

BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

NOV. 20 and 27, 1931.*

I.—GENERAL; PLANT; MACHINERY.

Formation and growth of crystals. W. E. GIBBS (Trans. Inst. Chem. Eng., 1930, 8, 38—56).

Rôle of surface energy in chemical engineering. W. E. GIBBS (Proc. Chem. Eng. Group, 1929, 11, 20—34).

Design and operation of gas-heated furnaces. C. M. WALTER (Proc. Chem. Eng. Group, 1929, 11, 35—43).

Insulation of heated and cooled surfaces. J. S. F. GARD and R. F. ROBINSON (Proc. Chem. Eng. Group, 1930, 12, 96—112).

Heat-transfer calculations, including recent methods of correlating convection data. O. A. SAUNDERS (Trans. Inst. Chem. Eng., 1930, 8, 209—213).

High-pressure reactions. W. A. BONE (Trans. Inst. Chem. Eng., 1930, 8, 98—106).

Hardness of water.—See XXIII.

PATENTS.

Rotary-hearth furnace. E. G. DE CORIOLIS, J. R. MOSER, and A. L. LARSEN, Assrs. to SURFACE COMBUSTION CORP. (U.S.P. 1,796,144, 10.3.31. Appl., 26.4.29).—The furnace is provided with a removable roof so that the hearth, and the supports and mechanism for the hearth, can be removed vertically in turn. Provision is made to admit gases through a hollow vertical shaft. B. M. VENABLES.

Rotary kiln. L. S. PETERSEN, Assr. to F. L. SMITH & Co. (U.S.P. 1,796,664, 17.3.31. Appl., 7.8.29).—A method of securing transverse chains in a cement or other kiln is described; metallic blocks are buried in the joints between the ceramic lining blocks or bricks. B. M. VENABLES.

Rotary dryer. W. A. HARTY and F. W. MOORE, Assrs. to HARMOR & Co., Inc. (U.S.P. 1,796,651, 17.3.31. Appl., 24.10.27).—A rotary dryer having a heated axial flue has the latter flexibly supported by radial rods extending through the wall of the dryer and secured by external springs. After passing through the axial flue, the products of combustion are passed backwards through the dryer in direct contact with the material. B. M. VENABLES.

Furnace structures. J. E. KENNEDY (B.P. 356,819, 14.6.30).—The wall of a furnace, e.g., a boiler furnace, is divided into panels each composed of bricks supported on metallic brackets and frames. B. M. VENABLES.

Increasing the durability of linings of furnaces or ovens and the like. F. J. MALHERBE (U.S.P. 1,797,780, 24.3.31. Appl., 20.7.28. Belg., 29.7.27).—The linings etc., especially the soles of flattening furnaces for reheating

glass sheets, are impregnated with an emulsion containing K and/or Na silicate and petroleum. L. A. COLES.

Handling of furnace residues. T. G. COGHLAN (B.P. 356,733, 3.4.30. U.S., 22.4.29).—Comminuted ash or fused slag is moistened and/or disintegrated by a primary supply of liquid which transports it along a sluiceway to an ejector device in which a secondary supply of liquid enters the stream at an angle of about 22.5° to the axis and suffices to transport the material any reasonable distance through a pipe. [Stat. ref.]

B. M. VENABLES.

Thermal controlling system. C. C. BOARDMAN, Assr. to THERMATOMIC CARBON Co. (U.S.P. 1,797,256, 24.3.31. Appl., 24.9.27).—When a number of gases are generated in separate furnaces and a mixture is desired at a const. temp., the gases are individually cooled, first, e.g., by water sprays, under manual control, and again before mixing by thermostatically controlled means, the thermostat being situated in the receiver for the mixture. B. M. VENABLES.

Centrifugal dryer. C. O. LAVETT (U.S.P. 1,795,495, 10.3.31. Appl., 31.10.28).—The material is spun in a basket with open ends and having hollow trunnions through which extends a hollow shaft driven at a different speed and carrying rakes to discharge the collected solid matter. Washing liquid is admitted through one end and heating medium through the other end of the hollow shaft to distributing devices within the basket. B. M. VENABLES.

Fluid separators. (A) H. E. BOYRIE, (B) G. D. BRADSHAW and R. N. ROBERTSON, [A, B] Assrs. to BLAW-KNOX Co. (U.S.P. 1,796,434—5, 17.3.31. Appl., [A] 2.1.25, [B] 20.5.27).—Modifications to the steam separator described in U.S.P. 1,381,767 are made. B. M. VENABLES.

Making heat exchangers. C. STEENSTRUP, Assr. to GEN. ELECTRIC Co. (U.S.P. 1,797,030, 17.3.31. Appl., 15.11.29).—An air-cooling device which may be used as the condenser in a refrigerating machine is described. B. M. VENABLES.

Aqueous or aqueous-alcoholic solutions suitable for use in cooling systems, storage vessels, etc. IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 352,311, 5.9.30. U.S., 7.9.29).—An aminocarboxylic acid or sol. salt thereof (phenylglycine, anthranilic acid, hydrolysed casein) is added to aq. alcohols, glycol, etc. to prevent the rusting of iron containers. The addition also of ore-floitation collecting agents, e.g., 2-thiolbenzthiazole, xanthates, benzyl mercaptan, thiocresol, diisoamylthiocarbamide, thioformaldehyde, etc., prevents discoloration of such liquids in presence of Cu or brass. C. HOLLINS.

* The remainder of this set of Abstracts will appear in next week's issue.

