooling) with 8% Cr, then rises with further addition of chromium, the curve finally meeting the A4 curve at 14% Cr; thus the field of γ -iron is limited to alloys containing less than 14% Cr. The temperature of the A2 transformation rises to a maximum of 771° with 2% Cr, then falls steadily in an almost straight line to 0° with 75% Cr. The heat evolved in the A3 and A4 transformations decreases rapidly with increase in the chromium content of the alloys.

A. R. POWELL.

Annealing effects of certain copper-nickel-aluminium-manganese alloys. L. J. WOOD (J. Physical Chem., 1927, 31, 1693—1703).—The influence of manganese on the ternary system copper-nickel-aluminium has been investigated by a comparison of the densities, corrosion resistance, and microstructure of the sand-cast alloys before and after annealing at 800±10° for 10 days. Alloys of the system copper-nickel-aluminium having the ratio copper/nickel equal, approximately, to 2, and containing 2—6% Al, form, essentially, an α -solid solution when sand-cast and quenched from just below a red heat. Addition of 1% of manganese tends to cause the separation of a second constituent which behaves as an α - β eutectic, and which is regarded as such. Chill-casting minimises the amount of this

constituent in the alloy as also does annealing, which further causes a decrease in density and in corrosion. The maximum combination of valuable properties decreases with an increase in the amount of α - β constituent. The relation between the ratio of copper to nickel and aluminium is also of importance.

L. S. THEOBALD.

Tensile tests on alloy crystals. IV. Copper alloy containing 5% Al. C. F. ELAM (Proc. Roy. Soc., 1927, A116, 694—702; cf. B., 1927, 558).—Crystals of a copper-aluminium alloy containing 5% Al were found to be very much cored, two directions of cores generally being formed irrespective of the orientation of the crystal to the axis of the rod, the directions agreeing in every case with planes parallel to the cube faces. Distortion measurements were made on both annealed and unannealed crystals, the coring being partially removed by prolonged annealing. The results confirm those obtained with copper-zinc alloys (*loc. cit.*), and fresh evidence is adduced on the effect of non-homogeneity of structure on the distortion. Both slip-plane and direction of slip appear to be uninfluenced by coring, but, as is shown by the effect of annealing, uniformity of structure tends towards greater strength. The copper-aluminium alloy is harder than copper at the beginning of the test, but copper hardens more rapidly than the alloy. The alloying element appears to facilitate slip rather than to impede it.

L. L. BIRCUMSHAW.

Removal of iron [from molten metals]. B. BOGITCH (Compt. rend., 1927, 185, 1046—1048).—Iron may readily be removed from copper in a converter without serious loss of the latter, but nickel and cobalt are more readily oxidised, and even when the temperature can be controlled so as to produce warm and fluid slags large quantities may be lost. At high temperatures also the lining of the converter is attacked. In the author's de-ironing process a jet of compressed air strikes a thin stream of molten metal and atomises it into droplets which readily oxidise. These are subsequently collected from the floors and walls of the vessel in the solid state and treated in the electric furnace. Silica is not required at this stage and, since the slag is fluid and consists of almost pure oxides, the losses are reduced to a minimum.

J. GRANT.

Metallographic investigation of metallic material [boiler tube]. F. HANAMAN (Arhiv Hemiju, 1927, 1, 236—242).—Metallographic examination of a burst steel boiler tube shows that it must have been heated at least to 850° and then quenched with steam, thereby causing the formation of martensite; on reheating at 750° it returns to its original homogeneous structure.

R. TRUSZKOWSKI.

Sorting, classification, and briquetting of chrome and manganese ores. K. R. KRISHNASWAMI (J. Indian Inst. Sci., 10A, 65—69).—The quality of the deposits of chrome and manganese ores in Mysore is not distinguished easily without recourse to analysis, but by a systematic examination of a number of samples it was found possible for different persons to agree within 1.5% for each type by inspection of a newly fractured surface. It must not be assumed that samples of similar appearance from different localities will have

the same chromium content. No such correlation between fracture and composition has been found for manganese. Considerable improvement in the quality of some chrome ores was effected with little loss of chromium by washing on a laboratory Wilfley table, but the results were not so satisfactory for manganese ores. Experiments on the feasibility of briquetting powdered ore for bulk transport included the use of tar, clay, lime, magnesia, and magnesium oxychloride as bonds, but without success. Briquettes made with 1.5% of a 35% solution of sodium silicate and heated to 200° were sufficiently strong to withstand rough handling.

C. A. KING.

PATENTS.

Direct production of liquid pig iron and steel from finely-divided materials. K. STRAUSS (G.P. 442,776, 22.7.25).—The finely-divided mixture to be charged to the blast furnace is blown through a series of arcs by means of a current of hot flue gas, whereby it is preheated and the ore is partially reduced and sintered.

A. R. POWELL.

Treatment of iron. I. R. VALENTINE, Assr. to GEN. ELECTRIC Co. (U.S.P. 1,648,750, 8.11.27. Appl., 29.12.23).—Iron to be malleabilised is melted in a cupola and oxidised in an electric furnace to reduce its carbon content. After desulphurising the charge, silicon is added and the product cast.

F. G. CROSSE.

Protection of iron from rusting. A. LÉVY (F.P. 617,890, 10.11.25).—After removal of grease the iron is galvanised in the usual way and then immersed for a short time in a solution containing a salt of nickel or copper, so as to produce a thin layer of either metal on the zinc. Finally the article is nickel-plated in any suitable bath. This procedure prevents partial dissolution of the zinc in the electrolytic nickel bath and obviates the necessity of using high current densities in the final plating operation.

A. R. POWELL.

Manufacture of steel. KOHLSWA JERNVERKS AKTIEBOLAG (B.P. 263,811, 23.12.26. Swed., 23.12.25).—The initial hardness and resistance to wear of high-percentage, austenitic, manganese steel may be increased by the addition of about 3.7% each of one or more of the elements, chromium, tungsten, or molybdenum. [Statutory ref. is directed to B.P. 124,817, 18,834 of 1906, and 25,794 of 1903].

M. E. NOTTAGE.

Non-rusting chromium steel. STEIRISCHE GUSSSTAHLWERKE A.-G. (Swiss P. 118,765, 7.9.25. Austr., 24.9.24).—A non-rusting steel, having good machinable properties and suitable for making table cutlery and surgical knives, contains 0.3—0.6% C, 11—15% Cr, 0.4—1% Mo, and 0.2—0.8% Ni.

A. R. POWELL.

Superheating of blast-furnace and cupola-furnace slag and addition of certain lacking constituents. H. BÜHRMANN (B.P. 271,087, 11.5.27. Ger., 15.5.26).—Fluxes, e.g., alkalis or metallic oxides, in powder form, are added to liquid slag from a blast or cupola furnace, and the enriched slag is caused to flow in a thin layer or stream through a furnace, mixing of the constituents being effected by a series of cascades. The enriched slag is useful for building purposes.

C. A. KING.

Refining of copper. E. H. JACOBS, Assr. to ELECTRICAL ENGINEERS EQUIPMENT Co. (U.S.P. 1,648,947,

15.11.27. Appl., 26.3.23).—Copper is melted under a layer of reducing material such as charcoal, and just before pouring about 0.28% by wt. of a purifying flux containing 66.7% Cu, 20.0% of phosphor-copper, 6.7% of copper sulphate, and 3.3% each of fluorspar and borax is added. M. E. NOTTAGE.

Magnetic alloys and their application in the manufacture of telegraphic and telephonic cables. W. S. SMITH and H. J. GARNETT (B.P. 279,549, 27.7.26. Cf. B.P. 224,972; B., 1925, 76).—An alloy consisting of 69–71% Ni, 14–15% Fe, 14–16% Cu, with, if desired, not more than 0.5% Mn and traces of a deoxidiser, has a magnetic permeability which is almost independent of the strength of the field between $H = 0.001$ and $H = 0.1$ gauss. The alloy should be heated at a temperature (880°) above that of the magnetic change point and cooled at a rate (80°/min.), such that its initial permeability is of the order of 6000. M. E. NOTTAGE.

Reduction of zinc ores or other zinc-bearing material. COMP. DES MÉTAUX OVERPELT-LOMMEL (B.P. 279,697, 9.3.27. Belg., 26.1.27).—Plasticity is given to zinc ores by kneading them together with a binder; oxide ores are usually sufficiently plastic with water alone, and iron sulphate or sulphuric acid is a suitable agent for calamines. The kneaded ore is expressed through a die to form threads 2–4 mm. in diameter and 2–15 mm. long, which are dried or roasted as necessary, and afterwards reduced in zinc retorts, the reducing agent preferably being 1–8 mm. in size. C. A. KING.

Treatment of finely-divided oxides [of zinc, tin, or lead] prior to reduction. F. A. GRUENNER and G. GRUENNER (G.P. 442,620, 29.11.25).—The material is treated with a solution of an alkali and the crumbly mass so obtained is mixed, while still moist, with a reducing agent. A. R. POWELL.

Magnesium alloy. J. A. GANN, Assr. to DOW CHEMICAL CO. (U.S.P. 1,649,521, 15.11.27. Appl., 27.10.21).—An alloy containing 80–99.5% Mg and 20–0.5% Ni is claimed, having a tensile strength exceeding 18,000 lb./in.², Brinell hardness 45 (approx.), and single-blow impact toughness of 40–30. F. G. CROSSE.

Treatment of aluminium screenings etc. J. G. G. FROST, Assr. to NAT. SMELTING CO. (U.S.P. 1,648,262–3, 8.11.27. Appl., [A] 28.7.24. Renewed 20.8.27; [B] 13.6.25).—(A) Aluminium dross screenings are digested with a solution of sulphur dioxide, and the resultant solution of aluminium compounds is separated from the insoluble material and boiled to precipitate aluminium hydroxide. (B) The aluminium hydroxide is precipitated without removing the material insoluble in sulphurous acid and, after filtration, the residue and precipitate are further treated to dissolve their content of aluminium. A. R. POWELL.

Apparatus for use in refining lead bullion and similar operations. G. K. WILLIAMS (B.P. 267,105, 17.2.27. Austral., 6.3.26).—Lead bullion is treated in deep narrow kettles having a spout outlet from the bottom by which metal may be removed intermittently. The kettle is surrounded by two or more independent heating flues, the upper part being required to be hotter than the lower, and the spout is also heated separately.

A stirring arrangement is fitted in the upper portion of the kettle, and the process is maintained continuous, if desired, by arranging a series of the melting pots stepwise so that the outlet of one discharges into the rest.

C. A. KING.

Manufacture of alloys of lead with the alkaline-earth metals. W. KROLL (G.P. 443,641, 30.12.25).—Lead is heated with the carbide of the alkaline-earth metal in an iron crucible in a vacuum or in an atmosphere of hydrogen or argon. The exclusion of air permits the action to be carried out at relatively low temperatures.

A. R. POWELL.

Bearing metal. S. CHOLEWINSKI (B.P. 272,889, 1.6.27. Poland, 18.6.26).—An alloy suitable for journal bearings and having a Brinell hardness of 29–40 consists of 97–98% Pb, 0.35% Ca, 0.45% Ba, 0.30% Sr, 0.50% Cu, and 0.40% Na. F. G. CROSSE.

Treatment of mercury-bearing ores. R. W. HYDE, Assr. to DWIGHT & LLOYD METALLURGICAL CO. (U.S.P. 1,650,360, 22.11.27. Appl., 10.5.24).—The finely-divided material containing mercury, mixed with just sufficient of a combustible to support combustion in the mixture, is spread in a uniform thin layer over a pervious support. The surface of the mixture is ignited, and combustion proceeds at a uniform rate from top to bottom through it, the temperature being maintained below the fusion point of the ore. The products of combustion are withdrawn and the volatilised mercury is condensed. M. E. NOTTAGE.

[Tarnish-resisting] silver alloys. R. P. JOSEPH and W. F. SCHNORR (B.P. 280,073, 7.2.27).—A standard silver alloy highly resistant to tarnishing comprises 92.5% Ag together with tin, zinc, aluminium, and gold in such proportions that the tin is at least one half of the sum of these four metals, the zinc one quarter, and the gold not more than one tenth, whilst the aluminium content is less than that of the gold. Part or all of the tin and zinc may be replaced by cadmium. A satisfactory alloy contains 92.5% Ag, 4.8% Sn, 2.1% Zn, 0.4% Au, and 0.2% Al. A. R. POWELL.

Recovery of platinum [from residues]. D. C. SMITH (U.S.P. 1,649,786, 15.11.27. Appl., 3.12.23).—Material containing platinum in a soluble form is extracted with water and the solution treated with a metal which liberates hydrogen and forms a salt. The platinum precipitate is collected and purified.

A. R. POWELL.

Preparation of uranium in a coherent mass. H. C. RENTSCHLER and J. W. MARDEN, Assrs. to WESTINGHOUSE LAMP CO. (U.S.P. 1,648,962, 15.11.27. Appl., 22.8.22).—Uranium powder, compressed into a compact mass in a closed vessel, is protected by an atmosphere of inert gas and transferred to a heat-treatment furnace, which is highly evacuated and wherein the uranium is heated at such a rate that occluded gases and volatile impurities are substantially completely expelled without causing the mass to disintegrate. The mass is then heated at a white heat and, finally, at least to its sintering temperature. J. S. G. THOMAS.

Manufacture of thorium alloys. E. C. R. MARKS. FROM KEMET LABORATORIES, INC. (B.P. 279,274, 17.12.26).—Alloys containing thorium and a refractory metal or

metals of the tungsten group (*e.g.*, tungsten and/or molybdenum) are prepared by heating a compressed mixture of thorium hydride and the metal at a temperature (about 1450°) sufficient to dissociate the thorium hydride and further to sinter the compressed rod. Thorium hydride may be formed by heating thorium in an atmosphere of hydrogen. C. A. KING.

Mineral separator. R. S. BALDWIN and W. A. JOHNSTON (U.S.P. 1,648,333, 8.11.27. Appl., 3.8.25).—A series of precipitating tanks, each having a gold-collecting cup, is combined with a concentrator table which is supported so as to oscillate over a second tank. Means are provided for elevating the material from the first tank to the table, the latter being adapted to retain values and to discharge lighter tailings over the sides of the table to the second tank, also for supplying water to the table, transferring heavier tailings from the table to the third tank, and for disposing of tailings from the third tank. M. E. NOTTAGE.

Ore separator. D. H. HERBERT (U.S.P. 1,648,478, 8.11.27. Appl., 14.11.25).—A shaking table provided with a collecting pocket is combined with a longitudinally inclined, transversely disposed, rotary screen, an inlet hopper being fixed between them. At the rear of the table is a tailings conveyor, whilst between the pocket and the conveyor is a magnetic separator. M. E. NOTTAGE.

Separation of minerals from one another and removal of gangue from flotation froth. T. FRANZ (G.P. 442,642, 5.12.19).—By the addition of alkalis, dyestuffs, oxidising agents, organic compounds, etc. to a flotation froth, one or more constituents thereof are precipitated by electro-capillary forces. The same effect may be produced by the direct action of a suitable electric current. A. R. POWELL.

