

BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

SEPT. 28, 1928.

I.—GENERAL; PLANT; MACHINERY.

Adhesives and adhesion. Pure chemical substances as adhesives. J. W. MCBAIN and W. B. LEE (*J. Physical Chem.*, 1928, **32**, 1178—1184; cf. B., 1927, 159).—Data are recorded for the adhesive power of many pure organic compounds when used for joining polished metal surfaces. The strength of the joint varies considerably and in relation to chemical constitution. With five specially purified, optically active higher *l*-ethylalkylcarbinols used with highly polished surfaces of steel and nickel, the joint-strength, static friction, and density are at a maximum in the middle of the series in the carbinol containing 15 carbon atoms. Stearic, palmitic, cerotic, and elaidic acids are good lubricants but poor adhesives; aurin and rosolic acid are good adhesives for metals. Pure glycolic acid after heating becomes a very strong adhesive for nickel surfaces, giving a strength of 1 ton/in.² Many pure substances give joints more stable than those of the recognised adhesives. Joints appear to fail owing to rupture of the adhesive itself and not through failure of the union between adhesive and metal.

L. S. THEOBALD.

Practical pyrometry. G. B. BROOK and H. J. SIMCOX (*Inst. Metals*, Sept., 1928. Advance copy. 10 pp.).—In the aluminium industry in which currents of considerable magnitude are used adjacent to pyrometric instruments, a millivoltmeter can be protected satisfactorily against magnetic effects by shielding with soft iron plates, preferably a double shielding with an air gap. Amongst methods of protection of the thermocouple tip from attack by molten aluminium, a cast-iron sheath coated daily with a slip of chalk and graphite, using sodium silicate as a binder, was more effective than one of mild steel. A double sheath with a filling of lime was found to protect couples liable to deterioration from the attack of sulphur gases. For quick reading, bare wires were dipped into the molten metal, the metal itself giving the necessary electrical contact. The protection of base-metal thermocouples is described, and the use of lead-covered, paper-insulated cable as an extension of the couple to the recording instrument is recommended.

C. A. KING.

Furnace system for chemical reactions at high temperatures. F. MEYER (*Chem.-Ztg.*, 1928, **52**, 599—600).—To obtain the advantages of a short furnace combined with heat economy, two or more small reverberatories are run in series, provision being made for direct firing of each furnace in turn and the others being preheated by the waste gases from that furnace. Alternatively, the hearth of a long reverberatory may be subdivided by means of cross-walls and the heating oil or gas supplied to each section in turn. A. R. POWELL.

Continuous extraction apparatus. H. L. MAXWELL (*Ind. Eng. Chem.*, 1928, **20**, 871).—An extraction flask containing the material to be extracted is connected with another flask by a siphon with bent-up tips and side tube for setting. Both flasks contain solvent and are heated. A vapour tube also connects them, and the excess condensation in the extraction flask operates the siphon.

C. IRWIN.

Use of rotating tubes for crystallisation and evaporation. H. BARKHOLT (*Chem. Fabr.*, 1928, 431—433).—The small crystals obtained in mechanical crystallisers suffer commercially from the fact that adulteration is not so readily detectable by the eye as with large crystals. The crystal size obtained depends on the speed of rotation. Crystal forms of borax, sodium sulphide, and other salts so made are described and illustrated and costs discussed. An analogous apparatus forms an economical evaporator for the concentration of sodium sulphide solution, caustic soda, and the like, the thermal efficiency being very good. The two steps have been successfully combined in one tube with sodium and ferrous sulphates.

C. IRWIN.

Recovery of vapours of volatile substances soluble in water. A. FICHOUX (*Chim. et Ind.*, 1928, **20**, 21—26).—The optimum conditions for the recovery of, e.g., acetone, when mixed with air, by absorption in water are discussed from a theoretical point of view. To remove the last traces it is more advantageous to cool the absorbing liquid than to dilute it. F. R. ENNOS.

Determination of organic solvents lost in the treatment of aqueous solutions. A. WEINDEL (*Brennstoff-Chem.*, 1928, **9**, 213—215).—The determination of the solubility of an organic solvent in aqueous residue after extraction is described. Particular mention is made of the determination of benzol in gas-works effluent liquors.

A. E. MITCHELL.

Determining the densities of liquids and ore pulps. A. W. FAHRENWALD (*U.S. Bureau Mines Tech. Paper* 403, 1927, 43—51).—A device for measuring the density of sand-water mixtures comprises a thick-walled glass tube of 1 mm. bore bent at the lower end so as to form a short tube parallel to the main tube. This short stem is closed with a flat, circular, light-walled rubber bag, and both tube and bag are filled with a coloured water. On immersing the bag in a sand-water mixture so that its centre is *s* inches below the surface of the water, the liquid in the tube rises to a height *h* above the surface of the water outside. Then the density of the pulp at a depth *s* is $(h + s)/s$. To obviate errors due to eddy currents and "pockets," the mean of several readings is taken. Examples of the

use of the instrument in classification of ore pulps are given.

A. R. POWELL.

Determination of moisture by rapid drying. S. H. MEIHUIZEN (Chem. Weekblad, 1928, 25, 494—495).—Drying for a short time at the temperature of boiling xylene (137°) gives results in many cases more accurate than those obtained by drying at 100° or 105°, decomposition being less than is usually sustained in the long drying necessary to remove all moisture at 100°. Milk powder and beet seed require only 15 min., tea only 20 min. at the higher temperature.

S. I. LEVY.

Behaviour of gases in foams. E. BIESALSKI (Z. angew. Chem., 1928, 41, 853—856).—By employment of aqueous solutions containing 0.1% of saponin and colloidal palladium, the hydrogenation of ethylene, acetylene, sodium cinnamate, and potassium oleate may be very considerably accelerated. This behaviour is contrasted with the inhibition of fire and explosion by foam formation.

S. I. LEVY.

Viscosimetry. ROWELL and FINLAYSON.—See II. **Laurent saccharimeter.** ANDERSON.—See XVII. **Dialysis of putrescible liquids.** URBAIN. **Corrosion in boilers.** GUNDERSON. **Boiler scale.** STUMPER—See XXIII.

PATENTS.

Heat-exchange apparatus. T. W. MUNFORD, Assr. to MANTLE ENGINEERING Co. (U.S.P. 1,673,418, 12.6.28. Appl., 9.4.26).—Before the air or other gas to be heated is passed in a single circuitous stream in counter-current with the heating gases, it is conveyed, in two independent parallel streams, through the hottest part of the apparatus. The usual high mean temperature difference of the air etc. and the heating gases is thus preserved, whilst damage to the hottest parts of the apparatus is reduced and the heat radiated from the latter is more effectively utilised.

F. G. CLARKE.

Heat-exchange device. S. T. NELSON, Assr. to SULLIVAN MACHINERY Co. (U.S.P. 1,679,134, 31.7.28. Appl., 27.6.22).—A heat exchanger especially useful as an intercooler in air compression comprises a number of flat, rectangular, cooling-fluid containers, assembled parallel to each other within a casing, with detachable end supports, so that they can be removed longitudinally.

B. M. VENABLES.

Heat-treatment processes and apparatus in which a hot liquid mass [of metal] is employed. C. F. HAMMOND and W. SHACKLETON (B.P. 294,697, 2.2.27).—A bath of metal is externally heated by a fire, and kept in circulation by an air-lift effect, which may be produced by the materials to be treated, or it may be that the metal itself needs treatment, e.g., "poling." The air to the fire is preheated in spaces in the furnace walls, and the products of combustion heat a boiler in which steam is produced. The steam is superheated in a coil submerged in the metal, and part may be used to produce the air-lift effect inside a stand pipe in the centre of the bath (cf. B.P. 278,768 and 278,985; B., 1927, 928).

B. M. VENABLES.

Grinding and mixing apparatus. M. DAVID (U.S.P. 1,679,241, 31.7.28. Appl., 28.9.25. Belg.,

2.10.24).—A fixed cylindrical jacket has rotating within it a number of rollers. One roller is provided with a helical groove deepest at the feed end, becoming shallower, the latter part of the roller being smooth conical; another roller is of similar construction but reversed, and another is similar to the first except that the grooves are annular.

B. M. VENABLES.

Mixing, cooking, and drying apparatus or machines. G. PORTEUS (B.P. 294,752, 25.6.27).—In an apparatus of the type where granular material passes down through a conical chamber and is stirred by a centrally-disposed worm, the worm may be heated by a steam coil, and rotary and fixed intercalating beater bars are provided at the top of the chamber, followed by a perforated plate and by brushes. At the outlet end rotary lifters operated above adjustable segmental apertures and brushing devices similar to the upper ones may also be provided.

B. M. VENABLES.

Vertical drying apparatus. BAECHLER, KISER, & Cie. (B.P. 281,664, 29.11.27. Fr., 4.12.26).—The material falls through a series of truncated cones. After falling out of the small end of a cone it travels inwards on an intermediate plate and outwards on a main plate below, the plates being provided with scraper-blade systems which rotate or are stationary according to whether the plates themselves are stationary or rotating.

B. M. VENABLES.

Apparatus for drying or cooling material. A. G. HUHNS (B.P. 294,320, 17.5.27).—The apparatus comprises fluid-heated tubes within a rotating casing which may be maintained under vacuum. The material is blown or showered by lifting blades in the casing over the tubes, which are kept clean by scrapers in the form of a cellular structure hanging loosely on the tubes and reciprocated by ropes brought through the ends of the casing.

B. M. VENABLES.

Drying of materials. J. P. DEVINE (U.S.P. 1,678,559, 24.7.28. Appl., 28.5.27).—The materials are dried under reduced pressure, in a closed heated receptacle, in the presence of a vapour which has, for a time, a relatively high humidity.

F. G. CLARKE.

Apparatus for drying industrial products. Soc. IND. DE BRIQUETERIE & CÉRAMIQUE (B.P. 275,174, 7.6.27. Fr., 30.7.26).—A drying chamber especially suitable for ceramic articles is provided with accessory apparatus such as heaters, humidifiers, fans, and dampers, all of which are controlled from one cabin.

B. M. VENABLES.

Leaching apparatus. W. L. REMICK (U.S.P. 1,678,787, 31.7.28. Appl., 17.9.25).—Solids are treated with a solution in two stages, and a filter is used from which the filtrate returns to the first stage and the filter cake to the second stage.

B. M. VENABLES.

Crystallisation apparatus. W. SEIDEL, Assr. to I. G. FARBENIND. A.-G. (U.S.P. 1,679,055, 31.7.28. Appl., 16.5.27. Ger., 29.6.26).—A crystallising vessel is adapted to be rocked, and is provided with a curved bottom higher at the centre than at the sides so that when left in an extreme rocked position substantially

all the liquor will drain away from, but the bulk of crystals will remain at, the higher side.

B. M. VENABLES.

Preparation of solid bodies in a finely-divided state. BRIT. DYESTUFFS CORP., LTD., A. J. HAILWOOD, and A. SHEPHERDSON (B.P. 293,896, 11.4.27).—The powdered solid is mixed with a "comminutor" and a liquid in which both are substantially insoluble, with or without the addition of a protective colloid or dispersing agent, and the mixture is stirred or ground in a mixing machine or mill or caused to flow through pipes or over surfaces so as to produce relative motion amongst the particles. If the comminutor is of harder material than the powdered solid, the latter in a short time (15–30 min.) is reduced to particles of ultra-microscopic size. Suitable comminutors for dye powders are iron dust (which may subsequently be removed with the aid of a magnetic field), zinc powder, copper bronze, sand. When the desired degree of fineness is reached the mixture is diluted and decanted or filtered, and the dispersion may be precipitated, *e.g.*, by acids, or the solvent evaporated. The use of a dispersing agent precipitable by acids is advantageous.

C. HOLLINS.

Rotary liquid distributors. J. T. ARGENT, and ADAMS-HYDRAULICS, LTD. (B.P. 294,461, 17.5.28).—A rotary receiver from which the radial tubular arms extend is suspended at the centre of the filter bed from the middle of a diametrical tube, one half of which acts as a supply pipe. The liquid siphons over from a supply tank into the receiver, and thence to the perforated radial arms.

F. G. CLARKE.

Treatment of solid-bearing liquids. W. L. REMICK (U.S.P. 1,678,788, 31.7.28. Appl., 10.5.26).—The pulp is agitated in a first receptacle by withdrawing liquid from the top and re-introducing it at the lower part; the pulp is then settled, and a portion of the liquid withdrawn and added to the lower part of a second receptacle, in which the solids are allowed to settle on the bottom; they are then withdrawn and added to the settled solids in the first receptacle.

B. M. VENABLES.

Filtering device. W. M. MORRISON, ASSR. to AMER. SMELTING & REFINING Co. (U.S.P. 1,678,704, 31.7.28. Appl., 17.2.27).—Cakes are formed between a number of vacuum-filter leaves immersed in a tank of preflit. The pile of leaves is withdrawn from the tank and subjected to mechanical squeezing while still maintaining the vacuum.

B. M. VENABLES.

Filters for fine filtration of liquids. O. PETERSEN (B.P. 293,668, 6.3.28).—An apparatus similar in principle to that described in B.P. 280,802 (B., 1928, 74) is constructed so that both inner and outer members have bottoms, thus becoming buckets with the walls perforated. A wide space is left between the bottoms to permit of accumulation of considerable impurity; channels lead to the space which are continuations of the slit-like openings in the walls of the buckets. In addition, a very small clearance space is left between the cylindrical surfaces, which forms the only aperture for filtrate when the filter is set as fine as possible, *i.e.*, when the slit-like apertures are entirely out of register.

B. M. VENABLES.

Pressure and vacuum filter. G. J. LIPSCOMB (U.S.P. 1,676,268, 10.7.28. Appl., 23.5.27).—The filter casing contains several layers of filter material placed on a perforate hollow carrier, inside which is a smaller imperforate tube adapted to convey liquid to one side of each layer, after which it flows away through the carrier from the opposite side of each of the layers.

H. ROYAL-DAWSON.

Apparatus for effecting intimate contact of gases and liquids. MELDRUMS, LTD., and F. MARSDEN (B.P. 294,680, 28.4.27).—An inverted, perforated, truncated cone rotates and dips into the liquid to be sprayed. Internal vanes are provided to lift the liquid, and a closed top (base) is provided for the cone to prevent the liquid passing out except through the perforations.

B. M. VENABLES.

Apparatus for cooling, cleaning, or otherwise treating gases or liquids. POWER GAS CORP., LTD., and N. E. RAMBUSH (B.P. 294,836, 19.12.27).—Nests of tubes running in one direction alternate with nests of tubes running at right angles. The sets in each direction are connected in series.

B. M. VENABLES.

Cooling of air and gases for condensing vapours therefrom. M. FRÄNKEL (B.P. 294,354, 22.6.27).—In a system of air-drying by refrigeration, cold-storage devices are arranged on each side of the refrigerator and are operated alternately in the following sequence: cooled by the dry cold air leaving refrigerator, heated and left wet by air entering the refrigerator, excess moisture blown off the surfaces by a further stream of atmospheric air, then repeat.

B. M. VENABLES.

Refrigeration [in the liquefaction of gases]. J. L. SCHLIT and W. DENNIS, ASSRS. to AIR REDUCTION Co., INC. (U.S.P. 1,678,485, 24.7.28. Appl., 20.4.25).—A gaseous mixture and the unliquefied, residual gases obtained on cooling the mixture are separately expanded, in heat-exchange relation, in a rotary expander, the resulting torque of the two expansions being applied to a single shaft.

F. G. CLARKE.

Exothermic synthesis under pressure. COMP. DE BÉTHUNE (B.P. 283,499, 10.1.28. Fr., 11.1.27).—In exothermic reactions under high pressure, *e.g.*, synthesis of methyl alcohol from carbon monoxide and hydrogen, the heat is removed actually in the reaction zone by introduction of an amount of a harmless liquid, *e.g.*, water, so small as to be negligible as a diluent, but important as a heat absorber on account of its high latent and specific heats.

B. M. VENABLES.

Carrying-out exothermic chemical reactions. L'AIR LIQUIDE SOC. ANON. POUR L'ÉTUDE ET L'EXPLOIT. DES PROC. G. CLAUDE, ASSEES. of SOC. CHIM. DE LA GRANDE PAROISSE (AZOTE & PROD. CHIM.) (B.P. 289,823, 19.7.27. Fr., 9.8.26).—The course of the reacting gases is as follows. They enter cool through the main body of catalyst with indirect contact, then through the inner of double tubes to direct contact with a small body of catalyst, where a partial reaction without great rise in temperature takes place, back through the outer of the above-mentioned tubes, and finally through the main body of catalyst in direct contact.

B. M. VENABLES.

Apparatus for carrying out chemical reactions between gases or vapours, or gases and vapours.

H. HARTER (U.S.P. 1,678,778, 31.7.28. Appl., 27.7.26. Ger., 5.3.25).—A propeller is coated with or carries a catalytic material and serves also to aspirate and mix the gases or vapours under treatment.

B. M. VENABLES.

Apparatus for determining refraction and dispersion. H. VOELLMY (B.P. 283,859, 14.1.28. Ger., 17.1.27).—A refractometer suitable for use with ultra-violet light is described.

B. M. VENABLES.

Ascertaining the optical properties of liquids and gases. F. HERZFELD (B.P. 284,607, 30.1.28. Ger., 31.1.27).—A transparent stepped plunger is immersed in the liquid to be investigated, thus providing two different thicknesses of fluid through which the light passes; the plunger may be rotated 180° to neutralise uneven illumination, and may be made hollow so that coloured liquids may be inserted.

B. M. VENABLES.

Bricks for checker work of blast and other furnace stones and regenerators. BOLCROW, VAUGHAN, & Co., LTD., and M. A. MCLEAN (B.P. 295,075, 16.5.27).

Refrigerators. W. and W. T. COLBROOK (B.P. 295,146, 30.9.27).

Evaporators for refrigerating machines. BRIT. THOMSON-HOUSTON Co., LTD., and C. STEENSTRUP (B.P. 280,538 and 293,773, [A] 7.11.27, [B] 3.5.27. U.S., [A] 13.11.26, [B] 18.5.26).

[Rotating] means for sealing vacuum treatment [drying] apparatus. O. MINTON (B.P. 283,099, 28.3.27. U.S., 26.3.26).

Tight closure or connecting means for tubes or receptacles for fluids under pressure. S. G. S. DICKER. From AMMONIA CASALE Soc. ANON. (B.P. 294,756, 29.6.27).

[Motor support for] liquid atomisers. SIEMENS-SCHUCKERTWERKE A.-G. (B.P. 294,460, 3.4.28. Ger., 9.12.27. Addn. to B.P. 287,105; B., 1928, 658).

Dephlegmator (U.S.P. 1,678,823). Absorbent for respirators (B.P. 293,962).—See II. Tunnel kilns (B.P. 285,323).—See VIII. Thermostat (U.S.P. 1,678,889).—See X.

II.—FUEL; GAS; TAR; MINERAL OILS.

Coalfields of Scotland. Carbonisation of "Kinneil gas" coal. (Dept. Sci. Ind. Res., Fuel Res. Survey Paper No. 11, 1928, 39 pp.).—Carbonisation tests have been carried out on a 500-ton consignment of "Kinneil gas" coal, representing the entire six-foot seam; the coal had been screened from fines (below 1½ in.) and had also been freed as far as possible by picking from associated dirt partings and slack. Analysis of an average sample gave: moisture 2.3%; volatile matter less moisture 33.5%; "fixed carbon" 57.2%; ash 7.0%. If desired, the ash could be readily reduced to 4% by efficient cleaning. Carbonisation of the coal in a Glover-West vertical retort setting using 5% of steam, and with a combustion chamber temperature of 1250° gave the following yields per ton: coke 12.6 cwt.; gas 16,770 cub. ft. of 477 B.Th.U. per cub. ft. (80 therms); tar 15.0 gals.; ammonium sulphate 23.4 lb. The coke was slightly more friable than that from strongly caking

coals and contained 12–16% of breeze; its volatile matter content was 0.4–0.8%. Working with a throughput of 3.26 tons per retort per day instead of the rated amount (2.5) increased the output of therms of gas from the setting by 23%, but decreased the yield per ton by 5.2%. Tests were also carried out with 10% of steam, and one of short duration with no steam. The yields from a horizontal retort setting (charge per retort 11.5 cwt.; carbonising period 11 hrs. 4 min.; combustion chamber temperature 1350°) were: coke 13.8 cwt.; gas 12,300 cub. ft. of 574 B.Th.U. per cub. ft. (70.6 therms); tar 9.4 gals.; ammonium sulphate 26.6 lb. A hard compact coke was produced. The coal worked well in both retort settings. It also proved very suitable for carbonisation at 625° in the Fuel Research Station vertical retorts (B., 1927, 288), giving a satisfactory smokeless fuel and yields of tar and gas above the average. The coke made by either high- or low-temperature carbonisation is quite suitable for firing a Lancashire boiler. The high-temperature coke proved satisfactory for use in a suction-gas plant, but gave trouble owing to excessive clinking in a water-gas generator.

A. B. MANNING.

Examination of a Nigerian lignite and isolation of montan wax. C. E. WOOD and S. D. NICHOLAS (J. Inst. Petroleum Tech., 1928, 14, 493–501).—The lignite contains 19.5–23.7% of water, and on analysis (calc. to a 10% moisture content) is shown to contain 58.87% of volatile matter, 25.24% of fixed carbon, 5.88% of ash, and 0.72% S. The lignite, powdered to pass 30-mesh, yields up to 19.5% of bitumen (on air-dried material). Butyl alcohol is preferred as a solvent as, owing to its comparative miscibility with water, it may be used to extract undried lignite; the extraction is practically complete after 20 hrs. The crude bitumen (crude montan wax) from Nigerian lignite extracted by means of xylene has m.p. 84–88°, acid value 41.3, saponif. value 140.5, ester value 99.2, and iodine value 48.7. Montan wax extracted by means of butyl alcohol and refined in solution by means of bauxite has m.p. 95–96° and acid value 68.0; it contains 51.5% of an acid (? montanic acid), 22.5% of esters, and 26% of unsaponifiable matter, m.p. 73–76°. The acid isolated by a modification of the method of Meyer and Brod (A., 1913, i, 1152) from Nigerian montan wax has m.p. 84–85°, *M* (monobasic) 416–420. Variation in the m.p. (70–90°) of crude montan wax examined by various authors is due to the presence of free acids other than montanic acid, of esters of acids of high mol. wt., and of hydrocarbons; an alcohol and a ketonic substance have also been detected. The ash of Nigerian lignite contains 64.69% SiO₂, 7.12% Fe₂O₃, 20.67% Al₂O₃, 2.32% CaO, 0.61% MgO, 3.48% SO₃, 1.11% alkalis and loss.

W. S. NORRIS.

Influence of preheating on the theoretical combustion temperatures of gaseous fuels. F. SCHUSTER (Gas-u. Wasserfach, 1928, 71, 759–761).—The theoretical combustion temperatures of hydrogen and carbon monoxide have been calculated for a wide range (0° to 1000° of initial temperatures of gas and air, for the theoretical amount of air, and for 20% and 40% excess of air, respectively. The relationship between

combustion temperature and preheating temperature is not quite linear owing to the variation with temperature of the degree of dissociation of the products of combustion. The combustion temperatures of hydrogen are higher than those of carbon monoxide, except over the lower ranges of preheating temperatures when a considerable excess of air is being used.

A. B. MANNING.

Auto-ignition temperatures. II. Pure compounds. H. J. MASSON and W. F. HAMILTON (Ind. Eng. Chem., 1928, 20, 813—816; cf. B., 1928, 42).—The auto-ignition temperatures of a further range of pure organic compounds have been determined in air at ordinary pressures. Composition primarily affects auto-ignition temperature, although for widely different substances it may be almost identical, whilst closely related materials may have widely different temperatures. Auto-ignition temperatures do not decrease with increasing molecular complexity. A study of the catalytic effect of surfaces showed that a given material changes in activity during use, and that the effect of different substances is not of the same order on compounds of different composition and structure. In general, the more marked the catalytic activity of the surface the higher is the auto-ignition temperature.

H. S. GARLICK.

Equilibrium conditions in the formation of hydrocarbons and alcohols from water-gas. D. F. SMITH (Brennstoff-Chem., 1928, 9, 249—250). H. TROPSCH (*Ibid.*, 250).—In reply to Tropsch (cf. B., 1928, 147) the author states that the conclusions drawn by himself (B., 1927, 593) refer only to the temperatures for which the equilibrium constants have been calculated. Apparent discrepancies between the calculated and the experimental results are due to the varying relative reaction velocities rather than to errors in the equilibria data.

Tropsch directs attention to recent calculations of the free energies of formation of some hydrocarbons (Francis, A., 1928, 478) and to the desirability of further investigation of the free energies of formation of unsaturated hydrocarbons.

A. B. MANNING.

Influence of radiant heat on the ignition velocity of gases. K. BUNTE and A. STEDING (Gas- u. Wasserfach, 1928, 71, 673—677, 701—705, 731—734).—The ignition velocities of hydrogen, carbon monoxide, methane, water-gas, producer gas, and coal gas have been determined over a range of gas-air mixtures from measurements of the dimensions of the inner cone of the Bunsen flame produced (cf. Ubbelohde and Dommer, B., 1914, 853; 1915, 411), and the velocities determined when the gases are burnt in the open air (room temperature 20°) have been compared with those obtained when they are burnt in an enclosure maintained at 700—1000°. Only hydrogen, or gases containing a high proportion of hydrogen, show an increased rate of ignition in the heated enclosure, an increase of 15% (257 to 295 cm./sec.) being observed for the hydrogen-air mixture of maximum ignition velocity (40—45% of hydrogen) with the enclosure at 900°. With a number of gases the increase in the rate of ignition of the mixtures of maximum ignition velocity is approximately proportional to their

hydrogen content. The addition of small quantities of hydrogen to carbon monoxide, however, produces a disproportionately large increase in the velocity of ignition.

A. B. MANNING.

Influence of inert gases and water-gas on the ignition velocity of technical gases. K. BUNTE and A. STEDING (Gas- u. Wasserfach, 1928, 71, 773—778; cf. preceding abstract).—The ignition velocity of coal gas is lowered by the addition of either nitrogen or carbon dioxide, the latter producing the greater effect owing to its higher sp. heat. The effect of flue gas is approximately proportional to its carbon dioxide content. Although the addition of water-gas to coal gas lowers the calorific value, it produces a considerable increase in the maximum ignition velocity. The maximum ignition velocity of a low-temperature gas from brown coal is slightly higher than that of an ordinary coal gas. The maximum ignition velocity of towns' gas is lowered by the addition of methane, and is also displaced slightly towards the weaker gas-air mixtures. The technical importance of these results, particularly with reference to the combustion of mixed gases in burners of the Bunsen type, is briefly discussed.

A. B. MANNING.

Examination of petroleum distillation from various sources. I. Preparation of a standard motor spirit and a standard kerosene. S. T. MINCHIN and G. R. NIXON (J. Inst. Petroleum Tech., 1928, 14, 477—492).—Standard paraffinic motor spirit and kerosene have been prepared from the pressure distillate from Burmah paraffin wax, and the physical constants determined of these and of 10° fractions thereof. The wax (solid) having $d_{40} 0.8965$ (approx.), m.p. 60.5°, mol. wt. 425, and containing C 85.25%, H 14.75%, is heated in an autoclave until the pressure reaches 100 lb./sq. in., at which constant pressure the distillation is carried out; the cracking temperature rises from 400° to 455° during the operation. The distillate is redistilled. The motor spirit (b.p. up to 150°) is given acid and alkali washes and redistilled, and the distillate is also washed and distilled in steam. The refined spirit has $d_{15.5}^{15.5} 0.708$, aniline point 68.1°, b.p. 66—155°. The kerosene fraction (b.p. 150—285°) is washed with sulphuric acid, treated with absorbent clay, again with acid, distilled in steam, and finally treated with acid, soda, and water. The refined kerosene has $d_{15.5}^{15.5} 0.764$, aniline point 82.5°, b.p. 157—292°. The motor spirit and the kerosene are redistilled through a ring-packed Hempel column, 10° fractions being taken; the physical constants indicate that the motor spirit and the kerosene are practically purely paraffinic, and that side-chain paraffins greatly predominate.