Pulveriser. C. R. TAYLOR, ASSR. to GRINDLE FUEL EQUIPMENT Co. (U.S.P. 1,796,545, 17.3.31. Appl., 11.10.29).—In a pulveriser having a vertical shaft and comprising a fan chamber above a beater chamber, the two chambers are connected by a comparatively small neck in which are provided subsidiary rotating vanes to prevent coarse particles being drawn upwards; the feed of raw material is around the neck, and additional air is admitted through adjustable openings in the upper end of the fan. B. M. VENABLES.

Pneumatic separator for pulverising mills. W. L. and H. L. McLAUGHLIN (U.S.P. 1,797,434, 24.3.31. Appl., 19.12.27).—In a conduit for an upward air-borne stream of pulverised material is placed a trough-shaped collector to which are attached shoots leading to the walls of the casing above the pulverising zone, the coarse particles which have been lifted in the middle of the conduit being able to slide down the walls where the current is less. The classification of the material is effected by the stream of air dividing into two while passing the trough and reuniting above it. B. M. VENABLES.

Mixer. A. MOYER (U.S.P. 1,796,659, 17.3.31. Appl., 18.1.30).—A mixer for stiff mixtures, *e.g.*, concrete, comprises a vertical fixed receptacle in which are rotated an outer worm, driving the material downwardly and inwardly, and an inner worm of the same hand but opposite rotation, driving the material upwardly and outwardly. B. M. VENABLES.

Submerged (A) drum filter, (B) continuous [disc] filter. [A] E. J. SWEETLAND, [B] E. J. SWEETLAND, J. V. ZENTHOEFER, and J. T. HOYT, [A, B] ASSRS. to OLIVER UNITED FILTERS, INC. (U.S.P. 1,796,491—2, 17.3.31. Appl., [A] 24.12.26, [B] 16.2.27).—The filters are operated entirely submerged. No attempt is made to obtain a solid cake, but the thick pulp is blown off a short arc or single segment (as the case may be) at the top of the rotation. Partitions are provided to separate the thick pulp from the prefilter as far as possible, and the former is removed by a conveyor. B. M. VENABLES.

Filter element. W. W. NUGENT (U.S.P. 1,796,532, 17.3.31. Appl., 18.10.26. Renewed 4.11.29).—Filter bags are operated with outward flow; they are attached to frames at the mouth, which is sufficiently wide for the bags to be turned inside out for cleaning, and elsewhere are supported by U-shaped rods. B. M. VENABLES.

Filter. A. BOULADE, ASSR. to SOC. DU CARBURATEUR ZENITH (U.S.P. 1,797,399, 24.3.31. Appl., 27.12.26).—A stack of filter elements is assembled loosely on metal strips and the ends of the latter are bent over, forming a bundle in which every element is easily cleaned. When placed in a housing the elements are clamped together, forming an edge-filter. B. M. VENABLES.

[Rotating-leaf] filters. E. W. W. KEENE (B.P. 356,806, 13.6.30).—The leaves of the filter are fixed at an angle to the axis, and the casing is provided with doors in the end for inspection and in the circumference for changing the leaves. B. M. VENABLES.

Separation of [dissolved] air from liquids. W. S. ELLIOTT (U.S.P. 1,797,405, 24.3.31. Appl.,

17.2.23).—The liquid, *e.g.*, make-up water for boilers, is treated by direct contact with steam (or its own vapour) in two chambers in succession. In the upper chamber the temp. is maintained at a predetermined const. val., usually the b.p., and in the lower the steam is bubbled under the water in sufficient vol. to reduce the partial pressure of the harmful gases to a very small figure, the mixed gases being allowed to escape. B. M. VENABLES.

Atomising or disintegrating liquids, and apparatus therefor. A. J. ADAMS (B.P. 356,720, 5.4.30).—An apparatus producing a conical spray diverging from the axis of a cylindrical stream of air is described. The spray is operated by air from a bellows driven by the same motor that drives the fan. B. M. VENABLES.

Evaporator. B. C. SPRAGUE, ASSR. to L. E. HANKISON (U.S.P. 1,795,743, 10.3.31. Appl., 27.7.26).—The scale-forming liquid which is to be evaporated is caused to flow successively through a number of compartments of a vessel having a common vapour space and common supply of steam or other heating fluid. B. M. VENABLES.

Evaporation of liquids in films. CHEM. FABR. BUDENHEIM A.-G. (B.P. 357,050, 24.1.31. Ger., 25.1.30).—Evaporation is effected by direct flame in a rotating cylindrical kiln which has an enlarged diam. at the burner end; the flow of liquid may be either con- or counter-current to the hot gases. The kiln is suitable for H_3PO_4 and other scale-forming and/or corrosive liquids. B. M. VENABLES.

Apparatus for concentrating solutions. J. HAMILL, J. F. TADDIKEN, and G. W. CONNON (U.S.P. 1,795,601, 10.3.31. Appl., 4.12.25).—In a calandria having vertical tubes, endeavour is made to give the steam a const. velocity in all parts. The entry of steam is at one side near which the tubes are widely spaced apart, the spaces diminishing towards the opposite side, where an outlet for permanent gases is provided, preferably behind a baffle forming a further contraction of the passage for the gases. The outlet for condensate is in the form of a gutter surrounding the axial downflow passage for liquid being concentrated. B. M. VENABLES.

Distillate-chilling apparatus. H. TORRANCE, ASSR. to CARBONDALE MACHINE Co. (U.S.P. 1,796,772, 17.3.31. Appl., 16.6.27).—An apparatus suitable for the separation of paraffin wax and similar purposes comprises a number of water-cooled straight conduits connected by headers; each of the former is provided with a rotating worm which scrapes the walls but permits free flow in an annular space between the shaft and blade of the worm. B. M. VENABLES.