Flotation process for sulphide minerals. A. W. HAHN and C. M. NOKES (U.S.P. 1,649,685, 15.11.27. Appl., 10.4.25).—In the preferential froth flotation of sulphide minerals the pulp contains small quantities of aluminium sulphate and an alkali cyanide. C. A. KING.

Sintering, desulphurising, or removing volatile constituents from ores and metallurgical products. A. L. MOND. FROM METALLBANK U. METALLURGISCHE GES. A.-G. (B.P. 279,693, 28.2.27).—In the treatment of ores on a furnace grate as of the Dwight-Lloyd type, the quantity of air supplied to the ignition point is just sufficient to attain the desired high temperature, and then the air supply is increased to a maximum theoretical value in order to concentrate the roasting operation in as short a space as possible, compatible with the permeability and fuel content of the charge. This is accomplished by fitting two or more fans to control the air supply in the different zones of the furnace, the zones possessing a number of suction compartments each under separate control. C. A. KING.

Production of alloys in a finely-divided form. E. SEYFFERTH (G.P. 443,742, 16.7.25).—A mixture of the finely-divided metals is heated in an atmosphere of inert gas or in a vacuum until reaction takes place. Alternatively, a mixture of the powdered oxides is heated in a reducing atmosphere. The powders obtained

by either method are homogeneous throughout and suitable for the manufacture of pressed articles or, after polishing, for decorative purposes.

A. R. POWELL.

Removal of deposits, scale, or incrustations from metal. G. RÜTSCHÉ (B.P. 280,099, 13.4.27. Addn. to B.P. 253,073; B., 1926, 1018).—An incrustated metal surface is subjected to the blast of a large flame produced by burning in an excess of oxygen a mixture of oil and oxygen issuing from a mixing chamber in which it has been preheated before reaching the burner nozzle. Oil is conveyed to the nozzle by means of an asbestos wick, and is volatilised while passing through the mixing chamber. C. A. KING.

Rendering joints, rivets, etc. water- and/or steam-tight. METALLISATION, LTD., and A. A. ARNOLD (B.P. 279,584, 25.8.26).—The cleaned joints etc. are sprayed with a suitable metal such as iron, nickel, or copper, thereby penetrating into and filling up any open spaces between the exposed edges; a very thin film of aluminium followed by a coating of a reducing substance may afterwards be applied and the whole heated (cf. B.P. 259,289; B., 1926, 984). M. E. NOTTAGE.

Electrodeposition of zinc. U. C. TAINTON (B.P. 280,103, 29.4.27).—In the electrolytic recovery of zinc from zinc ores, the impure zinc sulphate solution is electrolysed, using an anode of lead alloyed with 1% of silver and preferably also with arsenic. Manganese dioxide deposited at the anode is improved in quality if the lead anode contains substantial proportions of silver and tin (or arsenic). Power consumption is reduced materially by using two perforated silver-lead plates between each tier of cathodes and spacing the anodes and cathodes close together. C. A. KING.

Electrolytic extraction of pure aluminium from crude aluminium, alloys, etc. ALUMINIUM-IND. A.-G. (B.P. 272,246, 7.6.27. Ger., 7.6.26).—In the electrolytic production of aluminium a solid anode of impure aluminium is used, together with an electrolyte containing a greater molecular concentration of an aluminium halide than of the other metal (alkali) halides present. It is advisable to conduct the operation in a closed vessel. C. A. KING.

Electrolytic production of metals. A. C. JESSUP (B.P. 256,610, 30.7.26. Fr., 5.8.25).—The electrolyte used in the manufacture of magnesium and the alkaline-earth metals is heavier than the metal produced, which forms an upper layer protected by salts of low density. The electrolysis is conducted in a vessel of conducting material which is preferably capable of alloying slightly with the metal produced, the molten metal layer forming the active cathode, and the container the anode. The initial cathode may be a perforated metal plate. C. A. KING.

Fusing of metals by the electric arc process. BRIT. THOMSON-HOUSTON CO., LTD., Assees. of P. P. ALEXANDER (B.P. 259,590, 7.10.26. U.S., 7.10.25. Addn. to B.P. 257,955; B., 1927, 449).—For purposes of arc welding in an atmosphere of a mixture of hydrogen and nitrogen, ammonia is dissociated to form a suitable mixture of gases, or the proportion of nitrogen may be increased by burning air in the dissociated gases and

removing the water vapour formed. Organic ammonium compounds may be used similarly after dissociation if the presence of carbon or carbon gases is not deleterious.

C. A. KING.

XI.—ELECTROTECHNICS.

Nitrogen fixation. COLIN and TARTAR.—See VII.

PATENTS.

Electric induction furnace. ELECTRIC FURNACE Co., LTD. From E. F. NORTHRUP (B.P. 279,733, 21.5.27).—In an electric induction furnace comprising a plane loop duct or ducts communicating at the ends with the pool, one cross-sectional dimension of the duct or ducts being greater than the other, the greater cross-sectional dimension or the plane of the duct or ducts is arranged obliquely to the axis of a cylindrical transformer coil, so that a non-uniform inductive action, producing circulation, is obtained.

J. S. G. THOMAS.

Evacuated [electron-discharge] device and method of exhaust. R. E. MYERS, Assr. to WESTINGHOUSE LAMP Co. (U.S.P. 1,648,958, 15.11.27. Appl., 3.5.23).—An electron-emitting cathode, coated with the carbonates of alkaline-earth metals and sealed into an exhausted vessel, is heated so that oxides of carbon are liberated from the carbonates. The oxides of carbon are ionised by passage of an electric discharge and subsequently removed, and a high vacuum is produced in the envelope by a metallic clean-up agent.

J. S. G. THOMAS.

Metallic filaments for electric incandescence lamps. R. STEWART, Assee. of NEUE GLÜHLAMPEN G.M.B.H. (B.P. 277,634, 11.8.27. Ger., 18.9.26).—Wires, having a single-crystal or long-crystal structure, are bent in the cold state to an arc of internal radius approximately equal to the diameter of the wires, whereby the grid-structure of the crystal is partially destroyed.

J. S. G. THOMAS.

Manufacture of oxide-coated cathodes. W. B. GERO and G. W. HALLOCK, Assrs. to WESTINGHOUSE LAMP Co. (U.S.P. 1,648,941, 15.11.27. Appl., 16.7.26).—A coating composition for the cathodes consists of a suspension of alkaline-earth carbonates in a solution of potassium permanganate.

M. E. NOTTAGE.

Preparation of electric accumulator plates. EDISON SWAN ELECTRIC Co., LTD., and G. E. WEBSTER (B.P. 279,926, 8.7.26).—Electric accumulator lead plates are "formed" in a solution of sulphuric acid containing 1–3% by vol. of perchloric acid, and are then dried at about 116°.

J. S. G. THOMAS.

Negative electrode for storage batteries. R. C. BENNER and L. C. WERKING, Assrs. to PREST-O-LITE STORAGE BATTERY CORP. (U.S.P. 1,649,280, 15.11.27. Appl., 10.9.23).—A storage battery comprises a negative electrode consisting of a mixture of active material with 2–10% of barium sulphate and 0.35–5% of lampblack, and a separator pervious to electrolyte but impervious to the active material, held in direct contact with the active material to counteract the disintegrating action of the barium sulphate and lampblack.

J. S. G. THOMAS.

Apparatus for electro-deposition. INTERNAT. COPPERCLAD Co., Assees. of E. M. WANAMAKER (B.P. 276,306,

28.5.27. U.S., 19.8.26).—In apparatus for electro-deposition, more especially for use in the manufacture of "copper-clad" roofing elements, as described in E.P. 238,230, 255,113—4 (B., 1927, 81, 144, 47), positive and negative bus-bars are arranged near the electrolytic cell, and a frame which is movable along the cell is provided with shoes, one of which makes contact with the positive bars and is electrically connected to all the anodes, whilst the other makes contact with the negative bus-bar and is electrically connected to all the cathodes.

J. S. G. THOMAS.

Electroplating apparatus. J. G. NEWBY and C. B. JERRED (B.P. 279,616, 9.10.26).—A closed rotatable barrel of insulating material, adapted to receive the electrolyte and articles to be plated, has anode plates mounted in recesses behind perforated celluloid or other plates in or upon its end walls, and cathode contact studs or plates with which the articles to be plated make contact, arranged at intervals along its periphery.

J. S. G. THOMAS.

Electrical [gas] precipitator. W. A. SCHMIDT, Assr. to INTERNAT. PRECIPITATION Co. (U.S.P. 1,650,097, 22.11.27. Appl., 9.9.25).—In a device for separating suspended particles from gases, a high-resistance collecting electrode and a discharge electrode, insulated therefrom and consisting of conducting material covered with material facilitating uniform electrical discharge, are maintained at a high difference of potential.

J. S. G. THOMAS.

Electrical gas-purifying plant. SIEMENS-SCHUCKERTWERKE G.M.B.H., Assees. of R. HEINRICH (G.P. 442,876, 18.4.24).—The dust-collecting chamber is arranged below the electrodes and the whole of its cross-sectional area is covered with a permeable sheet provided with undulations disposed transversely or inclined to the gas stream, so that passage of gas to the dust-collecting chamber is prevented. The sheet can be used as an auxiliary precipitating electrode, and the lower edges of the discharge electrodes are provided with special discharge devices.

J. S. G. THOMAS.

Apparatus [discharge electrode] for electrical separation of suspended particles from gases. E. ANDERSON, Assr. to INTERNAT. PRECIPITATION Co. (U.S.P. 1,650,105, 22.11.27. Appl., 17.9.25).—A discharge electrode comprises a conducting member surrounded by a continuous coating of semi-conducting material.

J. S. G. THOMAS.

Working of electrical gas purifiers. METALLBANK U. METALLURGISCHE GES. A.-G., Assees. of E. HUETER (G.P. 443,019, 13.12.25).—The deposit of dust on the electrodes, and more especially that on the precipitating electrode, is removed by a short interruption of the direct voltage operating the plant and the establishment of a lower alternating voltage during that interval. Two or more discharge electrodes and purifiers can be arranged in the gas stream so that removal of dust from the electrodes can be effected alternately without the necessity for interrupting or reversing the gas stream.

J. S. G. THOMAS.

Photo-electric cell. W. S. SMITH and N. W. McLACHLAN (B.P. 279,937, 3.8.26 and 12.3.27).

Gas-filled photo-electric cell. GEN. ELECTRIC CO., LTD., and N. R. CAMPBELL (B.P. 280,077, 15.2.27).

Manufacture of electrical resistance bodies and machine therefor. S. LOEWE (B.P. 256,264, 31.7.26. Ger., 1.8.25).

Coke for electrodes (B.P. 269,849).—See II.

Magnetic alloys (B.P. 279,549).—See X.

XII.—FATS; OILS; WAXES.

Vulcanisation of oils. P. STAMBERGER (Rec. trav. chim., 1927, 46, 837—840).—When a mixture of rape oil with 20% of sulphur is heated at 170—180° an exothermic reaction occurs during which hydrogen sulphide is evolved. The viscous residue, after extraction with acetone and then with benzene, leaves an elastic solid which is insoluble in organic solvents. All three fractions have approximately the same elementary composition—64.33% C, 9.7% H, 16.38% S; the acetone-soluble portion (mol. wt. 990—1084) is a viscous liquid, the benzene-soluble portion (mol. wt. 2130—2285) has a honey-like consistency. The fractions on hydrolysis yield acids having mol. wt. of 807—831, 854—864, and 891—831 respectively, and approximately the same average composition (65.91% C, 9.82% H, 13.7% S). The figures indicate that a small amount of the total sulphur is combined with the alcoholic residue of the water.

G. A. C. GOUGH.

Lower fatty acids of coconut oil. E. R. TAYLOR and H. T. CLARKE (J. Amer. Chem. Soc., 1927, 49, 2829—2831).—Fractionation of 130 kg. of methyl esters of coconut oil acids indicates that this oil contains lower fatty acids as follows: hexoic (0.46%), octoic (8.7%), deoic (5.6%), lauric (45.0%), and myristic acids (16.5—18%).

F. G. WILLSON.

Determination of the iodine value [of oils] in aqueous emulsions. B. M. MARGOSCHES and K. FUCHS (Z. anal. Chem., 1927, 72, 185—187).—Repetition of the work of Fialkov (B., 1927, 304) showed that very low figures were obtained for the iodine value of oils by following the prescribed directions; good results were obtained only by a very much longer time of contact than 5 min., the time varying with different oils.

A. R. POWELL.

Adhesion of waxes. MCBAIN and LEE.—See I.

Refractometer for oils. LÖWE.—See I.

Jute seeds. SEN.—See XX.

PATENTS.

Extraction of fats. H. V. ATWELL (U.S.P. 1,648,102, 8.11.27. Appl., 27.2.23).—The powdered, fat-containing material of vegetable origin is moistened with water, insufficient to form a paste, before treatment with a solvent.

H. ROYAL-DAWSON.

Soaps containing succinic acid (B.P. 279,575).—See XX.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Causes of livering in paints, enamels, and printing inks. P. E. MARLING (Amer. Paint & Varnish Manufrs.' Assoc., Nov., 1927, Circ. No. 319, 535—540).—Mixtures of zinc oxide and variously treated linseed oils

(e.g., blown, heat-treated, free fatty acids added) were observed for livering. It is shown that the acid value of an oil is not a deciding factor in this connexion, its previous history being more significant. The formation of metallic soaps that later redissolve is discussed.

S. S. WOOLF.

Zinc oxide in exterior mixed paints. E. H. BUNCE (Amer. Paint & Varnish Manufrs.' Assoc., Nov., 1927, Circ. No. 319, 541—550).—The advantages of using zinc oxide in paints for exterior use are:—increased gloss of finished surface, protection of binding material from actinic rays, hardening of the film, and neutralisation of acidic decomposition products. Each of these points is amplified.

S. S. WOOLF.

Kauri reduction test as applied to flat wall paints. R. H. EVERETT (Amer. Paint & Varnish Manufrs.' Assoc., Nov., 1927, Circ. No. 319, 570—577).—The kauri reduction test does not give concordant results in the hands of various operators when applied to flat wall paints, nor are the results substantiated by exposure tests on the paints. Reliable conclusions as to the life of this type of paint on exposure may be drawn from the composition by volume of the paint.

S. S. WOOLF.

Evaluation of the kauri-butyl alcohol solvency test [for varnish thinners]. S. R. KIEHL (Amer. Paint & Varnish Manufrs.' Assoc., Nov., 1927, Circ. No. 319, 585—596).—A "solvency" test for varnish thinners dependent on their degree of miscibility with a standard solution of kauri in butyl alcohol is described in full detail. The applications of this test to the specification of individual thinners and to the examination of binary mixtures are illustrated. It is shown that mixtures of equal "solvency" may exercise similar functions when used as thinners.