W. S. NORRIS.

Viscosimetry [of motor fuels]. H. S. ROWELL and D. FINLAYSON (J. Inst. Petroleum Tech., 1928, 14, 402—433, 444—445).—The viscosities, densities, fluidities, and "kinematic" fluidities (absolute fluidity \times density) at 10° intervals up to 50° are given for 12 motor fuels. Fluidity and more especially kinematic fluidity are much more nearly linear functions of temperature than is viscosity. In chemically related fuels fluidity is at least an approximate indication of volatility. Fluidity-sp. vol. curves are very nearly linear, and are

grouped according to chemical similarity of the fuels; aromatic hydrocarbons form one group, paraffins another, whilst commercial spirits occupy intermediate positions, "benzol" mixtures falling nearer the aromatic group than No. 1 or No. 3 spirits. Thus viscosity data and density data taken together afford evidence of the chemical composition of a fuel. The conditions governing flow of fuel through the carburettor are discussed. The viscosities of seven lubricating oils (including castor oil) have been measured up to 250° using Bingham and Michell viscosimeters. To obtain constant values 15–25 hrs. heating at 200° is necessary. Log viscosity-temperature curves of different oils are roughly parallel, almost non-intersecting, and devoid of characteristic differences. The linear fluidity-temperature relationship suggested by Bingham for "ideal" fluids does not hold for lubricating oils. For high temperatures the square root, for low temperatures the cube root, of the fluidity is in linear relation with the temperature. For extrapolation to high temperatures the square root and cube root relations may be combined using known values for lower temperatures. A new viscosity characteristic is suggested, constructed by plotting on a temperature base the viscosity multiplied by $\{(T+10)/100\}^3$, where T is temperature in °C. If an oil had fluidity (ϕ) varying according to $\phi^{1/3} = A(10 + T)$, the characteristic would become a horizontal straight line. The principles of the air-bubble viscosimeter are considered in detail.

W. S. NORRIS.

Viscosimetry of lubricating oils. II. WO. OSTWALD and A. FÖHRE (Kolloid-Z., 1928, 45, 266–279).—Prolonged mechanical treatment of lubricating oils produces changes in the viscosity, often resulting in an increase. Examination of the time effect showed that the viscosity first falls, then suddenly increases, and is followed after long treatment (120 hrs.) by a further fall. The alteration in the colour of the oil indicates that some part of the effect may be due to chemical changes such as oxidation and polymerisation. Addition of acetic or oleic acid lowers the viscosity of lubricating oils; on the other hand, small amounts of alcoholic potassium hydroxide, sodium hydroxide (but not ammonia), or aniline raise the viscosity considerably. In the case of some Voltol oils, this effect is so great that 0.28% of potassium hydroxide causes Voltol 17 to gelatinise in a few minutes. Small quantities of highly dispersed graphite and talcum, soap, and lanoline raise the viscosity of all the mineral oils examined. The Voltol oils are again exceptional, for soap lowers their viscosity, and the other agents have no effect. The gelatinising effect of potassium hydroxide on Voltol oil cannot be connected with the formation of soap from the fatty acids. The individuality of the viscosity-pressure curves of the oils in presence of addition agents is borne out by the fact that the curves often cut those of the pure oils.

E. S. HEDGES.

Theory of the formation of petroleum. Composition of low-temperature tar from Tscheremchovski boghead coal. G. STADNIKOV and E. IVANOVSKI (Brennstoff-Chem., 1928, 9, 245–248; cf. B., 1927, 736).—The fraction volatile in steam of a low-temperature tar from a Siberian boghead coal has been shown to consist

principally of oxygen and sulphur compounds, and of saturated and unsaturated aliphatic hydrocarbons; it contained only 0.9% of bases and 3.9% of phenols. The non-volatile residue, consisting of about 79% of the tar, contained about 3.5% of "asphaltenes," 22% of solid paraffins, 1.85% of bases, and 1.67% of phenols. The results support the hypothesis of the formation of boghead coal from the fats and waxes of algæ, the cellulose and proteins of which have completely disappeared. They also throw light on the chemical processes undergone by such fats and waxes during geologic periods.

A. B. MANNING.

Dew points of air-gasoline mixtures from distillation curves. O. C. BRIDGEMAN (Ind. Eng. Chem., 1928, 20, 821–826).—Gasoline was vaporised by a dynamic method in the presence of known amounts of air at temperatures permitting successive approach to complete vaporisation. For each mixture and gasoline, the temperature-percentage evaporated curve extrapolated to 100% gave the dew-point temperature. Results obtained were in agreement with those of previous observers using different methods. The dew-point temperatures, at 1 atm. pressure, of gasoline vapour and of mixtures from 1:1 to 30:1 were found to be simply related to the 90% A.S.T.M. distillation points, corrected for loss, and to each other. An alignment chart given for calculating the dew-points obviates the use of the derived equations.

H. S. GARLICK.

Effect of volatility of petroleum fractions on detonation value. J. C. GENIESE and H. F. HUF (Ind. Eng. Chem., 1928, 20, 794–796).—Detonation tests on fractions of naphthas from different sources showed a relationship between the sp. gr. and detonation value. The 50% (including loss) distillation temperature also gives a good indication. By means of a graph constructed from these data, the effect of changing the volatility on the detonation value can be predicted.

H. S. GARLICK.

Solvents in aqueous solutions. WEINDEL.—See I. **Carbon blacks and rubber.** BEAVER and KELLER.—See XIV. **Petroleum oil as plant stimulant.** DE ONG.—See XVI.

PATENTS.

Drying of coal and like fuels. H. FLEISSNER (U.S.P. 1,679,078, 31.7.28. Appl., 25.4.27. Austr., 14.5.26).—Coal of a colloid character is prevented from falling to pieces by first heating it under pressure in saturated steam to a higher temperature than is required to dry it, then reducing the partial pressure of the steam preparatory to quick drying.

H. ROYAL-DAWSON.

Manufacture of [smokeless] coal briquettes. G. A. CHAPMAN and E. W. WILKINSON, Assrs. to MINERALS SEPARATION NORTH AMER. CORP. (U.S.P. 1,678,379, 24.7.28. Appl., 17.3.26).—The baked briquette consists of uncoked anthracite coal passing 10-mesh and a residual oil (less than 10% on the weight of coal) as binder.

H. ROYAL-DAWSON.

Manufacture of synthetic carbonaceous coke briquettes for metallurgical use. B. E. CROCKER (U.S.P. 1,676,729, 10.7.28. Appl., 22.1.25).—The carbon residue from manufacture of oil-gas from liquid hydro-

carbons is incorporated with a gas-liberating substance, briquetted, and heated to liberate the gas.

H. ROYAL-DAWSON.

Coke ovens. C. OTTO & Co., G.M.B.H. (B.P. 287,885, 28.3.28. Ger., 28.3.27).—To avoid injurious pressure differences within the chambers of large ovens and to obtain an unobstructed discharge of the gaseous distillation products, the free space above the charge is enlarged towards the gas-discharge outlet, either by a suitable construction of the roof or by lowering the level of the surface of the charge. A. B. MANNING.

Coke oven. T. G. KUS, Assr. to CHICAGO TRUST Co. (U.S.P. 1,676,736, 10.7.28. Appl., 16.7.23).—The oven consists of a series of elongated chambers having a wall common to each pair, each heating wall having heating chambers on opposite sides of the central plane. Ignition chambers are placed at the top and bottom of the heating chambers, with ports for conveying air to, and waste gases from, the lower members. Vertical passages between the chambers supply fuel gases to the lower ends, whilst the upper ends are supplied from the mains, which also supply the vertical passages placed at an intermediate height. Ports communicate with the upper chambers for supplying air and allowing the waste gases to escape. H. ROYAL-DAWSON.

Destructive hydrogenation of coal, tars, mineral oils, etc. I. G. FARBENIND. A.-G. (B.P. 272,539, 10.6.27. Ger., 11.6.26).—The material to be hydrogenated is supported on a porous mass of glass, quartz, earthenware, etc., up through which the hydrogen is forced in such a manner as to obtain very intimate contact between the gas and the material under treatment. A. B. MANNING.

Conversion of coaly materials into valuable liquid products. I. G. FARBENIND. A.-G. (B.P. 270,698, 30.4.27. Ger., 5.5.26).—Fine coal is mixed with a mineral oil, tar, or similar hydrocarbon, and with a finely-pulverised compound of molybdenum, and the mixture is distilled. A. B. MANNING.

Treatment of carbonaceous absorbent material for use in respirators and the like. N. C. DEAN (B.P. 293,962, 18.6.27).—Coke, vegetable carbon, etc. is treated with a solution of sodium tungstate and phosphate, dried at 150°, and immersed in fused caustic alkali, whereby its inflammability is reduced. F. R. ENNOS.

Gas producers. D. J. SMITH (B.P. 294,373, 20.7.27).—The main grate at the bottom of a vertical receptacle which acts as a hopper is frusto-conical in shape, and at its lower reduced end is a smaller frusto-conical grate pointing upwards. A double frusto-conical baffle, similar in shape to the grates, is placed immediately below the latter. The top of the inner portion of the baffle is open, to allow the gases to escape in a downward direction, the grates being slotted, but not the baffle. The air is superheated as it is sucked towards the grates down an annular space between the hopper and an outer packed chamber used for scrubbing the producer gases. All condensable gases are cracked, since they pass through a region of maximum temperature. F. G. CLARKE.

Splitting of acetylene. HYDROCARBON A.-G. F. CHEM. PROD. (B.P. 267,963, 18.3.27. Ger., 20.3.26).—The mixture of hydrogen and carbon produced in the splitting cylinders is passed through a carbon collector, and the hydrogen is then circulated repeatedly through the splitting cylinder and the carbon collector until the whole of the soot has been transferred from the former to the latter. A short pipe in which a plug of soot forms is connected to the exit of the carbon collector in order to prevent the entry of air into, or the escape of hydrogen from, the system. A. B. MANNING.

Determination of naphthalene in illuminating gas. W. H. FULWEILER, Assr. to U.G.I. CONTRACTING Co. (U.S.P. 1,678,591, 24.7.28. Appl., 29.6.22. Cf. U.S.P. 1,443,330; B., 1923, 259 A).—The capacities of the pair of conductivity cells described in the main patent are capable of being varied from the exterior of the cells, so that the cell constants can be adjusted to equality. A. B. MANNING.

Cracking of petroleum. L. J. GARY, Assr. to UNIVERSAL OIL PRODUCTS Co. (U.S.P. 1,676,895, 10.7.28. Appl., 14.3.21. Renewed 20.2.28).—The apparatus employed consists of a number of tube furnaces each of which discharges oil into an expansion chamber from which vapour passes to a dephlegmator. A pump is interposed between each expansion chamber and the associated dephlegmator. A common header joins the vapour spaces of the expansion chambers, and a second header is in communication with each dephlegmator; thus a uniform pressure is maintained in the dephlegmators, lower than the uniform superatmospheric pressure in the expansion chambers. W. S. NORRIS.

Pyrogenesis of petroleum products. F. A. HOWARD, Assr. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,676,694, 10.7.28. Appl., 2.2.26).—Cracking stock is heated to an active cracking temperature and passed into a primary drum in which the temperature is somewhat lower, but is nevertheless above cracking temperature, and thence to a secondary drum of similar form wherein the temperature is still lower. Part of the treated oil from the secondary drum is recirculated directly into the primary drum. W. S. NORRIS.

Pressure cracking treatment of liquid hydrocarbons. ANGLO-PERSIAN OIL Co., LTD., E. S. L. BEALE, G. H. COXON, and A. E. DUNSTAN (B.P. 293,889, 15.3.27).—In the cracking of hydrocarbon oils the production of carbon is minimised by imparting surges to the liquid while maintaining nevertheless a feed flow of relatively low velocity. This is accomplished by connecting opposite ends of a double-acting, valveless, reciprocating pump to points which are respectively near the inlet and outlet ends of the heating system through which the oil is forced at a comparatively low velocity by the ordinary feed pump. Thus a rapid and violent oscillatory movement is imposed on the normal flow of the oil. In an actual experiment the feed flow was 1/30—1/20 ft./sec. The surge pump was run at 120 r.p.m., and had a 24-in. stroke. The column of oil, therefore, had imparted to it a velocity of about 12 ft./sec. alternately in opposite directions. From Persian gas oil 23—25% of motor spirit of b.p. below

200° was obtained, together with less than 0.01% of coke, and from Persian 65% residue 15% of similar spirit together with less than 0.25% of coke.

W. S. NORRIS.

Cracking [of hydrocarbon] oils. R. T. POLLOCK, Assr. to UNIVERSAL OIL PRODUCTS Co. (U.S.P. 1,676,924, 10.7.28. Appl., 11.4.21. Renewed 15.3.28).—Oil from a furnace is vaporised by passing it through a coil or pipe located within a vaporising chamber (external to the furnace), there being outlets from the pipe at different points along its length through which the oil passes into this chamber.

W. S. NORRIS.

Cracking of mineral oil. J. M. SCHOONMAKER, JUN., Assr. to TEXAS Co. (U.S.P. 1,678,126, 24.7.28. Appl., 15.5.22. Renewed 3.6.25).—The oil passes under pressure through a heater, cracking chamber, and separating chamber, all of which are independently heated and of progressively increasing diameter. Cracking is inhibited by applying pressure until the normal cracking range, at 100 lb./in.², is raised 6–28°.

F. G. CLARKE.

[Cracking] treatment of oils. F. A. HOWARD, Assr. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,676,826, 10.7.28. Appl., 18.5.21).—Residues are heated to cracking temperature under sufficient pressure to maintain a liquid phase, and are passed to an expansion chamber wherein volatile constituents are vaporised and removed. Fresh cracking stock is brought into heat-exchange relationship first with the conversion products removed at the lower pressure from the expansion chamber, and then with the conversion products at the higher pressure before they enter the expansion chamber. Vapour evolved from the fresh cracking stock is removed, and the residue passed to the furnace and subjected to the process as described.

W. S. NORRIS.

Manufacture of hydrocarbons. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 293,887 and Addn. B.P. 293,906, 10.3.27).—(A) Liquid hydrocarbons obtained from the destructive hydrogenation of carbonaceous materials are converted into products rich in aromatic hydrocarbons by heating them, either alone or together with water vapour or hydrogen, in the presence of dehydrogenating catalysts. Oxides of the metals of the sixth group of the periodic system, or mixtures of these with oxides of the metals of the third and fourth groups, form suitable catalysts. Active charcoal, either alone or mixed with these metallic oxides, may also be used for the purpose. (B) The above process may be applied to hydrocarbons resulting from cracking processes, or to any hydrocarbons containing *cycloparaffins*.

A. B. MANNING.

Manufacture of gaseous olefines and liquid hydrocarbons from tars, mineral oils, and similar hydrocarbons. I. G. FARBENIND. A.-G. (B.P. 269,593, 19.4.27. Ger., 16.4.26).—The vaporised tar or mineral oil is mixed with steam and passed through a tube maintained at 700–800°, the process being carried out in the absence of metals which decompose superheated steam or which catalyse the reaction $\text{CO} + \text{H}_2\text{O} \rightarrow \text{CO}_2 + \text{H}_2$. Copper, silver, or alloys of chromium and nickel form suitable materials for the walls of the reaction vessel.

A. B. MANNING.

Production of oxidised products [from hydrocarbons]. R. B. MARTIN, Assr. to MINERALS SEPARATION N. AMER. CORP. (U.S.P. 1,678,403, 24.7.28. Appl., 30.10.20).—A continuous stream of hydrocarbons in the vapour state, mixed with oxygen, is conveyed past a source of ultra-violet light, and the oxidised products are condensed.

F. G. CLARKE.

Distillation of hydrocarbon oils. [A, C] R. D. HUNNEMAN, [B] R. E. WILSON, Assrs. to STANDARD OIL Co. (U.S.P. 1,676,609—1,676,611, 10.7.28. Appl., [A] 12.12.24, [B] 22.12.24, [C] 27.3.25).—(A) Oil is heated in a tube furnace and passed into an evaporating chamber. The unvaporised portion is passed counter-current to a stream of steam. Part at least of the steam and the vapour carried with it is forced into the stream of oil flowing through the furnace. (B) Oil is passed through a tube furnace, and thence to an enlarged vaporising chamber. Vaporised oil is removed from the latter and passed to a condenser. The unvaporised portion is subjected to contact with steam in a separate vessel, the resulting mixture of steam and vapour being then introduced at an intermediate point in the heating system. A sufficient head of liquid is maintained in the discharge line from the first vaporising chamber to prevent steam or vapour from being blown back that way. (C) Oil is heated in a tube still and discharged into an evaporating chamber. The unvaporised portion is treated with open steam, and the vapour so formed mixed with that from the vaporising chamber and carried to a vertical condenser, the reflux so formed being collected separately.

W. S. NORRIS.

Distillation [of hydrocarbon oils]. A. E. BECKER, Assr. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,676,724, 10.7.28. Appl., 6.3.23).—The oil is distilled in bulk, at a temperature not greatly above the b.p., in contact with steel wool.

W. S. NORRIS.

Sludge treatment. L. B. SMITH and G. W. JAMISON, Assrs. to ATLANTIC REFINING Co. (U.S.P. 1,676,294, 10.7.28. Appl., 9.11.25).—Sludge resulting from the treatment of petroleum with a compound of lead is treated with a substance to break the emulsion of oil and water. The aqueous layer is removed and the oil burned, whereby a solid residue is left of relatively high lead content.

W. S. NORRIS.

Reclaiming [naphthenic] distillation residues. S. P. COLEMAN and W. S. HUGHES, Assrs. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,676,687, 10.7.28. Appl., 7.2.24).—Hot naphthenic distillation residues are discharged on to running water, and the oil which separates from the aqueous metal naphthenates is taken off in stages as the separation progresses.

W. S. NORRIS.

Bleaching of mineral oils and fats. I. G. FARBENIND. A.-G. (B.P. 274,828, 7.6.27. Ger., 21.7.26).—To accelerate the action of hypochlorite bleaching liquors, a salt of nickel, copper, or cobalt, an acid salt of one of the alkali metals, or a mixture of one of the former with one of the latter is added.

F. G. CLARKE.

Flotation oil. G. L. ADAMS, Assr. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,678,312, 24.7.28. Appl., 28.7.27).—The oil consists of 80% of pressure-still tar,

about 19% of residuum from hydrolysis of sulphonated olefines, and about 1% of the water-soluble sodium salt of sulphonated petroleum hydrocarbons.

H. ROYAL-DAWSON.

Fuels for internal-combustion engines. C. J. SIMS (B.P. 294,129, 14.4.27).—To increase the rapidity of ignition of the fuel in compression-ignition engines, a small quantity of a primer, which has the property of exploding when rapidly heated, is added to the fuel oil. Suitable compounds for this purpose are trinitroresorcinol, methyl nitrate, iodoform, hydrazine perchlorate, etc.

A. B. MANNING.

Circulating dephlegmator [for oil refining]. D. PYZEL, Assr. to SIMPLEX REFINING Co. (U.S.P. 1,678,823, 31.7.28. Appl., 6.11.19).—Oil vapours are passed through a number of dephlegmators in series and the condensate from one dephlegmator is introduced to the top of another dephlegmator.

B. M. VENABLES.

Installations for dry-cooling of coke [in trucks]. B. E. D. KILBURN. From SULZER FRÈRES SOC. ANON. (B.P. 294,851 and Addn. B.P. 294,863, [A] 31.1.28, [B] 13.3.28).

Production of ethylene (B.P. 294,787).—See III. **Pyrolygneous acid** (U.S.P. 1,678,256).—See VII.

III.—ORGANIC INTERMEDIATES.

Miscible carbon disulphide. W. E. FLEMING and R. WAGNER (Ind. Eng. Chem., 1928, 20, 849—851).—When 55 pts. of castor oil are saponified for 2 hrs. with 10 pts. of 25% alcoholic potash at 93°, and the product is cooled and stirred with carbon disulphide until homogeneous (35 pts. of carbon disulphide to 65 pts. of the soap by vol.), the product is a mobile transparent liquid (d^{15} 1.1156) which mixes with water in all proportions forming a white emulsion, and is of use for destroying Japanese beetle without causing serious damage to plants.

F. R. ENNOS.

Introfiers, or impregnation accelerators. M. DARRIN (Ind. Eng. Chem., 1928, 20, 801—804).—Introfiers are added to impregnating materials, e.g., sulphur, in order to change the fluidity and specific wetting power of the latter towards the substance being impregnated, thus affording improved penetration. The molecular structure required by sulphur introfiers is to be found in compounds having a polycyclic nucleus, e.g., naphthalene, anthracene, diphenyl. Details of the impregnation of fibre-board with sulphur using various introfiers are given. The application to other impregnating materials than the one studied is discussed. Introfication is closely related to solubility, and is attributed to the breaking down of associated molecules in the liquid phase.

S. S. WOOLF.

Recovery of volatile substances. FICHOUX. **Behaviour of gases in foams.** BIESALSKI.—See I. **Analysis of glycerin.** BERTH.—See XII.

PATENTS.

[Catalytic] production of ethylene. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 294,787, 27.8.27).—Acetylene is passed with an equal volume, or even with excess, of hydrogen in fine bubbles into an

inert liquid (deca- or tetra-hydronaphthalene) containing the catalyst (palladium or nickel on kieselguhr) in suspension, preferably at about 150° and under pressure if desired. Ethylene with very little ethane is produced.

C. HOLLINS.

Manufacture of formates. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 294,396, 19.9.27).—Formates of cyclic compounds are prepared by the action of carbon monoxide on cyclic alcohols in the presence of ethoxides at high pressure and at an elevated temperature. Examples given are cyclohexanol and benzyl alcohol.

C. IRWIN.

Oxidation of ethyl alcohol. HOLZVERKOHLUNGS-IND. A.-G., and O. FUCHS (B.P. 294,037, 14.11.27).—Alcohol, which may contain as much as 30% of water, is passed with air over a catalyst (e.g., silver gauze), water and acetic acid are removed by cooling, and acetaldehyde is extracted from the residual gas with an anhydrous solvent (e.g., aldol or acetic acid). The condensate is treated with sulphuric acid and ethyl acetate is recovered.

C. HOLLINS.

[Manufacture of] sulphuro-anhydride compounds of tertiary bases. E. G. BECKETT, J. E. G. HARRIS, B. WYLLAM, J. THOMAS, and SCOTTISH DYES, LTD. (B.P. 294,507, 25.2.27).—For the preparation of pyridine-sulphuric anhydride, $C_5H_5N \cdot SO_3$, and like compounds, the components (tertiary base and sulphur trioxide, or chlorosulphonic acid or esters) are brought together in the form of finely-divided mist or vapour, with or without a diluent gas, in a cooled reaction chamber, which may be rotated or agitated or may be fitted with revolving vanes. Suitable apparatus is described. The products are obtained as loose, white powders, convenient for storing and handling, and are used for sulphonations and for the preparation of sulphuric esters of leuco-compounds.

C. HOLLINS.

Manufacture of methyleugenol. W. G. ANDREW-ARTHA (U.S.P. 1,678,416, 24.7.28. Appl., 20.10.27. Austral., 29.12.26).—The mill-waste and toppings of Huon pine timber are treated with steam under pressure in a closed vessel for 2 hrs., the vapour is drawn off and condensed, and water is separated from the condensate.

B. FULLMAN.

Manufacture of calcium and magnesium salts of eugenol. V. H. KIRKHAM and L. W. RAYMOND (B.P. 294,735, 24.5.27).—Eugenol (or oils containing it) is treated with the corresponding solid oxide or hydroxide of the metal.

B. FULLMAN.

Manufacture of aliphatic and hydroaromatic sulphonic acids. I. G. FARBENIND. A.-G. (B.P. 272,967, 21.6.27. Ger., 21.6.26).—Sulphonic acids (and their salts) obtained by sulphonation of aliphatic or hydroaromatic hydrocarbons with sulphur trioxide at temperatures up to 100°, are wetting-out, emulsifying, cleansing, and solubilising agents unprecipitated by acids or by calcium or magnesium salts. In the example paraffin oil is sulphonated.

C. HOLLINS.

Manufacture of N-diaryl[di]sulphonyl derivatives of arylaminesulphonic acids. BRIT. DYE STUFFS CORP., LTD., and A. J. HAILWOOD (B.P. 293,781, 12.4.27).—Compounds of the type $SO_3H \cdot Ar \cdot N(SO_2Ar)_2$, obtained

by the action of arylsulphonyl (toluene-*p*-sulphonyl) chlorides on arylaminesulphonic acids (sulphanilic acid, metanilic acid), are useful tanning agents and assistants in the preparation of finely-divided dyes and pigments.

C. HOLLINS.

Manufacture and application of aroylating agents.

BRIT. DYESTUFFS CORP., LTD., H. M. BUNBURY, and A. SHEPHERDSON (B.P. 293,924, 26.4.27).—Benzotrichloride (1 mol.) and benzoic acid (1 or 3 mols.) are heated in nitrobenzene or other suitable solvent at about 160° in presence or absence of zinc chloride to give a solution of benzoic anhydride or benzoyl chloride which is used for benzoylation of aminoanthraquinones or other aromatic amines. The reaction is applicable to other aromatic carboxylic acids and the corresponding trichlorides.

C. HOLLINS.

Manufacture of 2:3- and 2:5-dichloro-4-acetamido-1-methylbenzene and of pure 2:3- and 2:5-dichloro-4-amino-1-methylbenzene [2:3- and 2:5-dichloro-aceto-*p*-toluidides and -toluidines]. O. Y. IMRAY. From I. G. FARBENIND. A.-G. (B.P. 294,078, 24.1.28).—2-Chloroaceto-*p*-toluidide is dissolved in glacial acetic acid and precipitated by addition of water. On chlorination, dissolution occurs and is succeeded by precipitation of 2:5-dichloroaceto-*p*-toluidide, m.p. 140—141°; the isomeric 2:3-compound, m.p. 114—115°, is obtained by dilution of the filtrate. Hydrolysis with 40% sulphuric acid converts these into the corresponding pure dichloro-*p*-toluidines, m.p. 93° (2:5) and 58—59° (2:3), respectively.

C. HOLLINS.

Production of intermediates and [wool] dyes.

L. J. HOOLEY, J. THOMAS, and SCOTTISH DYES, LTD. (B.P. 294,672, 29.1.27).—The leuco-compounds (dry or paste) of indigoid or anthraquinone derivatives not containing cyclic substituents are sulphonated, and, if desired, oxidised in the same operation, with oleum. The oxidised products are acid wool dyes. Quinizarin-sulphonic acid (orange), 1:4-diaminoanthraquinone-sulphonic acid (purple), 1:4-di(methylamino)anthraquinonesulphonic acid (blue), thioindigosulphonic acid (red), and dibenzanthronesulphonic acid (reddish-blue) are described. In many cases brighter shades are obtained than by direct sulphonation of the oxidised substance.

C. HOLLINS.

Manufacture of *p*-[4'-]amino-*o*-benzoylbenzoic acid. NEWPORT Co. (B.P. 282,001, 29.8.27. U.S., 8.12.26).—See U.S.P. 1,654,290; B., 1928, 224.

Finely-divided solids (B.P. 293,896).—See I. **Oxidised products** (U.S.P. 1,678,403).—See II. **Glycerol** (U.S.P. 1,678,150).—See XVIII.

IV.—DYESTUFFS.

Use of buffers in the determination of colour [in azo dyes] by means of titanium trichloride. O. L. EVENSON and D. T. McCUTCHEM (Ind. Eng. Chem., 1928, 20, 860—862).—The use of hydrochloric acid in the determination of azo dyes with titanium trichloride is objectionable owing to the indistinct end-point and its limited applicability to dye mixtures. It has been found, however, that the acid can be replaced by certain salt solutions. These are: for Amaranth

sodium citrate, sodium bicarbonate, and potassium antimony tartrate; for Ponceau 3R the first two; and for Orange I the same two compounds along with sodium tartrate. The correct buffer must be determined for each dye. Results compare well with those of complete analyses.