Gas scrubber. A. G. McKEE (U.S.P. 1,797,271, 24.3.31. Appl., 21.12.25).—The gas is passed upwards through a number of centrifugally produced sprays in succession; the uppermost sprayer is surrounded by a number of parallel plates upon which the spray impinges at a small angle without much shock, so that no mist is produced at that zone. B. M. VENABLES.

Air cleaner. C. A. WINSLOW and E. J. HALL (U.S.P. 1,798,510, 31.3.31. Appl., 25.9.24).—An air filter for the intakes of compressors, internal-combustion engines, etc. is described. C. JEPSON.

Bubbling apparatus for treating gases with liquids. H. KOHL (B.P. 356,985, 27.10.30. Austr., 20.11.29).—The gas is bubbled under the liquid from a single conduit situated within a bell, and from the bell it passes through a number of conduits which dip under the liquid outside the bell in an inclined direction so that the liquid is set in rotation. B. M. VENABLES.

Collection and consumption of flue dust. BABCOCK & WILCOX, LTD. FROM FULLER LEHIGH CO. (B.P. 356,773, 11.6.30).—The flue dust is separated from the gases in a dry dust catcher and delivered to the slag floor of the furnace. B. M. VENABLES.

Viscosity-indicating instruments. L. A. MAPEL (B.P. 356,721, 8.4.30).—A device for testing the oil from the lubricating system of a motor engine etc. is described. B. M. VENABLES.

Apparatus for supplying reagents under pressure. UNITED WATER SOFTENERS, LTD., and H. G. MALIGNY (B.P. 356,796, 10.6.30).—The apparatus is suitable for supplying a regulated flow of reagent into a main liquid flowing under pressure. It comprises a closed tank divided into two compartments by a horizontal partition, the upper parts of each compartment being in communication through an air-pipe. While main liquid is admitted to the upper compartment the air cushion is compressed and reagent forced out of the lower compartment. The difference in pressure between the inlet and outlet sides of the apparatus is produced by an orifice inserted in the main pipe, and this difference, besides causing the flow of reagent, also operates a diaphragm-and-needle valve to control the flow.

B. M. VENABLES.

[Antifriction] bearing. B. H. MCQUEER, ASSR. to NAT. CARBON CO., INC. (U.S.P. 1,797,833, 24.3.31. Appl., 12.8.29).—Bearings made from, e.g., petroleum coke are steeped in a solution containing a B compound, preferably $\text{Na}_2\text{B}_4\text{O}_7$, and, if desired, a polyhydric alcohol, and are dried at 105–350°.

L. A. COLES.

Producing [high] vacua [in radio valves etc.]. H. S. COOPER, ASSR. to KEMET LABORATORIES CO., INC. (U.S.P. 1,800,134, 7.4.31. Appl., 31.12.29).—An alloy of Mg with 5–30% of Ba (or Sr) is introduced as a pellet into the envelope (e.g., valve) and is flashed after the latter has been partly evacuated and sealed.

L. A. COLES.

[Mechanical] removal of deposits from boilers and prevention of formation of scale and apparatus therefor. A. CZECZOTT (B.P. 356,869, 14.7.30. Poland, 13.7.29).

Heat-insulating material.—See IX. **Effecting reactions between gases. Precipitators for gases.**—See XI.

II.—FUEL; GAS; TAR; MINERAL OILS.

Petrography and the classification of coal. C. A. SEYLER (Proc. S. Wales Inst. Eng., 1931, 47, 549–555).—The methods of classification of the constituents of bituminous coal due, respectively, to Stopes, Thiessen, and Wheeler are discussed. A. B. MANNING.

Fuel technology and the classification of coal. C. A. SEYLER (Proc. S. Wales Inst. Eng., 1931, 47,

557–592; cf. B., 1924, 544).—Coals are classified according to the positions of the points obtained when the H content is plotted against the C content (both calc. to the "pure coal" basis) on a suitable chart. The position of any such point determines many of the properties of the coal, e.g., the calorific val., the volatile matter content, etc., such properties being conveniently represented on the chart by lines of equal calorific val. ("isocals" or "isocaustics"), equal volatile matter content ("isovols"), etc. The isocals are plotted by the aid of Dulong's formula, which has also been used to deduce the linear relation, derived empirically by Rosin, between the vol. of combustion gases and the nett calorific val. This relation permits some other related quantities to be represented on the chart, e.g., vol. of air required for combustion, flame temp., etc. It is believed that properties such as liability to oxidation, ignition temp., yields of products of carbonisation, etc. may also be represented. The softening points of bright coals are related to the ultimate composition and can be expressed as "isotectic" lines on the chart. The relation between the softening points of coals and their coking properties is discussed.

A. B. MANNING.

Behaviour of solid fuels during oxidation. VII. **Differentiation of coals as regards their tendencies to spontaneous ignition.** B. MOORE (Fuel, 1931, 10, 394–400; cf. B., 1931, 999).—The relation between the O_2 temp. and the time of occurrence of (a) glowing of the coal, and (b) ignition of volatile matter, has been studied by the methods and apparatus described previously. The tendencies for ignition to occur were greatest with coals from seams associated with fires in the mine, and the highest ignition factors were obtained with these coals.

A. B. MANNING.

Swelling pressure of coal and formation of "spongy" coke. J. TAYLOR (Fuel, 1931, 10, 390–393).—A thin layer, e.g., 2 mm. thick, of freshly powdered dry coal was heated in a cylindrical retort provided with a piston, which, when the coal reached the plastic stage, was loaded sufficiently to keep the vol. of the coal const. The coal was held between layers of asbestos paper and the base of the retort was perforated. The rate of heating was $10^\circ/3$ min. The max. load gave a measure of the actual swelling pressure in the plastic layer, whereas in other methods, using cylinders of coal 2–3 cm. high, this swelling pressure may be partly neutralised by the secondary contraction of the coke formed. With coals of high agglutinating val. the magnitude of the swelling pressure was a guide to the tendency of the coal to form spongy coke in the oven, and the blending of coals to avoid spongy coke formation could be controlled by this method of examination.