S. S. WOOLF.

Pigments for iron and steel primers. E. W. FASIG and J. M. PURDY (Amer. Paint & Varnish Manufrs.' Assoc., Nov., 1927, Circ. No. 319, 611—622).—A general dissertation on rusting and rust prevention is followed by details of tests on a number of pigments when placed in wet contact with steel. The results of the tests, which were still proceeding, indicated that among the foremost rust inhibitors, litharge compares favourably with zinc chromate, and it is suggested that red lead pigments with as much as 10% of free litharge are preferable to pure red lead in this connexion.

S. S. WOOLF.

Causes of instability of varnishes on standing. J. F. MAGUIRE (Amer. Paint & Varnish Manufrs.' Assoc., Nov., 1927, Circ. No. 319, 564—569).—A brief summary of the effects of the constituents of varnishes, mixing, ageing, chilling, and centrifuging on the stability of colloidal varnish systems.

S. S. WOOLF.

Polish turpentine. J. FLATAU and A. KORCZYŃSKI (Rocz. Chem., 1927, 7, 246—260).—Turpentine originating from Eastern and Western Poland has been examined. Treatment of the fractions of the former of b.p. 160—168° with hydrochloric acid yields a considerable quantity of bornyl chloride, which is not given by Polish Pomeranian turpentine. In the latter case only terpin hydrate is obtained by the action of dilute acids and subsequent hydrolysis.

R. TRUSZKOWSKI.

Adhesion of resins. MCBAIN and LEE.—See I.

Stability of varnishes and lacquers. BARTELL and OSTERHOF.—See I.

PATENTS.

Printing in greasy inks with gelatin printing surfaces. SANDOR G.M.B.H. (B.P. 263,125, 6.12.26. Ger., 18.12.25).—To avoid the formation of undesirable reliefs in the process of printing in greasy inks with gelatin surfaces, suitable substances are added to the wetting medium with which the gelatin is treated, in order to reduce or delay the swelling of the gelatin. In addition, the temperature of the medium is raised above 22°, the taking up of greasy ink by the high-lights being thereby prevented. S. S. WOOLF.

Printers' ink. CHEM. FABR. AUF ACTIEN (VORM. E. SCHERING) (B.P. 270,671, 13.4.27. Ger., 5.5.26. Addn. to B.P. 239,113; B., 1925, 891).—Manganese dioxide of low bulk density (0.9 or less) is prepared by precipitating a manganese salt with excess of sodium carbonate solution, passing in chlorine until the brownish-black precipitate has completely separated, and drying this precipitate to a water content not exceeding 1.5%. The use of such light-weight manganese dioxide in printers' ink obviates clogging of the type in rotary printing machines. S. S. WOOLF.

Obtaining indelible writings and prints. U. A. D'INZEO (B.P. 280,088, 9.3.27).—Paper or other suitable material, sensitised with a liquid containing gallic acid or tannic acid, is written or printed on with a solution of ferrous nitrate or a chromate, *e.g.*, potassium chromate, in water, alcohol, etc. S. S. WOOLF.

Production of colour bases for varnishes etc. J. S. WILSON, J. THOMAS, and SCOTTISH DYES, LTD. (B.P. 278,765, 12.4.26).—An aqueous vat dye paste is mixed with a suitable medium (castor oil, linseed oil, turpentine, etc.) and the water is evaporated, preferably in a vacuum at 50–60°. C. HOLLINS.

Treatment of decamphorated oil of turpentine. I. G. FARBENIND. A.-G., Assees. of FARBW. VORM. MEISTER, LUCIUS, & BRÜNING (B.P. 255,896, 23.7.26. Ger., 25.7.25. Addn. to B.P. 239,878; B., 1925, 999).—The residue obtained when the non-resinifying portion boiling up to 200° is removed by distillation from decamphorated oil of temperature (*cf.* prior patent) is treated with an oxidising agent, the product being used as a linseed oil substitute. S. S. WOOLF.

Manufacture of titanite oxide. N. SPECHT (U.S.P. 1,649,496, 15.11.27. Appl., 19.5.25. Ger., 24.5.24).—See B.P. 234,518; B., 1925, 670.

Plant for manufacture of paints, enamels, inks, etc. J. R. TORRANCE, and TORRANCE & SONS, LTD. (B.P. 280,041, 30.11.26).

Iron oxide pigment (B.P. 279,283).—See III.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

PATENTS.

Manufacture of elastic, waterproof coatings. H. QUITTNER (B.P. 263,849, 29.12.26. Austr., 30.12.25).—See Austr. P. 104,398; B., 1927, 420.

Method and means for drying rubber or articles containing rubber. TOMLINSONS (ROCHDALE) LTD., and E. W. SMITH (B.P. 280,016, 14.10.26).

XV.—LEATHER; GLUE.

Chrome tanning. V. Properties of differently prepared chromium chloride solutions. E. STIASNY and O. GRIMM (Collegium, 1927, 505–531).—The p_H value of various solutions of normal and 33% basic chromium chloride was determined before and after heating, after ageing for various periods up to three months, after adding a calculated quantity of hydrochloric acid, and, in the case of the basic chloride, after heating both before and after rendering basic respectively. Precipitation values and diffusibility were also determined on the different liquors. The results show that the composition and properties of a solution of chromium chloride depend largely on whether the liquor was heated before being rendered basic, the degree of basicity, on heating or ageing after it was rendered basic, and on ageing after the heating. The effects are indicated by the p_H value of the liquors and the size of the molecules of the basic salts, which determine the colloidal character of the liquor. The following changes are effected by the above treatments:—hydrolysis with the formation of hydroxy-salts or basic salts and free acid; the conversion of hydroxy-salts into "ol" compounds; the further conversion of "ol" bridges into oxygen bridges; the entrance of acid radicals into, or their removal from, the chromium complex; neutral salt effects on the free acid present. When a basic chromium chloride solution was boiled for 5 min. the p_H value altered and only recovered after three days. It also decreased on ageing until it reached 2.79 after four weeks; addition of hydrochloric acid postponed the "ageing" effect. Heating before rendering the solution basic caused chlorine to enter the chromium complex, but there was no chlorine in the complex after the solution had been rendered basic and aged for a short time. Boiling the solution before rendering it basic encouraged the formation of "ol" compounds; "ageing" had the same effect. Boiling was more effective in the formation of "ol" compounds and oxygen bridges after the liquor had been made basic than before. Heating increased the precipitation value both of normal and basic chromium chloride solutions, owing to the formation of "ol" compounds which are less easily precipitable than the hydroxy-compounds. The heating effect was more pronounced with the more basic salts. Ageing diminished the precipitation value of heated solutions, of solutions of normal chloride which had not been heated, and of basic solutions which had been heated before and after rendering basic, but increased the value for basic solutions which had been boiled before rendering basic only. The dialytic properties of the different types of chromium chloride solutions were almost the same, showing that conversion into "ol" compounds does not result in the formation of large molecules unless the basicity exceeds 33%. D. WOODROFFE.

Egg albumin and egg yolk as emulsifying agents in fat-liquoring [of leather]. J. A. WILSON (J. Amer. Leather Chem. Assoc., 1927, 22, 559–565).—A mixture of equal parts of neatsfoot oil and sulphonated neatsfoot oil was mixed with different amounts of fresh whole egg, yolk alone, egg white, and thickened whole egg, respectively, emulsified with water, and kept. The

stability of the various emulsions was determined and plotted as a function of the added egg product. The results showed that thickened whole egg increased the stability much more than fresh egg, and that the yolk alone had very little stabilising power. Egg-white was more stabilising than whole egg. Photomicrographs of leathers treated with various fat-liquors showed that penetration depends directly on the stability of the liquors. Completely penetrated leather was loose. It is necessary in fat-liquoring to lubricate the fibres in the outer layers only, to give strength, softness, and pliability, but an unlubricated layer should be left sufficiently thick to give the leather the necessary tightness and temper. The best fat-liquor distributes the oil in the outer layers of the leather, with the amount decreasing to zero at the middle of the skin. Egg products assist in producing this effect.

D. WOODROFFE.

Influence of neutral salts on the plumping of hides. R. O. PAGE and A. W. PAGE (Ind. Eng. Chem., 1927, 19, 1264—1268).—Pieces of bated cowhide were immersed in solutions of calcium chloride, sodium sulphate, and sodium chloride, of different strengths (0.25—4*N*) and having p_H values of 2, 5, 8, and 11, respectively. The plumping effects on the skins were determined by measuring the increase in thickness with a thickness gauge. The p_H value of the solutions greatly affected the influence of the neutral salts added. In acid solutions (p_H 2) the addition of each of the salts reduced the plumping to a minimum of 0.8 times the original thickness with 0.75*N*-solutions of neutral salt. At greater concentrations the plumping increased again, the increase being greatest with the calcium chloride. At p_H 5 and 8 sodium sulphate gave a flat plumping curve with a minimum at 0.7*N*. Sodium chloride also gave a maximum at about this concentration, but it was less pronounced at p_H 8 than at p_H 5. Increased concentration of calcium chloride increased the plumping at both these p_H values, rapidly at first, then more slowly for *N*- to 3*N*-solutions, and finally more rapidly up to 4*N*. The plumping was greater at p_H 8 than at p_H 5. Hide pieces plumped in the more concentrated solutions lost calcium chloride rapidly and completely on washing, but lost their plumping much more slowly. Hide plumped in 4*N*-calcium chloride retained its plumping even after soaking for one week in distilled water. At p_H 11, increased concentration of sodium chloride depressed the plumping, but much less than in acid solution. The least plumping (1.27) was obtained at the maximum concentration studied. Sodium sulphate depressed the plumping much more rapidly to a minimum 0.84 at 1.5*N*, and then there was a slight increase in stronger solutions. Hide plumped in sodium hydroxide solutions of p_H 12.5 reached apparent equilibrium after one week, but calcium hydroxide solutions of the same p_H value required two weeks. In neither case did the hide fall to its original thickness on restoring it to its original p_H value, but bating helped to reduce it. The nitrogen dissolved from the hide by solutions of neutral salts increased as the plumping in such solutions increased, from which it appeared that these two effects were due to the same cause. Hydrochloric acid was used to give acid solutions for the chlorides and sulphuric acid for the sulphates.

Both acids were tried with sodium chloride, but there was no difference in the influence of the salt on the plumping.

D. WOODROFFE.

Swelling of hide. H. OWRUTSKY (Collegium, 1927, 531—534).—Pieces of un haired, fleshed hide were swollen in 0.1*N*-solutions of hydrochloric and sulphuric acids, and sodium hydroxide, respectively, for 24 hrs., drained, and dried at 24—25°. Four weighings were made during the drying period and curves drawn to show the rate of drying. The results show that acid swelling causes a greater absorption of water than alkaline swelling, and monobasic acids more than dibasic. The acid-swollen pelt lost more water in drying than that swollen by alkalis. The alkaline drying curve was steeper than the acid curves, and the sulphuric acid curve than the hydrochloric acid curve. The water combined with alkaline-swollen pelt is in a weaker state of combination than that in acid-swollen pelt. These results confirm those of Loeb, Procter, and Wilson.

D. WOODROFFE.

PATENTS.

Tanning of animal hides. I. G. FARBENIND. A.-G., Assees. of K. H. MEYER and H. SCHÜTTE (G.P. 441,769, 15.11.23. Addn. to G.P. 420,646; B., 1926, 455).—The products obtained by the action of concentrated sulphuric acid or its monohydrate on lignite tar or low-temperature tar, or fractions derived from these, are used instead of the products described previously (*loc. cit.*).

L. A. COLES.

Tanning of animal hides. J. SCHÄFER, Assr. to J. R. GEIGY, Soc. ANON. (U.S.P. 1,650,541, 22.11.27 Appl., 1.9.26. Ger., 5.8.25).—The hides are treated with a salt of hydrofluosilicic acid before being tanned.

H. ROYAL-DAWSON.

Tanning and dyeing of furs and leather. V. ZETTLITZ, Assr. to A. PFEIFER (U.S.P. 1,649,502, 15.11.27 Appl., 13.1.27. Ger. and Czechoslov., 30.11.26).—Furs or hides are tanned with loam and sodium chloride, then with sodium chloride and alum, then with chrome alum, and finally dyed hot.

B. FULLMAN.

Production of tanning agents from sulphite-cellulose waste liquor. I. G. FARBENIND. A.-G., Assees. of H. SCHÜTTE (G.P. 441,770, 4.4.25).—The liquor, after concentration or evaporation to dryness, is heated with sulphur in the presence of alkaline solutions under such conditions that the product contains little or no insoluble matter. *E.g.*, a mixture of concentrated liquor containing 25% of water, with sulphur and aqueous sodium hydroxide solution, is heated at 110—115° with stirring under a reflux condenser until evolution of hydrogen sulphide slackens, when the product is diluted, filtered if necessary, neutralised, and evaporated to dryness.

L. A. COLES.

Manufacture of leather oil. STANDARD DEVELOPMENT Co. (B.P. 255,908, 27.7.26. U.S., 27.7.25).—A mineral oil (90 pts.) of lubricating grade and having a Saybolt viscosity of 100—300 sec. at 37.5°, is mixed with not less than 5 pts. (8.5 pts.) of sodium sulphonate residue from the acid-treatment of petroleum and 1.5 pts. of cod-oil soap, saponified organic material, or fatty material, and the mixture is heated, cooled, and allowed to settle.

D. WOODROFFE.

XVI.—AGRICULTURE.

Biochemistry of water-logged soils. I. Effect of water-logging on the different forms of nitrogen, on the reaction, on the gaseous relationships, and on the bacterial flora. II. Presence of a deaminase in water-logged soils and its rôle in the production of ammonia. V. SUBRAHMANYAN (J. Agric. Sci., 1927, 17, 429—448, 449—467).—I. Laboratory experiments on the effects of water-logging on soils from Rothamsted and from India are reported. The soils were air-dried, freed from undecomposed plant residues, shaken well with water (100 pts. of soil in 250 pts. of water), and incubated for 40 days, samples being taken for examination at 3-day intervals. There was a marked increase in the content of free and saline ammonia, especially during the first few days, and a slight, though significant, diminution of nitrates. No loss of total nitrogen was observed. The increase in ammonia was correlated with an increase in p_H value. There was no appreciable production of carbon dioxide, but there was diffusion of dissolved oxygen from the surface water into the soil. The results of bacterial counts on several media, together with the lack of production of carbon dioxide, indicate that the formation of ammonia in water-logged soils is not due to biological action. Enzyme action is suggested.

II.—Evidence is given for the occurrence of a deaminase in water-logged soils. The ammonia formed was present mostly in the soil sediment; on allowing the soils to dry, nitrification proceeded rapidly. The production of ammonia took place in presence of volatile antiseptics. An active preparation of the enzyme was extracted from the soil, and the enzymes from cultures of the mixed microflora of the soils also showed deaminising action. Only simple amino-compounds (glycine, aspartic acid, asparagine) were acted upon by the deaminase.

C. T. GIMINGHAM.

Physiological behaviour of moist, air-dried, and repeatedly dried soils. V. KAŠ (Sborn. Czechoslov. Akad. Zemedel., 1926, 1, 89—152).—The changes in physical, chemical, and biological properties of soil after drying, alternate wetting and drying, and freezing are described. The differences are considered to be a direct indication of productivity. CHEMICAL ABSTRACTS.