C. IRWIN.

PATENTS.

Production of insoluble colouring materials in a state of fine dispersion. I. G. FARBENIND. A.-G. (B.P. 270,293, 25.4.27. Ger., 28.4.26).—For the dispersion of inorganic pigments "trihydroxyethylamine" is used in conjunction with glue, gelatin, casein, agar-agar or other gelatinisable substances or water-soluble gums.

C. HOLLINS.

Manufacture of dyes containing chromium. I. G. FARBENIND. A.-G. (B.P. 269,522, 4.4.27. Ger., 15.4.26).—In the conversion of chromable dyes into their chromium derivatives, less than 1 atom of chromium is used for each chromable group. The shades obtained are different from those with 1 equivalent of chromium; e.g., 4-chloro-2-aminophenol-5-sulphonic acid → phenylmethylpyrazolone, + $\frac{2}{3}$ Cr (redder); 4-nitro-2-aminophenol-6-sulphonic acid → β -naphthol + $\frac{2}{3}$ Cr (black, instead of violet-brown).

C. HOLLINS.

Manufacture of a dye containing chromium.

J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 294,743, 10.6.27).—The azo dye, metanilic acid → salicylic acid, is warmed with chromium formate solution (etc.) to give a clear greenish-yellow suitable for batik dyeing, and for yellows or greens on an indigo ground.

C. HOLLINS.

Manufacture of condensation products of the benzanthrone series and of vat dyes containing nitrogen. I. G. FARBENIND. A.-G. (B.P. 294,360, 4.5.27. Addn. to B.P. 249,891, B., 1927, 647).—Ammonia is used in place of the amine or amide of the prior process. Vat dyes result from alkaline fusion of the products. Examples are: *amino-* and *diamino-3:3'-dibenzanthronyl sulphides* from the corresponding bromo- and dibromo-compounds; the former gives by alkaline fusion a violet-blue vat dye, becoming blue by treatment on the fibre with hypochlorite.

C. HOLLINS.

New azo dyes and their application. BRIT. DYESTUFFS CORP., LTD., and R. BRIGHTMAN (B.P. 294,284, 22.4.27).—4-Nitro-4'-aminodiphenyl sulphide (I) is diazotised and coupled with an amine or phenol of the benzene or naphthalene series, including carboxylic and sulphonic derivatives. In suitable instances the product is rediazotised and coupled with another component. Examples are: (I) → 2:6-naphthyl-aminesulphonic acid (orange on wool); (I) → 2:6- or 2:7-naphtholsulphonic acid (yellowish-red on wool); (I) → cresidine → phenyl-J-acid (violet on wool or viscose silk); (I) → *m*-phenylenediamine (yellow-brown on acetate silk); (I) → salicylic acid (reddish-brown on acetate silk). The wool dyes are fast to milling.

C. HOLLINS.

Manufacture of new azo dyes. W. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 294,291, 26.4.27).—2:3-Hydroxynaphthoic arylamides (e.g., the β -naphthylamide) are coupled on the fibre with diazotised amino-

naphthol ethers (*e.g.*, 1-amino-7-naphthyl methyl ether) to give violet shades, or in substance for violet pigments.

C. HOLLINS.

Finely divided solids (B.P. 293,896).—See I. Wool dyes (B.P. 294,672).—See III.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Swelling capacity of bleached sulphite-cellulose. W. NIPPE (Papier-Fabr., 1928, 26, 501—506).—The swelling capacity is determined hygroscopically by means of an air current the moisture capacity of which is maintained by means of saturated salt solutions. Severe chemical treatment in the digestion process reduces the swelling capacity of the cellulose; drying has a similar effect. The presence of hydrocellulose and oxycellulose tends to decrease rather than increase the swelling capacity. Comparison of this and other existing methods is made, and the use of such measurements in works control is suggested. A. G. POLLARD.

Acetylation of cellulose with pyridine and acetic anhydride. K. HESS and N. LJUBITSCH (Ber., 1928, 61, [B], 1460—1462).—Previous methods of acetylating cellulose involve the use of hydrolytic agents as catalysts. The danger thus involved is avoided when cellulose fibre, after purification in the customary manner, is immersed in sodium hydroxide solution, and subsequently washed with water until free from alkali. The water is displaced by pyridine, and the material thus obtained is shaken with pyridine and acetic anhydride during 24 hrs., after which the mixture is heated at 40—45° for a lengthy period. The triacetylcellulose thus obtained resembles closely the original material, but differs from all triacetylcelluloses hitherto described by its complete or almost complete insolubility in organic media. This difference does not necessarily denote a chemical individuality. H. WREN.

Alteration of cellulose by action of bisulphites. E. HÄGGLUND and F. W. KLINGSTEDT (Svensk Kem. Tidskr., 1928, 40, 181—188).—Pure cellulose is not readily converted into sugar by boiling with bisulphites, a maximum of 1% being so changed, the amount of sugar produced depending on the p_H value of the liquid employed. The amount of α -cellulose present, however, decreases during the boiling. A material containing 96.2% of α -cellulose contained only 31% after 9 hrs.' heating in a sealed tube at 130° with calcium bisulphite solution; further heating did not appreciably diminish this amount. The statement of Hess and others (B., 1924, 88) that the rotatory power of an ammoniacal copper solution of cellulose obtained from the acetate was identical with that of a similar solution of ordinary cellulose was confirmed experimentally. It is therefore concluded that the copper complexes formed by alkali-soluble cellulose and α -cellulose must be identical, and that any difference between these two forms of cellulose is physical rather than chemical. H. F. HARWOOD.

Testing artificial silks by means of ultra-violet light. M. KOPITSCH (Kunstseide, 1928, 10, 321—324).—It is possible to distinguish different types of artificial silk and real silk by means of differences in their fluores-

cence in ultra-violet light. Viscose silk shows a sulphur-yellow fluorescence (somewhat darker for non-purified silk) characterised by bluish gradations due to deflection of visible violet light passing through the filter of the ultra-violet lamp. Cuprammonium silk (Bemberg) shows a pink cloudy fluorescence having strong blue to bluish-violet gradations. Chardonnat silk gives a flesh-coloured fluorescence, and is thereby easily distinguished from viscose silk. Cellulose acetate silk shows a very deep bluish-violet to violet fluorescence having very strong bluish-violet gradations. The fluorescence of artificial silks is not affected by extraction with light petroleum, but after extraction with 96% alcohol the fluorescence of cellulose acetate silk is diminished and greyish-yellow. Cuprammonium and viscose silks are not affected by scouring with a solution containing 0.5% of soap and 0.5% of ammonia; after similar treatment the fluorescence of cellulose acetate silk is paler and less blue. The fluorescence of viscose silk is not affected, that of cuprammonium silk is changed to grey and reddish-violet, and cellulose acetate silk yields a pale yellowish fluorescence after treatment with caustic soda of d 1.008. Degummed real silk shows a bright bluish fluorescence which is always more intense than that of artificial silks. The fluorescence of raw silk is largely influenced by its colour in daylight; for instance, yellow Italian grège shows a bright yellow fluorescence. A. J. HALL.

Chemical decomposition of wood. B. HOLMBERG (Papier-Fabr., 1928, 26, 506—508).—Experiments on the "mercaptolysis" of wood are described. The lignin compounds isolated from pine wood by heating with acid solutions of thioglycolic acid are described. Evidence of the presence of two types of lignin in pine wood is obtained. A. G. POLLARD.

Pulping of hardwood and mixtures of hardwoods and conifers by the sulphite process. W. H. MONSSON (Pulp and Paper Mag., 1928, 26, 705—709).—The results are given for a series of semi-commercial, experimental, sulphite cooks on aspen, sugar maple, paper birch, and black gum, alone and in admixture with white spruce and hemlock. Acid containing 6% of total sulphur dioxide (1.20% combined) was used to ensure penetration of the chips, and 2 hrs. was allowed for the cook to reach 110°; otherwise temperature curves previously found suitable for spruce were followed. The yields of pulp (dry pulp on dry wood) varied from 45% for maple to 50% for aspen with a bleach consumption varying from 8—11% for aspen to 15—35% for maple, depending on the duration of the cook. Wood infected with black rot is preferably avoided, since black rot is not removed by sulphite cooking and rather drastic bleaching is necessary, with a consequent reduction of yield and fibre strength. Hardwood sulphite pulps possess opacity, bulk, and a certain degree of softness. They develop considerable strength on beating and give a close smooth paper. Mixtures of spruce or hemlock with hardwoods are as readily pulped as the hardwoods themselves. D. J. NORMAN.

Kraft pulp and paper from *Pinus insignis*. L. R. BENJAMIN, J. L. SOMERVILLE, R. B. JEFFREYS, and W. E. COHEN (Austral. Council Sci. & Ind. Res., 1928, Bull. 35, 32 pp.).—Laboratory followed by semi-

commercial trials indicate that *Pinus insignis* can be converted into kraft pulp practically equal in quality to Swedish kraft. The best results were obtained by cooking the chips for 4 hrs. at 100 lb./in.² maximum pressure with 20% of active alkali (on the weight of dry chips), one third (approx.) of the active alkali being present as sulphide; the optimum ratio of liquor to dry wood was found to be 6:1. The use of a proportion of black liquor in the liquor charge is permissible, but has no effect on the yield of pulp. Under these conditions the yield of screened pulp averages 49% (dry pulp on dry wood). Estimated costs of production, however, show that under present conditions *P. insignis* kraft pulp could not compete economically with imported pulp.

D. J. NORMAN.

Introfiers. DARRIN.—See III.

PATENTS.

Dry cleaning and washing of wool, laundry goods, and the like. A. E. HATFIELD, E. A. ALLIOTT, and ACHILLE SERRE, LTD. (B.P. 293,886, 15.2.27).—The articles to be cleaned are washed in an organic solvent or other liquor containing a soap having a high solubility and emulsifying power and but little tendency to dissociate (cf. B.P. 289,582; B., 1928, 492), the soiled liquor being treated with a filter aid (cf. B.P. 266,850; B., 1927, 579), then filtered, and again used.

A. J. HALL.

Manufacture of wool substitutes. B. H. KANTAWALA (B.P. 293,161, 16.5.27).—Jute waste is sprinkled with an emulsion of ground-nut oil and, when uniformly impregnated therewith, is passed through a carding engine, optionally after admixture with artificial silk waste. The emulsion may be prepared by boiling ground-nut oil with 2½% of caustic soda and adding water until a 15% oil emulsion is obtained.

D. J. NORMAN.

Manufacture of cellulose acetate. H. J. MALLABAR, and NON-INFLAMMABLE FILM Co., LTD. (B.P. 293,724, 6.4.27).—Cellulose acetate, free from combined sulphuric acid, is obtained by the action of an acetylating agent on cotton in the presence of zinc chloride and 0.5–5.0% (calc. on the weight of cellulose) of hydrochloric acid. *E.g.*, cotton cellulose is treated with a mixture of glacial acetic acid, acetic anhydride, zinc chloride, and hydrogen chloride at room temperature for 5–10 hrs. until the cellulose is completely dissolved, the product being then precipitated with water; a cellulose acetate not easily soluble in chloroform but readily soluble in a mixture of chloroform and alcohol is thus obtained. Alternatively, the precipitated cellulose acetate may be made soluble in acetone by dissolving it in acetic acid, adding 5–10% of a mineral acid and 20–50% of water, and heating the mixture at 90–100° for 6–12 hrs.

A. J. HALL.

Preparing [viscose] artificial silk with special mechanical properties. N. V. NEDERLANDSCHE KUNSTZIJDEFABR. (B.P. 282,721, 11.11.27. Holl., 27.12.26).—Viscose filaments having 50% higher wet and dry tensile strength than those spun by the usual methods are manufactured by carrying the freshly spun filaments through at least 50 cm. in the coagulating

liquor (2.5 m. is preferred in one example given) before emerging into the air.

A. J. HALL.

Manufacture of artificial forms or threads fast to water and easily dyed. Soc. CHEM. IND. IN BASLE (B.P. 268,363, 24.3.27. Switz., 24.3.26).—Acetate silk which possesses all the desirable properties of ordinary acetate silk and can be dyed with ordinary dyes is obtained by spinning a mixture of cellulose acetate with 5–20% of nitrocellulose and denitrating the resulting filaments in a bath containing at least 8% of a soluble hydrosulphide at a temperature above 50°.

D. J. NORMAN.

Rayon [artificial silk] manufacture. G. A. RICHTER, ASSR. to BROWN Co. (U.S.P. 1,678,354, 24.7.28. Appl., 13.7.26).—An aqueous solution of a cellulose derivative is heated, without appreciable coagulation, to reduce its viscosity immediately before spinning; the filaments from the spinning bath are delivered to a setting bath.

H. ROYAL-DAWSON.

Extraction of cellulose from vegetable products. F. G. P. LEO (B.P. 293,219, 15.8.27).—Cellulose is prepared from, *e.g.*, bamboo, bagasse, cereal straws, jute, reeds, grasses, and many kinds of wood by soaking the crushed and disintegrated raw material for 4–9 days at, *e.g.*, 32° in the unfermented sap extracted from freshly cut, mature, banana plants. The cellulose remaining after the removal of the spent liquor (which latter may be used as a fertiliser) is washed first with cold dilute hydrochloric or sulphuric acid and then with water, and is finally bleached.

D. J. NORMAN.

Stencil sheet. S. HORII (U.S.P. 1,679,034, 31.7.28. Appl., 17.12.27).—The sheet consists of a base of fibrous material including esters of polysaccharides and squalene.

H. ROYAL-DAWSON.

Sizing fibres. H. L. BECHER, ASSR. to AGASOTE MILLBOARD Co. (U.S.P. 1,678,720, 31.7.28. Appl., 22.4.26).—See B.P. 286,948; B., 1928, 363.

Continuous manufacture of cellulosic materials. E. MULLER (B.P. 294,676, 25.4.27).

Process for continuously drying cellulosic materials. E. MULLER (B.P. 294,675, 23.4.27).

Cellulose varnishes (B.P. 293,732).—See XIII.
Nutritive matter from fibrous vegetable materials (B.P. 293,779).—See XIX.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Mordanting and dyeing. VI, VII. E. ELÖD (Z. angew. Chem., 1928, 41, 14–16, 16–19).—VI. [With E. PIEPER and E. SILVA.] The X-ray diagram of silk weighted with tin salts consists of super-imposed diagrams of pure silk and tin dioxide, the diagram of the tin dioxide being more prominent relative to the silk diagram as the degree of weighting is increased, so that silk weighted with 30% of tin dioxide yields the diagram of tin dioxide only; similar phenomena are observed by determination of X-ray diagrams of pure silk covered superficially with powdered tin dioxide. It is concluded that in weighting silk with tin salts no chemical combination occurs between the protein of the fibre and the tin salts. Silk deaminated so that it contains only ⅔ths

of its usual content of nitrogen yields an X-ray diagram identical with that of pure silk. X-Ray diagrams of weighted silk show the particles of tin dioxide to be 33—37 Å. in length, thus being too coarsely dispersed to allow their removal from the fibre by treatment with $N-0.1N$ -hydrochloric acid. Silk mordanted with a solution of chromium chloride so that it contains 9.1% Cr_2O_3 yields an X-ray diagram identical with that of pure silk. Under comparable conditions of mordanting, silk retains 9.2% SnO_2 and but 2.3% Cr_2O_3 , the greater absorption of tin dioxide being ascribed to the greater hydrolysis of the stannic chloride during the washing process subsequent to the treatment of the silk with the metallic salt solution.

VII. [With E. PIEPER.] The absorption of a basic dye (Crystal Violet) by wool from solutions of initial p_H 1—12 steadily approaches a maximum at p_H 10; the absorption is constant over the range p_H 4.07—5.75, the isoelectric point being p_H 4.6. The rapidly decreased absorption in solutions of p_H 10.0 is due to an increase in the size of the dye particles, this increase being observed by means of an ultramicroscope. During dyeing under similar conditions, wool reduces and increases the p_H in dye solutions having initial p_H above or below 4.6, respectively, the absorption by wool of hydrogen and hydroxyl ions from acid and alkaline solutions being thus independent of the presence of a dye (basic or acid); tin-weighted silk and ordinary silk behave similarly. Japan "tram silk" weighted with tin phosphate and silicate absorbs about 60% less than unweighted silk of Rhodamine 3B from solutions of p_H 1—10; the weighting displaces the isoelectric point of the silk from p_H 4.1—5.1. Both wool and silk absorb basic dyes from solutions having p_H values greater or less than the isoelectric point of these fibres (cf. Briggs and Bull, B., 1923, 91 A). Complete absorption of the dye by silk does not occur in extremely dilute solutions of Rhodamine 3B. The absorption by silk of an acid dye (sulpho-rhodamine) differs considerably from its absorption of basic dyes, since absorption of the acid dye decreases rapidly when the p_H of the dye solution exceeds the isoelectric point. Silk deaminated so that it suffers a loss of $\frac{1}{3}$ th of its nitrogen content has an isoelectric point of p_H 4, and has a decreased and increased affinity for acid and basic dyes respectively (cf. Paddon, B., 1922, 411 A).

A. J. HALL.

Dyeing of gloving and clothing leathers. M. C. LAMB (J. Soc. Dyers and Col., 1928, 44, 225—229).—Nearly all glove leather is tanned by the alum process and then dyed by drumming (Gt. Britain) and by hand-brushing (the Continent); in America it is chrome-tanned. Before dyeing, the dried tanned leather must be "wetted-back," this being facilitated by the addition of about 1% (on the dry leather) of a diastatic enzyme (e.g., malt diastase) to the soaking liquor. In dyeing alum-tanned glove leather the use of natural dyewoods containing much tannin should be avoided, since this diminishes the extensibility required in the resulting dyed leather. Black shades are obtained by means of logwood and fustic on an iron mordant, or by drumming the leather for about 1 hr. at 40° with a solution containing 2.5% of gambier, 2.5% of chrome alum, and 2% of a direct black dye, then rinsing with water, and

re-dyeing with 1% Basic Black. Chrome-tanned leather washes more satisfactorily than alum-tanned leather; it may be dyed by means of natural, direct, basic, and acid dyes. Neolan dyes are suitable for dyeing chrome-tanned leather (alum-tanned leather may be first lightly retanned with basic chromium sulphate or basic chrome alum) in shades fast to washing. Clothing leathers should possess little extensibility, and can therefore be finished with mineral pigments (glove leathers cannot be finished in this manner owing to their greater extensibility). Clothing leathers are finished with a mixture containing a pigment and shellac as a binding and water-proofing agent. Lack of fastness to rubbing of suede leather is usually due to loose dyed fibres rather than to the use of loose dyes.

A. J. HALL.

"Zair" process. [Treatment of animal fibres with ozone.] R. B. BROWN (J. Soc. Dyers and Col., 1928, 44, 230—233).—The "Zair" process (cf. B.P. 242,027; B., 1926, 11) is described. Zaired wool has a strong affinity for acid, basic, direct, Soledon, and mordant dyes at much lower temperatures (40°) than are used for dyeing ordinary wool (100°). Under similar conditions of dyeing, ordinary and Zaired wool absorbed 43.9 and 71.9% at 40°, 62.5 and 94.2% at 60°, and 93.0 and 94.9% at 100°, of the total amount of Acid Magenta O in the dyebath. Zaired wool dyed at a low temperature is less penetrated by dyes than ordinary wool dyed at boiling temperature; Zaired wool yarn dyed at 40° so as to absorb 76.6% of Acid Green had a depth of shade equal to that of ordinary wool dyes at the boil so as to absorb 94.5% of the dye, but the interior fibres of the Zaired yarn were much paler than the outer fibres. After treatment by the Zair process, wool has an increased tensile strength, and, as in chlorination, the epithelial scales are partially removed. Zaired wool is superior to chlorinated wool, since it may be dyed evenly by a much wider range of dyes. The Zair process is useful for increasing the affinity of wool for dyes before printing. Cellulose fibres and real silk suffer a considerable loss of strength when treated by the Zair process; cellulose acetate silk is not appreciably affected. The dyeing of furs and sheepskins is much assisted by a preliminary treatment by the Zair process.

A. J. HALL.

Chemical effects of the natural sulphur in wool on fading of azo dyes. A. T. KING (J. Soc. Dyers and Col., 1928, 44, 233—236).—The suggestion of Meunier and Rey (B., 1926, 974) that the natural sulphur present in wool is oxidised to sulphurous acid during exposure to light has been confirmed by exposing scoured wool fabric to light from a fadeometer, then padding it with slightly alkaline solutions of Orange II and Crystal Scarlet, and plunging it into a boiling slightly acid liquor, the formation of the yellower azo-sulphite derivatives of these dyes being clearly observed on the exposed parts of the fabric. The azo-sulphite derivatives of Crystal Scarlet, Orange II, Fast Red A, and Acid Orange GG faded 150—200% more rapidly than the original dyes, but during the fading there was no evidence of conversion of the azo-sulphite into the original dye, this latter fact agreeing with the remarkable stability of these azo-sulphites towards iodine and other non-alkaline oxidising

agents. Oil colours such as Oil Orange E, Oil Vermilion, Oil Red BN, and Oil Brown D dyed on wool in the form of their azo-sulphites also faded with increased rapidity. The greater rate of fading of the azo-sulphite derivative accounts for the failure to detect formation of azo-sulphite formation when wool padded with a suitable β -naphthol azo dye is faded by exposure to light. Dyes capable of forming azo-sulphites faded more rapidly on alkaline than on acid cloth. Dyes susceptible to reduction by sulphur dioxide, *e.g.*, Fast Acid Blue RH, faded slightly more rapidly on acid than on alkaline wool. With few exceptions, dyes of poor fastness to stoving (sulphur dioxide) are also of poor fastness to light on wool.

A. J. HALL.

Action of light on dyed colours. F. SCHOLEFIELD, E. HIBBERT, and C. K. PATEL (J. Soc. Dyers and Col., 1928, 44, 236—237).—Pure crystalline dibromoisatin and 2-methylisatin have been separated from the aqueous extract of cotton dyed with Ciba Blue 2B and methyl-indigo, respectively, and faded by exposure to sunlight. From this and previous results (*cf.* Hibbert, B., 1927, 840; Haller and others, B., 1928, 479) it is concluded that oxidation is the cause of fading of cotton materials dyed with indigoid dyes.

A. J. HALL.

Determination of Katanol O and investigation of its absorption by viscose silk. P. E. KING, G. M. WADADEKAR, and E. N. JOHNSON (J. Soc. Dyers and Col., 1928, 44, 237—241).—Katanol O (*cf.* B.P. 173,313; B., 1922, 139 A) may be determined in aqueous solutions by a modification of the potassium permanganate method used for tannic acid. Dilute sulphuric acid (5 c.c. of the concentrated acid in 100 c.c. of water) is added to 10 c.c. of a solution of Katanol (1 g. of Katanol, 0.2 g. of anhydrous sodium carbonate, 500 c.c. of water) and 200 c.c. of water, whereby the Katanol is precipitated, and the product is then titrated with 0.1*N*-potassium permanganate until a pink coloration persists for 2 min. after the addition of 2 drops; the potassium permanganate solution is added only 0.5 c.c. at a time, and the suspension is heated at 70° towards the end of the titration. The presence of Glauber's salt does not affect the titration. The absorption of Katanol O by viscose silk increases with duration of mordanting process, concentration and temperature of the mordanting liquor, and the use of Glauber's salt as an assistant. Maximum absorption occurs within 2 hrs. of entering the silk, and when entered at 100° or 85° but little further absorption occurs after the first $\frac{1}{2}$ hr. The absorptions of Katanol O by viscose silk immersed for 2 hrs. at 60° in solutions of equal concentration but having vol. of liquor/wt. of viscose silk ratios of 12:1 and 50:1, were 1.76 and 0.46%, respectively; the absorptions in the presence of 0, 25, and 50% of Glauber's salt were 0.65, 1.48, and 1.83% respectively. Soda ash has little effect on the absorption, but the maximum absorption occurs when Katanol O:soda ash = 5:1. Viscose silk mordanted with Katanol O bleeds during washing; this is largely prevented by souring with dilute acetic acid.

A. J. HALL.

Rubber colours. NAUNTON.—See XIV. **Coal-tar colours in foods.** JAMESON and KEYWORTH.—See XIX.

PATENTS.

Bleaching composition. E. M. JONES (U.S.P. 1,677,283, 17.7.28. Appl., 17.8.25).—The composition contains sodium silicate, oxalic acid, borax, and sodium perborate. This composition may be used in an iron kier without the formation of rust, and is capable, when used in boiling liquors, of simultaneously bleaching the white ground of printed fabrics and setting the colours.

D. J. NORMAN.

Dyeing and printing [with water-soluble vat dyes]. STANDFAST DYERS & PRINTERS, LTD., J. I. M. JONES, and W. KILBY (B.P. 293,890, 15.3.27).—Cotton, silk, and wool materials dyed or padded with water-soluble esters of vat dyes (*cf.* B.P. 247,787 and 251,491; B., 1926, 403, 625) are developed to their full shade by treatment with a boiling acid solution containing a cupric salt; over-oxidation of the dye which may occur when development is effected with nitrous acid or a dichromate is thus avoided. *E.g.*, wool dyed with the water-soluble ester of dimethoxydibenzanthrone is rinsed and then immersed in a boiling bath containing 5 pts. of copper sulphate and 10 pts. of sulphuric acid per 1000 pts. of water, development being complete within 10 min.

A. J. HALL.

Production of dyeings on the fibre. W. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 293,813, 6.4.27).—Cotton is impregnated with a phosgenated *p*-aminoazo or *p*-aminodisazo dye containing one or more carboxyl groups (excluding the salicylic group), and is then immersed in a solution of a chromium salt with or without an intermediate drying. The process is especially useful in batch dyeing. Examples are the phosgenated derivatives of: 2-chloro-3-amino-5-sulphobenzoic acid \rightarrow cresidine (golden-yellow); 3-amino-5-sulphobenzoic acid \rightarrow *o*-anisidine (greenish-yellow); aminoazobenzenedisulphonic acid \rightarrow 3-amino-*p*-tolylglycine (reddish-orange).

C. HOLLINS.

Dyeing of fibres. A. WINOGRADOFF, Assr. to INECTO, INC. (U.S.P. 1,677,508, 17.7.28. Appl., 11.7.25).—When the colour is developed by the oxidation of a leuco-compound the fibres are treated with an inorganic iodide.

D. J. NORMAN.

Treatment of fibrous materials. I. G. FARBENIND. A.-G. (B.P. 267,924, 14.3.27. Ger., 18.3.26).—Mixtures of sulphonated aromatic, hydroaromatic, and saturated and unsaturated cyclic and aliphatic compounds such as may be obtained from mineral oils, oil distillates, and brown-coal tar oils, may be used as assistants in the wet processing (bleaching, dyeing, carbonising, finishing, etc.) of wool, cotton, silk, and other textile materials, or in mixture with other assistants such as soaps, Turkey-red oils, organic solvents, etc.

A. J. HALL.

Production of azo dyes on weighted silk. I. G. FARBENIND. A.-G. (B.P. 271,089, 11.5.27. Ger., 11.5.26. Addn. to B.P. 253,865; B., 1927, 553).—In the process of the prior patent when applied to weighted silk the effect of the alkaline padding bath on the weighting agents is avoided by adding to this bath a soluble silicate and/or a soluble phosphate.

C. HOLLINS.

Increasing the fastness to light of basic dyes. W. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P.

294,286, 22.4.27).—Materials dyed with basic dyes (*e.g.*, tannin-mordanted cotton dyed with Rhodamine B extra) are treated with a solution of reduced phosphotungstomolybdenum compound of B.P. 292,253 (B., 1928, 603). C. HOLLINS.

Preventing the weakening of vegetable fibres in the production of Aniline Black. K. SCHMIDT (B.P. 294,554, 24.1.27).—Salts of weak or easily oxidisable acids are added to the padding liquors used for dyeing Aniline Black on cotton materials by the copper or prussiate methods in order to increase the stability of the padding liquor and the fastness of the resulting black shade, and also to diminish the tendering of the cotton fibres; the amount of protective salt used is not less than 40% (by wt.) of the aniline hydrochloride present in the padding liquor. Suitable salts are those of sulphurous, phosphorous, and thiocyanic acids. A. J. HALL.