A. B. MANNING.

Determination of volatile matter in coal. Temperature of the preliminary heating, and an electric furnace therefor. T. SŌMIYA and Y. NAKAMURA (J. Soc. Chem. Ind., Japan, 1931, 34, 282–283 B, 283 B).—Variations in the loss of wt. of a number of coal samples on heating for 7 min. at 950°, with or without a pre-heating for 6 min. at 500°, 600°, 700°, or 800°, are tabulated. A temp. of 700° is recommended as giving the

most concordant results in the final determination. Dimensions of a suitable furnace are given. C. IRWIN.

Production and use of "Dryco" [smokeless fuel]. R. E. GIBSON (*Gas J.*, 1931, 195, 739—741).—A method of preparing high-temp. coke, suitable for use as a domestic fuel, is described. Coke of the desired quality is obtained by blending suitable coals, carbonising them in retorts for 9—10 hr. at about 1000°, and cooling the coke in a Sulzer plant. The coke is then crushed to 2-in. size and screened to remove fines below $\frac{1}{2}$ in. C. B. MARSON.

Table for the calculation of the calorific value of solid fuels. W. ZWIEG (*Chem.-Ztg.*, 1931, 55, 723).—For a H₂O equiv. of the calorimeter + H₂O of 3450 a table has been constructed giving the total cal. evolved by 1 g. of coal for a rise in temp. of 1.740—2.229°, *i.e.*, the calorific val. of the coal. A. R. POWELL.

Properties of cokes in relation to their reactivity. T. J. DRAKELEY and E. T. WILKINS (*J.S.C.I.*, 1931, 50, 331—342 T).—Homogeneous cokes, prepared from crushed and briquetted coal by carbonisation at various temps. between 450° and 1100°, were recarbonised rapidly at 1000° in the laboratory. A microscopical examination of the coke sections showed that the structure became more open as the temp. of coking increased and that certain changes in the appearance of the low-temp. cokes took place during recarbonisation. These observations are illustrated by means of photomicrographs. The "real" and "apparent" density of the cokes showed that the porosity of the recarbonised samples was almost const., as were the C and H contents. The approx. ignition temp. was found to exhibit a tendency to vary with the reactivity of the coke samples towards CO₂. The adsorptive capacity of the cokes for methylene-blue, which is probably dependent on the extent of the readily accessible surfaces, was found to bear no relation to the reactivity, although many experiments were conducted in an endeavour to discover a disturbing factor. The adsorptive capacity for CO₂ at 30 in. pressure and 15° was measured before and after recarbonisation, and the effect of "activation" by CO₂ at 1000° was also examined. There appears to be some relationship between this adsorptive capacity and the reactivity, but all the variations in reactivity cannot be thus explained. The ignition temp. and reactivity of a coke are considered to be largely influenced by the condition of the micropores.

Reactivity of coke. T. J. DRAKELEY (*J.S.C.I.*, 1931, 50, 319—330 T).—The passage of gas through crushed coke in a tube is principally governed by the law of capillary flow, and only about 2% of the gas may be supposed to pass through the actual pores of the coke. A large variation in the porosity of cokes prepared at the same temp. had only a slight influence on their capacity to reduce CO₂. The law of mass action is shown to be applicable to the reaction between the cokes and CO₂ at 900°, 1000°, and 1100°, and vals. are respectively calc. for the direct and reverse reaction velocity coeffs. The samples of coke were prepared from the same coal at temp. varying from 450° to 1100°, and the direct reaction velocity coeff. was found at each of the three

reaction temp. to diminish slowly as the temp. of carbonisation was increased from 450°. At 700° the coeff. diminishes rapidly and again more slowly between 900° and 1100°. The velocity coeff. of the reverse reaction, in which CO is decomposed to give C and CO₂, shows an abrupt rise at about 700°, after which increased temp. of carbonisation has little effect. A rise in the temp. of the reaction increases the direct reaction velocity coeff., but diminishes the coeff. for the reverse reaction with all cokes. On the assumption that the reaction proceeds as it commenced, the % of CO in the hypothetical equilibrium mixtures have been calc. The vals. so obtained are exceptionally low. Continued heating of the sample of coke gives data which indicate that the hypothetical equilibrium mixture will then contain more CO than with the original sample of coke. This effect is due to a considerable decrease in the reverse reaction velocity coeff., which more than counterbalances the decrease in the direct reaction coeff. Hence the reactivity of a sample of coke cannot be expressed solely in terms of the velocity coeff. for the direct reaction; the reverse reaction velocity coeff., which is particularly sensitive to heat effects, must also be stated. The formation of CO and the rates of the reaction are explained on the assumption that coke contains C which becomes more cryst. as the temp. of carbonisation increases. Thus the production of CO and the rate of the direct reaction decrease as the temp. of carbonisation increases. On the other hand, the more cryst. is the C, the more rapid becomes the reverse reaction, probably due to catalytic influences. At higher reaction temp. the formation of CO and the rate of the direct reaction increase for all samples of coke. On the other hand, the rate of the reverse reaction diminishes. This may be due to diminished absorption, and therefore decreases decomp. of the CO by a relatively smaller amount of cryst. C consequent on the promotion of cracks in the coke surface.