Acidity, degree of saturation, and lime requirement of soils on the basis of pot experiments. P. OBST, K. WODARZ, and D. MEYER (Z. Pflanz. Düng., 1927, 10A, 65—90).—Comparison is made of the effects of lime, precipitated chalk, and potassium carbonate in reducing soil acidity. Precipitated chalk was the most rapidly effective and potassium carbonate the least. The "exchange" acidity was neutralised within four weeks in most cases, but the calculated amount of lime necessary for this proved insufficient to remove all acidity. The lime requirement of various soils for different crops showed considerable differences in the degree of acidity necessary for optimum growth. In a few cases the addition of more than the optimum quantity of lime reduced crop yields. The physiological reaction of nitrogenous fertilisers is shown to be of importance in acid soils. The "degree of saturation" characteristic of a neutralised soil differs for soils of

different types, and is not a satisfactory basis for determination of their lime requirement. A. G. POLLARD.

Effect of different manures on soil of strongly acid reaction. A field experiment. E. MÖLLER-ARNOLD and E. FEICHTINGER (Z. Pflanz. Düng., 1927, 6B, 497—501; cf. B., 1926, 959).—In continuation of earlier work, the results of field experiments with various manures on the yield of rye on a very acid soil (p_H 4.0) are discussed. The effect of liming in the spring showed itself in the same year. Sodium nitrate gave a greater increase of yield than ammonium sulphate. C. T. GIMINGHAM.

Action of phosphoric acid on lime in the presence of clay and pulverulent materials. R. DUBRISAY and (Mlle.) F. DESBROUSSES (Compt. rend., 1927, 185, 1036—1038; cf. A., 1927, 827).—The fixation of phosphoric acid in the soil (*i.e.*, its reaction with calcium carbonate to form an insoluble phosphate) is shown to be inhibited by the presence of absorbing material, particularly clay, even when the proportion of lime is high enough to convert all the acid. The phenomenon is due to the increased solubility of calcium phosphate in water containing carbon dioxide. J. GRANT.

Neubauer's seedling method [for determination of available phosphorus and potassium in soils]. E. GÜNTHER (Z. Pflanz. Düng., 1927, 6B, 502—506).—In using the Neubauer method it is essential to select the rye seed to be used so that the weight per 100 seeds is constant within narrow limits. Experiments indicate that the upper layers of the soil samples tested are not completely exhausted of available phosphorus and potassium by the growth of one lot of seedlings. The weakest point in the method is the difficulty of fixing limiting values for available phosphorus and potassium which will apply to all soils. C. T. GIMINGHAM.

Evaluation of phosphatic fertilisers by means of their solubility in nitric and citric acids. K. BAMBERG (Z. Pflanz. Düng., 1927, 10A, 100—103).—The effect of the reaction of extracting acids on the solubility of fertiliser phosphates is recorded. The p_H value of citric extracts increases with the period of contact with the fertiliser to an extent characteristic for each fertiliser, and the final value differs for each. The solubility of the phosphate also increases with the contact period, but not proportionally to the p_H value. Variations in p_H values when nitric acid is used differ in nature and extent from those of citric acid. Nitric acid extracts more phosphate from fertilisers than citric acid when used at similar relative concentration. The possibility of the activity of nitrifying organisms affecting the availability of phosphates in soil is indicated.

A. G. POLLARD.

Influence of prolonged cultivation on the nitrogen content of unmanured soils. J. DUMONT (Compt. rend., 1927, 185, 605—608).—The nitrogen content of a piece of unmanured land fell from 2.04 to 1.19 g./kg. during 53 years of cultivation. The annual losses vary considerably, and are much less during the years in which leguminous crops were grown. The loss of nitrogen of another piece of unmanured land, which was cultivated annually for 35 years, was found to be slightly more than

half that of a similar piece of land not regularly cultivated.

G. A. C. GOUGH.

Soil acidity. S. ODÉN (Trans. 2nd Comm. Internat. Soc. Soil Sci., 1927, B, 10—29).—The action of acids on clay consists of the neutralisation of hydroxyl ions on the surface of the particles, together with the aggregation of particles, whereby part of the surface becomes protected from the action of the acid, and finally direct dissolution of mineral particles. The rate and extent of these three processes are largely dependent on the hydrogen-ion concentration of the fluid and on the physical conditions of the mixture. With high hydrogen-ion concentration the coagulating effect predominates, and at low concentrations neutralisation is the main effect. The complete neutralisation of hydroxyl ions is not instantaneous, and this is assumed to be due to the plaited or spongy nature of the clay particle surface and to the consequent lapse of time required for the diffusion of neutralising ions to the interior.

A. G. POLLARD.

Behaviour of acid and alkaline soils with iodine manuring. T. VON FEELLENBERG (Biochem. Z., 1927, 188, 326—338).—Animal charcoal adsorbs elementary and ionised iodine much better than do kieselguhr, kaolin, or precipitated calcium carbonate, and these latter substances adsorb elementary iodine better than ionised iodine. The power to set iodine free from added potassium iodide of two alkaline and two acid soils is investigated. With a particular soil, formation of iodine increased with increasing amounts of added iodide, and from 5% of potassium iodide upwards became slower and quite regular. Two acid soils set free considerable amounts of iodine, but only traces from two alkaline soils, the amount of iodine set free varying directly with the acidity of the soil. By mixing the acid soil with 10% of stable manure, its action was almost completely inhibited. With acid soil and iodine manuring, the roots were completely rotted. In the corresponding experiments without iodine, and in similar experiments with the addition of stable manure, the roots were uninjured, and the conclusion is drawn that iodine manuring with acid soils impairs resistance to disease. With four types of soil a comparison is made of the amount of iodine used as manure and the amount absorbed by plants. Increase of iodine affects the leaves more than the roots.

P. W. CLUTTERBUCK.

New form of quinhydrone cell for measurements of hydrogen-ion concentration in soils. L. SMOLIK (Trans. 2nd Comm. Internat. Soc. Soil Sci., 1927, B, 149—150).—The use of the agar bridge and the connecting vessel for potassium chloride solution is obviated, and the whole is enclosed in one vessel.

A. G. POLLARD.

Potentiometric p_H determinations in soil. F. TERLIKOWSKI (Trans. 2nd Comm. Internat. Soc. Soil Sci., 1927, B, 151—155).—Variations in p_H values due to drying of soil samples or alterations in the soil: water ratio of the suspensions follow no definite rule. Changes in p_H with varying soil: water ratio are greatest between the ratios 2:1 and 1:1. Fresh soil samples are recommended for the determination. For the most satisfactory results a soil: water ratio of 1:1 or 1:0.5

should be used, as under these conditions the fluid is well-buffered, and not seriously affected by carbon dioxide.

A. G. POLLARD.

Rapid method for the mechanical analysis of soils. G. J. BOUYOUKOS (Science, 1927, 65, 549—551).—Since most of the physical and physico-chemical properties of soil reside in the colloidal portion, a determination of this fraction by the rapid hydrometer method may replace the tedious mechanical analysis.

A. A. ELDRIDGE.

Mechanical analysis of soils. II. M. KÖHN (Z. Pflanz. Düng., 1927, 10A, 91—99).—Mathematical formulæ underlying standard methods of mechanical analysis do not commonly include temperature effects. The effect of temperature changes on the density and viscosity of water, and therefore on the rate of sedimentation of soil particles, is discussed. Particles of more than 0.2 mm. mean diameter are not seriously affected by changes of temperature, but with finer particles the velocity of settling at 30° may be as much as double that at 5°. Means for calculating a temperature correction are indicated.

A. G. POLLARD.

Micro-determination of nitrogen in soils. M. TANAKA (Bull. Agric. Chem. Soc. [Japan], 1927, 2, 161—162).—An application of Dubsy's method (A., 1919, ii, 169), whereby 0.01 mg. of total nitrogen may be determined in soil is described; the error does not exceed 1%.

CHEMICAL ABSTRACTS.

Determination of nickel in soils. G. SCHIECKENTHAL (Z. Pflanz. Düng., 1927, 10A, 104—107).—Methods for the determination of nickel in soil are described, and many determinations of iron and nickel are recorded. The relative proportions of iron and nickel in soils of similar origin are generally similar. The nickel content of soils of more recent origin is relatively greater than that of older soils.

A. G. POLLARD.

Applicability of Trénel's "acidimeter." G. LAUFER (Z. Pflanz. Düng., 1927, 6B, 486—489).—The use of Trénel's "acidimeter" for electrometric determination of the p_H value of phosphate solutions, soil suspensions, and soil filtrates has been investigated. The method is rapid, and the results are accurate if the standard solution and the unknown solution differ only slightly in p_H value. If solutions differing considerably are compared a much longer time must be allowed before taking the reading, and the results, even then, are not entirely reliable.

C. T. GIMMINGHAM.

Crop variation. IV. Experimental determination of the value of top dressings with cereals. T. EDEN and R. A. FISHER (J. Agric. Sci., 1927, 17, 548—562).—A contribution to field experimental technique. The experiment described was designed to compare the effect on the yield of autumn-sown oats of single and double dressings of ammonium sulphate and chloride (equivalent amounts of nitrogen), applied at two different dates (March 15 and June 5). Ninety-six plots were laid out (eight-fold replication of treatments), and the arrangement of the plots and the choice of combination of treatments were such that the effects of soil heterogeneity were eliminated, and each plot yield contributed to the accuracy of all the comparisons desired. A high

degree of accuracy in the results was thus obtained, the standard error for grain being 1.39% and for straw 2.22%. The results showed that a significant response in the yield of grain was confined to the quantity of nitrogenous top-dressing, the effects of kind and date of application being inappreciable, even with the low standard error attained. In regard to yield of straw, the advantage shown by the double dressing was confined to the early application; no differences as between the effects of sulphate and chloride were found.

C. T. GIMINGHAM.

Nutritive and manurial values of sugar beet tops. H. E. WOODMAN and J. W. BEE (J. Agric. Sci., 1927, 17, 477—488).—The results of digestibility trials on sheep with English-grown sugar beet tops are recorded. The figures for the digestion coefficients of the various constituents are in good agreement with corresponding figures given by Kellner, and it is concluded that sugar beet tops form a palatable feeding stuff of high digestibility, the carbohydrate constituent, consisting partly of sugar derived from the crowns of the roots, being especially digestible. The digestibility of the fibre is also notably high. A study of the lime balances in the sheep during the trials indicate that the lime in the tops may not be in an available form, possibly owing to the presence of oxalic acid in the leaves. Analytical data show that sugar beet tops are extremely rich in inorganic constituents, though the percentage of phosphoric acid is relatively low. Average figures are given from which the manurial value may be calculated.

C. T. GIMINGHAM.

Solubility of phosphorites in salt solutions saturated with carbon dioxide. K. FLEROW (Z. Pflanz. Düng., 1927, 10A, 109—114).—In the presence of carbon dioxide, comparison of the effect of alkali salts on the solubility of phosphorites indicates that the influence of anions is in the order $SO_4 > NO_3 > Cl$. Increased concentration of salts increases the phosphate solubility, though not in direct proportion. Among the cations calcium is the least effective on the solubility of phosphate. Fertiliser salts affect the solubility of soil phosphates, calcium usually decreasing this.

A. G. POLLARD.

Reactions of Moravian soils. J. SMOLÍK (Vestn. Czechosloven. Akad. Zemedelske, 1926, 219 pp.).—Values of the p_H of various types of Moravian and Central European soils are recorded. The quinhydrone method of determination is preferred. CHEMICAL ABSTRACTS.

Laterite and lateritic soils in Sierra Leone. F. J. MARTIN and H. C. DOYNE (J. Agric. Sci., 1927, 17, 530—547).—A study of the red soils of Sierra Leone leads to the suggestion that the classification of laterite and lateritic soils should be based on an examination of the clay fraction. It is proposed that soils in which the silica-alumina ratio in the clay fraction falls below 2.0 should be described as lateritic, and those in which this ratio falls below 1.33 as laterite soils.

C. T. GIMINGHAM.

Contact insecticides. V. Toxicity of amines and N-heterocyclic compounds to *Aphis rumicis*, L. VI. Insecticidal action of the fatty acids, their methyl esters, and sodium and ammonium salts. F. TATTERSFIELD and C. T. GIMINGHAM (Ann. Applied

Biol., 1927, 14, 217—239, 331—358; cf. B., 1927, 86).—V. Using the methods already described, it is shown that tetramethylammonium hydroxide and salts are highly toxic to *A. rumicis*, and that the corresponding tetraethylammonium compounds are markedly less toxic. Certain interesting relationships in regard to toxicity to insects among the substituted anilines and naphthylamines are noted. The heterocyclic rings constituting the molecule of nicotine are much less toxic than is nicotine itself. Hydrogenation of pyridine and pyrrole increases their toxicity. Benzylpyridine is the most toxic pyridine derivative tested.

VI. The toxicity of the fatty acids increases as the series is ascended from acetic to undecic acid, formic acid being exceptional. Beyond this point there is a fall in toxicity, and acids higher than tridecic show only slight toxic action. The sodium and ammonium salts and the methyl esters are, in general, much less toxic than the corresponding acids, the differences being least in the case of the ammonium salts. The fatty acids do not show marked toxicity to certain insect eggs at concentrations below 2%. Possible relationships between certain physical properties (physical state, volatility, dissociation constants, partition coefficients, and surface tension) of the fatty acids and their insecticidal action are discussed.

C. T. GIMINGHAM.

Manufacture of artificial "farmyard manure." O. LEMMERMANN and E. GERMUM (Z. Pflanz. Düng., 1927, 6B, 481—485).—Experiments are reported on the preparation of artificial farmyard manure by fermentation of straw wetted with dilute solutions of urea and other nitrogen compounds (cf. Hutchinson and Richards, J. Ministry Agric., 1921, 28, 398; B., 1920, 827A). The product closely resembled well-rotted natural farmyard manure in composition and general appearance.

C. T. GIMINGHAM.

Amount of resins in forest humus and its influence on humification of organic matter. A. NĚMEC (Compt. rend., 1927, 185, 1154—1155; cf. B., 1926, 335).—The formation of humus in the dead surface layer of forest soils and the rate of nitrification vary inversely with the percentage of resins present and inversely with the acidity of the soil. *Oxalis acetosella* and other plants are found where the soil is rich in humus and nitrifying bacteria.

B. W. ANDERSON.

Action of metals [zinc, copper, and iron] on solutions of fungicides. A. WINKELMANN (Z. angew. Chem., 1927, 40, 1393—1394).—The behaviour of solutions of mercurial fungicides, of the strength usually employed, during contact for 30 min. with sheets of iron, copper, and zinc has been investigated. None of the metals has any serious action on "Germisan" or "Segetan-Neu" solutions, iron precipitates practically the whole of the mercury from "Kalimat B" and wheat "Fusariol" solutions, and the greater part from "Urania" and "Uspulun" solutions, zinc precipitates serious amounts of mercury only from the "Fusariol" solutions, and copper is badly corroded by "Urania," precipitates only small quantities of mercury from "Uspulun" and "Fusariol," and is inert in the other cases.