Process and apparatus for parti-colour treatment of yarns. J. BRANDWOOD (B.P. 294,504, 22.1. and 29.4.27).

Azo dyes (B.P. 294,284).—See IV. **Artificial threads** (B.P. 268,363).—See V. **Dye soaps** (B.P. 270,637).—See XII. **Coloured reproductions** (B.P. 270,279).—See XXI.

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

Assay of phosphoric acid. F. A. MAURINA (J. Amer. Pharm. Assoc., 1928, 17, 668—671).—The U.S. Pharmacopœia method of determining phosphoric acid, *viz.*, by adding excess of silver nitrate to a solution neutralised to phenolphthalein, maintaining neutrality by addition of zinc oxide, and titrating the filtered solution with potassium thiocyanate, has the disadvantage that zinc oxide does not react completely and forms a bulky deposit in which silver may be included. The zinc oxide is therefore replaced by an aqueous suspension of the hydroxide, prepared from zinc carbonate and potassium hydroxide, by means of which accurate results are obtained. E. W. WIGNALL.

Determination of sulphur combined as sulphides in potassa sulphurata (liver of sulphur). C. H. ROGERS (J. Amer. Pharm. Assoc., 1928, 17, 658—661).—Liver of sulphur is treated in aqueous solution with excess of standard copper sulphate solution, and the precipitate is removed by filtration; the copper in the filtrate is precipitated as sulphide, which is collected on a filter and converted into copper oxide by ignition. The copper employed in the first precipitation is found by difference; it is considered to have combined with sulphide ions, and the sulphur present as sulphides is thus determined. E. W. WIGNALL.

Physical characteristics of chromium sulphate solutions. W. J. CHATER and J. S. MUDD (J. Soc. Leather Trades' Chem., 1928, 12, 272—279).— p_H value—basicity and conductivity—basicity curves derived for solutions of chromium sulphate and chrome alum, respectively, indicate a change in the constitution of the liquors at about basicity 124 and p_H 2.3. The change in p_H due to the presence of neutral salt appears to be

dependent on the basicity. The difference in acidity caused by the neutral salt is a minimum at basicity 124. The penetration of gelatin jelly by chromium sulphate solutions has been shown to depend on the acidity; the greater the acidity the greater is the penetration. D. WOODROFFE.

Analysis of pitchblende. E. KÖRNER and F. HECHT (Monatsh., 1928, 49, 438—443, 444—459).—The analytical scheme of Davis (A., 1926, 380) appears to yield trustworthy results, and with certain minor modifications has been used to obtain complete analyses of Morogoro and Katanga blends. Assuming that molybdenum is present as lead molybdate (wulfenite), the lead/uranium ratios are of the same order of magnitude as those observed by Davis and others for Katanga blende. J. S. CARTER.

Thorium content of Katanga pitchblende. F. HECHT and E. KÖRNER (Monatsh., 1928, 49, 460—475; cf. preceding abstract).—Improvements in the method for the determination of thorium according to the Davis scheme are suggested and possible sources of error are indicated. Such data as exist indicate that thorium is not, as has been suggested, a decomposition product of a uranium isotope. J. S. CARTER.

Detection of carbon dioxide. G. ELTESTE (Z. angew. Chem., 1928, 41, 858).—Filter paper moistened with a solution of 0.1*N*-barium hydroxide to which 10% by vol. of a 0.1% solution of phenolphthalein has been added is decolorised immediately in an atmosphere of carbon dioxide, due to the formation of barium bicarbonate. The colour reappears in air, and with freshly prepared damp papers the change may be repeated several times. The papers were used to detect leaks in containers of compressed gas. S. I. LEVY.

Stress-strain curves for plastic sulphur and raw rubber at various temperatures. J. D. STRONG (J. Physical Chem., 1928, 32, 1225—1230).—The stress-strain curves for thin filaments of plastic sulphur have been determined by means of a modified Jolly balance at -10.3° , -3.6° , and $+11.2^\circ$; and those for raw rubber on a modified Schopper machine at -65° , -60° , -55° , and -45° . The automatic recording of the data, by increasing the speed of testing, made the measurements less dependent on plastic flow. A certain similarity is claimed for the two series of curves. The data for rubber do not agree quantitatively with those of Kröger and Le Blanc (B., 1925, 932). L. S. THEOBALD.

Crystallisation etc. BARKHOLT.—See I. **Reactions between ferrous oxide and carbon.** FALCKE.—See X.

PATENTS.

Manufacture of sulphuric acid. H. PETERSEN (B.P. 276,659, 15.8.27. Ger., 28.8.26).—The first production tower in a series for manufacturing sulphuric acid without lead chambers is of large dimensions, and is irrigated intensively with nitrosylsulphuric acid so that an amount of nitrogen oxides is liberated at least sufficient to oxidise the sulphur dioxide in all the subsequent towers. W. G. CAREY.

Manufacture of sulphuric anhydride and sulphuric acid. VEREIN F. CHEM. U. MET. PROD. (B.P. 289,879, 27.4.28. Ger., 5.5.27).—The contact process for the preparation of sulphuric anhydride is separated into stages with systematic arrangements for heat transfer. In one method the gases leaving the first catalyst chamber pass around the second chamber before removal of sulphuric anhydride, then through a secondary heat-exchanger to the absorption apparatus. The gases from the second catalyst chamber are made to transfer their heat to the supply for the first chamber. A conversion of 80–90% is obtained in each stage without any considerable external heat, and the process can be operated without risk on rich gas containing 8–9% SO₂.
C. IRWIN.

Simultaneous production of phosphorus or phosphoric acid and binding agents with latent hydraulic properties. I. G. FARBENIND. A.-G. (B.P. 285,055, 27.1.28. Ger., 10.2.27).—In the production of phosphorus or phosphoric acid in an electric or shaft furnace clay is added to the mixture of phosphate and coke so that a slag is obtained containing 12–35% Al₂O₃, 18–38% SiO₂, and 40–55% CaO. The expulsion of phosphorus is complete and there is no tendency to the formation of carbides as occurs if bauxite is used. The slag on granulation is suitable for the production of blast-furnace slag cement.
C. IRWIN.

Manufacture of white lead acetate solutions and crystals from pyroligneous acid. M. KLAR (U.S.P. 1,678,256, 24.7.28. Appl., 22.12.25. Ger., 28.10.24).—Pyroligneous acid containing organic colouring impurities is neutralised with lead or its compounds, and the solid acetate formed is then heated at 200–220°, lixiviated, and the solution filtered, evaporated, and allowed to crystallise.
H. ROYAL-DAWSON.

Preparation of cooling brine. N. DAHL (B.P. 281,632, 14.11.27. Fr., 1.12.26).—Salt solution flows through an ice column surrounded by a cylindrical receptacle or series of receptacles arranged co-axially within one another and fitted with horizontal and vertical baffles disposed so that the mass of liquid is divided and is caused to follow a zig-zag path.
W. G. CAREY.

Preparation of sodium phosphate. H. HOWARD, ASS. to GRASSELLI CHEM. CO. (U.S.P. 1,676,556, 10.7.28. Appl., 4.12.25).—Phosphoric acid solution containing a sulphate and a silicofluoride is treated with a sodium compound, then with a barium compound capable of precipitating the total sulphate from solution.
H. ROYAL-DAWSON.

Manufacture of phosphate fertilisers. L. ADELANTADO (B.P. 276,297, 17.1.27. Spain, 19.8.26).—Natural phosphates are treated with soluble sulphates in the proportion of 2 mols. of tricalcium phosphate to 3 mols. of sulphate in the presence of 3 mols. of mineral acid additional to that required to react with any impurities. The product is extracted with water and crystallised. The sulphates indicated in examples are ammonium and potassium sulphates. The product is a mixture of mono- and di-alkali phosphates, practically all the phosphoric acid being water-soluble. The aqueous extract obtained is slightly acid. If not neutralised and crystallised they may be employed for impregnating inert matter, e.g., peat.
C. IRWIN.

Production of commercial borax from Na₂O, 2B₂O₃, 4H₂O. T. M. CRAMER, ASS. to PACIFIC COAST BORAX CO. (U.S.P. 1,678,381, 24.7.28. Appl., 12.1.27).—The naturally-occurring mineral is rendered more soluble by heat, then dissolved in an aqueous medium, and commercial borax is crystallised out.
H. ROYAL-DAWSON.

Hypochlorite composition. J. D. MACMAHON, ASS. to MATHIESON ALKALI WORKS (U.S.P. 1,678,987, 31.7.28. Appl., 20.5.27).—The dry mixture consists of anhydrous sodium sulphate and calcium hypochlorite.
H. ROYAL-DAWSON.

Production of alkali compounds from silicates containing them. T. A. EDISON, ASS. to T. A. EDISON, INC. (U.S.P. 1,678,246, 24.7.28. Appl., 28.6.22).—The pulverised silicate containing an alkali metal is mixed with an alkaline-earth hydroxide and water, and the mixture heated sufficiently to free the alkali and then lixiviated.
H. ROYAL-DAWSON.

Production of base-interchanging substances. A. ROSENHEIM (B.P. 266,313, 27.1.27. Ger., 16.2.26).—Minerals containing iron oxide, alumina, etc., but deficient in constituents having base-exchange properties, are treated at increased pressure and, if necessary, raised temperature with solutions of alkali, alumina, or silicic acid, the last-named preferably as water-soluble silicates rich in silicic acid. Hydrolysis with water vapour is then effected (cf. B.P. 265,578; B., 1928, 110).
W. G. CAREY.

Production of aluminium oxide from aluminium sulphide or mixtures containing same. METALLBANK U. METALLURGISCHE GES. A.-G., and C. B. VON GIRSEWALD (B.P. 294,079, 27.1.28).—Aluminium sulphide is converted into the oxide by heating with calcium oxide and/or a calcium compound convertible into the oxide by heating; or the calcium oxide etc. may be added to molten aluminium sulphide. The resultant aluminium oxide is freed from the calcium sulphide formed by treatment with water and acids.
B. FULLMAN.

Production of metal cyanamides or mixtures containing the same. N. CARO and A. R. FRANK (B.P. 279,420, 30.9.27. Ger., 23.10.26).—A mixture of ammonia and carbon monoxide is allowed to act on calcium carbonate at its dissociation temperature. The carbon monoxide decomposes the water vapour and prevents reversal of the reaction. Metals which catalyse the decomposition of ammonia must not be used in the apparatus, which is best made of silica.
C. IRWIN.

Fluorescent preparations. L. A. LEVY and D. W. WEST (B.P. 295,078, 19.5.27).—Fluorescent preparations of desired colours are prepared by mixing fluorescent substances with non-fluorescent or feebly fluorescing substances of suitable shades, such as dyes, pigments, oil paints, etc.; e.g., a mixture of zinc and cadmium sulphides with vermilion oil paint gives a scarlet fluorescence.
L. A. COLES.

Exothermic synthesis (B.P. 283,499).—See I. **Bleaching composition** (U.S.P. 1,677,283).—See VI. **Fertilisers** (B.P. 283,558).—See XVI. **Organic tin compounds** (B.P. 294,287).—See XX.

VIII.—GLASS; CERAMICS.

Brown silica bricks. V. E. GROUM-GRJIMAILO (Feuerfest, 1928, 4, 105—106).—In the manufacture of silica bricks, the inversion of quartz to tridymite is not readily attained if pure, coarsely-ground quartzites are used. The formation of tridymite is facilitated if iron-bearing material, such as furnace slag, is added to the brick mixture, together with a reducing agent (coal, coke, etc.). The slags provide the necessary lime-iron flux "ready-made," and the addition of powdered charcoal, coke, etc. ensures the formation of ferrous oxide, and not ferric oxide, the former having better solvent properties. The addition of phosphoric acid promises special advantages, but this awaits confirmation from works' practice. Bricks were made in the usual way, but with the addition to the quartzite of 2.5% of basic slag from a Martin furnace (grain-size below 1 mm.), powdered wood charcoal, and 2% of milk of lime. The bricks obtained were of a chocolate colour; under the microscope the ground mass appeared as a network of interlocking crystals, only the coarser quartz grains being shattered and unconverted. The bricks showed no expansion or cracking in service in a Martin furnace, and they proved much more durable than ordinary silica bricks, and were mechanically much stronger. The chemical composition was: 93.68% SiO₂, 0.19% Al₂O₃, 2.31% Fe₂O₃, 3.21% CaO, 0.25% MgO, 0.38% MnO (P₂O₅ not determined). Similar experience was obtained with bricks made with the addition of 2—4% of reheating furnace slag, 1.5% of clay, 1.5% of coke dust, and 1—1.5% of milk of lime.

F. SALT.

[Quartz] inversion phenomena in silica bricks in the crowns of Martin furnaces. V. E. GROUM-GRJIMAILO (Feuerfest, 1928, 4, 125).—Silica bricks taken from the crown of a Martin furnace consist of four zones, and analysis of these zones shows a considerable accumulation of lime in the third (brown) zone from the hot face. Before use, a silica brick contains colloidal tridymite in which quartz grains are embedded; these grains are, so to speak, "moistened" with the glassy lime-iron-alumina matrix. The colloidal tridymite constitutes the solid cement, binding the brick together. The quartz is converted by the glass into colloidal tridymite, which subsequently changes into the crystalline form. The more fusible the glassy matrix, the more readily does quartz inversion take place. Ferrous oxide in the furnace gases is absorbed by the bricks, and this increases the fusibility of the fluxes in the bricks. If iron is absorbed in sufficient quantity to form the eutectic compound 3FeO, SiO₂, CaO, SiO₂, the glass has a softening point of 1030°, and its capacity to penetrate the brick by capillary action in an upward direction reaches a maximum. Ferrous silicate, on the other hand, has a softening point of 1190°, so that a glass of this composition remains in the lower portion of the brick. This explains the accumulation of lime in the upper portion. It is suggested that ferrous oxide and lime should be added in the form of Martin furnace or Thomas slag to the silica brick mixture, together with a certain quantity of coke or coal dust, in order to ensure the formation of ferrous silicate.

F. SALT.

Destruction of blast-furnace building materials,

particularly firebricks. E. DIEPSCHLAG and K. FEIST (Feuerfest, 1928, 4, 49—51, 106—108).—Methods for testing the resistance of refractories to slags are critically reviewed. Tests were made on a number of firebricks by filling small hollows in them with weighed quantities of sodium and potassium hydroxides, and firing to various temperatures between 200° and 1100°, the change in the alumina:silica ratio being taken as a measure of the reaction. A considerable quantity of brick material was dissolved by sodium hydroxide at 400°, though no corrosion of the refractory was evident. Silica, particularly in the amorphous form, was attacked much more readily than alumina at this temperature, but at 600—800° this difference was largely eliminated. Potassium hydroxide behaved similarly, but the quantity of refractory dissolved was much smaller. The melts formed at the low temperature were largely soluble in water, indicating the formation of simple silicates and aluminates, whereas those formed above 1000° took the form of insoluble complexes. Between 1000° and 1015° the quantity of brick material dissolved increased considerably, but the lower reactivity of potassium hydroxide was still more marked at this temperature. The degree of penetration into the body of the brick depends almost entirely on the viscosity of the melt produced. It therefore does not constitute a measure of the chemical reaction which has taken place. The alumina content of the refractory has no important effect on the resistance to slag attack.

F. SALT.

PATENTS.

Manufacture of glass in a shaft furnace. K. KÜNZEL (U.S.P. 1,676,267, 10.7.28. Appl., 18.3.27. Ger., 10.2.25).—A flame is carried upwards through the shaft and the charge of crude glass material contained in the furnace.

H. ROYAL-DAWSON.

Preventing the weathering (especially clouding, tarnishing, and lustering) of the surface of glass. K. KAMITA, and ASAHI GARASU KABUSHIKI KAISHA (B.P. 294,391, 25.8.27).—The surface is exposed to the action of an acid gas, or a gaseous mixture containing such, at 300—600° (e.g., at or near the annealing point), after which the white deposit so formed is wiped off. The gas may be introduced into thelehr during the annealing process.

A. COUSEN.

Manufacture of tinted [violet] glass. SOC. ANON. DES MANUF. DES GLACES ET PROD. CHIM. DE ST. GOBAIN, CHAUNY, & CIRBY (B.P. 293,310, 30.6.28. Fr., 2.7.27).—Violet glass which in combination with green silicate glass forms neutral grey doublets is produced by the addition of titanium oxide to a vitrifiable mixture having a base of phosphoric acid or a mixture of it with boric acid. A suitable composition contains 72.5% P₂O₅, 22.4% CaO, 3.1% MgO, and 2.0% TiO₂.

L. A. COLES.

Tunnel kilns. WOODALL-DUCKHAM (1920), LTD., and A. McD. DUCKHAM (B.P. 285,323, 12.8.27. Addn. to B.P. 280,044; B., 1928, 92).—More gradual cooling of the ware is effected by connecting the exhaust ducts with longitudinal flues in the walls of the cooling zone, these flues being in communication with the interior of the kiln at a point between the ducts and the open

heating zone. In the preheating zone the products of combustion escape through groups of ports, each group communicating with a separate duct in the lower portion of the kiln wall; the duct in turn communicates with waste-gas flues in the kiln walls. F. SALT.

Manufacture of ceramic ware. L. MELLERSH-JACKSON. From AMER. ENCAUSTIC TILING Co., LTD. (B.P. 293,069, 28.2.27).—A ceramic body contains about 27% of magnesia, 6% of alumina, 61% of silica, to which a small proportion of calcium, in any suitable form, is added. For the semi-dry press method of manufacture the powdered mixture contains about 10% of water. In the manufacture of tiles, a pressure in the moulds of about 1200 lb./in.², a maximum firing temperature between cones 6A and 7, a biscuit-firing period of about 48 hrs., and a glaze-firing period of about 12—14 hrs. are required. The biscuit ware may be saturated with an organic substance to improve the dielectric properties or to render it non-absorbent to water. F. SALT.

Production of ceramic and like articles. M. HAUSER (B.P. 289,031, 26.4.27. Switz., 28.4.26. Cf. B.P. 270,300; B., 1928, 606).—A mixture of ceramic raw materials, *e.g.*, clay, felspar, quartz, etc., with powdered or granular silicon or ferrosilicon, with or without the addition of boric acid or borates and/or adhesives, *e.g.*, glucose, tragacanth, etc., is worked up into a plastic mass, shaped, and fired. L. A. COLES.

Reducing the coefficient of expansion of ceramic materials. F. SINGER (B.P. 282,403, 14.12.27. Ger., 17.12.26).—The coefficient of expansion of steatite bodies and similar ceramic materials containing magnesium or alkaline-earth compounds is reduced by the addition of an aluminium compound (hydroxide) to the body mixture and submitting this mixture to suitable heat-treatment until at least three phases are formed: a glass having n 1.530—1.555; crystals of the sillimanite or mullite type; and alkaline-earth silicates, particularly magnesium silicates, of the type RO_2SiO_2 and $2RO_2SiO_2$. The heat-treatment must be interrupted when there is risk of the formation of spinels of the type $RO_2Al_2O_3$. F. SALT.

Manufacture of silicon carbide refractory articles. CARBORUNDUM Co., LTD., Assees. of M. L. HARTMANN (B.P. 284,732, 4.2.28. U.S., 4.2.27).—Oxidation of silicon carbide at high temperatures is greatly reduced by the removal of certain catalysts, *e.g.*, the oxides or salts of easily reducible metals, particularly iron. Silicon carbide is therefore freed of such impurities, and refractory articles are made by mixing about 90% of this purified material with about 10% of a suitable bond, *e.g.*, a mixture of kaolin and felspar. F. SALT.

Manufacture of objects from zirconium [oxide]. DEUTS. GOLD- u. SILBER-SCHNEIDANSTALT VORM. ROESSLER (B.P. 282,795, 23.12.27. Ger., 27.12.26).—Zirconia is intimately mixed with small amounts of a hydrolysable salt (*e.g.*, the chloride) of zirconium, aluminium, or magnesium, and water is then added to give a plastic mass, which is shaped and fired in the usual way. Other refractory materials, such as thoria, may partly replace the zirconia. A. COUSEN.

Manufacture of abrasives. O. Y. IMRAY. From T. HIRAO, S. SUZUKI, and T. SUZUKI (B.P. 294,124, 15.1.27).—Finely-powdered volcanic ash and obsidian (the latter heated to 900° before crushing) are mixed with small-grained quartz, sand, or other silicious material, the mixture is then pressed in a mould, and heated to fuse the obsidian and ash. A. COUSEN.

Temperature control in furnaces or lehrs. BRIT. HARTFORD-FAIRMONT SYND., LTD. From HARTFORD-EMPIRE Co. (B.P. 294,775, 4.8.27).

Drying apparatus (B.P. 275,174).—See I.

IX.—BUILDING MATERIALS.

Light porous concrete. J. MEYER (Chem. Fabr., 1928, 433—435, 449—450).—To produce a porous concrete, 0.1—0.5% of an alloy of calcium is added to the cement mixture before addition of water. Moulds are only filled to the extent of 70—80% and the evolution of gas can be regulated to require 30—45 min. or 3—4 hrs. The concrete can, if desired, be made lighter than water, the apparent sp. gr. varying, of course, with the proportions of the usual ingredients. The relation of compression strength to apparent sp. gr. is given by curves. The two diminish together, so that the lightest forms are only suitable for filling material etc. A further addition of the calcium alloy results in a part of the gas evolved being lost. With a proper mixture the gas pores are very uniform, and heat conductivity measurements show that the porous concrete is a very good insulating material. It can be structurally combined with iron in the same way as ordinary concrete. C. IRWIN.

Silica bricks. GROUM-GRJIMAILO. **Blast-furnace building materials.** DIEPSCHLAG and FEIST.—See VIII.

PATENTS.

Manufacture of acid-proof cements and acid-proof masonry. I. G. FARBEIND. A.-G. (B.P. 283,471, 9.1.28. Ger., 8.1.27. Addn. to B.P. 256,258; B., 1927, 333).—To acid-proof cements, prepared as previously described, may be added 2—4% of neutral material, other than silicon, silicon alloys, and fluosilicates, capable of reacting with alkalis to yield products more or less insoluble in acids, *e.g.*, tungstic acid, cryolite, or salts of fluozirconic, fluogermanic, hydrofluoric, fluotitanic, fluotantallic, fluoniobic, and fluostannic acids. L. A. COLES.

Manufacture of magnesia cements. Soc. "LE XYLUM" (B.P. 269,518, 2.4.27. Fr., 16.4.26).—The colloidal magnesium oxychloride formed in cements of this type is protected from weathering by the addition of an insoluble lead soap, as a waterproofing colloid, maintained in a state of dispersion by casein or a similar agent. A. COUSEN.

Manufacture of bricks and tiles. J. DUNLEVY and R. JOHNSON (B.P. 294,760, 5.7.27).—A mixture of glassmakers' waste sand, powdered limestone, and brickmakers' clay is worked to a plastic mass with water, moulded under pressure, and fired. L. A. COLES.

Preservation of timber and other materials and destruction of insect and other pests therein. A. M. KOBIOŁKE (B.P. 295,126, 9.8.27).—The timber is enclosed in an air-tight vessel which is successively evacuated, charged with impregnating liquor, drained to remove excess liquor when impregnation is complete, again evacuated, and suddenly filled with air by releasing the vacuum.

L. A. COLES.

Hydraulic binding agents (B.P. 285,055).—See VII.

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

Is the hearth chamber of a Siemens-Martin furnace a black body for optical pyrometry? H. SCHMIDT and W. LIESEGANG (Arch. Eisenhüttenw., 1927—8, 1, 677—685; Stahl u. Eisen, 1928, 48, 1049—1050).—The temperature of the walls of a Siemens-Martin, basic, open-hearth furnace has been measured through the peep-hole in the discharging door using a Wanner optical pyrometer with various coloured filters. The results showed a variation of up to 55° between the temperature measured through a red and that measured through a blue filter, indicating that the interior of the furnace does not radiate as a perfect black body. It would appear that the most reliable temperature measurements in such a furnace by means of an optical pyrometer should be obtained with a suitable blue filter instead of the red one usually employed.

A. R. POWELL.

Change in elastic constant in metals caused by cold-working. K. HONDA and R. YAMADA (Sci. Rep. Tôhoku Imp. Univ., 1928, 17, 723—742).—The change in Young's modulus as the result of cold-working has been measured for iron, steel, copper, aluminium, and brass. For polycrystalline material the elastic constant is reduced by 6—10%, but may be largely recovered on annealing at a low temperature. Single crystals of iron showed a decrease of 3%, which was unaffected by annealing at 100°.

C. J. SMITHELLS.

Reactions between ferrous oxide and carbon and between carbon monoxide and iron. V. FALCKE (Z. Elektrochem., 1928, 34, 393—398; cf. A., 1926, 684; B., 1927, 191; Schenck, B., 1926, 633; A., 1927, 939, 1030).—Previous work on the equilibria $C + CO_2 \rightleftharpoons 2CO$ and $FeO + CO \rightleftharpoons Fe + CO_2$, chiefly by the author and by Schenck (*loc. cit.*), is summarised and discussed. Measurements have been made of the equilibrium constant of the first reaction, using as catalysts iron and nickel which had been previously heated in a stream of carbon monoxide. The values obtained with a nickel preparation containing 86.5% C are in agreement with those obtained with iron, whilst those with a nickel preparation containing less carbon are lower. The significance of this is discussed. The equilibrium constants of the reaction $C + CO_2 \rightleftharpoons 2CO$ were calculated by Schenck from the isochores of Jellinek and Diethelm (B., 1922, 972A). It is pointed out that these were incorrectly computed from the constants of amorphous carbon.

L. L. BIRCUMSHAW.

Equilibria in the system iron-carbon-oxygen. R. SCHENCK (Z. Elektrochem., 1928, 34, 399—403).—A résumé is given of previous work by the author and his collaborators on the equilibria in the reduction, oxidation, and carburization of iron, and a reply is made to the criticisms of Falcke (cf. preceding abstract). The line of future research in this field is indicated.

L. L. BIRCUMSHAW.

Repeated stress, structure, and damping [of special steels]. W. HEROLD (Arch. Eisenhüttenw., 1928—9, 2, 23—39; Stahl u. Eisen, 1928, 48, 1051—1052).—The structure of a pearlitic steel at the point of fracture by fatigue under repeated stress shows that the cementite has been forced towards the grain boundaries, whilst lamellar pearlite has been crushed and converted into granular pearlite giving the metal a very coarse-grained structure. In martensitic steels the hard η -phase becomes crushed into small particles which are forced through the softer ϵ -phase towards the grain boundaries. In some austenitic steels after fracture by fatigue, cementite may be observed at the grain boundaries, although the presence of this constituent is not visible in the original structure; in other cases the fatigued metal has a nodular structure which cannot further be resolved. Generally, steels which have been hardened and tempered lose their capacity for damping (*i.e.*, for converting energy into heat by internal friction) after subjection to repeated stress sufficient to produce failure by fatigue.

A. R. POWELL.

X-Ray investigation of density of quenched steels and internal stress existing within them. S. SEKITO (Sci. Rep. Tôhoku Imp. Univ., 1928, 17, 679—692).—The variation in the lattice parameter for a series of quenched carbon steels of different carbon contents has been measured, and found to be 0.45% for 1% C. This is in agreement with direct determinations of density, and indicates that the decrease in density obtained on quenching carbon steels results from an expansion of the lattice. From the broadening of the spectral line the calculated value of the internal stress is 192 kg./mm.², which is of the same order as the tensile strength. It is concluded that the increased strength results from the distortion of the iron lattice due to the presence of carbon atoms, and the distortion was found to be greatest in the direction perpendicular to that of easiest slip.