Desiccation of lignite by the Fleissner process. H. KLEIN (*Internat. Bergwirts. u. Bergtechn.*, 1930, 23, 377; *Fuel*, 1931, 10, 385—389).—The process, which is particularly suitable for drying woody lignites, is carried out in large tanks and comprises four steps: (1) preheating, (2) heating with live saturated steam under pressures of 10—20 atm., (3) expansion of the steam to atm. pressure, and (4) final drying of the material by circulation of air. On heating under pressure with saturated steam, H₂O in the liquid form flows out of the lignite; this, together with H₂O from condensation of part of the steam, is continuously drained away. The steaming period occupies 75—80 min. The steam leaving the tank during expansion is utilised in preheating the lignite in another tank. The total heat consumption is about 460 kg.-cal. per kg. of H₂O removed. The product is a solid fuel of high calorific val. and good storing properties. A plant at Köflach, Austria, having 16 tanks each of 13,500 kg. capacity, and producing 1100 tons of desiccated fuel per day, is described. The raw coal is a typical lignite of 35—38% H₂O content, which is reduced to 13—17%, the calorific val. being raised from 3600 to 5000 kg.-cal./kg. A. B. MANNING.

Modern methods of investigation in gas technology. H. BROCHE (Brennstoff-Chem., 1931, 12, 312—315).—Recent developments in the methods of determining tar and dust, S, O₂, C₁₀H₈, etc. in coke-oven and other gases, of evaluating gas-purifying material, and of controlling gas purification are briefly discussed.

A. B. MANNING.

Effect of temperature and moisture content of [iron] oxides [for use in purification of coal gas]. D. V. REID (Gas J., 1931, 195, 742—745).—A method for determining the purifying efficiency of Fe oxides under varying conditions is described, the apparatus and oxides used being those described by Dunkley and Leitch (B., 1925, 487). It is shown that each oxide has an optimum range of H₂O content, and that increasing or decreasing the H₂O content beyond this range lowers its activity. The activity of some oxides is confined to a narrow range of H₂O content, but with others (e.g., the precipitated oxide) it is const. over a wide range; the activity increases with rise in temp., up to a max., and then decreases. Curves relating rate of gas purification and (a) % H₂O, (b) rise in temp., for the various oxides are given.

C. B. MARSON.

Determination, transformation, and removal of organic sulphur in gases. O. ROELEN (Brennstoff-Chem., 1931, 12, 305—312).—The S in gases of low S content has been determined by the catalytic combustion of the gas over a Pt spiral, followed by absorption of the SO₂ produced. The apparatus had a throughput of 100 litres/hr. The results were low, and a more suitable method, to be described in a later communication, has been worked out. For the catalytic production of benzene from water-gas the S content of the latter must be reduced to 0.1—0.2 g./cu. m. Initial attempts to purify water-gas to this degree by the catalytic conversion of the org. S into H₂S, and absorption of the latter, failed with intermediate-scale apparatus, using as catalysts CuO—PbCrO₄, finely-divided Ag deposited on MgO, or Fe wool; desulphurisation of the gas was satisfactory at first, but later the efficiency decreased, owing mainly to conditions which brought about a re-formation of org. S compounds, e.g., COS and CS₂, from the H₂S and CO in the gas. Thus with Fe as catalyst this reaction occurred in the cooler parts of the purifier, being accelerated by the catalytic action of a deposit containing Fe, C, and S, which was formed on the walls of the apparatus. In producing an H₂:CO mixture from coke-oven gas (cf. Fischer, B., 1931, 231) the greater part of the org. S was simultaneously converted into H₂S. Such a gas mixture, freed from H₂S by passage over luxmasse, was passed through a heated Fe tube, then cooled by direct contact with a stream of H₂O, and finally washed with an alkaline solution of K₄Fe(CN)₆. The rapid cooling prevented the re-formation of org. S compounds and the final washing removed the residual H₂S. This arrangement has given a gas of the required purity over long working periods, requiring only an occasional cleaning out of the Fe tube. Luxmasse is unsuitable for the final removal of H₂S, for it also can bring about the formation of COS and CS₂ from H₂S and CO.

A. B. MANNING.

Removal of nitric oxide from coke-oven gas by its catalytic reduction to ammonia. H. TROPSCH

and R. KASSLER (Brennstoff-Chem., 1931, 12, 345—348).—The gas is passed at 200—250° over a MoS₂ catalyst formed by impregnating "Stuttgart mass" with NH₄ thiomolybdate and reducing the latter in H₂ at 210°. The rapidity with which the NO was reduced was greatly increased by carrying out the process under pressure, e.g., 13—16 atm. A similar W catalyst was much less effective. The NO was converted almost completely into NH₃, little or no N₂ being formed. Small quantities of NO in coke-oven gas were determined by treatment of the gas with excess of O₂, absorption of the NO₂ in NaOH solution, treatment of the neutralised solution with Ilosvay's reagent, and comparison of the colour produced with standards corresponding with known amounts of NO.

A. B. MANNING.

Hydrogenation of nitrogen compounds of primary tar. G. ROBERTI (Atti R. Accad. Lincei, 1931, [vi], 13, 527—531).—When hydrogenated at 350°/100 atm. in presence of CoS, pyridine yields pentane, amylene, hexane, hexene, heptane, and an unsaturated hydrocarbon, *d*¹² 0.7503, *n*_D^{15.5} 1.4223, formed apparently by hydrogenation of a condensation product of 2 mols. of pyridine. Similarly, quinoline gives propylcyclohexane, propylcyclohexene, etc. The N is liberated as NH₃ in each case (cf. B., 1931, 833).