A. R. POWELL.

Jute seeds. SEN.—See XX.

PATENTS.

Increasing the yield of the soil for growing plants and fruits. A. WENDLER (B.P. 251,285, 22.4.26. Ger., 22.4.25).—The yield of crops may be increased by covering the soil with strips of material composed of two layers of weatherproofed paper or the like, having a series of wires fitted between them through which an electric current is passed. The covering is perforated for the growth of the plants in a manner which avoids exposing the wires. C. T. GIMMINGHAM.

Manufacture of an arsenical product [insecticide]. J. F. BLYTH and C. ELLIS (U.S.P. 1,649,562, 15.11.27. Appl., 3.1.25).—Finely-divided arsenious oxide is treated with an excess of quicklime in the presence of just sufficient water to give a substantially dry powder consisting of a mixture of basic calcium arsenite and calcium hydroxide. An insecticide low in water-soluble arsenic is claimed. C. T. GIMMINGHAM.

Copper derivative for combating animal and plant pests. R. LIESKE and W. BONRATH, Assrs. to WINTHROP CHEMICAL CO., INC. (U.S.P. 1,649,536, 15.11.27. Appl., 23.3.25. Ger., 10.4.24).—See F.P. 595,974; B., 1927, 536.

XVII.—SUGARS; STARCHES; GUMS.

Extraction of crystallised sucrose from the carob. G. ODDO and V. DE FONZO (Giorn. Chim. Ind. Appl., 1927, 9, 400).—Industrial extraction of sugar from the carob, which contains 20–26% of sucrose and about 15% of invert sugar, may be effected by the direct action of organic solvents, especially ethyl or methyl alcohol or acetone. The sugar is obtained first as pale yellow crystals with a pleasant carob odour, both colour and odour disappearing after a single crystallisation; the yield of white sugar varies from 16 to 23% of the weight of carobs. Distillation of the mother-liquors leads to the recovery of almost the whole of the solvent, which may be used for subsequent extractions. The residual thick molasses contains dextrose and lævulose, together with 2–3% of sucrose, and may be utilised for the preparation of sweetmeats, alcohol, antiparasitic mixtures for plants, etc. The seeds, amounting to about 10% of the weight of the carob, sell at about 1.2 lire per kg., the perisperm yielding a dyestuff which imparts delicate pink tints to silk and wool, and the albumin a size for dressing and tanning; the residues also are utilisable. Sicily produces 300,000–450,000 quintals of carobs per annum, and the whole of Italy about 800,000 quintals. T. H. POPE.

Adsorption of sucrose by adsorbent carbons. J. VAŠÁTKO (Z. Zuckerind. Czechoslov., 1927, 52, 21–32).—Adsorption equilibrium between active carbons and pure sucrose solutions of concentrations up to 65% was investigated with apparatus which enabled the solutions to be filtered at the equilibrium temperature without evaporation losses. 200 c.c. portions of the sugar solutions, rendered very slightly alkaline, were shaken with 10 g. of carbon previously freed from acidity, dried at 80°, and then exposed to the air, and the change in concentration of the sugar solutions was determined. The results obtained at 20° are accounted for by assuming that both sucrose and water are adsorbed,

each in proportion to the logarithm of its concentration. In the case of Supranorit 3, for example, 1 g. adsorbs 0.302 g. of water from pure water; with increasing concentration of sugar the amount of water adsorbed diminishes logarithmically whilst that of sugar increases, so that 0.575 g. would be adsorbed from a 100% solution. The maximum adsorption of water and sugar together occurs in presence of 40% solutions, and amounts to 0.703 g. per g. of carbon. For the six carbons tested, the relative adsorptive powers for sucrose, at 20°, were: Carbo animalis, 0.954; Supranorit 3, 0.575; Carboraffin, 0.616; Kahlbaum's Spodium, 0.436; Superior Norit, 0.224; Standard Norit, 0.229. The relative water-adsorbing powers were, in the same order, 0.539, 0.302, 0.500, 0.369, 0.225, 0.231. Adsorption of water, or imbibition, is of technical importance, for it increases the volume of the carbon and retards filtration. In general, imbibition will be greater with carbons activated by means of chemicals (impregnation) than with those activated by hot gases. Experiments at high temperatures, up to 80°, indicate that adsorption of sucrose increases slightly with rise of temperature, but adsorption of water decreases considerably. J. H. LANE.

Decomposition of sucrose by adsorbent carbons. J. VAŠÁTKO (Z. Zuckerind. Czechoslov., 1927, 52, 129–137).—Twelve active carbons were treated with dilute alkali, washed until practically neutral, and dried. Quantities up to 18 g. were shaken with 200 c.c. portions of a 20% sucrose solution of p_H 8.0 for 5 hrs. In many cases considerable decomposition of sucrose occurred with formation of invert sugar and acid products. The amount of decomposition varied with the temperature, the character and amount of the carbon used, and the intensity of shaking. At 20° the decomposition was negligible in all cases. At 85° all the solutions containing more than 10 g. of carbon per 200 c.c. became more or less acid, as did some of those containing less. In a number of cases 10–20% of the sucrose was inverted or decomposed. Only slight decomposition was produced by the carbons activated by gaseous treatment, viz., Carbo animalis, the Norit products, and Polycarbon. In marked contrast with this group were Carboraffin, Carboraffin H, blood charcoal, Antichromos, and Kahlbaum's Spodium, most of which are activated by impregnation processes. With few exceptions the members of the first group contain more than 90% C, less than 2% of ash, and less than 0.2% Fe_2O_3 , whilst those of the second group are poorer in carbon and contain more mineral matter and iron. There is no apparent relation between adsorptive power and decomposing action on sucrose. The decomposition is autocatalysed by the acids formed, and is, therefore, greatly reduced by increase of initial alkalinity. J. H. LANE.

Molasses formation and the nature of molasses. H. CLAASSEN (Z. Ver. deut. Zucker-Ind., 1927, 675–678).—The formation of molasses is attributed to combination of part of the sugar with salts present, whereby the ratio of free sugar to water falls below the ordinary saturation ratio. In cane molasses the salts combine by preference with the invert sugar, so that the ratio of sucrose to water corresponds more nearly with that of a pure solution than is the case with beet

molasses. Another factor contributing to molasses formation is the high viscosity, which at low temperatures impedes or prevents crystallisation to the true equilibrium point. Prolonged heating of impure syrups at high concentrations and high temperatures increases the amount of sugar-salt compounds and so diminishes the recoverable sugar. Hence in sugar-boiling it is best to work quickly and at as low a temperature as possible, and to limit the re-boiling of syrups; three rapid boilings are preferable to two slow ones. Another effect of prolonged boiling, not detectable by analysis or viscosity measurements, is to increase the temperature difference necessary between the heating steam and the evolved steam; probably the sugar-salt compounds impede the formation of bubbles and so raise the temperature required for ebullition under a given pressure.

J. H. LANE.

Trimethylamine in the vapours from carbonatation [of beet juices]. J. DĚDEK (Z. Zuckerind. Czechoslov., 1927, 52, 33—35).—An account of an attempt to identify and determine the volatile bases which accompany ammonia in the vapours from beet sugar factory juices. These bases represent less than 1% of the total nitrogen of the volatilised matters. Only trimethylamine was isolated in the pure state. No traces of mono- or di-methylamine were found, but more complex bases of the pyridine group were present although not identified.

J. H. LANE.

Determination of the crystal content of raw sugars. O. SPENGLER and C. BRENDL (Z. Ver. deut. Zucker-Ind., 1927, 679—689).—The method recently described (B., 1927, 730) gives the amount of technically recoverable crystals in raw sugars, but for accurate determinations of the total crystal content a modified method is now described in which the raw sugar is mixed with syrup saturated at the temperature of the test instead of 3° below, and a felt or flannel pad is placed in the centrifugal apparatus to retain fine grain. The new method is thus identical in principle with that of Herzfeld and Zimmermann (B., 1912, 244), but the apparatus is smaller and somewhat different in design.

J. H. LANE.

Determination of ash in raw [beet] sugars by incineration and by the electrometric method. F. HERLES (Z. Zuckerind. Czechoslov., 1927, 52, 145—148).—The electrometric determination of ash in beet sugars by means of Sandera's apparatus (B., 1927, 312) gave results which in 108 out of 127 cases enumerated agreed to within 0.03% with the values found by the usual method of incineration. In the remaining 19 cases the differences were due to the presence of matter insoluble in water and therefore without melassigenic action. With few exceptions the sugars tested contained less than 1.3% of ash.

J. H. LANE.

Determination of ash in raw [beet] sugars. C. MRASEK (Z. Zuckerind. Czechoslov., 1927, 52, 149).—Results for 21 first-product beet sugars confirm the close agreement between the results of the electrometric and the incineration methods, reported by Herles (preceding abstract) and others. The average difference for the 21 samples was 0.007%.

J. H. LANE.

Determination of melassigenic nitrogen in beet-

root. M. S. FILOSOFOV (Ukraine Chem. J., 1926, 2, 127—135).—The total soluble nitrogen in beetroot was first determined and then that present as amides and ammoniacal salts, the difference giving the amount of melassigenic nitrogen—*i.e.*, that present as betaine and primary amines. The values so obtained agreed within 0.04% with those found by direct titration with formalin. In the case of treacle it is necessary to acidify the solution before titration until an acid reaction towards litmus is given.

A. RATCLIFFE.

Control of spectrophotometric measurements [of sugar juices]. H. LUNDÉN (Z. Ver. deut. Zucker-Ind., 1927, 709—713).—A reply to criticisms of a recent paper (B., 1927, 395) by Spengler and Landt (*ibid.*, 664). The Lambert-Beer law of absorption holds only for perfectly clear solutions, and cloudiness is much more difficult to eliminate from cane than from beet sugar products. In refinery working the yield of sugar obtainable from a massecuite can be calculated if two suitable analytical values are known for the massecuite itself, and for the sugar and syrup obtained by centrifuging. Using as analytical values the dry-substance content and the spectrophotometric absorption, the author calculated yields from affination and from massecuite working which agreed to within 3% with the actual yields of sugar found by weighing.

J. H. LANE.

Clarification of starch conversion liquors in manufacture of corn sugar and corn syrup. M. S. BADOLLET and H. S. PAINE (Ind. Eng. Chem., 1927, 19, 1245—1246).—A method for the flocculation of the colloidal material in acid starch conversion liquors is described. Since the colloid particles have a positive electric charge, coagulation is produced by the addition of negatively charged colloids such as bentonite, colloidal aluminates, colloidal alkaline compounds of iron, silicates of aluminium, etc., together with sodium carbonate to reduce the acidity. The results obtained by clarification with sodium carbonate alone and with bentonite and sodium carbonate are compared. The latter method, after correcting for the weight of bentonite present, gave an increase in weight of flocculated precipitate over that obtained by sodium carbonate, varying from 3 to 258%. The colloidal material flocculates and settles more rapidly, and the liquor is better prepared for treatment with activated carbon. Of the nine converter liquors examined, the amount of bentonite per 1000 gals. of liquor, *i.e.*, the amount required to reach the isoelectric point, varied from 0.8 to 23.3 lb. (cf. B., 1926, 507).

E. H. SHARPLES.

Decomposition of starch by the amylase of *Aspergillus oryzae* and of malt with special reference to the limit of decomposition. S. NISHIMURA (Woch. Brau., 1927, 44, 533—535).—When starch is acted on by commercial taka-diastrase (from *Aspergillus oryzae*) or by an extract from malt, over 95% may be hydrolysed provided a sufficiently large amount of enzyme is employed. Under these conditions the normal limit of decomposition (70—80%) is exceeded independently of the action of "complement." W. O. KERMACK.

Purity quotient of [sugar] beet juice. O. SPENGLER and C. BRENDL (Z. Ver. deut. Zucker-Ind., 1927, 747—752).

Adhesion of gums. MCBAIN and LEE.—See I.

Refractometer for sugar. LÖWE.—See I.

PATENTS.

Decolorisation of sugar crystals. RAFFINERIE TIRLEMONTAISE SOC. ANON. (B.P. 278,302, 2.11.26. Ger., 30.9.26).—Sugar crystals which have undergone a preliminary washing to free them from the adhering syrup, but which are still coloured, are mashed with a colourless saturated or nearly saturated sugar solution for a period of time depending on the depth of colour. The crystals are then separated from the solution by centrifugal action or other means, and the separated solution which has absorbed the colouring matter is decolorised by filtration through charcoal and used again.

F. R. ENNOS.

Curing of massecuite. RAFFINERIE TIRLEMONTAISE SOC. ANON. (B.P. 274,799, 2.11.26. Ger., 24.7.26).—An increased yield of sugar crystals is obtained from massecuite by subjecting it to prolonged cooling and removing a part of its water content by evaporation, either during the cooling process or on its completion. The resulting pasty or plastic mass is then separated into sugar crystals and syrup by centrifuges operating at a considerably greater centrifugal force (1500—1600 times the weight of the mass) than those previously used for the purpose.

F. R. ENNOS.

Removal of false grain from sugar syrups or molasses. RAFFINERIE TIRLEMONTAISE SOC. ANON. (B.P. 274,800, 2.11.26. Ger., 24.7.26).—The sugar syrup or molasses is (a) subjected to an extremely high centrifugal force (1800—8000 times the weight of the mass treated, depending on the viscosity of the syrup and the size of the false grain) and the false grain collected on the unperforated casing of the centrifuge; or (b) mixed, before centrifuging, with air or other gas in a fine state of division and the false grain separated with the froth formed on the upper surface of the mass after centrifuging.

F. R. ENNOS.

Porous materials from sugar-factory residues (B.P. 280,116).—See IX.

Polyamyloses (G.P. 442,963).—See XVIII.

XVIII.—FERMENTATION INDUSTRIES.

Transformation of the α -bitter acid of hops (humulone) on boiling in aqueous solutions of different p_{H} values, and the nature of the products formed. W. WINDISCH, P. KOLBACH, and R. SCHLEICHER (Woch. Brau., 1927, 44, 453—459, 473—478, 485—490, 497—502).—Humulone, the α -bitter acid of hops, when boiled with malt wort or aqueous solutions not far removed from neutrality, is converted into a mixture of soft resins, soluble in light petroleum, and hard resins insoluble in this solvent. The hard resins are oxidation products and are not formed if air is rigorously excluded. The soft resins are intermediate products in the transformation of humulone into humulinic acid, a transformation which proceeds to completion on boiling with moderately strong alkali. In slightly acid liquids, such as wort, only about a third of the humulone is converted into soft resins by 2 hrs. boiling, and scarcely any humulinic acid is formed. The soft resins are probably

a mixture of two compounds, one isomeric with humulone and the other of lower mol. wt. J. H. LANE.