C. J. SMITHELLS.

Abrasion in carbon steels. M. SUZUKI (Sci. Rep. Tôhoku Imp. Univ., 1928, 17, 573—638).—The relative abrasion under a constant coefficient of friction has been measured for six hypo-eutectoid steels having different carbon contents and heat-treatments. It is shown that if the specific abrasions of substances m and n with respect to a given substance N are W_{mN} and W_{nN} , then the relative abrasion $W_{mN} = \alpha \mu^2 W_{nN} / W_{nN}$, where μ is the coefficient of friction and α is a constant which remains invariable for a series of substances of similar properties, but varies when their properties differ considerably from one another. For hypo-eutectoid steels martensitic, troostitic, sorbitic, annealed and rolled structures show decreasing abrasional resistance. With martensitic structures the minimum abrasion occurs with 0.7—0.8% C.

C. J. SMITHELLS.

Determination of vanadium in steel. A. T. ETHERIDGE (Analyst, 1928, 53, 423—428).—Iron is removed from the steel as chloride by the ether extraction process, and other interfering metals by electrolysis in which a mercury cathode is used; the vanadium is then determined by the ordinary permanganate titration. The error from the titration is less than 0.01%. Slight modifications in the details of the procedure are given for high-silicon, tungsten, high-chromium, molybdenum, and high-manganese steels.

D. G. HEWER.

Effect of chromium on the electrical properties of iron-nickel alloys. P. CHEVENARD (Stahl u. Eisen, 1928, 48, 1045—1049).—Addition of chromium to nickel lowers the temperature of magnetic transformation very rapidly, the alloy with 6% Cr being paramagnetic at 20°. The anomaly in the resistance curve accompanying the magnetic change becomes feebler in intensity, and finally disappears with 4.35% Cr, whilst a new anomaly occurs in the paramagnetic state at 550° and increases in intensity with more than 2.35% Cr. The thermoelectric power of these alloys exhibits similar changes as the chromium content is increased, but with 8—10% Cr the alloys have a high positive thermoelectric power which is practically free from irregularities. In iron-nickel alloys with more than 50% Ni addition of chromium produces similar effects on the electrical properties, and in alloys with low percentages of nickel it lowers the temperature of the Ar₂ and Ar₃ points and enlarges the region of the reversible austenitic alloys towards the iron side.

A. R. POWELL.

Variation of the composition of alloys of silver and copper melted in contact with air. GUICHARD, CLAUSMANN, and BILLON (Bull. Soc. chim., 1928, [iv], 43, 752).—The variation is due to the contrary effects of the disappearance of copper by progressive oxidation, and to volatilisation which affects the silver more than the copper. It therefore depends on the temperature, the silver content rising at 1000° and falling at 1300°, whilst at 1100° equal amounts of silver and of copper are removed and the composition remains constant.

J. GRANT.

Deoxidation of silver castings. GUICHARD, CLAUSMANN, and BILLON (Bull. Soc. chim., 1928, [iv], 43, 752—753).—Instead of a protecting layer of powdered carbon, about 0.001 pt. of copper phosphide added to silver-copper castings acts as an efficient deoxidant. A smaller number of reheatings for hammering-out are required.

J. GRANT.

Laboratory experiments on high-temperature resistance alloys. C. J. SMITHELLS, S. V. WILLIAMS, and J. W. AVERY (Inst. Metals, Sept., 1928. Advance copy. 22 pp.).—Resistance to oxidation at high temperature was studied by electrically heating a helix of standard dimensions, formed from an alloy wire, and observing the endurance or life of the wire under the particular conditions which were comparable with the use of the alloy in practice. Thus a helix of nickel-chromium wire was attached to the lead-in wires of an electric lighting bulb. The influence of adventitious draughts when the

helix was heated in the open air was less than when enclosed in a glass bulb, as the loss of chromium as sodium chromate outweighed any increase in weight due to oxidation. For the binary alloys of nickel and chromium, resistance to oxidation increased as the chromium content increased up to 30%. A second phase appeared with more than 40% Cr and the alloy oxidised more readily. Ternary alloys containing 10% Cr were low in resistance, which, however, was high when 20% Cr was present. Whilst the resistance to oxidation is due to the formation of an oxide coating, the composition of the oxide is determined by, but not necessarily the same as, the composition of the alloy, and the oxide must contain at least 50% Cr₂O₃ to render adequate protection against further oxidation. Resistance to sag of similar wires determined by deformation of a wire of hairpin shape when heated showed that increasing chromium content increased the tendency to sag; a 50% Cr alloy sagged completely at 1050° and 900°, but was rigid at 750°. Ternary alloys sagged slightly more than binary alloys having similar contents of nickel, and alloys made from prepared pure metals were considerably more resistant than commercial alloys containing usual impurities. Electrical resistance curves showed that at room temperature resistance increases with decreasing nickel. Substitution of chromium by tungsten lowers resistance, whilst molybdenum has the opposite effect. Generally, maximum resistance was shown at 500—550°.

C. A. KING.

Strength of a cadmium-zinc and of a tin-lead alloy solder. C. H. M. JENKINS (Inst. Metals, Sept., 1928. Advance copy. 19 pp.).—With reference to use for soldering purposes comparative strengths of the eutectic cadmium-zinc and 60:40 tin-lead alloys were determined. Prepared in a similar manner the strength of the cadmium alloy was 3—4 times as great as for the tin solder, the cast alloy with a value of about 10 tons/in.² being by far the strongest. Cold-rolled material possessed a decidedly lower tensile strength, a value as low as 1.7 tons/in.² being found for the tin-lead alloy; similar low values were also shown by aged (120°) and long-annealed alloys. None of the cadmium-zinc specimens showed intercrystalline cracking, and under prolonged loading and heat-treatment conditions this alloy showed greater relative strength than the tin alloy.

C. A. KING.

Treatment of aluminium and aluminium alloys with chlorine. D. R. TULLIS (Inst. Metals, Sept., 1928. Advance copy. 8 pp.).—In order to secure effective degasification of aluminium and its alloys the necessity is assumed for introducing an element which disturbs the equilibrium existing between aluminium and the dissolved gases, e.g., magnesium, zinc. The removal of dissolved gases was attempted by passing a highly active gas (chlorine) through the molten alloy. Considerable increase in density was observed in the gassed alloys and general improvement in the castings; large surface crystals were evident with cast silicon-aluminium alloys when gassed, and eutectic extrusion was less than when slowly solidified. Aluminium alloys containing 10% Fe were responsive to chlorine treatment, but with 15 and 20% Fe it appeared to be necessary to add an element which causes gas disturbance.

C. A. KING.

"Rockwell" hardness test [for metals]. J. E. MALAM (Inst. Metals, Sept., 1928. Advance copy. 20 pp.).—Data obtained to attempt to correlate the hardness of metals, in particular copper-zinc alloys, by Brinell, Rockwell, and scleroscope methods showed that the Rockwell number is comparable with the Brinell number only for certain critical values, and, generally, the Rockwell ball-test must be considered misleading. Certain modifications in the method of expressing the results of the Brinell and scleroscope tests are desirable.

C. A. KING.

Determination of "objectionable" sulphur in roasted [zinc] blende. E. BEYNE (Ann. Chim. analyt., 1928, [ii], 10, 221—225).—The sulphur content of roasted blends may occur as undecomposed sulphides, as zinc sulphate, or as lead, magnesium, barium, or calcium sulphate. None of the four last-named sulphates can be further decomposed by roasting, hence the term "objectionable" sulphur is applied only to that existing as sulphide or as zinc sulphate. The latter is determined by extracting the material with hot water and determining the soluble zinc, and the former by the evolution method (boiling with hydrochloric acid and stannous chloride and oxidising the hydrogen sulphide evolved).

A. R. POWELL.

Pyrometry. BROOK and SIMCOX. **Densities of ore pulps.** FAHRENWALD.—See I. **Blast-furnace firebricks.** DIEPSCHLAG and FEIST.—See VIII. **Testing magnet steel.** BABBITT.—See XI.

PATENTS.

Cupola furnaces. FREIER GRUNDER EISEN- U. METALLWERKE GES.M.B.H. (B.P. 294,027, 13.10.27. Ger., 21.7.27. Addn. to B.P. 267,008).—To assist discharge of the residue of slag and iron from a cupola, the downwardly inclined passage from the slag separator is arranged at the lowest point of the base of the furnace shaft. A closed lower tapping hole is connected in line with the separator to allow removal of residues.

C. A. KING.

Metallurgical furnace. F. B. MCKUNE, ASSR. to OPEN HEARTH COMBUSTION Co. (U.S.P. 1,679,340, 31.7.28. Appl., 5.5.22).—A reversible metallurgical furnace is provided with air entrance passages, means for restricting the admission of air to the furnace chamber, and fans for supplying forced air to the passages.

M. E. NOTTAGE.

Metallurgical separator. A. T. SWEET, ASSR. to W. G. RICE, H. GUNDLACH, and P. B. WOODWORTH (U.S.P. 1,678,884, 31.7.28. Appl., 21.10.26).—The ore is caused to move in a stream across a beam of light, separation of the ore being effected owing to variations of light-reflecting values between the minerals and the remainder of the stream.

M. E. NOTTAGE.

Enriching oxide iron ores, flue dust from blast furnaces, burnt pyrites, purple ore, etc. AKTIEBOLAGET FERRICONCENTRAT, Assees. of H. A. MUELLER (B.P. 279,797, 3.9.27. Swed., 28.10.26).—Weakly paramagnetic ores are heated in an oxygen-free atmosphere to a strongly paramagnetic condition and then separated by means of a low-intensity magnetic separator. Carbonate ores are given a preliminary roasting in air.

C. A. KING.

Manufacture of stainless iron. A. L. FEILD (B.P. 282,387, 10.12.27. U.S., 18.12.26).—Stainless iron within the usual limits of composition is produced from a bath of molten iron, a material high in iron oxide, and an iron-chromium alloy relatively high in carbon. The operation is conducted so that chromium is oxidised and enters the slag and the metal is decarbonised. The chromium content of the metal is then increased by introducing a non-carbonaceous reducing agent, e.g., silicon, ferrosilicon, and final adjustment may be made by adding stainless iron or steel scrap.

C. A. KING.

Flux for welding cast iron. C. C. MARYAN, ASSR. to GEN. ELECTRIC Co. (U.S.P. 1,676,988, 10.7.28. Appl., 8.12.25).—The flux contains 4 pts. of ferric carbonate, 12 pts. of ammonium chloride, 16 pts. of sodium borate, 20 pts. of sodium bicarbonate, and 12 pts. of sodium chloride.

H. ROYAL-DAWSON.

Copper-chromium ferrous alloys. B. D. SAKLATWALLA (U.S.P. 1,676,929, 10.7.28. Appl., 7.4.24).—Iron containing carbon is alloyed with 8—25% Cr, 0.5—5% Cu, and 1—3% Si.

H. ROYAL-DAWSON.

Thermostatic material. V. G. VAUGHAN, ASSR. to WESTINGHOUSE ELECTRIC & MANUF. Co. (U.S.P. 1,678,889; 31.7.28. Appl., 12.9.25).—In the thermostat one element consists of an alloy of cobalt and iron, the other of nickel-steel.

H. ROYAL-DAWSON.

Solvent treatment of copper ores. ANGLO-AMER. CORP. OF S. AFRICA, LTD. (B.P. 294,868, 22.5.28. S. Africa, 7.12.27).—The cupriferous material is reduced by wet grinding to a slime pulp which is then dewatered by filtration, compressed air being subsequently forced through the resulting cake. This pulp is then treated with a suitable ammoniacal solvent (e.g., a cupric ammonium carbonate solution), the cake being re-pulped with the solvent solution and again filtered, or, preferably, the dewatered pulp is formed as a cake in a pressure filter and the solvent solution forced through it.

M. E. NOTTAGE.

Bearing-metal alloys. H. and S. BONDI and O. NEURATH [J. NEURATH] (B.P. 283,862, 16.1.28. Poland, 17.1.27. Addn. to B.P. 238,895; B., 1926, 62).—0.5—3.5% of indium or cadmium is added to the alloy previously described.

H. ROYAL-DAWSON.

Extraction of zinc. A. ROITZHEIM and W. REMY (B.P. 294,127, 6.4.27).—In a zinc furnace of which the heating is aided by a partial combustion of carbon in the furnace, volatilised zinc oxide is condensed and recovered in baffled chambers at 900—1000°, whilst zinc vapours pass into a further chamber and are condensed at 850—500°.

C. A. KING.

Aluminium alloys. DEUTS. VERSUCHSANSTALT F. LUFTFAHRT E.V. (B.P. 282,701, 6.4.27. Ger., 27.12.26).—Aluminium alloys containing copper and magnesium (in which both the Mg_2Si and $CuAl_2$ can exert their full effect during ageing of duralumin at room temperature) and having improved mechanical properties may be made from aluminium electrolytically purified or chemically free from iron, the necessary amount of silicon for the formation of $MgSi_2$ being added in the form of aluminium-silicon.

M. E. NOTTAGE.

Manufacture of alloys of nickel and chromium. GEN. ELECTRIC Co., LTD., and C. J. SMITHELLS (B.P. 293,727, 7.4.27).—The alloys consist either of nickel and chromium in which the chromium content is 10–50%, or of nickel and chromium together with molybdenum and/or tungsten, in which the chromium content is above 10% and the nickel above 60%. The pure metals, prepared electrolytically in the form of powder by the use of a current of high density, are consolidated in an atmosphere of hydrogen either by sintering at a temperature below their m.p., preferably with intermediate working, or by fusion, in which case the metal powders may be heated either by an outside furnace or by means of an induced current. In the latter case the enclosure containing the hydrogen may be cooled.

M. E. NOTTAGE.

Manufacture of tools of tungsten. O. DIENER (B.P. 294,086, 15.2.28).—Powdered carbonaceous tungsten, containing more than 3% of combined carbon and no auxiliary metals, is heated at about 2000°, and a reaction pressure of about 150–200 kg./cm.² is simultaneously applied, so that separation of the combined carbon is prevented. Up to 0.6% B or 1.5% Si, or 1.5% (B + Si), may be added to facilitate the process of pressing and still further to increase the hardness.

M. E. NOTTAGE.

Concentration of mixed sulphide ores. H. S. MARTIN (U.S.P. 1,678,259, 24.7.28. Appl., 30.6.27).—A substance which, under the conditions of the flotation process, is capable of liberating the sulphite radical and hydrogen ions is added to the pulp (made alkaline), in order to effect the selective froth-flotation of copper sulphides from ores containing iron sulphides.

H. ROYAL-DAWSON.

Flotation method [for ores]. G. L. ADAMS, Assr. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,678,311, 24.7.28. Appl., 30.1.24).—The flotation agent claimed in U.S.P. 1,678,312 (B., 1928, 702) is used for the concentration of ores.

H. ROYAL-DAWSON.

Manufacture of electrical resistance elements. GEN. ELECTRIC Co., LTD., and C. J. SMITHELLS (B.P. 293,728 and 293,740, 7.4.27).—(A) Nickel-chromium alloys free from deleterious impurities are claimed, the content of nickel being above 50% and of chromium above 10%. In an example the alloy contains 70% Ni and 30% Cr. (B) Resistance to oxidation of such alloys may be increased by substituting molybdenum or tungsten for part of the chromium. Suitable alloys contain 70% Ni, 20% Cr, and 10% W or Mo.

M. E. NOTTAGE.

Blast furnaces [for iron ores]. BROKEN HILL PROPRIETARY Co., LTD. (B.P. 282,042, 1.12.27. Austral., 9.12.26).—See U.S.P. 1,664,832; B., 1928, 411.

Heat-treatment and concentration of copper ores. J. C. MOULDEN and B. TAPLIN, Assrs. to METALS PRODUCTION Co. OF N. AMERICA, INC. (U.S.P. 1,679,337, 31.7.28. Appl., 14.9.25. U.K., 29.10.24).—See B.P. 250,991; B., 1926, 590.

Treatment of ores of copper and other metals. F. DIETZSCH (U.S.P. 1,679,294, 31.7.28. Appl., 31.10.27. U.K., 7.7.26).—See B.P. 281,741; B., 1928, 128.

Welding electrodes [for nickel]. N. B. PILLING and J. G. SCHOENER, Assrs. to INTERNAT. NICKEL Co. (U.S.P. 1,679,002, 31.7.28. Appl., 19.10.25).—See B.P. 259,967; B., 1927, 784.

[Torch for] surface-hardening of metal articles. G. H. FLETCHER, C. L. SUMPTER, and METROPOLITAN-VICKERS ELECTRICAL Co., LTD. (B.P. 294,709, 3.5.27).

Metallurgical coke (U.S.P. 1,676,729).—See II. **Furnace electrodes** (B.P. 282,672).—See XI.

XI.—ELECTROTECHNICS.

Permeameter for testing magnet steel. B. J. BABBITT (J. Opt. Soc. Amer., 1928, 17, 47–58).—The common commercial permeameters are not capable of producing the high magnetising forces required to determine accurately the magnetic properties of cobalt steel in bar form. The yoke type of permeameter may be adapted for this purpose by the use of extensions to the poles so that the distance between them is much less. In this way the greater part of the magnetomotive force is distributed over a short portion of the magnetic circuit and the force per cm. is correspondingly greater. The instrument described gives a very uniform magnetising force, directly proportional to the magnetising current, throughout a wide range of values. It is automatically compensated so that it records only ferric induction, is simple and rapid in operation, and possesses a high degree of accuracy.

L. L. BIRUMSHAW.

Coal conductivity cell. SINKINSON.—See II. **Iron-nickel alloys.** CHEVENARD. **Resistance alloys.** SMITHELLS and others.—See X. **Penetrability of leather.** GERSSEN.—See XV.

PATENTS.

Ironless induction furnaces or heating apparatus. SIEMENS & HALSKE A.-G. (B.P. 277,352 and 277,361, [A] 8.9.27, [B] 9.9.27. Ger., [A, B] 11.9.26. Addns. to B.P. 274,888; B., 1928, 415).—(A) The induction coil of the furnace is enclosed in a double-walled cylinder so that the coil is protected, and supported, and has also free movement for expansion particularly in the direction of the axis of the coil. The protective cylinder may be of carborundum or other suitable refractory. (B) The induction coil is inserted from the bottom of the furnace so that the outer and inner lines of force of the coil pass through the charge. In one arrangement hollow refractory cylinders are provided in the base of the furnace and are accessible from the outside.

C. A. KING.

Furnace electrodes [for manufacture of aluminium]. SOC. ELECTRO-MÉTALLURGIQUE DE MONTRICHER (B.P. 282,672, 17.12.27. Fr., 21.12.26).—To prevent overheating of the electrodes each is formed of sections dove-tailed and bolted together as a cylindrical casing which is filled with a non-conducting material. The upper part of the conducting casing is mounted on metal rings and bars for the better distribution of the current.

C. A. KING.

Furnace electrodes. SOC. ELECTRO-MÉTALLURGIQUE DE MONTRICHER (B.P. 294,837, 20.12.27. Fr., 13.10.27. Addn. to B.P. 282,672; preceding).—The

longitudinal metal bars in the electrodes previously described comprise vertical stanchions in contact over their whole length with the inner faces of the conducting sections, and attached to means for raising and lowering the electrode. Adjacent sections of the electrode are connected together by a paste of carbonised sugar or glucose under pressure. L. A. COLES.

[Filling for] gas-filled electric lamps. SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., and P. D. OAKLEY (B.P. 295,072, 13.5.27).—A filling for gas-filled lamps having a filament composed wholly or mainly of tungsten consists of a mixture of an inert gas or gases, *e.g.*, a mixture containing 85% of argon and 15% of nitrogen together with 0.2–1% of a chlorine-substitution product of an aliphatic hydrocarbon, *e.g.*, ethyl chloride. J. S. G. THOMAS.

[Filling for] electric incandescence lamps with an incandescent body of tantalum carbide. B. ERBER (B.P. 286,687, 16.2.28. Austr., 9.3.27).—The lamps are filled with an inert gas, *e.g.*, argon, to prevent decomposition of the carbide. J. S. G. THOMAS.

Obtaining a perfect high vacuum in electric discharge tubes. S. LOEWE (B.P. 279,842, 24.10.27. Ger., 26.10.26).—In the assembling of electric discharge tubes, a plate of magnesium is situated at a sufficient distance from the anode as to be heated separately by high-frequency eddy currents. During the process of evacuation the anode is heated first for the discharge of occluded gases, then by raising the inductance coil the magnesium is heated to dull redness before heating to a higher temperature to disperse the metal. C. A. KING.

Obtaining a very high vacuum [in electric discharge tubes]. S. LOEWE (B.P. 280,908, 14.11.27. Ger., 16.11.26).—The residual traces of gas are bound by a double dispersion of magnesium metal by high-frequency induction before and after sealing off. The second dispersal is effected at a point in the bulb remote from the first so that the first magnesium mirror should not be affected by the second heating. As an additional precaution the second dispersal may be effected in a space between mica discs. B. M. VENABLES.

Introduction of chemically active [alkali] metals into evacuated or gas-filled containers. WESTINGHOUSE LAMP CO., ASSEES. OF J. W. MARDEN (B.P. 267,902, 23.2.27. U.S., 20.3.26).—A mixture of a non-hygroscopic, anhydrous compound of potassium, rubidium, caesium, or barium, *e.g.*, a chromate, dichromate, permanganate, or double halide (potassium zirconium fluoride etc.), with a reducing agent, *e.g.*, misch metal, iron, nickel, aluminium, or magnesium, preferably enclosed in a metal capsule of low m.p., is decomposed inside the container by heating. L. A. COLES.

Production of metal-containing electric resistances. M. HAUSER (B.P. 270,301, 26.4.27. Switz., 28.4.26).—The resistances comprise mixtures of silicon or ferrosilicon with a high silicon content, a chromium alloy, *e.g.*, ferrochromium, boric acid or a borate, and ceramic raw material, the mixtures being fired under such conditions that oxidation of the charge is avoided. L. A. COLES.

Manufacture of accumulator plates. I. G. FARBERENIND. A.-G. (B.P. 284,352, 28.1.28. Ger., 28.1.27).—A lead grating is cast around a casting of an alloy of lead with a metal, *e.g.*, sodium, which is subsequently removed by dissolution. J. S. G. THOMAS.

Art of galvanoplasty. UNITED PRODUCTS CORP. OF AMERICA (B.P. 273,664, 29.4.27. U.S., 3.7.26).—The preparation of a non-metallic article for the electro-deposition of a metal consists in coating the article with a colloidal film of rubber, making the film conductive, and then rendering the film water-resistant. Thus a film of colloidal rubber containing sulphur may be partially dehydrated, coated with powdered metal when "tacky," vulcanised, and coated with metal by electro-deposition. C. A. KING.

Heat-sensitive recording papers and the like suitable for use in picture and the like telegraphy. MARCONI'S WIRELESS TELEGRAPH CO., LTD., ASSEES. OF R. H. RANGER (B.P. 276,020, 13.8.27. U.S., 14.8.26).—Paper suitable for recording with a jet of hot air or an electric spark is coated with a composition comprising, *e.g.*, 5 g. of nickel nitrate, 3.9 g. of sodium thiosulphate, 3.6 g. of sodium nitrate, and 5 c.c. of 1% gelatin solution per 100 c.c. of water. L. A. COLES.

Electric bright-annealing furnaces. W. ROHN, ASSR. TO SIEMENS-SCHUCKERTWERKE GES.M.B.H. (U.S.P. 1,678,875—6, 31.7.28. Appl., [A, B] 23.10.25. Ger., [A] 15.12.24, [B] 1.11.24).—See B.P. 244,425 and 242,283; B., 1927, 115; 1926, 834.

Flexible [laminated] insulating material. BRIT. THOMSON-HOUSTON CO., LTD., ASSEES. OF L. V. ADAMS (B.P. 280,189, 25.10.27. U.S., 8.11.26).

Resistance elements (B.P. 293,728 and 293,740).—See X. Rubber (B.P. 293,815).—See XIV.

XII.—FATS; OILS; WAXES.

Analysis of glycerin by the acetin method, and its sources of error. O. BERTH (Chem.-Ztg., 1928, 52, 597—598, 619—620).—The international standard acetin method for the analysis of commercial glycerin yields slightly (0.2–0.3%) high results owing to the presence of carbon dioxide in the alkali used and to absorption of that gas from the air. To obviate these errors the standardisation of the alkali against the acid should be carried out under exactly the same conditions as the analysis, except that no glycerin is used, *i.e.*, the acetic anhydride and sodium acetate are boiled together with water, the solution is neutralised to phenolphthalein with sodium hydroxide, a further 50 c.c. are added in excess, and, finally, the mixture is titrated with *N*-hydrochloric acid. This value is used in calculating the results. A. R. POWELL.

Chemistry of lead "soaps" made from litharge and neutral fat. S. H. DIGGS and F. S. CAMPBELL (Ind. Eng. Chem., 1928, 20, 828—829).—When fats are "saponified" with lead oxide in the absence of water at 149°, no free glycerol is formed, nor is any appreciable water or aldehyde liberated. The reaction appears to be one of addition. It can only be carried out satisfactorily if excess of fat or some other diluent such as paraffin oil is present in order to facilitate thorough

mixing during the heating. Unlike the normal and basic fatty acid salts of lead made from lead oxide and fatty acid, these "soaps" from neutral fats show no indication of a colloidal nature, nor are their molecules associated in solution. F. R. ENNOS.

Simpler derivation of the Cook formula for determination of acetyl value of fats and oils. W. RIEMANN III and A. T. HAWKINSON (J. Amer. Chem. Soc., 1928, 50, 2311—2312).—Cook's formula (B., 1922, 299 A) is derived by a simple calculation.

R. K. CALLOW.

Drying oils. VIII. Adsorption of liquids by oil gels. J. S. LONG, E. K. ZIMMERMANN, and S. C. NEVINS (Ind. Eng. Chem., 1928, 20, 806—809). **IX. Action of cold-blowing on linseed oil.** J. S. LONG and W. S. EGGE (*Ibid.*, 809—811).—VIII. The adsorption of various fatty acids, raw linseed oil, mineral oil, glycerol, etc. by extracted heat-bodied oil gels and extracted linseed oil films was measured. The results indicate that the semi-solid material obtained by heat-bodilying of drying oils actually are gels, and that films made by the ordinary drying process have in part a similar gel structure. The gels of both types show similar adsorptions, are equally softened by fatty acids, and are converted into similar tough, rubbery products by the adsorption of mineral oil and glycerol. The heat of combustion is put forward as a criterion for studying the progress of oil-oxidation, the value decreasing from 9367 g.-cal. for raw linseed oil to about 7000 g.-cal. for dry linseed oil films. The heats of combustion of solid and liquid phases in oil films of increasing ages were determined, the value for the solid phase (after extraction) remaining sensibly constant, whilst that for the extracted oil decreased steadily from the much higher value characteristic of slightly oxidised oil. It is considered that the adsorption of the liquid phase by the solid gel structure in the course of solidification of oil involves definite orientation as opposed to simple mechanical entanglement. The oriented, adsorbed, liquid phase changes chemically into the complex molecules characteristic of the solid.

IX. Linseed oil was blown at 30° in the presence of manganese driers, α -naphthol, and sodium and calcium oleate, and after 8 hrs. heating in an inert atmosphere at various temperatures. The changes in d , n_D^{20} , acid value, iodine value, and hexabromide value are recorded. The decrease in unsaturation observed in the presence of positive catalysts is inhibited in the presence of negative catalysts (even if positive catalysts be also present). The oleates lower the surface tension of the oil and permit the immediate formation of a thick, stable foam, the rapid oxygen-absorption at the thus increased interface causing a given viscosity to be attained in about half the time taken by a positively catalysed oil. Previous heat-treatment also proportionately shortens the time taken to reach a given "body." The addition of 0.5% of thioglycollic acid was found quantitatively to precipitate the metals of metallic driers in oils and varnishes. Apart from its analytical significance, this may be used to study the course of particular reactions, driers being withdrawn from the system at any desired stage. S. S. WOOLF.

[Criticism of] a colorimetric reaction to determine the purity of olive oil. M. CUCCURULLO (Annali Chim. Appl., 1928, 18, 297—299).—The eosin test described by Milani (B., 1927, 915; 1928, 130), and apparently dependent on the amount of free acid present, is unreliable; pure olive oil may give a permanent coloration. E. W. WIGNALL.