T. H. POPE.

Formation of oil from dilute acetylene. D. BINNIE (J.S.C.I., 1931, 50, 297—299 T).—Ni carbonyl or Ni used in conjunction with CO is a suitable catalyst for condensing dil. C₂H₂ (4%) in the presence of H₂ into a complex olefinic oil of *d* 0.69. Yields of 60% (wt. of oil on wt. of C₂H₂) were obtained. Ni alone hydrogenates the C₂H₂ to C₂H₆.

Determination of bitumen in natural asphalt and asphaltic materials by centrifuging. M. ILMENEV (Nef. Choz., 1930, 19, 614—615).—The sample (1.5—2 g.) is refluxed for 10—15 min. with C₆H₆ (100 g.); after cooling, 70 c.c. are centrifuged for 5 min. at 2500 r.p.m., 50 c.c. of this being then evaporated, and the residue of bitumen dried and weighed. H₂SO₄ in "kontakt" is determined iodometrically by the use of BaCrO₄.

CHEMICAL ABSTRACTS.

Bitumen from Ural crude oil. A. N. PARSHIN (Nef. Choz., 1930, 19, 560—564).—A report and discussion.

CHEMICAL ABSTRACTS.

New oil fields in the Benoisk district. V. SELSKI (Groznenki Nef., 1930, 1, No. 1, 15—21).—Oil from a well 150 km. S.E. of Grozni contained 30% b.p. < 200°, *d* 0.774, and 40% b.p. 200—315°, *d* 0.814. The bottoms were almost pure gas oil, *d* 0.866. The crude oil contains up to 10% of paraffin.

CHEMICAL ABSTRACTS.

Crude oil from the Benoisk district. A. Y. GANCHIKOVA (Groznenki Nef., 1930—1931, 1, No. 2—3, Suppl. 1, 1—5).—Characteristics of the crude oil and its fractions are recorded.

CHEMICAL ABSTRACTS.

Refining Ural crude oil. D. M. MARKO (Nef. Choz., 1930, 19, 560—561).—Characteristics of the crude oil and its fractions are recorded.

CHEMICAL ABSTRACTS.

General constituents of Japanese petroleum. I. The fraction of petroleum from Nisayama distilling

under 200° at ordinary pressures. R. KOBAYASHI (J. Soc. Chem. Ind., Japan, 1931, 34, 289—294 B).—The characteristics and constitution of each fraction having a boiling range of 10° from 50° to 200° are described.

E. H. SHARPLES.

Gasoline fractions of representative Japanese crude petroleums. III. M. MIZUTA (J. Soc. Chem. Ind., Japan, 1931, 34, 288 B).—Halogen absorption methods cannot be adapted to the determination of unsaturated hydrocarbons in gasoline; 80% H₂SO₄ is the most suitable reagent and completely removes these hydrocarbons without affecting other substances. Japanese gasolines contain < 1% of unsaturated hydrocarbons.

E. H. SHARPLES.

Total heat and sp. heat of a series of fractions of petroleum oil, and their relation to other properties (Persian oil fractions). VI. Preparation of samples and determination of their mean mol. wt. and other properties. VII. Temperature variation between 0° and 100° of the sp. heat. H. R. LANG and R. JESSEL. **VIII. Total heat of the liquids.** H. R. LANG (J. Inst. Petroleum Tech., 1931, 17, 572—576, 577—581, 581—584).—VI. Mean mol. wts. in PhNO₂, b.p., *n*²⁰, coeff. of expansion, and sp. gr. of crude oil have been determined.

VII. Sp. heats have been measured from 0° to 100° by the continuous-flow method.

VIII. The total heats are calc. C. W. GIBBY.

Doctor test and silver nitrate test for the detection of sulphur compounds in gasoline. M. MIZUTA (J. Soc. Chem. Ind., Japan, 1931, 34, 287—288 B).—Variations between the doctor test and the AgNO₃ test with S compounds are described. The AgNO₃ test gave the highest no. of "positive" reactions and is recommended for straight-run gasolines, whilst the doctor test gives better results for the detection of mercaptans in cracked gasolines, mercaptans giving a positive reaction on the addition of flowers of S. E. H. SHARPLES.

Mol. wts. and sp. gr. of gasoline fractions obtained in the Vickers unit. L. SELSKI and A. SOMOV (Groznski Neft., 1930—1931, 1, No. 2—3, Suppl. 1, 7—8).—Vals. are tabulated.

CHEMICAL ABSTRACTS.

Sediments in the condensers of the Foster-Wheeler unit. B. BONDARENKO (Groznski Neft., 1930—1931, 1, No. 2—3, Suppl. 1, 5—7).—The sediment is removed by injection of HCl. The temp. of the cooling H₂O should not exceed 50°. CHEMICAL ABSTRACTS.

Uncondensed refinery gases and their utilisation. A. DOLADUGIN and S. ISAEVA (Groznski Neft., 1930, 1, No. 1, 54—56).—The composition of the gas is recorded; the quantity per ton is calc. for various units. CHEMICAL ABSTRACTS.

Removing sulphur from Chusovskie Gorodki (Ural) [oil] distillates. I. Y. POSTOVSKI and V. G. PLUSNIN (Neft. Choz., 1930, 19, 561—564).—The fractions are passed with steam over Fe ore at 350—450°. The S content of the first 100 c.c. is thus reduced from 1.25 to 0.25%, 5% of the distillate being lost. The S content was reduced to 0.14% by treatment with 2% of conc. H₂SO₄. The activity of the catalyst was lowered by formation of C. CHEMICAL ABSTRACTS.

Breaking crude oil emulsions. F. SCHNEIDER and A. V. HEIFETZ (Azerbaid. Neft. Choz., 1930, No. 12, 138).—Crude oil emulsions (up to 50% H₂O) formed from Bibi-Eibat "emulsifying" crude oil are broken by treatment with acid sludge obtained in the treatment of the vaseline oil distillate with fuming H₂SO₄.