Influence of temperature of storage of yeast under water on fermentation, reproduction, and acid-formation in wort. F. STOCKHAUSEN and F. WINDISCH (Woch. Brau., 1927, 44, 478—481).—If bottom-fermentation brewery yeast from the vats, after being sifted and washed, is kept under cold water until required for later fermentations, the temperature of the water has an influence on the vigour of the yeast. Comparison of the effects of storage for three days under water at 1°, 4°, 7°, and 18° showed that the lower the temperature the more rapid were fermentation and reproduction during the first few days of the subsequent fermentations, but by the end of the full fermentation period (nine days) the degree of attenuation, the weight of the yeast crop, and the wort acidity were practically the same in all cases. J. H. LANE.

Tartaric acid index in red and white pressed wines. FONZES-DIACON (Ann. Falsif., 1927, 20, 467—471).—A red, pressed wine may have a very similar content of alcohol and acid to the corresponding unpressed wine. The two classes of wine may be distinguished by means of the tartaric acid index, which is greater than 1 for the unpressed wine and less than 1 for the pressed wine; in addition, the pressed wine has a larger extract and ash, and a smaller total of fixed acid and alcohol. The differences in composition between the pressed and unpressed white wines are somewhat greater, and the former might easily be mistaken for a diluted wine were it not for the fact that it has the characteristics of an abnormal wine (cf. B., 1926, 104; 1927, 24), viz., potash calculated as cream of tartar greater than 4, tartaric acid index less than 1, volatile acidity less than 1. The relatively high alcohol and potash content, as well as the low percentage of tartaric acid, in pressed wines is probably accounted for by the fact that there is a larger amount of sugar and a smaller amount of tartaric acid in the outer than in the inner portion of the grape before complete ripening, whilst in pressed wine a large proportion of potash is derived from the stalks. F. R. ENNOS.

***l*-Glutamic acid as nitrogenous nutriment for yeast.** A. DOLINEK (Z. Zuckerind. Czechoslov., 1927, 52, 35—43).—Among the nitrogenous constituents of beet molasses *l*-glutamic acid, the lactam of α -amino-glutaric acid, is second only to betaine in quantitative importance. Raw sugar molasses contain more than 2% and sometimes 5—8%. Molasses from refineries working beet sugar usually contain rather more than raw sugar molasses of the same campaign, probably because prolonged heating of molasses converts part of the glutamic acid present into *l*-glutamic acid. The nitrogen of glutamic acid is more readily assimilated by yeast than that of ammonium sulphate, but glutamic acid is much inferior to either in this respect. This may account in part for the fact that the nitrogen of beet molasses from refineries is sometimes less assimilable than that of raw sugar molasses. J. H. LANE.

Melibiose. I. R. WEIDENHAGEN (Z. Ver. deut. Zucker-Ind., 1927, 696—708).—Melibiose is present in bottom- but not in top-fermentation yeasts. From

the former it can be quantitatively extracted after autolysis with toluene if the liquid is maintained neutral by addition of ammonia as required. Extracts so obtained are much more active than those from dried yeast. Their hydrolytic action on melibiose solutions does not proceed as a unimolecular reaction, the velocity declining too rapidly. The optimum reaction is at p_{H} 5.0. Yeast extracts obtained as described have the power of decomposing α -methylgalactoside (cf. Hérissey and Aubry, B., 1914, 272). J. H. LANE.

Influence of certain factors on formation of empyreumatic oil by fermentation of molasses. S. JANKOVIĆ (Arhiv Hemiju, 1927, 1, 218—226).—The yields of empyreumatic oil from the alcoholic fermentation of molasses increase with temperature and concentration of molasses, and fall with increasing acidity of the culture medium. With dilute solutions the addition of large quantities of yeast causes increased production of oil, whilst with concentrated solutions the yield of oil is greater when smaller quantities of yeast are used. R. TRUSZKOWSKI.

Dehydration of aqueous-alcoholic liquids. P. BRUN (Compt. rend., 1927, 185, 1132—1134).—The method of Gay and Massol (cf. B., 1924, 802) has been applied in the light of the author's studies of mixtures of ethyl and isoamyl alcohols and water, the principal constituents of fusel oils (A., 1926, 895). Mixtures containing less than 92% of amyl alcohol should be treated with potassium carbonate after the mixture of the alcohols. In other cases the separated ethyl alcohol should be partly dehydrated with potassium carbonate and, after removal of the saline layer, added to the pure isoamyl alcohol (purified by simple rectification). J. GRANT.

Power alcohol from waste vegetable materials. ANON.—See II. **Decomposition of starch by amylase.** NISHIMURA.—See XVII.

PATENTS.

Treatment of [alcoholic] liquids containing tasty and aromatic substances for the purpose of improving their taste and aroma. I. G. FARBENIND. A.-G., Assees. of CHEM. FABR. GRIESHEIM-ELEKTRON (B.P. 259,598, 7.10.26. Ger., 12.10.25).—Alcoholic liquids may be "aged" by withdrawing a portion of the liquid, subjecting it while under pressure to the action of very rapidly moving surfaces, e.g., the blades of a rotor rotating at high speed, with substantially complete exclusion of air, returning the treated portion to the main body of the liquid, and continuing the process until the desired effect has been obtained. According to the nature of the liquid it may be cooled, heated, or alternately cooled and heated during the treatment, and the internal friction of the liquid and the heating effect produced by the action of the rapidly moving surfaces may be increased by the presence of substances dissolved or finely distributed in the liquid. F. R. ENNOS.

Fermentation at constant temperature. C. O. BERTÍN (F.P. 615,532, 3.5.26).—The number of yeast cells in a given quantity of liquid is artificially reduced by mechanical means, or by the addition of a definite quantity of fermented liquid or of must from which the

yeast has been removed completely or partially after the beginning of the fermentation. In this way the heat losses due to radiation, convection, etc. are balanced by the heat given out by the fermentation process, so that the temperature remains constant. F. R. ENNOS.

Dehydration of alcohol by distillation. U.S. INDUSTRIAL ALCOHOL CO., Assees. of D. B. KEYS (B.P. 268,728, 29.11.26. U.S., 30.3.26).—A continuous process for the removal of water from alcohol by means of benzene, ethyl acetate, carbon tetrachloride, hexane, etc. is described, the essential novelty being that after separation of the two layers forming the condensate, the aqueous-alcoholic layer poor in benzene (etc.) is diluted with sufficient water to cause a further separation of benzene (etc.) before passing to the rectifier. Alternative arrangements of plant are figured suitable for use with (a) benzene, ethyl acetate, hexane, (b) carbon tetrachloride. About equal amounts of benzene and 95% alcohol are introduced into a plate-column heated at 79° at the bottom and kept at about 65° at the top. Absolute alcohol is run off through a trapped pipe at the bottom; the vapours of constant-boiling ternary mixture pass from the top of the column through a dephlegmator to a condenser, and the condensate is collected in a separating chamber. The benzene layer overflows into a rectifying column, where vapours of ternary mixture are evolved and returned by way of a dephlegmator and condenser to the separating chamber; pure benzene is drawn off from the bottom of the rectifying column and pumped back to the alcohol-dehydrating column. The aqueous-alcoholic layer (containing some benzene) is diluted with water in a second separating chamber, the upper layer passing to the benzene-rectifying column, and the lower layer to an alcohol-recovery column. Here the remaining benzene passes off in vapour of ternary mixture, leaving behind aqueous alcohol of about 30% strength, which, after rectification to 95% in a final column (water being run off), returns to the original dehydrating column. C. HOLLINS.

Dehydration and rectification of alcohol and other volatile products. G. BAUGÉ and T. ÉPAILLY (F.P. 615,732, 6.5.26).—The alcohol is intimately mixed with the dehydrating material, consisting of powdered copper sulphate and an inert non-porous material, e.g., sand, silica, etc., both of which have been freed from water (including that of crystallisation). The process is repeated as many times as is necessary with fresh portions of dehydrating material, and the alcohol is subsequently distilled; the dehydrating material is freed from water for further use. F. R. ENNOS.

Butyl [alcohol]-acetone fermentation. COMMERCIAL SOLVENTS CORP., Assees. of D. A. LEGG (B.P. 278,307, 28.3.27. U.S., 1.10.26).—A normal yield of solvents is obtained from carbohydrate fermentation, regardless of the presence of an ultravirus or bacteriophage in the mash, by rendering the butyl-acetone bacilli resistant to epidemics of sluggishness. The immunisation is accomplished by repeatedly subcultivating the bacilli in a sluggishly fermenting mash or in a Berkefeld filtrate therefrom, the cultures being heated for 3 min. at 100° before each transfer in order to eliminate attenuated vegetative cells (cf. U.S.P. 1,582,408; B., 1926, 563). C. RANKEN.

Isolation of polyamyloses. I. G. FARBENIND. A.-G., Assees. of F. LANGE (G.P. 442,963, 25.1.25).—The solution obtained by fermentation of starch or starchy materials with bacteria is treated with a halogen derivative of the ethylene series. The additive compounds of polyamyloses separate in easily filterable form.

C. HOLLINS.

XIX.—FOODS.

Influence of the age of a milk on the result of pasteurisation. A. WOLFF (Milch. Zentr., 1927, 11, 233—238).—Cultures on gelatin and agar-agar were made of samples of fresh milk and of the same milks after sterilising by heating for $\frac{1}{2}$ hr. at 62–63°, followed by rapid cooling, and a comparison was made of the total number and of the relative proportions of the different kinds of bacteria in the fresh and sterilised milks. Similar tests were made on the milk after keeping for periods varying from 2 to 8 hrs. at temperatures from 8° to 30°. The results show that the number of bacteria surviving pasteurisation, as well as the percentage of these calculated on the total number present in the unpasteurised milk, are greater for the milks which have been kept for a time than for those which were sterilised at once. In practice, it is therefore preferable to sterilise a milk as early as possible and then to keep it cool, rather than to keep it in cold storage and sterilise later.

F. R. ENNOS.

Composition of the fat of mare's milk. O. LAXA (Ann. Falsif., 1927, 20, 462—464).—The fat extracted from a sample of mare's milk had m.p. 8–9°, f.p. 5–6°, saponif. value 227.8, Reichert–Meissl value 7.0, Wauters–Polenske value 6.1. The composition of the fat was caprylic acid 2.29%, capric acid 2.19%, oleic acid 67.80%, the remaining 27.72% consisting of lauric, myristic, and palmitic acids, and glycerol. The milk fat, unlike that of ruminants, contained no butyric or caproic acids.

F. R. ENNOS.

Determination of lactic acid in milk. J. STRAUB (Rec. trav. chim., 1927, 46, 866—884).—Lactic acid is determined in milk, which has been freed from casein and lactose, by distilling with 1% of sulphuric acid and 0.02*N*-potassium permanganate, collecting the distillate in standardised potassium hydrogen sulphite, and determining the excess with iodine solution. Other constituents which affect the freezing point of milk (chlorides and lactose) are determined and their total contribution to the observed depression is calculated. The difference between this figure and the observed depression is due to substances of unknown nature, and is large in the milk from cows suffering from udder disease, but is also present in normal milk.

G. A. C. GOUGH.

Use of quinhydrone electrode for following changes of p_H in Swiss cheese. P. D. WATSON (Ind. Eng. Chem., 1927, 19, 1272—1274).—For control of the cheese-making process, a combination of the capillary quinhydrone electrode of Cullen and Billmann (A., 1925, i, 1201) and the cheese quinhydrone electrode of Knudsen (B., 1926, 105) is employed, the former for the 3- or 4-hr. period after dipping (*i.e.*, on the whey) and the latter on samples of the cheese itself during the remainder of the run. Whereas the hydrogen

electrode can only be used for 3 hrs. owing to the difficulty of obtaining sufficient whey, the method described allows the changes in p_H value to be followed during the whole process. Identical values were obtained with the three types of electrodes on two unrelated cheeses during the first 3 hrs. The method is fully described and the effect of varying the cooking temperature, type of starter, and variation in percentage of starter on the p_H of the cheese during manufacture has been examined.

E. H. SHARPLES.

Effect of temperature on the basic viscosity of ice-cream mixes. A. LEIGHTON and O. E. WILLIAMS (J. Physical Chem., 1927, 31, 1663—1668; cf. B., 1927, 375).—The basic viscosity of different water concentrations of two mixes of essentially the same composition has been found over the temperature range 8° to –1°. The viscosity varies linearly, inversely as the temperature. The viscosity of the unfrozen portion of the mix increases during the freezing process, which brings about an increase in concentration of the milk solids and sugar in the liquid phase.

L. S. THEOBALD.

Composition, constitution, and food value of residues from the grinding of wheat. J. ALQUIÉR (Ann. Falsif., 1927, 20, 445—462).—The bran residues in modern milling practice fall into three or four main classes, the exact number, nomenclature, and fineness of division of each residue of which vary with the source of supply and methods of grinding employed. Microscopical examination reveals no predominant structure in any one type, each being a mixture of the pericarp, germ, and small amounts of adhering flour. Chemical analysis shows that the proportion of starch diminishes with increase in the pentosan and the cellulose content, and the ratio of starch to pentosan or of starch to cellulose varies regularly from one type to another, having values which within fairly wide limits are characteristic of each. Biological analyses based on the period of survival of rats fed solely on these residues serve to differentiate them into two distinct classes. The suitability of the residues as constituents of stock foods is due not only to the adhering flour, but also to their high content of amino-acids and vitamins. 100 pts. of corn yield 74.5 pts. of flour for bread-making, 6 pts. of flour adhering to the residues, 16 pts. of residues (without flour), 1.5 pts. of germ, and a 2% milling loss.

F. R. ENNOS.

Application of p_H theory to the conservation of grain and cereal by-products. H. LEGENDRE (Compt. rend., 1927, 185, 1156—1158).—The addition of small quantities of harmless alkaline materials to grain in storage or transport, by altering the p_H value, successfully inhibits the formation of sugars by the action of diastases on starch from the split grains. The absence of sugars prevents the multiplying of bacteria and thus obviates the usual rise in temperature with its attendant evils of germination and fermentation.

B. W. ANDERSON.

Behaviour of certain varieties of pears towards cold storage. E. BOTTINI (Annali Chim. Appl., 1927, 17, 457—486).—Pears of certain varieties cultivated in Italy may be stored under suitable conditions at 1–2°. Different kinds require different degrees of atmospheric

moisture and different rates of ventilation. Pears thus treated contain no appreciable amount of sucrose when mature, but otherwise scarcely differ from those ripened naturally, although their weight is diminished by about 10%. "Internal breakdown" sometimes occurs, but may be minimised by gathering the fruit in the proper condition, and "scald" may be avoided by promoting the elimination of the volatile esters by suitable ventilation. T. H. POPE.

Barbary figs. A. AZADIAN (Ann. Falsif., 1927, 20, 464—467).—Analyses of a number of samples of the fruit from different sources show that it is composed on the average of 40% of rind, and 60% of fruit containing 82% of pulp and 18% of seeds. The pulp contains 8.66—12.36% of solids, 0.28—0.73% of ash, 0.05—0.81% of acidity, 0.20—0.70% of proteins, and 8.06—10.22% of sugars. On extraction with ether and light petroleum, the seeds yield 5.8% of an oil which has d_{4}^{25} 0.9253—0.9493, saponif. value 193—205, acid value 3—6, and iodine value 102.8—117.4. F. R. ENNOS.