Laboratory apparatus for extraction of oils with solvents. H. V. DE CAMPOS (Chimica e Ind., 1928, 3, 482—484).—Descriptions and diagrams are given of apparatus, which may be constructed from ordinary laboratory materials, for the extraction of oil from seeds etc. in quantities of up to 5 kg., by either hot or cold solvents, working on the Soxhlet principle.

R. K. CALLOW.

Testing oleine oils by the thiocyanate method. H. P. KAUFMANN (Z. angew. Chem., 1928, 41, 19—22).—The results of examination of a number of samples of oleine obtained from various Continental manufacturers, and used for lubricating textile fibres during processes of manufacture, indicate that the susceptibility to oxidation and consequent spontaneous ignition of an oleine is proportional to the difference between its iodine and thiocyanate values. A. J. HALL.

Locust-kernel oil. WILLIAMS.—See XVII. **Cod-liver meals.** BETHKE and others.—See XIX.

PATENTS.

Treatment of oils or fats or mixtures of the same or fatty acids for the production of sulphuric acid compounds. E. C. R. MARKS. From CHEM. FABR. STOCKHAUSEN & CO. (B.P. 293,717, 6.4.27).—Sulphonated products of great stability are obtained by treating oils etc. with concentrated sulphuric acid, in excess of 35%, at temperatures not above 10—15° (cf. B.P. 293,480; B., 1928, 678). Addition of the acid should be as rapid as possible to prevent excessive rise in temperature. E. LEWKOWITSCH.

Extraction and preparation of animal fats rich in vitamins. J. LYONS & CO., LTD., L. H. LAMPITT, and J. H. BUSHILL (B.P. 293,777, 5.4.27).—Visceral material is frozen, comminuted, thawed, and treated with caustic soda at 40° to dissolve protein matter. The fat is neutralised and separated. E. LEWKOWITSCH.

Obtaining certain remedial principles of oils. T. F. ZUCKER, ASSR. to UNIVERSITY PATENTS, INC. (U.S.P. 1,678,454, 24.7.28. Appl., 7.12.22).—Cod-liver oil is extracted with alcohol, the fatty acids in the extract are saponified, and the soaps converted into calcium soaps, from which the antirachitic principles are extracted.

B. FULLMAN.

Dye soaps. W. KRITCHEVSKY and H. C. PRUTSMAN (B.P. 270,637, 29.12.26. U.S., 5.5.26).—Dye soaps which give no scum when used with hard water and do not dry out on storage nor liberate fatty acid when prepared with acid dyes are made from sulphonated soaps of the general formula $\text{CO}_2\text{X} \cdot \text{R} \cdot \text{O} \cdot \text{SO}_3\text{X}$, where X represents a metal and R a hydrocarbon radical or a derivative thereof. [Stat. ref.] D. J. NORMAN.

Bleaching of fats (B.P. 274,828).—See II. **Phosphatides** (U.S.P. 1,673,615).—See XIX.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Chipping and abrasion tests for paint coatings on metal. A. D. CAMP (Ind. Eng. Chem., 1928, 20, 851—852).—The chipping test is made by dropping a series of tools of specified dimensions down a 24-in. tube on to standardised, painted, test panels and observing the extent and character of the impression made on the coating. The abrasion test is made by determining the number of revolutions of the painted test panel under a standard abrading disc which are required to wear through the paint film.

S. S. WOOLF.

Yellowing of white enamels. H. MUNZERT (Farben-Ztg., 1928, 33, 2849—2851).—Previous German work on the yellowing of enamel vehicles with age is summarised. A series of comparable enamels were prepared, using equal bulks of zinc sulphide ("Sachtolith"), titania, zinc oxide, and white lead, all in a high state of purity, with each of the following vehicles (white spirit being the solvent):—60% solution of lime-hardened rosin, 60% solution of ester gum, 70% solution of pale linseed oil stand oil, and 60% solution of a tung oil-linseed oil stand oil. The 16 enamels were brushed on tin plate, and dried for 4 days in diffused daylight. The films were then half-covered by black paper and exposed to direct sunlight for 14 days, after which the degree of yellowing was noted in comparison with freshly-prepared films of the stored enamels and with films of similar freshly-prepared enamels. The covered films were found to yellow more than the exposed ones, whilst of the pigments white lead caused most yellowing, followed by zinc oxide, titania, and zinc sulphide in descending order. Yellowing is attributed in the main to dark-coloured oxidised acids which rapidly undergo further degradation in the light to form gaseous or colourless compounds. This degradation is, however, delayed in the dark and to a greater degree still by salt-formation with pigments, the "fixing" of the yellowing being proportional to the basic nature of the pigment.

S. S. WOOLF.

Graphical methods in lacquer technology. H. E. HOFMANN and E. W. REID (Ind. Eng. Chem., 1928, 20, 431—436).—Rectangular co-ordinates are useful in interpreting the results of distillation and evaporation tests of solvents, and tests of tensile strength and elongation under load, of lacquer films. The values of dilution ratios when a standard non-solvent is added to a solution of nitrocellulose in a true solvent until precipitation begins may be represented by bars or lines parallel to the ordinate. For two non-solvents mixed in varying proportions the dilution ratio is plotted against the composition of the diluent mixture. The use of triangular co-ordinates in the investigation of the capacity of a solvent mixture of three components to dissolve nitrocellulose is described. Constant-cost mixtures may also be similarly represented. Examples are also given of the application of nomographs in mixing lacquers to give a product of desired viscosity or weight per gallon.

W. J. BOYD.

Phenol-formaldehyde resinification. I. J. NOVÁK and V. ČECH (Ind. Eng. Chem., 1928, 20, 796—801).—The isolation and purification of phenol-aldehyde condensation products at intermediate stages of the resinification

having proved impracticable, the authors have studied the kinetics of the reaction by observing changes in refractive index, viscosity, and "bromine value." The methods adopted are described fully. Typical resinifications in aqueous mixtures were examined by these methods without catalyst and with alkaline and acid catalysts. The progress and products of resinification are shown to differ considerably in each case, and the reaction mechanisms are discussed. In the absence of catalysts condensation reactions occur until an intermediate insoluble resinous substance is precipitated; this now undergoes polymerisation, but the condensation also continues. With alkaline catalysts the initial condensation is accelerated and the subsequent polymerisation is intensified. Products of acid resinification, however, have a very limited tendency to polymerisation.

S. S. WOOLF.

Drying oils. LONG and others.—See XII.

PATENTS.

Non-livering coating compositions. E. I. DU PONT DE NEMOURS & Co., Assees. of J. D. MCBURNEY and E. H. NOLLAU (B.P. 294,029, 20.10.27. U.S., 22.7.26).—Livering of coating compositions with a drying-oil base is prevented or removed by the admixture of small quantities (at least 0.1%) of substances with a dissociation constant between 1 and 3.4 (e.g., citric acid, tartaric acid).

E. LEWKOWITSCHE.

Coating and binding compositions. C. TAUBER [G. LEUCHE NACHF.] (B.P. 275,610, 27.7.27. Ger., 3.8.26).—Vehicles for primers for wood, brick, plaster, etc. are obtained by incorporating magnesium soaps with linseed oil, tung oil, etc. The stronger basic character of magnesia compared with alumina (as previously claimed) obviates reaction of the soaps with basic pigments in the mixed paint. [Stat. ref.] S. S. WOOLF.

Production of permanent paste containing red oxide of lead (minium). E. ASSER (B.P. 294,436, 9.1.28).—Red lead is ground in linseed oil, or other paint vehicle, in the presence of a small proportion of infusorial earth and/or a neutral or basic resinic or fatty acid salt of alumina that has undergone colloidal swelling in a suitable solvent, e.g., benzene. The paste thus produced does not harden, and may be converted into paint by the addition of linseed oil etc.

S. S. WOOLF.

Production of cellulose varnishes. H. WOLFF and R. SINGER (B.P. 293,732, 11.4.27).—Stable cellulose lacquers containing lead pigments are obtained by the introduction of acid organic compounds (e.g., picric acid, fatty acids, etc.).

E. LEWKOWITSCHE.

Production of coloured brushwork lacquers. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 294,158, 19.4.27).—Coloured cellulose derivatives prepared from nitrocellulose, acetylcellulose, or water-insoluble cellulose ethers (cf. B.P. 247,288 and 293,485; B., 1926, 315; 1928, 668) are dissolved in glycol mono- or di-alkyl ethers or their esters or other similar solvents, and the resulting lacquers are diluted with aromatic hydrocarbons or their halogen derivatives and/or aliphatic or hydroaromatic alcohols. The products are

brushable and give coatings of high gloss without further treatment when dry. S. S. WOOLF.

Making resinous compositions. BRIT. THOMSON-HOUSTON CO., LTD., Assees. of E. S. DAWSON, JUN. (B.P. 285,459, 15.2.28. U.S., 17.2.27).—Drying oil is compounded with a "glyptal" resin (cf. B.P. 235,595; B., 1926, 638) by dissolving the oil in the polybasic organic acid component, *e.g.*, phthalic anhydride, and reacting on this solution with the polyhydric alcohol component, *e.g.*, glycerol, at a temperature sufficiently high to produce resinification, no separate solvent being used. Alternatively, the three components may be treated together. S. S. WOOLF.

Manufacture of phenol-formaldehyde condensation products. KUNSTHARZFABR. DR. F. POLLAK GES.M.B.H. (B.P. 267,901, 23.2.27. Austr., 17.3.26).—A colloidal dispersed condensation product of 1 mol. of phenol and 2½ mols. of formaldehyde is produced by conducting the main condensation under strongly alkaline conditions. The colloidal solution of the intermediate product is neutralised and gelled by heat. The gel is finally hardened by heat, preferably under weakly acid conditions (the use of halogenated lower fatty acids being recommended for the neutralisation process). S. S. WOOLF.

Manufacture of a powder which can be pressed by the condensation of urea or its derivatives and formaldehyde. KUNSTHARZFABR. DR. F. POLLAK GES.M.B.H. (B.P. 271,037, 28.1.27. Austr., 15.5.26).—An aqueous solution of the condensation product is diluted to such an extent, or, alternatively, the condensation takes place at such a dilution, that no gelatinisation takes place, and the product is precipitated as an amorphous, flocculent precipitate by the addition to the solution of a flocculating agent, *e.g.*, an acid, base, or albumin precipitant. The precipitate is washed, dried, and moulded under heat and pressure into glass-clear objects. L. A. COLES.

Plastic [insulating] material and its manufacture. P. E. BASSET (B.P. 293,436, 21.11.27. Fr., 8.7.27).—Vegetable proteic materials and glutens (*e.g.*, spent grains, malt, etc.) are condensed with phenolic compounds under the influence of catalysts or hydrolysing substances. E. LEWKOWITSCH.

Arylaminesulphonic acid derivatives (B.P. 293,781).—See III. **Azo dyes** (B.P. 294,291). **Insoluble colouring materials** (B.P. 270,293).—See IV. **Fluorescent preparations** (B.P. 295,078).—See VII.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Dispersoidological investigations on latex. P. P. VON WEIMARN (Bull. Chem. Soc. Japan, 1928, 3, 157—168).—A *résumé* of the salient features of recent investigations, details of which will appear later. Amongst the microscopically visible particles are particles of all the shapes reported by previous observers. The main conclusion regarding the structure of latex is expressed as follows: Latex is a polydisperse system of iso-aggregate particles (iso-spherulites), the general consistency of which is fluid-gelatinous. The individual solid particles which compose the iso-aggregate particles

of latex are very small, the greater part of them being invisible under the ultramicroscope; the constituent parts of serum (*i.e.*, the dispersion medium in which the iso-aggregate particles are suspended), *viz.*, protein, water, resin, etc., are present not only in the surface film, but also inside the particles. These non-caoutchouc components play corresponding rôles in the changes the iso-aggregates undergo in their consistency and structure, during the drying-up and during other coagulation processes of latex. When latex is mixed with solutions of substances which are dispergators of protein, but without effect on caoutchouc, complete gelatinisation of latex into a coherent elastic material occurs. Elastic films of vultex are caused by the union of the caoutchouc contents of particles and not by the union of the non-caoutchouc layers. J. S. CARTER.

Effect of various types of carbon black on certain physical properties of rubber compounds. D. J. BEAVER and T. P. KELLER (Ind. Eng. Chem., 1928, 20, 817—819).—Acetylene black, thermatomic black, lampblack, and five varieties of carbon black are tested as to density, iodine adsorption, oil adsorption, acetone extract, oxidation by 0.02*M*-permanganate, and calorific value. The oxygen content of the various blacks, as indicated by differences in the inverse of the calorific value, causes a corresponding retardation in the rate of vulcanisation, decrease in the maximum physical properties attainable, and increase in the rate of ageing. It is therefore expected that in rubber mixtures thermatomic black and acetylene black with a low oxygen content will give better ageing results than lampblack or standard gas blacks with higher oxygen content. None of the other analytical features shows any correlation with the effect on ageing. D. F. TWISS.

Organic rubber colours. W. J. S. NAUNTON (Trans. Inst. Rubber Ind., 1928, 4, 68—84).—Rubber colours should be tested as to moisture content, fineness, freedom from water-soluble colour, shade, strength, light-fastness, and bleeding; they should also be tested under the exact conditions intended. Using a standard mixing of pale crêpe rubber 100 pts., zinc oxide 6 pts., lithopone 22 pts., catalpo 50 pts., magnesia 2 pts., sulphur 2 pts., tetraethylthiuram disulphide ⅓ pt., and sufficient of various colours to impart a full shade, with vulcanisation for 10 min. at 40 lb. steam pressure, the colours appeared to have a bad influence on ageing at 70° but a good effect on normal ageing; in the additional presence of an anti-ager (nonox 1 pt.), even the heat-ageing was unaffected. Ageing had little influence on the actual colour of the mixed rubbers. Organic colours are classified into those (a) soluble in rubber, (b) slightly soluble in rubber, and (c) insoluble, and the characteristics of each group are given. The selection of colours for use with latex or in soft rubbers or ebonite, or for the production of transparent or "jazz" effects is indicated. D. F. TWISS.

Softeners and anti-softeners [for rubber]. E. C. ZIMMERMAN and L. V. COOPER (Ind. Eng. Chem., 1928, 20, 812—813).—Fluxes for rubber may be classified into lubricants and true softeners. For the evaluation of

a softener, a standard sample of raw rubber masticated under definite conditions is tested in a Williams plastometer (cf. B., 1924, 480) before and after the incorporation of 5% of the softening agent. Certain substances, *e.g.*, benzidine, *p*-aminophenol, and the naphthylamines, are anti-softeners, and cause a stiffening of unvulcanised stock. D. F. TWISS.

Classification of [organic] accelerators [of vulcanisation of rubber]. R. P. DINSMORE and W. W. VOGT (Trans. Inst. Rubber Ind., 1928, 4, 85—106).—The chemical nature of the commoner organic accelerators is indicated together with their practical features, such as their relative activity, tendency to produce scorching, best proportion of sulphur for vulcanisation, influence on tensile strength and extensibility of "unloaded" and black-compounded mixings, persistence during vulcanisation, antioxidant effect, influence on alteration in extensibility on storage, need for simultaneous presence of stearic acid, and effectiveness for vulcanisation in hot air. The decisions as to vulcanisation criteria were based on the hand-tear test (Dinsmore and Zimmerman, B., 1926, 289). In unloaded stocks, especially when vulcanised with sulphur only, but also in the presence of an accelerator, the discrepancy between the vulcanisation optimum as decided by hand-tear and tensile product is great, the former placing the optimum at a much shorter time; for loaded stocks the two methods show fair agreement. D. F. TWISS.

Machine for testing rubber products used to absorb vibration. F. D. ABBOTT (Ind. Eng. Chem., 1928, 20, 853—857).—The ordinary physical characteristics, such as tensile strength, ultimate elongation, and permanent set after extension or compression, fail to give a satisfactory index of the resistance of vulcanised rubber to dynamic fatigue from flexure under compression. A machine is described for the testing of shock-insulators etc. which submits compressed samples to flexure at a rate of 800 cycles/min.; in these circumstances the permanent set approaches a maximum in 3 or 4 hrs., the temperature also rapidly attaining a maximum. The results place stocks in the same order as service and dynamometer tests. D. F. TWISS.

Introfiers. DARRIN.—See III. **Stress-strain curves for rubber.** STRONG.—See VII.

PATENTS.

Electrodeposition of rubber or the like. W. A. WILLIAMS (B.P. 293,815, 8.4.27).—The process of B.P. 289,965 (B., 1928, 494) is extended to latex which has been previously vulcanised and to which chemicals or fillers may have been added. D. F. TWISS.

Preservation and treatment of latex. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 294,412, 12.11.27).—Soluble salts of sulphonic acids possessing soap-like qualities, *e.g.*, of aromatic or hydroaromatic sulphonic acids containing substituent alkyl, cycloalkyl, aralkyl, or aryl groups, or of sulphonic acids yielded by aliphatic tar oils, mineral oils, or fatty acids, are used for the preservation of latex. The presence of such a salt, *e.g.*, sodium butylnaphthalenesulphonate,

alone or in conjunction with ammonia, is advantageous when latex is used for impregnating porous materials, *e.g.*, fabrics, cork, or paper. D. F. TWISS.

Treatment of rubber latex. L. MELLERSH-JACKSON. From GEN. RUBBER CO. (B.P. 294,002, 25.8.27).—Rubber latex, preferably containing a little ammonia, is treated with a small proportion of ammonium alginate solution. In 24 hrs. separation occurs with formation of a cream containing practically all the rubber in a concentrated but uncoagulated form; the lower layer contains the greater portion of the soluble non-rubber constituents. The cream can be converted into rubber by known methods, *e.g.*, spraying. D. F. TWISS.

Production of a reversible paste from rubber latex. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 294,804, 10.10.27).—Rubber latex is mixed rapidly with sufficient acid, *e.g.*, 7% hydrochloric acid, to give a p_H value below 2 and preferably below 1. After a period, *e.g.*, 24 hrs., the finely-divided deposit of rubber is removed and constitutes a reversible paste which can be stored unchanged in closed vessels. Other substances of importance for the further treatment of the rubber may be added either before or after the addition of acid. D. F. TWISS.

Galvanoplasty (B.P. 273,664).—See XI.

XV.—LEATHER; GLUE.

Determination of sulphuric acid in vegetable [tanned] leather. R. F. INNES (J. Soc. Leather Trades' Chem., 1928, 12, 256—272).—Free sulphuric acid in vegetable-tanned leather is determined by combining results with the Procter-Searle method (cf. B., 1927, 283) with those obtained by the following gravimetric and physical methods. The former consists in extracting 2 g. of the leather with 400 c.c. of 0.2*N*-sodium bicarbonate solution for 24 hrs. at laboratory temperature, and determining the total sulphates in the extract by means of barium chloride. In the physical method 1 g. of the leather is treated with 50 c.c. of water free from carbon dioxide for 24 hrs. with occasional shaking, and the p_H value of this aqueous extract is determined. A portion of the extract is diluted ten times, and the p_H value of the diluted extract is determined. If the difference between these two values is 0.5 or below, no strong mineral acid is present, but if it is 0.7 or above then it is concluded that strong mineral acid is present. Experiments on pelt and leather treated with sulphuric acid and afterwards extracted with water and sodium bicarbonate solution, respectively, showed that only the sodium bicarbonate removed the whole of the acid. D. WOODROFFE.

Determination of insoluble matter [in tannin] by filtration in presence of kaolin. A. JAMET and A. J. GIRARD (J. Soc. Leather Trades' Chem., 1928, 12, 279—281).—The amount of insoluble matter as determined by the official method is shown to vary with the kaolin and also with its degree of fineness. The apparent insoluble matter increased when the kaolin used had been ground in an agate mortar. Other determinations with sieved kaolin gave variations of 2.45—4.1% in the values obtained with fine kaolin (300-mesh) and the residue from 230-mesh. D. WOODROFFE.

Tannin analysis. J. PAESSLER (Collegium, 1928, 352—361).—The hide powder is chromed, washed, and used for detanninisation without removal from the container—a small cylindrical glass vessel tapering slightly at its closed end and fitted with a stopper and tube at the mouth. The lower end of tube is attached to a small Berkefeld filter candle inside the container, the other end being attached to a filter pump. The vessel and powder are weighed together, and, after chroming and washing, the wash water is filtered off until the weight of wet chromed powder corresponds to a content of 20 g. of water. This method avoids handling the powder.

D. WOODROFFE.

Apparatus for determining the ethyl acetate value of tannins. C. RIESS (Collegium, 1928, 275).—A flask containing the tannin solution is in the form of a flat-bottomed tube. During the extraction condensed ethyl acetate drops into a funnel, the point of which leads into a cavity in the bottom of the tube, closed by a rough glass filter which will disperse the solvent into very fine droplets, thereby considerably increasing its surface and facilitating tannin extraction.

D. WOODROFFE.

Grading of commercial gelatin, and its use in the manufacture of ice cream. D. C. CARPENTER, A. C. DAHLBERG, and J. C. HENING (Ind. Eng. Chem., 1928, 20, 397—406).—Methods of grading commercial gelatin include measurement of mutarotation, gel strength, and viscosity, and also formol titrations. Experiments on purified, de-ashed, calfskin gelatin show that mutarotation is dependent to some extent on p_H . For bone and calfskin gelatins a p_H of 7.3 is satisfactory, but, owing to the isoelectric point of pigskin gelatin being close to this value, p_H 5 is selected in order to avoid the opacity of such solutions. For purified de-ashed calfskin gelatin, the gel strength at 0.7° and 10°, as measured by the Bloom gelometer (cf. Richardson, B., 1923, 413 A), shows a maximum value over the range, p_H 5—7. By lowering the hardening temperature from 10° to 0.7° the gel strength in this region is increased about 55%. For both calfskin and pigskin gelatins, the relation of gelatin concentration to gel strength at low temperatures is given by the equation: $s = KC^n$, where s is the Bloom strength, C the gelatin concentration (%), and K and n are constants. With longer time and lower temperature of hardening the gain in gel strength is greater with the lower-grade gelatins, especially for pigskin gelatin. Since increase in gel strength is also most marked in the less concentrated gels, the Bloom test should be made at 0.7° in gelatins to be used in ice cream. Addition of ammonium sulphate increases gel strength only slightly. Commercial pigskin gelatin gained materially in strength on adjustment of the p_H from the original acidity to 6.6, which is the p_H of milk and cream. The relation between Bloom strength and mutarotation for pigskin is linear, but for calfskin gelatins it is linear only at high gel strengths; hence mutarotation is not a specific property of the chemical species causing gelation. There is evidence also of a relationship between Bloom strength and viscosity, but the former is the more reliable index. The grading of commercial gelatins by means of formol titrations is unreliable, and suggested

changes in the method for use in ice-cream manufacture are discussed. Calfskin gelatin appears to exist in two forms: the sol form stable at 40°, in which the amino-acids are probably in chains, and the gel form stable at 0.5° which contains ketopiperazine linkings.

W. J. BOYD.

Pure food gelatin. Physical properties related to economy of manufacture. M. BRIEFER and J. H. COHEN (Ind. Eng. Chem., 1928, 20, 408—413).—A method has been devised for measuring the consistency of jellies which are too weak to permit the finger test or Bloom gelometer to be applied. A very small shot of definite weight is allowed to fall from a fixed height through the jelly, in which the fall is arrested at different levels according to the consistency of the jelly. The method of measuring turbidity is described, and the effect of p_H on jelly consistency and turbidity is studied, the four types of gelatin used being extracted from (a) acid-plumped pig skins, (b) limed splits, (c) limed sinews, and (d) limed pieces. The jelly consistency- p_H curves have each two maxima, but the depressions for limed-stock gelatins occur at about p_H 5, and for acid-plumped stock at about p_H 8. For pig-stock gelatin a 6.3% jelly tested by the Bloom gelometer shows a maximum at the p_H at which the jelly consistency shows a depression, a 0.76% jelly being used for the latter test. For gelatins of class (a) there is a turbidity maximum at p_H 8, whilst for the limed stock (classes b—d) the maximum occurs at p_H 4.9. The two types of gelatin cannot be mixed at any useful p_H value without producing a turbid solution. The significance of viscosity of the gelatin in relation to the sp. gr. of marshmallow cream has been studied. Experiments with gelatins, all of 200 g. Bloom but of different viscosities, reveal a steady rise in sp. gr. with decreasing viscosity. Gelatins of different jelly strengths but approximately equal in viscosity were then used to show the relation of jelly strength to sp. gr. Thus for a gelatin testing 140 g. Bloom it was necessary to increase the concentration much above the value based on jelly strength in order to give a marshmallow of the same sp. gr. obtained on that basis with a gelatin testing 200 g. Bloom.

W. J. BOYD.

Effect of previous history on the viscosity of gelatin solutions. C. E. DAVIS and H. M. SALISBURY (Ind. Eng. Chem., 1928, 20, 829—831).—A method is described for determining the viscosity of gelatin solutions. Owing to a gradual transition of the solutions to the gel form at 25°, reproducible results could not be obtained at this temperature, and the bulk of the measurements were therefore made at 40°. Viscosity- p_H curves are shown for a number of gelatins of which the sources of the raw material and the method of extraction are known. Gelatins of greatest jelly strength produce the highest viscosity- p_H curves. The maximum viscosity occurs in all cases at p_H 2.5—2.6. The short duration and low temperature of heating required to dissolve the gelatin has no effect on its viscosity.

F. R. ENNOS.

Dipping refractometer for determining the concentration of dilute glue liquors. A. C. HART (Ind. Eng. Chem., 1928, 20, 870—871).—The composition of

dilute glue liquors is usually inferred from their sp. gr., a method which does not give an accuracy of more than $\pm 0.5\%$. Greater accuracy is obtained by the use of the Zeiss dipping refractometer. A number of determinations of n for known solutions were made with this instrument, and the average value for the specific refractivity of glue was determined as 0.00183. Variations which were not correlated to the ash constant were found between different classes of glues. If the grade of glue is known determinations by this method should be accurate to $\pm 0.1\%$.

C. IRWIN.

“Zair” process. BROWN.—See VI.

PATENTS.

Treatment of skins containing calcified formations. J. PAISSEAU and R. A. GERMAIN (B.P., 272,199, 27.5.27. Fr., 3.6.26).—Skins, such as crocodile skin, with calcareous tubercles, are macerated in an acidic liquid adopted to convert the calcareous substances gradually into soluble diffusible salts without harm to the derm; fixing or tanning agents are also included in the bath in order to assist the protection of the derm. The skin is then washed and tanned. Glycerin or deliquescent salts may be added to the acid bath or the tanning bath to prevent contraction of the decalcified nodules during drying.

D. F. TWISS.

Preparation of a cold glue powder. G. HÖNSCH (B.P. 274,490, 14.7.27. Ger., 16.7.26).—Finely-powdered animal glue is mixed with a colloid-liquefying substance of a neutral or weakly acid character, e.g., solid organic acids or their salts, calcium nitrate, etc., and with a drying or dressing agent, e.g., magnesium carbonate, alum, or quartz powder.

F. R. ENNOS.

Arylaminesulphonic acid derivatives (B.P. 293,781).—See III.

XVI.—AGRICULTURE.

Colloidal behaviour of soils and soil fertility.

IV. Anion effect on precipitation reactions and degree of dispersion of aluminium and iron hydroxides. J. S. JOFFE and H. C. MCLEAN (Soil Sci., 1928, 26, 47—59; cf. B., 1927, 308).—The solubility of aluminium and iron and the formation of the different states of aggregation are controlled not only by the hydrogen-ion concentration, but primarily by the anions present. Experiments on sol and gel formation in solutions of iron and aluminium salts showed that gel formation with salts of aluminium occurred at the following p_H values for various anions: sulphate 4.7—4.8, chloride 5.4, nitrate 5.8—6.0. With iron, corresponding values are: 3.2—3.8, 5.4, 5.4. In mixtures of anions the properties of bivalent or trivalent anions control the states of aggregation of the aluminium and iron colloids. This almost precludes the existence of free iron in molecular state in normal soils.

H. J. G. HINES.

Determination of exchangeable calcium in carbonate-free soils. R. WILLIAMS (J. Agric. Sci., 1928, 18, 439—445).—Exchangeable calcium can be determined satisfactorily by using 0.5*N*-acetic acid as the leaching agent.