CHEMICAL ABSTRACTS.

Knocking properties of motor fuels and knock prevention. E. ENDO (J. Fuel Soc. Japan, 1931, 10, 57—58).—Using an Armstrong fuel testing plant it was found that (1) the variation of engine speed between 550—850 r.p.m. was not effective on the knocking rate, (2) the highest useful compression ratio (H.U.C.R.) decreased by about 0.5 when the ignition timing was advanced from —12° to —31°, (3) the knocking tendency, which decreased with throttling, increased with temp. rise of the intake air and cooling water, (4) the fuel-air ratio at the max. knocking intensity was nearly the same as that at the max. power output. The most important influence of knocking on engine performance is power drop. Nineteen varieties of gasoline were tested and their C₆H₆ vals. were found to depend mainly on their volatility. The knocking rate of common antiknocks was investigated and three classes were recognised. The first contains those only powerful in a rich concentration in gasoline, e.g., C₆H₆; the second, those having antiknock power proportional to their concentration, e.g., PhMe; and the third is effective in a low concentration, but does not increase its antiknock power proportionally to its concentration, e.g., PbEt₄. Initial results, using a N.A.C.A. universal test engine in comparison with the Armstrong engine, indicate that the same knocking val. will be obtained with different engines under the same measuring conditions. H. S. GARLICK.

Motor-fuel testing. O. ENOCH (Brennstoff-Chem., 1931, 12, 348—352).—Methods of evaluating motor fuels, and in particular the recent developments in methods of determining the antiknock value, are discussed. A. B. MANNING.

Fuel testing in slow- and high-speed Diesel engines. L. J. LE MESURIER and R. STANSFIELD (J. Inst. Petroleum Tech., 1931, 17, 387—418).—Standard engines have been used to determine fuel consumption, fuel-system leakage, the combustion process from the point of injection through the delay period to the beginning of expansion, combustion stock, ease of starting, and the effects of dopes, nozzle alterations, and changes in speed in relation to combustion and shock. The characteristics of 14 different fuels are tabulated and the behaviour of the fuels was observed on engines of the Robey, Petter, Benz, and Junkers type under standardised conditions of running. Very little difference was found in the consumptions of the engines, although fuels of paraffinic, aromatic, and naphthenic types were used. Viscosity was found to affect only the fuel-system leakage and not the consumption. The process of combustion may be divided into 3 stages: delay period between injection and commencement of pressure rise, a period of rapid uncontrollable combustion, and a period during which the remainder of the fuel burns as injected at the nozzle. The effect of the delay period

is shown to be least with paraffinic fuels, which give less combustion shock. No relationship was found between ease of starting and self-ignition temp. The addition of materials which promote knocking in petrol engines was found to be of some value in promoting smoother running in the Diesel engines, and in shortening the delay period. Finer sprays were found to give more rapid pressure rise in the earlier stages of combustion. Slower speeds were found to increase the tendency to combustion shock. In general, the Diesel fuels from crudes which give the highest anti-knock petrols are likely to be worst for use in Diesel engines. T. A. SMITH.

Determination of mean mol. wts. of lubricating oils by improved cryoscopic methods. N. G. GULLICK (J. Inst. Petroleum Tech., 1931, 17, 541—571).—Mol. wts. of such oils can be determined cryoscopically to $\pm 1-1.5\%$, using C_6H_6 or $PhNO_2$ as solvent. The presence of Na_2SO_4 as a drying agent does not impair the accuracy of the method. To obtain consistent results it is essential to maintain a const. temp. difference between the temp. of the cooling bath and the f.p. Differentiation may be made between different types of oil. C. W. GIBBY.

Preparation of lubricating oil by once-through distillation of fuel oil. Y. E. EMMUL and R. M. SHATIROV (Nef. Choz., 1930, 19, 582—585).—The characteristics of the source and products (obtained with little steam and much fuel, or *vice versa*) are recorded. CHEMICAL ABSTRACTS.

Dewaxing paraffinic lubricating oils. ARISTOV (Groznski Neft., 1930, 1, No. 1, 57).—Various methods are discussed. Dilution of the cylinder oil residue with ligroin or other solvent and addition of a fine porous solid is the method preferred. CHEMICAL ABSTRACTS.

Prevention of explosion danger in oil-tankers. Optical analysis of very weak mixtures of petroleum vapour [with air]. Z. TUZI and O. KADITA (Sci. Papers Inst. Phys. Chem. Res., Tokyo, 1931, 16, 147—158).—Doi's modification of Jamin's refractometer has been used with satisfactory results for the determination of small quantities of petroleum vapour in air. C. W. GIBBY.

Preparing petroleum soap in Grozni refineries. E. MUISHKIN (Groznski Neft., 1930—1931, 1, No. 2—3, 44—46).—The following percentages of naphthenic acids are recorded: kerosene from paraffin-base crude oil 0.012, from semi-paraffin crude oil 0.090, from asphalt-base crude oil 0.35, from lubricating-oil crude oil 1.01, from Maikop crude oil 0.66; gas oil from asphalt-base crude oil 0.72, from heavy crude oil 0.60; heavy gas oil 1.94 and 1.95; gas oil from Maikop crude oil 0.72; spindle-oil distillate 1.60; spindle-oil distillate from asphalt-base crude oil 0.90; machine oil distillate 0.50. The naphthenic acids are first removed with NaOH, because they are partly sulphonated by H_2SO_4 . These acids are less suitable for soap-making and are difficult to recover. CHEMICAL ABSTRACTS.