Nutritive value of sugar beet tops. WOODMAN and BEE.—See XVI.

PATENTS.

Preparation of flavouring, nourishing, and similar substances from proteins, carbohydrates, or other animal or vegetable matter. M. FUJII (B.P. 279,985, 11.9.26).—Animal or vegetable matters such as proteins or carbohydrates are decomposed to peptones or sugars respectively by treatment with alkali or acid, and the resulting product is neutralised by glutamic acid or its salts produced by treating animal or vegetable proteins in an autoclave with a catalyst (powdered iron or iron oxide) and mineral acid and heating to the usual temperature and at a pressure not exceeding 4 atm. The disodium or other metallic salts are used for neutralisation after the acid treatment, and glutamic acid or its hydrochloride after the alkaline treatment, the quantity of each which is used being sufficient to produce the monosodium salt of glutamic acid. The neutralised product may be concentrated or dried with or without the addition of one or more medicinal substances, foods, or flavours. F. R. ENNOS.

Method and apparatus for curing [maturing] flour. E. C. R. MARKS. From INDUSTRIAL APPLIANCE Co. (B.P. 279,958, 10.8.26).—A mixture of chlorine with a small quantity of nitrosyl chloride gas is diluted with air or other inert gas and forced through dilute aqueous ammonia contained in a reaction tower, the chlorine and nitrosyl chloride being in excess of the amount which will combine with the ammonia. The tower is filled with glass balls or similar objects to ensure intimate mixing of the gases resulting from the reactions, which are then brought into contact with the flour in a dispersed state in a treating chamber. F. R. ENNOS.

Preservation of eggs. A. ANDRIEU (F.P. 619,375, 28.11.25).—The eggs are cooled to -1° and placed in a closed, air-tight container into which, after removal of the air, a mixture of carbon dioxide and nitrogen is introduced. After allowing sufficient time for the eggs to absorb the inert gases, they are removed and stored at $0-1^{\circ}$. F. R. ENNOS.

Preservation of feeding stuffs. J. TAUFER, V. PAVLAK, and M. BAYER (F.P. 613,213, 22.3.26. Conv., 6.4.25).—Green fodder, beet parings, etc. are placed in an air-tight container, e.g., of concrete, which has a lid with a rim dipping into a liquid seal consisting of water, oil, or a mixture of water and glycerin. While in the container the feeding stuffs undergo lactic acid fermentation with evolution of carbon dioxide which escapes through the liquid seal, and the final product is preserved and protected from further decomposition by the absence of air. F. R. ENNOS.

Preservation of green fodder containing sap. B. DIRKS (G.P. 443,884, 12.1.23).—Green fodder may be economically, simply, and safely preserved by treating layers of the material, pressed for storage purposes, with a dilute solution of formic acid. F. R. ENNOS.

Manufacture and preservation of green fodder pulp or other green plant pulp and of dry products made therefrom. K. EREKY (B.P. 270,629, 28.9.26. Hung., 7.5.26).—Green plants are comminuted by a cutting apparatus, so as to disrupt the individual cells and set free the fluid plasm therefrom. The fluid pulp produced, which contains fragments of cell walls but no intact cells, may be separated into cell juice and cell-wall residues by sieving, centrifuging, etc., and brought into condition for storage by cooling or treating with disinfectants. F. R. ENNOS.

Production of [stabilised] vitamins. C. FUNK and H. E. DUBIN, Assrs. to H. A. METZ LABORATORIES, INC. (U.S.P. 1,649,520, 15.11.27. Appl., 13.5.22).—The vitamin content of materials may be stabilised by mild hydrogenation of the material at a temperature insufficient to destroy the vitamin. The stabilised vitamin may be separated. E.g., a vitamin concentrate may be obtained from cod-liver oil by emulsification in water, hydrogenation in the presence of colloidal platinum, separation of the hydrogenated product, and crystallisation from chloroform. The product is extracted with alcohol and ether, and the residue purified by the digitonin precipitation. B. FULLMAN.

Production of pure white pectin. R. PAUL and R. H. GRANDSEIGNE (F.P. 614,882, 22.4.26).—Pectin is precipitated from solution by the addition of acetone and the product is washed repeatedly with acetone. L. A. COLES.

Production of leavened dough products. T. B. WAGNER and C. A. GLABAU (U.S.P. 1,649,144, 15.11.27. Appl., 21.6.24. Renewed 5.4.27).—See B.P. 235,874; B., 1927, 154.

Apparatus for treating [pasteurising] milk etc. A. G. ENOCK & Co., LTD., and E. C. ENOCK (B.P. 280,328, 21.9.26.)

XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Production of saponins from horse-chestnuts. R. VADAS (Chem.-Ztg., 1927, 51, 895).—Horse-chestnuts are defatted with light petroleum, extracted with 70% alcohol, and the extract is evaporated under reduced pressure. The residue is dissolved in alcohol and the raw saponin, containing 5—6% of ash, is precipitated by the addition of ether. The product

is heated with 6 pts. of acetic anhydride in presence of zinc chloride; the acetylated saponin is collected on a filter and mixed with freshly precipitated lead hydroxide, whereby a snow-white, ash-free saponin is produced which is removed by filtration and dried in a vacuum (cf. B., 1924, 993; 1925, 469).

E. H. SHARPLES.

Determination of morphine when present in small quantities. H. BRINDLE (Pharm. J., 1927, 119, 608—609).—The method proposed by Nicholls (B., 1922, 159 A) and recommended by Caines (B., 1927, 570) is found to be accurate both for small and large quantities. Free alkali hydroxide must be neutralised before the addition of ammonia. For quantities less than 0.02 g. the colorimetric method with potassium iodate is employed; in this case it is essential that the standard colours and the morphine solution should be prepared under exactly the same specified conditions.

S. I. LEVY.

Rapid determination of urotropine. E. OLIVERI-MANDALA and G. RICCARDI (Annali Chim. Appl., 1927, 17, 487—490).—About 0.5 g. of the urotropine is boiled with 40 c.c. of *N*-sulphuric acid until all odour of formaldehyde disappears (about 30 min.). The cold liquid is diluted with water and the unused acid determined by titration with *N*-sodium hydroxide in presence of Methyl Orange, the amount of urotropine in the sample being calculated in accordance with the equation: $(\text{CH}_2)_6\text{N}_4 + 6\text{H}_2\text{O} + 2\text{H}_2\text{SO}_4 = 6\text{CH}_2\text{O} + 2(\text{NH}_4)_2\text{SO}_4$. The result may be checked by adding excess of formaldehyde to the neutralised solution, so as to effect the reverse reaction to the above, and determining by titration the sulphuric acid liberated. Disagreement between the two results indicates the presence in the original urotropine of ammonium salts, the amount of which is determined by the excess of alkali required in the second titration.

T. H. POPE.

Reactions of anæsthetic ethers with potassium hydroxide and with mercury, and the test for foreign odours. E. MALLINCKRODT, JUN. (J. Amer. Chem. Soc., 1927, 49, 2655—2666).—The method of the U.S.P. X. test for aldehyde in ethyl ether is normally not sensitive to less than 0.05% of aldehyde; 0.01% of aldehyde may be detected by pouring 30 c.c. of the ether on to 5 g. of freshly-broken potassium hydroxide stick, adding 1 drop of water, and keeping the mixture in the dark for up to 12 hrs., when a brown colour is produced on the surface of the potassium hydroxide and a paler tint in the solution. If alcohol is present a brown coloration, due to this impurity, may develop on the potassium hydroxide in 12 hrs., so that the test for aldehyde should be examined after 6 hrs. Disturbance of the aldehyde test due to alcohol is reduced by the addition of water. Thus anhydrous ether containing 1.42% of alcohol becomes turbid and yellowish in contact with dry potassium hydroxide in 6 hrs., but remains clear for 24 hrs. if 3 drops of water are added in the test. The test is unreliable in the presence of peroxides unless the amount of the latter is very small. Shaking the ether with metallic mercury decomposes the peroxides with liberation of aldehyde, but probably not quantitatively. The presence of considerable amounts of per-

oxides and alcohol is indicated by the appearance of a turbidity which remains constant in intensity for some hours, but this turbidity is not easily distinguishable from that due to alcohol alone. If the ether contains several per cent. of alcohol together with about 0.1% of acetaldehyde, there is formed in the above test a precipitate resembling ferric hydroxide. Acetaldehyde and furfuraldehyde behave similarly to acetaldehyde. Traces of paraldehyde produce no coloration unless previously decomposed by warming the sample with a drop of sulphuric acid. By evaporating 30 c.c. of ether slowly in a beaker covered with a watch-glass to 1—2 c.c., and pouring the residue slowly on to filter paper, a final residue is obtained the odour of which affords a delicate test for impurities. The presence of alcohol is thus made manifest, whilst water retards the evaporation on the paper. Peroxides form an oily spot at the centre of the paper or at the margin of the evaporating liquid, and then produce a characteristic irritation when placed close to the nostrils.

F. G. WILLSON.

Jute seeds—*Corchorus Capsularis*. I. N. K. SEN (J. Indian Chem. Soc., 1927, 4, 205—208).—A preliminary investigation of jute seeds, used medicinally in India in cases of fever, is made. Extraction of the seeds with light petroleum yields a yellow oil (14.7%; d_{20}^{25} 0.921; $[\alpha]_D^{25} \pm 0$; iodine value, 109.2; acid value, 24.07) which dries in air to a rubber-like mass. The oil is thought to be a mixture of glycerides of unsaturated fatty acids. The extracted seeds lose their bitter taste when re-extracted with spirit—a process which yields a substance which separates from acetone and glacial acetic acid in white, hygroscopic crystals (shrinking at 98° and decomposing at 105°, $[\alpha]_D^{25} + 103.6^\circ$; found, C, 31.16%; H, 9.65%). This substance has a bitter taste and corresponds in chemical properties with a glucoside. From the mother-liquors another colourless substance with a very bitter taste is obtained in small amount.

G. A. C. GOUGH.

Essential oil of *Eucalyptus Bakeri* (Maiden). A. R. PENFOLD (J. Proc. Roy. Soc. New South Wales, 1927, 61, 179—189).—Examination of the oils, obtained in 1% yield on freshly cut leaves, and 2% on air-dried, from four samples of *E. Bakeri*, shows the presence of the following substances: cineole (70—77%), together with small amounts of cymene, *d*- α -pinene, phloracetophenone dimethyl ether, m.p. 82—83° (from one sample only), *p*-isopropylphenol, cuminal, cryptal, phellandral, cuminal, phellandrol, and formic, isobutyric, and isovaleric acids (free and combined).

H. BURTON.

Biological assay of aconite. M. G. JAUREGUI (J. Amer. Pharm. Assoc., 1927, 16, 1045—1052).

Refractometer for sugar. LÖWE.—See I.

Calcium citrate. MELIS.—See VII.

Contact insecticides. TATTERSFIELD and GIMMINGHAM.—See XVI.

PATENTS.

Preparation of ethyl chloride from ethyl alcohol. I. G. FARBENIND. A.-G., Assees. of K. DACHLAUER and E. EGGERT (G.P. 441,747, 15.2.24).—Ethyl alcohol vapour and hydrogen chloride are passed over a phos-

phoric acid-active carbon catalyst at 280–300°. The yield (75% with ordinary active carbon) is 97%.

C. HOLLINS.

Preparation of hydroxyalkylamides of o-hydroxybenzoic acids. I. G. FARBENIND. A.-G., Asses. of W. KROPP (G.P. 442,038, 13.12.24).—Salicylic and cresotic hydroxyalkylamides, obtained by the usual methods, have powerful antirheumatic and antineuralgic action. *Salicylic β-hydroxyethylamide*, m.p. 119°, prepared from β-aminoethyl alcohol and methyl salicylate or o-acetoxycarbonyl chloride (with subsequent hydrolysis), *salicylic βγ-dihydroxy-n-propylamide*, and *m-cresotic β-hydroxyethylamide*, m.p. 88°, are described. C. HOLLINS.

Preparation of water-soluble, easily hydrolysed benzyl derivatives. AUGUSTE-VICTORIA-APOTHEKE REHWALD & WEISS, and H. OHLE (G.P. 441,463, 10.5.25; cf. Hintzelmann, Joachimoglu, and Ohle, A., 1926, 288).—Benzyl esters of aliphatic and aromatic hydroxy-acids are esterified with chlorosulphonic acid, e.g., in pyridine at –10°, to give sulphato-compounds which form water-soluble sodium salts. *Benzyl sodiosulphatoglycolate*, $\text{CH}_2\text{Ph}\cdot\text{O}\cdot\text{CO}\cdot\text{CH}_2\cdot\text{O}\cdot\text{SO}_3\text{Na}$, sinters at 90°, fully melted at 170° (*potassium, calcium, and barium* salts also described), and benzyl sodiosulphatomandelate (“betilon,” *loc. cit.*) are obtained from benzyl glycolate and mandelate, respectively. C. HOLLINS.

Manufacture of 1:3-di[hydr]oxy-4-carboxy-6-phenylethylbenzene [2:4-dihydroxy-αβ-diphenylethane-5-carboxylic acid]. F. HOFFMANN-LA ROCHE & Co. A.-G. (B.P. 272,232, 7.6.27. Ger., 4.6.26).—2:4-Dihydroxy-αβ-diphenylethane, obtained by reduction of the condensation product of resorcinol with phenylacetonitrile, is carboxylated by heating with aqueous sodium hydrogen carbonate at 140° under pressure, or by the action of carbon dioxide on the dry sodio-derivative (prepared by means of sodium ethoxide) at 100–120° under pressure. The 2:4-hydroxy-αβ-diphenylethane-5-carboxylic acid, m.p. 190° (decomp.), so produced has strong germicidal properties even in neutral solution and passes unabsorbed through the human body. C. HOLLINS.

Preparation of means for fighting bacterial diseases. C. RÄTH (B.P. 262,080, 10.11.26. Ger., 24.11.25).—Virulent bacterial cultures are inoculated with non-alkaloid derivatives of pyridine or quinoline (e.g., 5-iodo-2-hydroxypyridine), or such derivatives are added to a nutrient broth on which the culture is then grown, or a culture is washed with salt solution, centrifuged, and the residue treated with the pyridine or quinoline derivative in salt solution. Vaccines are so obtained which are both prophylactic and curative; they may also be used in the processes of B.P. 247,965 (B., 1927, 619). C. HOLLINS.

Manufacture of n-propyl ester of 2-phenylquinoline-4-carboxylic acid. A. J. STEPHENS. From J. A. VON WÜLFING (B.P. 279,745, 17.6.27).—*n-Propyl 2-phenylquinoline-4-carboxylate*, m.p. 63°, obtained by the usual esterification methods, is non-irritant and tasteless, and dissolves uric acid in the human body more readily than methyl, ethyl, or allyl esters. C. HOLLINS.

Production of 6-chlorothymol. F. RASCHIG (B.P.