H. J. G. HINES.

Potash manures and their influence on soils. A. STROBEL and W. SCHROPP (Illustr. Landw. Ztg., 1927, 47, 642; Bied. Zentr., 1928, 57, 255—257).—Poppies, potatoes, beet, and cabbages benefited considerably from potash manuring in a 12-year experiment, but straw crops were not greatly affected. No harmful effect of potash salts on the reaction, physical properties, or the microflora of the soil could be observed.

H. J. G. HINES.

Factors affecting the iron and manganese content of plants, with special reference to herbage causing “pining” and “bush-sickness.” W. GODDEN and R. E. R. GRIMMETT (J. Agric. Sci., 1928, 18, 363—368).—Preliminary pot experiments with oats and mustard are reported using New Zealand soils on which the disease known as “pining” was prevalent. These soils were compared with a local soil (Aberdeen), and with sand with various manurial treatments. It is indicated that lack of drainage is an important factor in increasing the manganese content of the crop.

H. J. G. HINES.

A “deficiency disease”: lack of available manganese in a lime-induced chlorosis [in crops]. B. E. GILBERT and F. T. MCLEAN (Soil Sci., 1928, 26, 27—31).—“Yellowing-off” of maize, onions, and mangolds was prevented by treatment with manganese salts, preferably in a liquid form.

H. J. G. HINES.

Assimilation of biogenic elements by the roots of crops. J. STOKLASA (Vestn. Cekoslov. Akad. Zmedelske, 1927, 3, 242—255; Bied. Zentr., 1928, 57, 259—262).—Difficultly soluble substances in the soil are brought into solution by acid excretions from plant roots, organic acids and carbonic acid both being excreted. The carbon dioxide produced by microbiological action also plays an important part in rendering insoluble materials soluble.

H. J. G. HINES.

Increase of iodine content of plants. E. HILTNER (Forts. Landw., 1928, 3, 1; Bied. Zentr., 1928, 57, 258—259).—In an experiment on meadow land using potassium iodide as a source of iodine, the values obtained for the iodine content of the dry matter were: untreated, 0.146; manured with potassium iodide, 0.797; sprayed with potassium iodide solution, 2.351 mg./kg.

H. J. G. HINES.

Composition and metabolism of the tobacco leaf at different stages of growth of the plant. A. SMIRNOV and co-workers (Ber. Centr. Inst. Tabakforsch. Krasnodar, 1926, 29; Bied. Zentr., 1928, 57, 264—265).—A complete account of the distribution of organic substances in the leaves is given for four stages in the life of the plant, viz., at planting, at the stage of 8—10 leaves, in full bloom, and at the technically ripe state of the leaf.

H. J. G. HINES.

Growth of grapes. IV. Initial changes in acidity. V. Relationship between sugar and soluble solids in the juice. VI. Acid:sugar ratio. P. R. V.D. R. COPEMAN (Trans. Roy. Soc. S. Africa, 1928, 16, ii, 103—106, 107—113, 115—120; cf. A., 1927, 908).—The above relationships have been expressed in definite mathematical forms.

H. J. G. HINES.

Compound and complete fertilisers. A. MITTASCH (Z. angew. Chem., 1928, 41, 902—916).—Compound fertilisers may be classified as (1) superphosphates with added nitrogen or potash, (2) organic residues used mainly in America, (3) fertilisers developed by the synthetic nitrogen industry. The last-named include "Kalamonsalpeter" (a mixture of potassium nitrate and ammonium chloride in equimolecular proportions), "Leunaphos" or diammonium phosphate, now chiefly prepared from phosphoric acid made in the electric furnace, and "Nitrophoska," prepared by adding to fused ammonium nitrate diammonium phosphate and potassium chloride or sulphate. Five different mixtures are prepared, according to the soil and requirements of the crops. Another group contains the nitrogen as urea. The microscopical examination of these mixtures is described, and solubility diagrams and vapour-pressure curves of the saturated solutions of the salts concerned are given. In the study of caking not only the rate of water absorption from the air, but the amount of water required to cause caking must be considered. The total "water capacity" is determined by tests in air of known moisture content. An apparatus is illustrated which determines the "capability of distribution" of a fertiliser, *i.e.*, the quantity spread over a given area. The caking pressure may also be determined. The proportioning of nitrogen, phosphorus, and potash in the plant substance, in animal manure, and in Nitrophoska is compared. It is claimed for Nitrophoska that all its ingredients are readily assimilated, that the mixture is perfectly uniform, and that it can be stored and sown in any climate and at any time of the year. C. IRWIN.

Field experiments on the availability of nitrogenous fertilisers, 1923—1927. J. G. LIPMAN, A. W. BLAIR, and A. L. PRINCE (Soil Sci., 1928, 26, 1—25).—In discussing the results for the last five years of this twenty-year old experiment emphasis is laid on the following points. Great difficulty is experienced in maintaining the nitrogen supply of the soil where no legumes are grown. Under field conditions the recovery of applied nitrogen is very low (about 30%), and great losses of nitrogen occur. Liming is imperative where physiologically acid fertilisers are used. Mineral nitrogenous manures have proved superior to the organic forms. H. J. G. HINES.

Nitrogen fixation by soil micro-organisms. P. G. KRISHNA (J. Agric. Sci., 1928, 18, 432—438).—*Azotobacter* and *B. amylobacter* groups are the important agents in the fixation of nitrogen in soil, their optimum ranges being p_H 7.0—8.4 and p_H 6.0—7.0, respectively. Fungi are responsible for the fixation of small amounts of nitrogen. H. J. G. HINES.

Bordeaux mixture in combination with arsenical sprays. W. GOODWIN and H. MARTIN (J. Agric. Sci., 1928, 18, 460—477).—The interaction of Bordeaux mixture with lead arsenate and with calcium arsenate was studied by examining the effects produced (*a*) by adding hydrated lime to the arsenical compounds, (*b*) by adding copper sulphate to the arsenical compounds and hydrated lime. Under conditions involving the

long-continued action, in the presence of water, of calcium hydroxide on lead arsenate, the latter is decomposed with the formation of basic calcium arsenates which in the presence of water and carbon dioxide are converted into the relatively soluble calcium monohydrogen arsenate. If, however, the conditions are such that the carbonation of the excess of calcium hydroxide occurs with sufficient rapidity, the amount of soluble arsenate compounds formed is not sufficient to make the liability to arsenical injury greater. It is concluded that when the conditions are such that the addition of hydrated lime brings about a reduction of arsenical injury, the use of an "equal lime" Bordeaux mixture containing an equivalent amount of calcium hydroxide will prove far more effective.

H. J. G. HINES.

Petroleum oil as carrier for insecticides and as plant stimulant. E. R. DE ONG (Ind. Eng. Chem., 1928, 20, 826—827).—Attention is drawn to the increased penetrating, spreading, and wetting powers of nicotine and other insecticides when used in combination with emulsions of fractions of petroleum oils which are not injurious to foliage. Some physiological effects of oil sprays on fruit trees are also discussed.

C. T. GIMMINGHAM.

Analysis of insecticides. Liquid insecticides miscible with water: alcohol, mercury and formaldehyde, picric acid, nicotine, and garlic essence. M. FRANÇOIS and (Mlle.) L. SEGUIN (J. Pharm. Chim., 1928, [viii], 8, 105—112; cf. B., 1928, 382).—Methods for the detection and determination of nicotine, picric acid, formaldehyde, mercuric chloride, and ethyl alcohol in liquid insecticides are given. E. H. SHARPLES.

Miscible carbon disulphide. FLEMING and WAGNER.—See III.

PATENTS.

Treatment of [manufacture of fertilisers from] material containing magnesium [and potassium chlorides]. F. G. LILJENROTH (B.P. 283,558, 26.4.27. Swed., 15.1.27).—A solution of a mixture of potassium and magnesium sulphates, prepared by treating the material, *e.g.*, kainite, with sulphuric acid, is treated with ammonia and carbon dioxide, and, after removal of the precipitated magnesium carbonate, the liquor, which contains potassium and ammonium sulphates, is used for precipitating calcium from the liquor obtained by leaching phosphatic rocks with nitric acid, yielding a fertiliser containing nitrogen, potassium, and phosphoric acid, but practically free from sulphuric acid, chlorides, and magnesium. L. A. COLES.

Manufacture of ammonia phosphate fertiliser. AMER. CYANAMID CO. (B.P. 284,322, 16.1.28. U.S., 28.1.27).—Dry monoammonium phosphate is treated with gaseous ammonia in a closed container at temperatures (preferably 60—150°) and pressures above atmospheric. The granules in this way become coated with triammonium phosphate. On storage, diammonium phosphate is formed throughout the mass, and any excess ammonia is removed by evacuation.

H. J. G. HINES.

Fertilisers (B.P. 276,297).—See VII.

XVII.—SUGARS; STARCHES; GUMS.

Recovery of potassium salts and other alkaline substances in the sugar industry. T. G. Y ARNAL (Chim. et Ind., 1928, 20, 27—29).—Molasses is treated with a solution of calcium ferrocyanide which reacts with the potassium salts present to form the slightly soluble ferrocyanide of calcium and potassium. After filtration a further yield of sugar crystals may be obtained from the syrup. For the recovery of the reagents and salts, the filter cake is mixed with a solution of ferric chloride or sulphate, preferably the latter, and the Prussian blue and calcium sulphate formed are separated from the soluble potassium sulphate and treated with slaked lime. The soluble calcium ferrocyanide is recovered, and to the ferric hydroxide and calcium sulphate is added the theoretical quantity of sulphuric acid to convert the former into ferric sulphate, which is separated by decantation. F. R. ENNOS.

The Laurent saccharimeter. W. ANDERSON (J. Mun. Coll. Tech. Manchester, 1928, 13, 158—160).—The instrument may be used to determine the rotation of light of any colour, but its sensitiveness will depend on the phase difference produced by its crystal for that colour. The sensitiveness of the instrument is reduced in the ratio $(1 - \cos \phi)/2$ when the crystal produces a phase difference ϕ , compared with the ideal phase difference π . F. G. TRYHORN.

New soluble starch and an improved polarimetric Lintner method. H. C. GORE (Ind. Eng. Chem., 1928, 20, 865—866).—Starch is treated with 13% hydrochloric acid at room temperature for 6 days, washed free from acid, and dried in a current of warm air. By cooling the hot 6% solution, keeping it, and filtering, a clear permanent solution of about 5% concentration is obtained, the use of which greatly increases the accuracy of Lintner's method for the determination of diastatic activity, since a polarisation fall of at least 11.3° V. is permissible as against 3° V. with the 2% solution of soluble starch in the earlier method (cf. B., 1924, 648). F. R. ENNOS.

Locust-kernel gum and oil. A. L. WILLIAMS (Analyst, 1928, 53, 411—415).—Commercial "locust-kernel gum" or "gum tragon" is a nearly white powder made from the heated endosperms of *Ceratonia siliqua*, which are stirred in about twenty times their weight of boiling water, filtered, and dried. "Tragasol" is a tough jelly containing about 4% of solids. The composition of the gum calculated on the ash-free substance present agreed with the formula $C_6H_{10}O_5$, i.e., it is a carbohydrate composed of the anhydrides of the hexoses mannose and galactose, and probably belonging to the hemicelluloses. The gum is precipitated by a dilute solution of tannin. The soft gelatinous mass formed shrinks on keeping and finally separates as a white or buff-coloured clot and a clear supernatant liquid, but disperses on warming and reappears on cooling. Precipitation occurs in acid but not in alkaline solutions, but not in the presence of acetic acid. Industrial uses of the gum are indicated. It may be detected by its reaction with tannin, borax, and Fehling's solutions. The extracted dark-green oil from a sample of old and fresh locust kernels had: d_{20}^{25} 0.950, 0.951; butyro-

refractometer reading at 40° 65.0, 65.0; iodine value (Wijs) 98.5, 99.1; saponif. value 205.5, 198.0; unsaponifiable matter, —, 2.86%; insoluble fatty acids 86.5, 87.4%; Reichert-Meissl value, —, 1.8; Polenske value, —, 0.8; titre 25.4—25.7, 25.2—25.6°; iodine value of insoluble fatty acids 101.7, 100.5. The ground kernels contained water 12.08; oil 1.80; ash 2.80; proteins 15.12; and fibre 6.10%.

D. G. HEWER.

Sugar-beet pulp. WOODMAN and CALTON.—See XIX.

PATENTS.

Production of sugar from dried beet. SUGAR BEET & CROP DRIERS, LTD., W. K. MELROSE, and J. C. STEAD (B.P. 293,946, 24.5.27).—The raw syrup obtained by extracting dried beets with water at 50—70° is treated with lime (0.08—0.16% by wt. of the beets) and clarified by a centrifuge. After increasing the sugar content to 60—65% by addition of low-grade or second-product sugar from a later stage, the liquor is decolorised by addition of 2—4% of activated carbon and crystallised. F. R. ENNOS.

Purification of sugar solutions. F. W. MEYER (U.S.P. 1,678,571, 24.7.28. Appl., 10.5.27. Ger., 7.7.26).—The solution is treated, at 90°, with lime until free from colour, neutralised, filtered, and the surface tension increased by addition of carbon.

B. FULLMAN.

Manufacture of dextrose. C. EBERT, W. B. NEWKIRK, and M. MOSKOWITZ, ASSIS. to INTERNAT. PATENTS DEVELOPMENT Co. (U.S.P. 1,673,187, 12.6.28. Appl., 1.4.27).—"Hydrol," the mother-liquor obtained in the ordinary process for the manufacture of solid dextrose, is neutralised until the impurities which cause polymerisation of the dextrose are coagulated and precipitated. The filtered liquid is then hydrolysed with sufficient acid in a vessel the inner surfaces of which are catalytically inert, neutralised, filtered mechanically or through carbon, and evaporated to crystallisation.

F. R. ENNOS.

Starch size (U.S.P. 1,677,614—5).—See XVIII.

XVIII.—FERMENTATION INDUSTRIES.

Origin of yeast. J. GRÜSS (Woch. Brau., 1928, 45, 341—344, 353—357).—A description of certain fossil forms from the Devonian of Spitzbergen, Neunkirchen, etc., which appear to be the remains of yeast-like organisms. F. E. DAY.

Volumetric determination of carbon dioxide in beer. H. LUNDIN and J. ELLBURG (Woch. Brau., 1928, 45, 339—341, 349—352).—By means of a cork-borer of special construction, the beer is transferred to a measuring flask without loss of carbon dioxide. The flask already contains an excess of carbonate-free caustic soda, and the alkaline beer is made up to volume. The carbon dioxide is determined on 1 c.c. of the liquid by addition of sulphuric acid in a Van Slyke blood-gas apparatus. It is claimed that a determination can be completed in 15—20 min., the accuracy being about 1% of the amount present. F. E. DAY.

Photometric determination of colour of malt worts. F. MĚŠTAN (Woch. Brau., 1928, 45, 373—377).—An improved form of Zeiss' "step photometer" is

described in which Ostwald's grey filters are replaced by Aubert's adjustable apertures, one in front of each objective. These are each operated by a drum graduated in degrees, which scale gives a finer division for low than for high intensities. By the use of suitable colour filters the absorption (colour) of malt worts can be very accurately determined, and is stated to vary by about 4% for a colour difference corresponding to 0.01 c.c. of 0.1*N*-iodine for colours equivalent to 0.15—0.17 c.c. of 0.1*N*-iodine per 100 c.c. The colour of beer may be similarly determined. The slightest opalescence necessitates the use of a special nephelometric addition to the apparatus.

F. E. DAY.

Objective determination of colour of malt worts.

F. DUČHÁČEK (Woch. Brau., 1928, 45, 359—362, 369—373).—For the determination, Sandera's "universal objective photometer" (B., 1928, 344) has been employed. Using approximately monochromatic screens, it is found that the absorption curves for different wavelengths are similar in the cases of iodine, wort, beer, and a standard solution containing potassium dichromate and cobalt sulphate. By using 100 c.c. of wort, colour differences of 0.015 c.c. of 0.1*N*-iodine can be certainly distinguished at the most important range, about 0.15 c.c. of 0.1*N*-iodine, the millivoltmeter showing a difference of 4 scale divisions for blue light, or 2—3 divisions when white light is used. The possibility of increasing this sensitivity by the use of a deeper layer of liquid or by increased concentration of laboratory worts is discussed. In the latter connexion the colour is shown to be directly proportional to the concentration.

F. E. DAY.

Fermentation products. III. Effect of vessel on the constituents of "saké." T. HIGASI (Bull. Inst. Phys. Chem. Res., Japan, 1928, 7, 763—775).—The effect of aqueous and alcoholic extracts of "sugi" wood (*Cryptomeria Japonica*) on Japanese "saké" has been studied. The distillate of an alcoholic extract of sugi shavings contains acetaldehyde, the increase in the aldehyde content of saké during storage being due to the catalytic oxidation of alcohol by the sugi wood. The extract and especially the distillate also contain a sesquiterpene "cryptene" (Keimatsu, J. Pharm. Soc. Japan, 1905, No. 277, 189) and a substance which gives similar colour reactions to those obtained with the oxidation product of protocatechuic aldehyde or vanillin with hydrogen peroxide, and is probably a hydroxy- or methoxy-quinol.

J. W. BAKER.

Detection of isopropyl alcohol [in wine]. D. HENVILLE (Analyst, 1928, 53, 416—418).—In order to test wine for added methylated spirit a 10% alcoholic solution of the sample after distillation is made. The presence of isopropyl alcohol is detected by the presence of acetone after oxidation. To a mixture of 10 c.c. of water and 5 c.c. of sulphuric acid when cool, 10 c.c. of the alcoholic solution are added. After addition of 3 g. of potassium dichromate, the mixture is shaken, left for 5 min., and the contents are distilled; to the first 2 c.c. of distillate are added 2 c.c. of water and 1 c.c. of acetic acid (B.P.) followed by 2—3 drops of a strong fresh solution of sodium nitroprusside. Ammonia solution is added in excess to a total volume of about

8 c.c. and a violet coloration is produced either at once or on keeping, according to the amount of acetone present. Industrial methylated spirits contain about 0.5% of acetone. The test will detect 0.1% of isopropyl alcohol in the prepared solution.

D. G. HEWER.

Improved Lintner test. GORE.—See XVII. **Treatment of distillery slop.** NEAVE and BUSWELL.—See XXIII.

PATENTS.

Production of yeast. S. SAK (B.P. 294,123 and 294,131—4, 14.1.27).—(A) During the fermentation a predetermined or constant weight of yeast per unit volume of wort is established for a short or long time by a controlled return to the fermenting wort of part or all of the yeast centrifuged from the yeast-containing wort withdrawn during the fermentation. (B) The yeast which is added to the fermenting wort may originate from a source other than the fermenting wort. (C) The desired weight of yeast per unit volume of fermenting wort may be maintained by the addition during fermentation to the fermenting wort of fresh wort and the withdrawal of yeast-containing wort. (D) During the fermentation the yeast-containing wort is withdrawn and centrifuged, and the centrifuged wort, after complete or partial removal of its content of alcohol by distillation, in some cases under reduced pressure, is returned continuously to the fermenting wort. (E) Part or all of the centrifuged yeast from a fermenting wort is transferred to another fermentation vat containing fermenting wort, the concentration of which with regard to nutrients and salts is higher than the concentration of the same substances in the initial vat. After the yeast has displayed a more or less intensive activity of growth in the second vat, it is returned in the form of centrifuged yeast to the initial vat.

C. RANKEN.

Production of glycerol by fermentation. J. W. LAWRIE, Assr. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 1,678,150, 24.7.28. Appl., 27.7.22).—A mixture of substantially the same composition as the incinerated ash of a fermented molasses mash is added to a molasses mash during its fermentation by yeast.

C. RANKEN.

Making a size or dressing. Prepared starch material. A. BODIN and J. EFFRONT (U.S.P. 1,677,614—5, 17.7.28. Appl., 24.2.25).—(A) Starchy material is subjected to the action of a suitable starch-liquefying bacterial enzyme, and, when the required amount of starch has been converted, further enzyme action is arrested. (B) A dry starch product suitable for making size is obtained by compounding a preparation of enzymes from micro-organisms capable of liquefying starch with a neutral starch and adjusting the relative moisture content of the enzyme preparation and the starch so that the final product contains a normal (air-dry) amount of moisture.

D. J. NORMAN.

Beverages (U.S.P. 1,673,273—5).—See XIX.

XIX.—FOODS.

Effect of alkali solutions on bacteria found in unwashed milk bottles. C. S. MUDGE and B. M. LAWLER (Ind. Eng. Chem., 1928, 20, 378—380).—To determine the influence of concentration, tempera-

ture, and time of contact on the germicidal action of the alkali used in milk bottle washing machines, a wash water was prepared by rinsing 40 dirty bottles each with 10—15 c.c. of sterile distilled water, and uniting the rinsings. Plate cultures were prepared from 1 c.c. portions of this, which had been subjected to the required conditions. The p_H of the alkali solution is a determining factor. A 0.5% solution of sodium hydroxide is almost as effective as a 2% solution of a commercial cleanser consisting of a mixture of sodium carbonate and hydroxide. W. J. BOYD.

Viscosity and the ice cream mix. G. D. TURNBOW and K. W. NIELSON (Ind. Eng. Chem., 1928, 20, 376—378).—True viscosity is derived from the components in solution in the mix, but during normal ageing (24—48 hrs. at 1.1—4.4°) there develops an "apparent viscosity" due to the formation of a gel structure and believed to be necessary for proper yield and smoothness of texture. As the ageing is continued, incorporation of air into the mix during freezing becomes difficult. Although the apparent viscosity increases during ageing, it is reduced again to the viscosity of the fresh mix from the cooler by sufficient agitation. The benefits obtained by ageing are due not to the effect of increased viscosity, but rather to some change in the proteins in the mix. By repeated homogenisation the apparent viscosity is decreased, and although it still increases during ageing the relationship is maintained. Surface tension is not affected by ageing, but tends to increase slightly with successive homogenisation. Repeated homogenisation has no material influence on the total time for freezing and whipping nor on the texture of the final product. W. J. BOYD.

Determining a satisfactory standard for beriberi-preventing rices. E. B. VEDDER and R. T. FELICIANO (Philippine J. Sci., 1928, 35, 351—389).—The relation between the beriberi factor (number of birds developing polyneuritis, expressed as a percentage of the total number used in the experiment, divided by average number of days before appearance of first symptoms) and percentage of pericarp remaining on the grain of polished rice, and percentages of moisture, fat, phosphorus, and ash is investigated with 200 different samples of rice, variously polished, fed with water to pigeons as sole food. The best and most rapid criterion of vitamin content is the percentage of remaining pericarp, estimated visually after staining the grains with an iodine solution: no rice with above 50% of pericarp remaining caused beriberi. As a chemical index nitrogen content is valueless, and ash content poor; a phosphorus minimum expressed as 0.62% of the pentoxide or a fat minimum of 1.28% is better. A minimum of 1.77% of phosphorus pentoxide plus fat (of which at least 0.4 is phosphorus pentoxide) is suggested as a standard. Washing the rice with cold water causes a fall of about 0.25 in the phosphorus percentage, and presumably also removes the water-soluble vitamin. Storage, even in a damp place, does not destroy the beriberi-preventing property, if insects are excluded (e.g., by use of chloroform or carbon tetrachloride), but in samples in which insects are allowed to live the above chemical indices fell, and polyneuritis of pigeons occurred with each sample. E. W. WIGNALL.

Chemical examination of army biscuit. J. STRAUB and J. P. PEPPER (Pharm. Weekblad, 1928, 65, 765—776).—The manufacture of the emergency ration biscuit for the Dutch army is discussed in the light of the specification laid down, and of analyses of the materials used and of the products. S. I. LEVY.

Coffee parchment as adulterant of bran and sharps. J. EVANS and T. E. WALLIS (Analyst, 1928, 53, 432—434).—Coffee parchment—the thin and tough endocarp of the coffee fruit—in transverse section shows three or four layers of lignified sclerenchyma, each layer consisting of groups of cells with their long axes parallel to each other. When found in bran the particles of parchment are fairly large, of a pale buff colour, and appear homogeneous and semi-opaque; they are free from starchy matter, show no definite lines, ridges, or striations, and are stiff, hard, and usually slightly curved. In sharps the parchment is more finely comminuted, and if present in such a material in small quantities a crude fibre should be prepared, and the amount present calculated, since coffee parchment yields about 60% and bran and sharps about 10%. D. G. HEWER.

Antirachitic properties of cod-liver meals. R. M. BETHKE, G. ZINZALIAN, D. C. KENNARD, and H. L. SASSAMAN (J. Agric. Res., 1928, 36, 747—753).—The antirachitic value of cod-liver meals (dried residues after extraction of the oil) is below that of the fresh oil. Experiments with rats and chicken show that the residual antirachitic properties vary considerably, but are not proportional to the oil remaining. A. G. POLLARD.

Action of hydrocyanic acid on fruit and vegetables and its determination. K. AMBERGER (Pharm. Zentr., 1928, 69, 481—483).—Apples, pears, celery, and potatoes, after being exposed to the action of hydrocyanic acid, become soft, wrinkled, and pasty, and are found to contain 7—16 mg. of the acid per 100 g. of material. The distillation test is very unsatisfactory for the determination, probably because of the formation of cyanohydrins which hydrolyse to carboxylic acids. A colorimetric method, based on the formation of Prussian blue by extraction with cold water, addition of ferrous and ferric salts, and acidification, is described, the blank solutions being prepared from similar fruit or vegetable not subjected to the disinfection treatment. S. I. LEVY.

Jelly-strength measurements of fruit jellies by the Bloom gelometer. C. R. FELLERS and F. P. GRIFFITHS (Ind. Eng. Chem., 1928, 20, 857—859).—The Bloom gelometer with a few minor modifications can be satisfactorily used for the determination of the jelly strength of fruit jellies, and for the standardisation of manufactured products and the grading of commercial pectins. The maximum increase in jelly strength occurs very soon after making the jelly, but a gradual change takes place over a period of several days. Jellies for testing should be sealed with paraffin, stored for at least 24 hrs., and the determination made at constant temperature, preferably 20—23°. F. R. ENNOS.

Composition and nutritive value of sugar-beet pulp. H. E. WOODMAN and W. E. CALTON (J. Agric. Sci., 1928, 18, 544—568).—Sugar-beet pulp is shown to

be highly digestible in the ruminant organism. Drying does not depress digestibility, and the dried pulp can be regarded as a carbohydrate concentrate, 1 lb. of which is capable of replacing 0.8 lb. of maize or 0.9 lb. of barley in the productive part of the rations of ruminants. The digestion coefficient of the protein is relatively low, but that of the fibrous constituents and nitrogen-free extractives is very high. Almost four fifths of the total dry matter of the pulp is digested not by enzymic processes but by the agency of bacteria.

H. J. G. HINES.

Determination of iodine in mineral mixtures [for feeding stuffs]. M. D. KNAPHEIDE and A. R. LAMB (J. Amer. Chem. Soc., 1928, 50, 2121—2125).—The sample of animal food (10 g.) is fused with sodium hydroxide (20 g.) and potassium nitrate (10 g.), the solidified mass is dissolved in water (600 c.c.) containing syrupy phosphoric acid (10 c.c.), 10 c.c. of 20% sodium hydrogen sulphite solution are added, and the whole is heated at 100° and cooled. The solution is then neutralised with 85% phosphoric acid, 1.5 c.c. of which is added in excess, and after addition of a small piece of anthracite coal the mixture is evaporated to 400—500 c.c. Excess of bromine water is added, and the whole boiled until colourless. A few salicylic acid crystals are added, and after the addition of 5 c.c. of reduced phosphoric acid (Kendall, B., 1920, 707 A) and 0.5—1.0 g. of pure potassium iodide to the cooled solution it is titrated in the usual way with 0.005*N*-sodium thio-sulphate, standardised according to Kendall's method.