270,283, 21.4.27. Ger., 29.4.26. Cf. G.P. 433,293; B., 1927, 237).—6-Chloro-*m*-cresol is condensed with isopropyl alcohol in presence of sulphuric acid at 80–90° giving 6-chlorothymol in 54% yield. This may be reduced by iron and alkali at 200° (G.P. 396,454; B., 1924, 825) to thymol. C. HOLLINS.

Production of santalol derivatives. S. G. S. DICKER. From VER. F. CHEM. IND. A.-G. (B.P. 278,982, 14.7.26).—*Santalyl bromoacetate*, prepared by treating santalol in chloroform solution with bromoacetyl bromide and quinoline, combines with hexamethylenetetramine to form a soluble, non-irritant compound with scarcely any bitter taste. The bromoacetate may be replaced by santalyl nitrate, sulphate, *thiocyanate* (prepared from santalyl chloride and sodium thiocyanate in dry acetone), or *benzenesulphonate* (prepared from santalol, benzenesulphonyl chloride, and pyridine in ether). C. HOLLINS.

Production of derivatives of organic amino- or imino-compounds. S. G. S. DICKER. From VER. F. CHEM. IND. A.-G. (B.P. 255,468, 14.7.26).—Amines, imines, amides, or imides (e.g., pyrrolidine, diethylbarbituric acid, or diaminodihydroxyarsenobenzene) are solubilised by condensation first with bromoacetyl bromide, then with hexamethylenetetramine. C. HOLLINS.

Preparation of monocyclic ketones, having more than nine ring members, and of their alkyl derivatives. M. NAEF and F. FIRMINICH (B.P. 263,153, 14.12.26. Switz., 15.12.25. Addn. to B.P. 235,540; B., 1925, 738).—Polymethylenedicarboxylic acids or their anhydrides are converted into cyclic ketones by heating with metals (or their oxides etc.) of the aluminium and titanium groups (excluding cerium and thorium) or with uranyl compounds. 3-Methylcyclopentadecanone, b.p. 125°/0.3 mm., is prepared by heating aluminium γ-methyltetradecane-αω-dicarboxylate in a vacuum at 300–500°, fractionating the distillate, and isolating the ketone as *semicarbazone*, m.p. 164°. 4-Methylcyclopentadecanone, b.p. 125°/0.3 mm. (*semicarbazone*, m.p. 166°), from δ-methyltetradecane-αω-dicarboxylic acid, and cyclonadecanone, m.p. 72°, b.p. 160°/0.3 mm. (*semicarbazone*, m.p. 184°), are similarly prepared. Erbium, yttrium, didymium, lanthanum, uranyl, titanium, zirconium salts, or mixtures of these may be used. The ketones have an odour of natural musk. C. HOLLINS.

Production of organic arseno-compounds. A. BINZ and C. RÄTH (B.P. 255,892, 22.7.26).—The formation of alkali-insoluble products in the reduction of hydroxylated organic arsenic acids, containing no amino-group, to arseno-compounds is prevented by using as reducing agent aldehyde- or ketone-sulphoxylic acids, e.g., formaldehydesulphoxylic acid, acetone-sulphoxylic acid, or diformaldehydesulphoxylic acid (hydroxymethyl hyposulphite; cf. Binz, Hueter, and Goldenzweig, A., 1918, i, 4; Binz, *ibid.*, i, 291). The freshly prepared acids may be used, or they may be introduced as sodium salts and acid added. Arseno-compounds are prepared from 2-hydroxypyridine-5-arsinic acid, its 3-bromo-derivative, and *o*-, *m*-, and *p*-carboxybenzenearsinic acids. C. HOLLINS.

Manufacture of 4-hydroxy-3-acetamidoaryl-arsinic acids. W. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 278,789, 7.7.26).—A 4-nitro-2-acetamidophenol is reduced to amine and converted by Bart's method (B.P. 568 of 1911) into the corresponding 2-acetamidophenol-4-arsinic acid. 3-Acetamido-*o*-cresol-5-arsinic acid (B.P. 254,086) and 6-chloro-2-acetamidophenol-4-arsinic acid (B.P. 257,361; B., 1926, 932) have already been prepared by this method. 4-Nitro-2-acetamidophenol is reduced to the 4-amino-compound which is converted into 2-acetamidophenol-4-arsinic acid; 6-chloro-4-amino-2-acetamidophenol, m.p. 222—224°, gives 6-chloro-2-acetamidophenol-4-arsinic acid.

C. HOLLINS.

Production of soaps, cosmetics, and medicinal preparations containing succinic acid. H. H. VON KORNATZKI (B.P. 279,575, 7.8.26).—Rectified oil of amber and succinic acid, in the same relative proportions as they are obtained in the rectification with water of crude oil of amber, are added to the usual ingredients of soaps, cosmetics, and medical preparations.

S. S. WOOLF.

Removal of nicotine from tobacco products. C. PORT (B.P. 279,757, 16.7.27).—After subjecting the products to warm, moist air in a storage chamber for 2—6 days, they are transferred to a closed, uniformly heated vessel, the temperature of which is quickly raised to 150°. The generated steam is continually removed by means of a pump. H. ROYAL-DAWSON.

Purification of vaccines. F. BILLON (U.S.P. 1,649,381, 15.11.27. Appl., 2.6.26. Fr., 6.6.25).—The vaccine pulp is treated with a diluting mixture consisting of 1500 pts. of glycerin and 1 pt. of trichloronitromethane.

F. G. CROSSE.

Ampoules for the preparation of solutions, more particularly for medical and like purposes. "PHARMAGANS" PHARMACEUTISCHES INST. L. W. GANS A.-G. (B.P. 264,215, 22.7.26. Ger., 5.1.26).

Recovery of acetic acid (B.P. 268,778).—See V.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Latent image and development. H. J. VOGLER and W. CLARK (Brit. J. Phot., 1927, 74, 670—671).—The evidence for the view that developability of the latent image is occasioned by its having a certain minimum of size is summarised, and it is suggested that developability is due to the formation on the grains of a stable space-lattice of silver. Latent image centres may be incapable of acting as development centres if they do not form a lattice which is sufficiently stable to withstand the peptising tendency of the developer or, in the case of physical development after fixation, of the fixing bath.

W. CLARK.

Hypersensitisation and ultrasensitisation [of positive plates]. P. GUILLEMINOT (Bull. Soc. Franç. Phot., 1927, 69, 234—237).—Dyestuffs studied were Pinachrome, Pinaverdol, Pinaflavol, Pinacyanol, and Orthochrome of Meister Lucius, and Olochrome, Chlorochrome, and Erythrochrome of Calzavarrá, the general

formula for hypersensitisation being distilled water 40 c.c., 90% alcohol 40 c.c., alcoholic dye solution (1/1000) 4 c.c. For ultrasensitisation, 10 c.c. of a 0.2% solution of ammoniacal silver chloride were added. Strict control of temperature is necessary otherwise fog results. Results showing the effects for exposure to various colours are tabulated for the positive plate "Lactate tons noirs." The basic dyes Pinaflavol and Olochrome confer practically no sensitivity by the methods used. Best results were obtained with Pinaverdol and Chlorochrome, which gave sensitivity values respectively 34—40 times the initial value. The red sensitisers Pinacyanol and Erythrochrome give good results in hypersensitisation, but bad fog when ammoniacal silver chloride is added to the bath. Blue sensitivity is reduced by the use of most of the dyes alone, an effect which is due to their screening action rather than to a true desensitisation. Addition of ammoniacal silver chloride does not change the screening effect but increases the sensitivity to the blue. The gamma of the plates is only slightly reduced by the treatment. It is possible to obtain fine-grained plates of high gamma with a speed higher than that of many negative plates.

W. CLARK.

XXII.—EXPLOSIVES; MATCHES.

Safety explosives. P. NAOÛM (Z. angew. Chem., 1927, 40, 1351—1359).—An account is given, with special reference to German conditions, of the various stages by which freedom from explosions due to the use of explosives in dusty and fiery mines has been attained. The claim is made that any explosions at the present time can be attributed, not to the explosive, but to ignition of coal or firedamp by burning remnants of the detonator. The most recent German procedure for testing explosives prior to authorisation for use in mines is described. The problem of determining the duration and amount of flame following the initiation of an explosion is then discussed, and photographs are given of the flames from typical modern French and German explosives; it is deduced that, in this respect, the German explosives are in advance of the French. Examples are quoted to illustrate the loss in power due to the necessity of keeping the temperature of the explosion gases below a certain maximum.

S. BINNING.

Nitroglycerin washing process. A. SCHMID (Z. ges. Schiess- u. Sprengstoffw., 1927, 22, 308—311).—The loss of nitroglycerin occasioned by the normal washing method, consisting of three pre-washes (100 g. of oil to 40 c.c. of water at 30°, 35°, and 40° for 10 min.), a soda wash (40 c.c. of 4% soda at 40° for 30 min.), and a final water wash (40 c.c. at 30° for 10 min.), is only about 1% (calculated on the glycerin used), the alkaline wash being responsible for at most 0.2% loss. Stabilisation is slow owing to the insolubility of soda in nitroglycerin, and may be hastened by the use of aqueous ammonia as the wash liquor or by adding to the soda solution a small quantity of an amine, e.g., aniline, which dissolves readily in the nitroglycerin, forms with the free acid a water-soluble salt, and is regenerated when this salt passes into the aqueous alkaline phase. The amine should not be added until about 2 min. after the beginning of the wash, when the bulk of the free acid has been

neutralised (as otherwise the oil becomes discoloured), and stirring continued for 3—5 min. A single wash of this nature yields a product of high heat-test and a final water wash is unnecessary. The amine remains dissolved in the nitroglycerin at the end of the wash, but it acts as a stabiliser and, owing to the small amount present, the explosive properties of the product are not affected. An apparatus suitable for a continuous washing of nitroglycerin by this process is described.

W. J. POWELL.

Nitrocelluloses soluble in alcohol. S. K. HAGEN (*Z. angew. Chem.*, 1927, 40, 1359—1361).—The solubilities in ethyl alcohol have been investigated for nitrocelluloses prepared from cotton that has been heated at $155^{\circ} \pm 2^{\circ}$ in a stream of nitrogen for various periods. Experiments were also made on nitrocelluloses prepared from mercerised cotton and from cotton that had been both heated and mercerised. The percentage of nitrogen was lowered to some extent by these treatments, which, however, had a marked effect on the solubility in alcohol. Nitrocellulose from untreated cotton had a solubility of 28%, which was doubled when the cotton had been heated for 6 hrs. Complete solubility in alcohol was not attained even after prolonged heating. Mercerisation, although more effective than a 48 hrs. heating, failed to yield a completely soluble nitrocellulose, but a cotton that had been both mercerised and heated yielded on nitration a nitrocellulose which had a solubility of 97—99% in alcohol.

S. BINNING.

PATENTS.

Manufacture of explosives. R. K. HEZLET and A. HIGHFIELD (B.P. 279,529, 25.6.26).—The gelatinisation of nitrocellulose by nitroglycerin or other nitric esters is facilitated by using a gelatiniser which contains suitable proportions of polar and non-polar groups. A mixture of an alcohol and/or nitroglycerin or other nitric ester is suitable. In the cases of blasting gelatin, gelignite, or gelatin dynamite the alcohol is added to a mixture of nitroglycerin and nitrocellulose. In manufacturing ballistite small amounts of alcohol are added during the rolling of the paste. The process is applicable to both solvent and non-solvent powders. The surface of granular powders may be gelatinised by spraying the grains with alcohol or with an alcoholic solution of nitric esters.

S. BINNING.

Propellant powder. C. H. KECK (U.S.P. 1,649,784, 15.11.27. Appl., 6.11.26).—The powder contains nitrocellulose 74.5%, dinitrobenzene 20%, mononitroxylene 5%, and a stabiliser 0.5%.

S. BINNING.

XXIII.—SANITATION; WATER PURIFICATION.

Determination of oxygen in drinking and river water. L. W. HAASE (*Gas- u. Wasserfach*, 1927, 70, 1065—1067).—In preparing the precipitate of manganous hydroxide in Winkler's method of determining oxygen in water, the sodium hydroxide should not be added before the manganous chloride, as this results in a visible liberation of oxygen which persists for several days. Errors are liable to occur on account of the heat evolution, with subsequent contraction of the liquid,

accompanying the formation of manganous hydroxide, and to differences in temperature between the water sample and the surrounding air. Care must be exercised in removing the clear liquid above the hydroxide precipitate, to prevent any unoxidised hydroxide coming into contact with the atmosphere. To destroy traces of nitrites in water a few drops of 5% sodium azide solution should be added before acidification, and to ensure complete liberation of iodine after acidification the mixture must be kept in a closed flask for at least 10 min. before titrating with 0.01*N*-thiosulphate. The latter must be standardised with potassium chromate shortly before each determination. In taking the original water sample, it is important to avoid the passage of air bubbles through the water.

W. T. K. BRAUNHOLTZ.

Determination of dissolved oxygen in water. V. SUBRAHMANYAN (*J. Agric. Sci.*, 1927, 17, 468—476).—A modification of Thresh's method (B., 1890, 327) is described, which eliminates the error due to loss of iodine, carried away by the gas passing through the apparatus during the titration. The method also obviates the need for making separate determinations of the dissolved oxygen in the reagents used.

C. T. GIMMINGHAM.

Determination of free chlorine in drinking and washing water. W. OLSZEWSKI and H. RADESTOCK (*Pharm. Zentr.*, 1927, 68, 733—735).—The limits of sensitiveness and methods of preparing the appropriate solutions are given for the determinations by means of benzidine and potassium iodide, respectively. The former is positive for concentrations of free chlorine between 0.03 and 0.1 g. per litre; for higher concentrations the iodide method is more suitable. The temporary hardness of the water to be tested must be known before the benzidine method can be employed; tables are given of the quantities of reagent and acid to be employed with increasing hardness.

S. I. LEVY.

Volumetric determination of sulphates in water by Bahrdt's method. M. KEHREN and H. STOMMEL (*Chem.-Ztg.*, 1927, 51, 913—915, 934—935).—A series of tests on the volumetric method of determining sulphates in water by filtration through permutit followed by titration with potassium palmitate (cf. Bahrdt, B., 1927, 238) has shown that for hard waters at least 100 g. of permutit must be used, and the rate of filtration should not exceed about 400 c.c./hr. For the regeneration of the permutit a 10% solution of sodium chloride should be used. Iron compounds in the water interfere so that ferruginous water must first be filtered through manganese permutit.

A. R. POWELL.

Contact insecticides. TATTERSFIELD and GIMMINGHAM.—See XVI.

PATENTS.

Stable dry mixtures of soluble colloidal metals or metalloids with indifferent materials. F. STEINITZER and P. LOOCK (G.P. 443,512, 28.9.24).—Insecticide powders comprise a mixture of a soluble metal colloid and a purified and dehydrated, inert material such as talc, kieselerde, or barytes.

A. R. POWELL.

Fumigant. R. C. ROARK (U.S.P. 1,649,254, 15.11.27. Appl., 4.8.24).—See B.P. 234,456; B., 1926, 564.