S. K. TWEEDY.

Detection and determination of starch in margarine. A. SCHMIDT (Milch. Zentr., 1928, 57, 213—214, and Chem.-Ztg., 1928, 52, 671).—The presence of starch may be detected by its reaction with iodine under the microscope or in the fat-free layer formed on melting the fat below 60°. For its determination the margarine is melted (below 60°), the fat removed, and starch in the residue, after digestion with acid, is determined polarimetrically. The Soltsien reaction (fuming stannous chloride) for sesame oil is preferred to the Baudouin test.

E. LEWKOWITSCH.

Identification of prohibited coal-tar colours in foodstuffs. A. R. JAMIESON and C. M. KEYWORTH (Analyst, 1928, 53, 418—423).—About 1.5 c.c. of the extract of colouring matter is placed in each of five test-tubes. The first is used to determine whether the dye is sulphonated or not. To the second 1 drop of berberine sulphate is added, a precipitate indicating either picric acid or Martius Yellow, the latter to be confirmed by the gold chloride test. If there is no precipitate or change of colour the contents of the tube are then tested for Victoria Yellow by the reduction test (2 drops of hydrochloric acid and 1 drop of Wijs' solution are added, the mixture is boiled, and granulated zinc added; after 12—48 hrs. a delicate pink forms in the presence of the dye). To the third tube a drop of phosphotungstic acid is added. A precipitate with discolouration may indicate Aurantia, which may be confirmed by the reaction with silicotungstic acid. The contents of the fourth tube are tested for Aurin, and the fifth is used for confirmatory tests. Precipitates are examined microscopically after being kept overnight,

and the results may be compared with the characteristic photomicrographs reproduced. D. G. HEWER.

Gelatin for ice-cream. CARPENTER and others, also BRIEFER and COHEN.—See XV. **Ginger.** CLEVENGER.—See XX.

PATENTS.

Re-making cheese. S. K. ROBINSON, Assr. to KRAFT-PHENIX CHEESE Co. (U.S.P. 1,678,167, 24.7.28. Appl., 21.6.23).—The comminuted cheese is heated and mixed with a small amount of sodium potassium tartrate. C. RANKEN.

Beverage extracts. Alcohol-reduced cereal beverages rich in proteins. L. WALLERSTEIN, Assr. to WALLERSTEIN Co., INC. (U.S.P. 1,673,273—5, 12.6.28. Appl., 13.8.20. Renewed [c] 4.4.28).—A mixture of malt with excess of wheat is mashed under such conditions of temperature and time that a high percentage of dextrin and a low percentage of fermentable sugars are produced. It is then (A) proteolysed at 50° by addition of an enzyme, filtered, and the filtrate evaporated to a thick syrup extract; (B) proteolysed, boiled with hops, and finished to form a beverage; (C) mixed with material rich in soluble non-coagulable proteins and converted into a beverage.

F. R. ENNOS.

Production of protein products. F. C. ATWOOD, Assr. to AMER. PROTEIN CORP. (U.S.P. 1,673,964, 19.6.28. Appl., 5.12.22).—After separation of all the red corpuscular matter from a quantity of animal blood, the solution is heated to 38° to ferment the blood sugar, separated from coagulated fibrinogen, and dried. By adding to the protein solution sufficient fibrinous material to form a froth when whipped, a product having the characteristics of egg-white is produced.

F. R. ENNOS.

Vitamin food products. V. F. FEENY. From VITAMIN FOOD Co. INC. (B.P. 293,735, 11.4.27).—Food-stuffs containing vitamin are protected from deleterious aerial oxidation by thorough admixture with a film-forming edible gum (*e.g.*, karaya gum).

E. LEWKOWITSCH.

Purification of phosphatides. H. BOLLMANN, Assr. to M. F. FOSTER (U.S.P. 1,673,615, 12.6.28. Appl., 13.7.25. Ger., 13.6.25).—An emulsion of lecithin, phosphatides insoluble in alcohol, oil, bitter substances, and other impurities is diluted with 1 pt. of benzene and 9 pts. of alcohol, heated, and maintained at b.p. for some time. After settling, the clear solution therefrom is cooled to about 20° and the phosphatides insoluble in alcohol are removed. The remaining solution is evaporated in a vacuum to obtain the lecithin, which may be freed from oil and impurities by washing with acetone.

F. R. ENNOS.

Extraction of nutritive matter from fibrous vegetable materials. V. P. H. I. W. D'OBRY (B.P. 293,779, 11.4.27).—Grass, straw, etc. is subjected to the action of steam for 2—4 hrs. at 155—159° under 5—6 atm. pressure. After disintegration of the steamed mass it is mechanically worked into a form suitable for cattle food, or the liquid containing all the nutritive materials is separated by pressure. F. R. ENNOS.

Treating fish, animal, or vegetable products. M. AVANZI (B.P. 269,923, 22.4.27).—The fish etc. is centrifuged to remove blood or juices, passed through steam cooking ovens and then through hot-air drying ovens, filled into boxes, impregnated with oil *in vacuo*, and sterilised in tubular autoclaves. B. FULLMAN.

Manufacture of chocolate. A. NYROP (B.P. 294,790, 14.9.27).—The usual materials are first liquefied. Thus the sugar is dissolved in the milk and the ground beans are swelled, or the roasted and peeled beans are swelled by being heated in water or milk and comminuted. The liquefied raw materials are atomised in hot air or other gas simultaneously with melted cocoa-mass by the same or different atomisers. The fine powder of chocolate coated with fat is subsequently moulded. The beans, in aqueous suspension, may be fermented or treated with alkali before the drying process to modify the flavour. B. FULLMAN.

Chewing gum. B. ARKELL (B.P. 294,299, 2.5.27).—1–3% of magnesium oxide or hydroxide, milk of magnesia, etc. is incorporated in chewing gum to neutralise acids in the mouth. B. FULLMAN.

[Steam-heated retorts for] preservation of food. ANCHOR CAP AND CLOSURE CORP., Assees. of G. W. MULLEN (B.P. 271,052, 11.4.27. U.S., 12.5.26).

Drying apparatus applicable to preparation of fish flour and the like. E. L. RICHARDSON and W. WEST (B.P. 294,914, 29.4.27).

[Spraying device for] treatment of air for preservation of foods etc. W. S. LEECH and A. E. SHERMAN (B.P. 294,586, 27.1.27).

Fats rich in vitamins (B.P. 293,777).—See XII.

XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Effect of sunlight on citric acid in presence of ferric salts, with special reference to the elixir of iron, quinine, and strychnine, and elixir of iron, quinine, and strychnine phosphates. J. B. BURT (J. Amer. Pharm. Assoc., 1928, 17, 650–658).—The instability of these preparations is partly due to the oxidation of citric acid when exposed to sunlight in the presence of ferric salts; acetone and carbon dioxide are produced, and the iron is reduced to the ferrous state (cf. Benrath, A., 1918, i, 290; Plotnikow, Lehrb. d. Photochemie, 1920, 538). If air is present, ferric salts are reformed, and further quantities of citric acid are oxidised. E. W. WIGNALL.

Fluid extracts. I. Fluid extract of *Chelidonia*. A. ALBANESE and A. PEDRONI (Annali Chim. Appl., 1928, 18, 318–326).—This commercial product yields 24% of dry residue, 3% of ash (of which 42% is potassium carbonate), 11% of resinous matter, and 0.18% of alkaloids (of which 28% is β - and γ -homochelidonine). E. W. WIGNALL.

Analysis of ginger and its preparations. J. F. CLEVINGER (J. Amer. Pharm. Assoc., 1928, 17, 630–634).—Ginger rhizomes, and the pharmaceutical fluid (alcoholic) extract of ginger, contain 1.2–3% of volatile oil having d_{25}^{20} 0.875–0.885, n_D^{25} 1.490–1.493, and 3.5–7.1% of non-volatile oil, soluble in ether, and containing the active constituent, iodine value 36–50, saponif. value 45–70. E. W. WIGNALL.

Conservation of the characteristics of emulsin of almonds. M. BRIDEL and (Mlle.) M. DESMAREST (J. Pharm. Chim., 1928, [viii], 8, 153–159; cf. Bridel and Arnold, A., 1921, i, 282).—The properties of the sample of emulsin prepared by acetone precipitation in 1920 and since preserved under suitable conditions have been re-examined. The properties of β -glucosidase were preserved intact; the lactase had lost about one third of its activity, and the invertase, which in 1920 hydrolysed 100% of sucrose, hydrolysed only 13.2% under similar conditions after 8 years. E. H. SHARPLES.

Commercial cholesterol. I. LIFSCHÜTZ (Chem.-Ztg., 1928, 52, 609–610).—Commercial cholesterol, which contains metacholesterol and oxycholesterol formed by the process of manufacture or by subsequent oxidation in the light, is more reactive than the pure substance; therapeutic measurements made with the commercial article are of doubtful value as it is uncertain to which constituent the action is due. F. R. ENNOS.

Use of Mitchell's ferrous tartrate reagent in studying the precipitation of alkaloids by tannin. A. E. JONES (Analyst, 1928, 53, 429–432).—When the precipitation of alkaloids is effected by addition of a measured excess of gallotannin and subsequent determination of the excess by colorimetric methods, it is found that the amount of alkaloid in the precipitate cannot thus be calculated owing to the apparent impossibility of preventing or of standardising the absorption of gallotannin by the tannate. The colorimetric method affords a means of measuring this absorption. D. G. HEWER.

Determination of adrenaline in suprarenal glands. M. PAGET and P. LOHÉAC (J. Pharm. Chim., 1928, [viii], 8, 159–169).—A modification of Bailly's colorimetric method (cf. A., 1925, ii, 248) is used. The gland is weighed, minced with three times its weight of anhydrous sodium sulphate, and the powder triturated for 5–10 min. with 5–10 c.c. of 0.1*N*-sulphuric acid, the volume of acid depending on the weight of the gland. After 5 min. the mixture is made up to 50 or 100 c.c. with distilled water and, after a further 15 min. with frequent shaking, it is filtered. 1 g. of sodium acetate is then dissolved in 10 c.c. of the filtrate, and a known number of drops of 5% aqueous mercuric chloride solution are added. The rose colour, which slowly appears, is compared with that given by 10 c.c. of a 0.01% solution of adrenaline treated in an exactly similar manner. Several determinations on glands after different treatments are described. Under habitual conditions of autopsy the adrenaline has disappeared after 13–14 hrs. If the glands are placed over sulphuric acid for 24 hrs. the adrenaline content is higher than that in the gland immediately after death. Examination after varying periods of cadaverisation showed that for reliable results to be obtained the gland must be removed and the powder prepared immediately after death. The increase in adrenaline after drying over sulphuric acid is ascribed to the decomposition of a labile adrenaline compound which is not detected by the above reaction, and thus for the determination of the total adrenaline, it is necessary for it to remain over sulphuric acid for 24 hrs. E. H. SHARPLES.

Determination of the iodine content of thyroid gland preparations. E. SCHULEK and A. STASIAK (Pharm. Zentr., 1928, 69, 513—514).—The method of Winterfeld and Roederer (A., 1928, 787) has the disadvantage that nitrite may be formed; following their procedure, the present authors find that traces of added nitrite can be detected after the fusion. S. I. LEVY.

Determination of camphor in alcoholic camphor solutions. E. SUSSER (Pharm. Zentr., 1928, 69, 499—500).—An excess of salol is added to the alcoholic solution of camphor diluted with water; a yellow, oily, molecular compound of salol and camphor separates, and the excess of salol is removed and weighed. Practical details of the method are given and very accurate results are claimed. E. H. SHARPLES.

Germicidal powers and capillary activities of certain essential oils. S. RIDEAL, E. K. RIDEAL, and A. SCIVER (Perf. Ess. Oil Rec., 1928, 19, 285—304).—The connexion between germicidal power and capillary activity of 26 samples of pure essential oils has been examined. The drop numbers of the oils dissolved in B.P. paraffin at different concentrations have been determined, and also the Rideal-Walker coefficients at varying dilutions. Generally the higher the drop number of an oil the greater is its germicidal activity, and from the drop-number curves a good indication of the probable Rideal-Walker coefficient could be obtained, thus saving a number of preliminary ranging tests. Due to the chemical character of the oils, there is difficulty in relating germicidal power to chemical constitution. This is also complicated by the tendency for peroxide formation possessed by certain constituents; e.g., white camphor and eucalyptus oils form peroxides, which have considerable germicidal power. In a supplement a comprehensive table is given of the Rideal-Walker and Lancet coefficients and the physical constants of a large number of essential oils, especially eucalyptus oils, their constituents, and synthetic substances. E. H. SHARPLES.

Determination of oil in extract of lemon. Precipitation and polarimetric methods: influence of temperature and ageing on the latter. C. V. NETZ (J. Amer. Pharm. Assoc., 1928, 17, 663—668).—The percentage of oil of lemon in the commercial alcoholic extract is more accurately determined by precipitation with water than by polarimetric methods. The optical rotation is less by 8% in a 5% alcoholic solution, but generally increases on keeping.

E. W. WIGNALL.

Assay of phosphoric acid. MAURINA. **Liver of sulphur.** ROGERS.—See VII. **Insecticides.** FRANÇOIS and SEGUIN.—See XVI.

PATENTS.

Serum. Gland serum. Antitubercular serum. C. LEVENTIS (U.S.P. 1,676,995—7, 10.7.28. Appl., [A] 27.1.27, [B] 20.6.27, [C] 28.4.28).—(A) An animal is treated with an antigen, injected with human serum or with serum from an animal of different species to be protected, and the required antitoxin or antibacterial serum subsequently withdrawn. The latter may also be obtained from an animal not normally responsive to a specific disease by treating it with the specific antigen

and then injecting serum from an animal normally responsive to the disease. (B) A sexually-immature animal is castrated, implanted with a corresponding gland from a higher animal, and then injected with human serum. Serum is subsequently withdrawn from the animal. (C) The method of U.S.P. 1,676,995 (preceding) is applied. B. FULLMAN.

Rendering stable the combination of 4-dimethyl-amino-1-phenyl-2:3-dimethyl-5-pyrazolone with butyl chloral hydrate. SOC. CHIM. DES USINES DU RHÔNE, and J. ALTWEGG (B.P. 294,092, 16.5.28).—The instability of the compound is due to the liberation of traces of hydrochloric acid from the chloral, and may be obviated by the addition of calcined magnesia either during the preparation of the compound or subsequently. B. FULLMAN.

Manufacture of 4-alkylquinolines and derivatives thereof. SCHERING-KAHLBAUM A.-G. (B.P. 283,577, 30.12.27. Ger., 14.1.27).—Arylamines are condensed with alkyl β -halogenoethyl ketones in aqueous instead of non-aqueous media (cf. Blaise and Maire, A., 1908, i, 566) to give 4-alkylquinolines in improved yield. 4-Methylquinoline (from aniline, methyl β -chloroethyl ketone, and mineral acid in nitrobenzene), 6-methoxy-4-methylquinoline (from *p*-anisidine), the 8-methoxy-isomeride (from *o*-anisidine), m.p. 83°, b.p. 170°/11 mm. (picrate, m.p. 184°), 6-ethoxy-4-methylquinoline (from *p*-phenetidine), 6-nitro-4-methylquinoline (from *p*-nitroaniline), m.p. 137°, 6-chloro-4-methylquinoline (from *p*-chloroaniline), m.p. 71—72° (picrate, m.p. 222°), 4-methylquinoline-8-carboxylic acid (from anthranilic acid), m.p. 186—187°, and 4-ethylquinoline (from aniline and β -chlorodiethyl ketone; picrate, m.p. 195°) are described. C. HOLLINS.

Manufacture of derivatives of substituted quinolinecarboxylic acids. SOC. CHEM. IND. IN BASLE (B.P. 270,339, 30.4.27. Switz., 30.4.26).—A 2-chloroquinoline-4-carboxylic halide is treated first with ammonia or an amine, and the chlorine in the resulting amide is replaced by an ether or an amino-group by the action of alkali ethoxides or phenoxides, or ammonia or amines. The following compounds are described: 2-chloroquinoline-4-carboxylic dimethylamide, m.p. 114°; diethylamide, m.p. 124°; dipropylamide, m.p. 77°; diallylamide, m.p. 104°; diisoamylamide, b.p. 185°/0.015 mm.; piperidide, m.p. 140°; ethylanilide, m.p. 126°; ethylamide, m.p. 143°; benzylamide, m.p. 217°; ethylenediethyldiamide [bis-2-chloroquinoline-4-carboxyl-*NN'*-diethylethylenediamine], m.p. 74°; 2-ethoxyquinoline-4-carboxylic amide, m.p. 205°; dimethylamide, m.p. 69°; ethylamide, m.p. 152°; diethylamide, m.p. 68°; di-n-propylamide, m.p. 60°; diallylamide, m.p. 53°; diisoamylamide, oily; piperidide, m.p. 90°; ethylanilide, oily; benzylamide, m.p. 166°; ethylenediethyldiamide, m.p. 98°; and the following 2-substituted quinoline-4-carboxylic diethylamides: 2-methoxy-, m.p. 93°; 2-n-propoxy-, m.p. 61°; 2-isopropoxy-, oily; 2-allyloxy-, m.p. 33°; 2- β -phenylethoxy-, m.p. 59°; 2-cyclohexyloxy-, m.p. 63°; 2-phenoxy-, m.p. 112°; 2- β -diethylaminoethoxy-, b.p. 168—170°/0.005 mm.; 2-diethylamino-, b.p. 165°/0.02 mm. (picrate, m.p. 178°). The products are therapeutically valuable. C. HOLLINS.

Manufacture of organic tin compounds. C. T. J. VAUTIN and C. V. STEPHENS (B.P. 294,287, 22.4.27).—Methyl iodide is added to a solution of sodium stannite in aqueous alcohol, the temperature being maintained at 30–40°. After acidification, filtration, and boiling with ammonia methylstannoxylic acid, MeSnO_2H , is precipitated. This is converted by hydriodic acid into pure methylstannic tri-iodide [methyltri-iodostannane], m.p. 84–86°, which after recrystallisation from acetic acid yields a preparation (containing a little solvent) of the same m.p. which dissolves readily in cold water. C. HOLLINS.

Testing of nicotine solutions. E. COX, Assr. to TOBACCO BY-PRODUCTS & CHEM. CORP. (U.S.P. 1,678,636, 31.7.28. Appl., 30.1.25).—To nicotine solutions (such as occur in dipping baths) after acidification, sufficient tungsten trioxide is added to combine with the organic impurities present, followed by direct titration with silicotungstic acid. H. ROYAL-DAWSON.

Preparation for the cure of foot-rot in sheep, and for external application in other animal diseases. W. EVANS (B.P. 294,734, 23.5.27).

Remedial principles of oils (U.S.P. 1,678,454).—See XII.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Reduction of the latent image. LÜPPO-CRAMER (Z. wiss. Phot., 1928, 25, 129–133).—So long as there is no solvent present for the silver halide adsorbed to the silver of a negative, all silver solvents have a greater reducing action on the higher densities. This is shown to be the case with ammonium persulphate, potassium permanganate, cupric chloride, ferric chloride, potassium ferricyanide, mercuric chloride, and quinone. With persulphate and cupric chloride there is also fogging, although this does not occur in the case of persulphate with little-ripened emulsions. With peroxide acting on plates exposed beneath a wedge and developed after the treatment, there is at first a formation of fog and an intensification of the latent image. With increased action the latent image is reduced and fog is decreased. With sufficient action fog may be reduced to less than its original value. Similar results were obtained with persulphate. W. CLARK.

Nucleus poisoning with dyes. LÜPPO-CRAMER (Z. wiss. Phot., 1928, 25, 133–137).—Process plates were exposed, developed in metol-quinol, fixed, and washed, and then bathed in dye solutions. They were then reduced in 2% ammonium persulphate. The adsorption of the dyes retarded the reduction, the effect varying with the dye, but being independent of its being a sensitiser or desensitiser. No relation could be found between the nature of the dye and its effect. Rhodamine B completely stopped reduction by persulphate. Dyes have a similar retarding action on physical development, an effect which may account for the bad results often obtained with such development when sensitisers or desensitisers have been used. An

analogous case is the fact that the latent image on silver bromide-collodion is considerably reduced by bromide ions, whereas that on silver bromide-gelatin is not. This may be due to a similar protective action of the gelatin. W. CLARK.

Photographic diffusion-halation. R. WILDT (Z. wiss. Phot., 1928, 25, 153–184).—The properties of the photographic emulsion as a turbid medium are discussed, and an expression is evolved for the intensity distribution in diffusion-halation, which is discussed in detail. W. CLARK.

Photographic enlargement of small solid objects and the limitation of definition obtainable on gelatin plates. A. MALLOCK (Nature, 1928, 122, 239–240).

Effect of sunlight on citric acid. BURT.—See XX.

PATENTS.

Manufacture of photographic negatives and prints. L. KLAVER (B.P. 269,912, 21.4.27. Holl., 21.4.26).—A sensitive material with an easily transferable light-sensitive layer is prepared by coating the sensitive emulsion on to a temporary support consisting of a dark red or black, non-transparent, liquid-pervious paper which has been coated with a solution of casein in ammonia solution and dried. The sensitive layer is removed by damping the rear side of the support with dilute ammonia solution. J. W. GLASSETT.

Preparation of coloured reproductions by imbibition. TECHNICOLOR MOTION PICTURE CORP. (B.P. 270,279, 19.4.27. U.S., 30.4.26).—In the preparation of coloured films by imbibition printing from a dyed gelatin matrix on to a wetted gelatin film, much purer colour values and a greater range of colour contrasts are obtained if the dye solution be purified by the addition of a solution of albumin or similar amphoteric colloid, followed by coagulation of the colloid. Thus treated, the dye is imbibed much more evenly and rapidly, but in order to prevent side diffusion, which results in diffused margins, a small amount of a second dye (Metanil Yellow) of low penetrability is added. J. W. GLASSETT.

Production of hardened gelatin impression receiving surfaces [films], more especially for imbibition printing. TECHNICOLOR MOTION PICTURE CORP. (B.P. 270,280, 19.4.27. U.S., 30.4.26).—Celluloid films are coated with a gelatin solution containing potassium dichromate in the proportion of approx. 5% of the gelatin used and a small quantity of acetic acid. This coating is allowed to dry and is then subjected to heat treatment at 32–43° until a sufficient degree of hardening has been attained. J. W. GLASSETT.

XXII.—EXPLOSIVES; MATCHES.

PATENT.

Treatment of nitrocellulose [for removal of water]. HERCULES POWDER Co., Assees. of J. B. WIESEL (B.P. 293,291, 20.10.27. U.S., 1.7.27).—

Water-wet nitrocellulose is dehydrated with *sec.*-butyl alcohol. When the water has been removed, as much butyl alcohol as possible is centrifuged or pressed out, leaving 20–40% in the nitrocellulose, which keeps it moist and lessens the fire-risk.

S. BINNING.

XXIII.—SANITATION; WATER PURIFICATION.

Atmospheric pollution (Dept. Sci. Ind. Res., Rep. 13, 1928, 54 pp.).—The deposits obtained from 80 stations are tabulated and classified. A general decrease in the amount of sulphates deposited is observable—a natural result of the increased substitution of gas for coal as a source of heat. At Burnley, 2.7% of the total deposit is attributed to tar. A simple apparatus is described by means of which a sample of haze particles can be obtained for microscopical examination.

C. JEPSON.

Toxicological analysis of air, diffusion of fumes, and results of experiments at the Eiffel Tower. II. E. KOHN-ABREST (Chim. et Ind., 1928, 20, 30–36).—Four samples of air taken simultaneously at the base of the Eiffel Tower and at 57, 115, and 288 m. from the ground afforded 31, 31, 31, and 37.5 pts. of carbon dioxide and 0.0, 1.5, 1.0, and 0.0 pts. of carbon monoxide per 10,000. The increased pollution of the air at higher levels is noteworthy.

F. R. ENNOS.

Ethylene oxide as fumigant. R. T. COTTON and R. C. ROARK (Ind. Eng. Chem., 1928, 20, 805).—Experiments on a small scale and in a 500 cub. ft. chamber show that ethylene oxide at the rate of 1–2 lb. per 1000 cub. ft. of space is completely toxic to a number of different kinds of insect pests of stored products. The vapour is rather more toxic than carbon disulphide, and, owing to its low b.p., the compound is effective at comparatively low temperatures (15–25°). Ethylene oxide has pronounced powers of penetration, and has no harmful effects on foodstuffs (liquid foods were not tested), clothing, furniture, or metals. It does, however, seriously affect the germination of wheat.

C. T. GIMMINGHAM.

Comparative tests with certain fumigants. L. F. HOYT (Ind. Eng. Chem., 1928, 20, 835–837).—Values are given for the efficiency of a number of fumigants against various stored-product insects. Among those tested, commercial calcium cyanide at 24–27° for 24 hrs. gave a 100% kill of all insects used at 0.5 lb. per 1000 cub. ft.; chloropicrin at 0.8 lb.; "Lethane 23" at 1.5 lb.; ethylene oxide at 2 lb. Details of the effects on foodstuffs are also given. With the exception of ethylene oxide, none of the substances tested affected the germination of seeds.

C. T. GIMMINGHAM.

Dialysis of putrescible liquids. O. M. URBAIN (Ind. Eng. Chem., 1928, 20, 811).—Apparatus is described by means of which the liquids, *e.g.*, sewage, creamery waste, etc., may be dialysed without serious bacterial decomposition or oxidation occurring. The dialysing tray is enclosed in an atmosphere of nitrogen, and the dialysing water used is oxygen-free distilled water. The temperature is kept at about 0° by means of an ice jacket.

C. JEPSON.

Treatment and disposal of distillery slop by anaerobic digestion methods. S. L. NEAVE and A. M. BUSWELL (Ind. Eng. Chem., 1928, 20, 837–838).—The waste liquors from the stills during the production of industrial alcohol give rise to nuisance when diluted and allowed to ferment under aerobic conditions. If dilutions of 1:9 are inoculated with well-digested Imhoff sludge and allowed to ferment anaerobically, the waste is completely digested in 10–11 weeks with a destruction or gasification of 55% of the total solids in the slop and the production of a rapidly draining, inoffensive sludge. Dilutions less than 1:4 are too acid to permit bacterial growth.

C. JEPSON.

Electrochemical polarisation process for prevention of corrosion in locomotive boilers. L. O. GUNDERSON (Ind. Eng. Chem., 1928, 20, 866–869).—The distribution of the damage done by corrosive water depends on the temperature and rate of circulation as well as on the chemical analysis. Corrosion may also occur with alkaline waters of p_H 10.5. The author has observed currents of as much as 2 amp. between the flues and the boiler still, and this factor accounts for much corrosion. It may be prevented by the addition of an arsenic salt to the water, together with the passage of a small electric current. An excess of polarised hydrogen is constantly being "plated out," and this destroys any oxygen adjacent to the metal surface. By this means pitting and grooving have been entirely prevented over a period of 4 years.

C. IRWIN.

Formation of boiler scale. R. STUMPER (Chim. et Ind., 1928, 20, 10–20).—The formation and composition of boiler scale are discussed in the light of physico-chemical laws. Three types are recognisable according to their crystalline texture. With strong or rapid heating the crystals are all arranged at right angles to the surface of the metal, but if the heat flux is reduced a tangled, irregular mass of crystals is produced. The third and commonest type consists of alternate layers of the first two.

F. R. ENNOS.

PATENTS.

Prevention of boiler incrustation. W. LAZARUS (B.P. 283,517, 29.10.27. Ger., 12.1.27).—A quantity of alkali or alkali carbonate adapted to the total hardness of the water is added at the beginning of the operation, together with a larger quantity of soot, vegetable or animal carbon, or graphite, and thereafter alkali or carbonate is added in regular amounts and in shorter periods to convert calcium and magnesium salts remaining dissolved after boiling.

W. G. CAREY.

Manufacture of boiler composition. H. KARPLUS and W. BACHMANN, Assrs. to E. DE HAEN A.-G. (U.S.P. 1,679,037, 31.7.28. Appl., 8.5.26. Ger., 20.11.22).—The composition, which also serves as a disinfectant, consists of a mixture of colloidal graphite and sulphite liquor, the former being one sixth of the mixture by wt.

H. ROYAL-DAWSON.

Base-exchange substances (B.P. 266,313).—See VII. **Nicotine solutions** (U.S.P. 1,678,636).—See XX.