Naphthenic acid soaps. R. A. VIRABYANTZ and O. A. ARTEMIEV (Groznski Neft., 1930—1931, 1, No. 2—3, Suppl. 1, 9—13).—The naphthenic acids are determined by dissolving the product in a mixture of

$EtOH$ and C_6H_6 and titrating with alcoholic alkali in presence of alkali-blue. The naphthenic acid content of various oil fractions is recorded.

CHEMICAL ABSTRACTS.

Asphalt paving materials.—See IX. **Determination of CO.**—See XIII. **Oil sprays.**—See XVI.

PATENTS.

Preventing explosions in [coal] mines. E. WITTE (B.P. 355,412, 14.6.30. Ger., 14.6.29).—The coal dust in the mine is mixed with such a proportion of mineral dust of const. colour shade that the grey mixture is lighter in shade than a crit. mixture, determined by experiment, which fixes the explosive limit for the mine. A. B. MANNING.

Apparatus for washing coal or the like. G. E. DEAN (B.P. 355,269, 20.5.30).—The apparatus comprises a water tank containing two conveyors arranged side by side and having a lateral extension wherein is a breaking mechanism. The crushed material falls on to an adjustable chute which delivers it into the tank. One or more nozzles, disposed immediately below the chute, produce a deflecting current of water, so regulated as to carry the material of lower sp. gr., *e.g.*, coal, on to the further conveyor, whilst that of higher sp. gr., *e.g.*, slate and other impurities, is deposited on to the nearer conveyor. The conveyors discharge the materials, after affording opportunity for drainage, from the tank on to separate chutes. A. B. MANNING.

Dissolution of coal. KOPPERS Co., Assees. of H. J. ROSE and W. H. HILL (B.P. 356,239, 31.5.30. U.S., 1.6.29).—The process described in B.P. 268,372 (B., 1928, 882) is carried out by mixing the coal and solvent in a porous container at a temp. at which the coal is dissolved without decomp., and under such conditions that the insol. material forms a filter layer on the inside of the container which facilitates separation of the coal solution from the foreign solid matter. Means may be provided for recirculating the heated oil through the container or for vaporising the oil and condensing the vapours directly above the container. A. B. MANNING.

Manufacture of briquettes and like agglomerated bodies or lampblack from coal dust. H. HARDY (B.P. 356,236, 7.5.30. Belg., 22.5.29).—Caking coals, alone or admixed with non-caking coals, are heated in the granular state and with agitation, *e.g.*, in a horizontal tubular retort provided with a spiral conveyor, until the particles swell and assume a spheroidal shape, the heat treatment being arrested before the particles burst. The material is then cooled, moistened with H_2O , reheated to about 100° , and briquetted without the addition of tar or other binder. The cooling may be carried out in such a manner that, on moistening, the particles burst with the production of lampblack, which may be separated. The briquettes may subsequently be carbonised. A. B. MANNING.

Working of coal-distillation ovens. C. STILL (B.P. 355,956, 2.9.30).—Ducts or hollow spaces are formed in the compressed coal charge by means of suitable forming members, *e.g.*, tubes, which are then withdrawn from the coal. The volatile products of

distillation are withdrawn from the retort, under a relatively high vac., *e.g.*, 40 mm. water gauge or higher, through tubes connected with the ducts in the coal. The ducts may be strengthened by being filled with lumps of coke.

A. B. MANNING.

Coke ovens and the like. C. STILL (B.P. 356,079, 9.1.31. Ger., 14.1.30. Cf. B.P. 355,956, preceding abstract).—Ducts may be formed in the charge by rods which are pushed in from the oven roof; these are then withdrawn and tubes of slightly larger diam., tapered at the ends, are jammed into the openings of the ducts to form therewith as gastight a connexion as possible. The tubes communicate with a common gas-collecting pipe, through which the volatile products are withdrawn, preferably under vac. (at least 50 mm. water gauge).

A. B. MANNING.

Furnaces for burning waste materials and the like. STETTINER CHAMOTTE-FABR. A.-G., VORM. DIDIER (B.P. 356,278, 6.6.30. Ger., 10.6.29).—The waste material is fed on to an inclined grid on which it is divided into thin layers for drying and sifting purposes, and after being dried and freed from its finer constituents is conveyed to the combustion space and burned, all the steps taking place within a single furnace.

A. B. MANNING.

Gas-producing apparatus. J. U. McDONALD (U.S.P. 1,798,617, 31.3.31. Appl., 13.6.25).—The producer consists of a double shell, the annular space acting as a steam boiler. Solid fuel (with or without the addition of oil), steam, hot (preheated by the producer gas) and cold air enter the producer at the top. The gas is withdrawn at the bottom through a pipe inside a conical ash discharger. The discharger is attached to a rotary vessel which holds water.

D. K. MOORE.

Apparatus for manufacturing carburetted water-gas. F. B. DEHN. FROM GAS MACHINERY CO. (B.P. 355,490, 8.8.30).—The generator is connected with the carburettor by a single duct which opens centrally into and co-axially with the top of the latter. The oil-supplying duct and the secondary air duct are also arranged co-axially with the opening of the gas duct. By these means uniform heating of the chequerbrick and lining of the carburettor is obtained.

A. B. MANNING.

Manufacture of gas from liquid fuels. O. O. THWING, Assr. to GEN. OIL GAS CORP. (U.S.P. 1,796,733, 17.3.31. Appl., 1.4.25).—The composition and calorific val. of gas manufactured by the partial combustion of hydrocarbon oil are kept const. by keeping the temp. of the combustion zone of the retort const. This is done by thermostatic control of the oil supply.

D. K. MOORE.

Automatically controlling the calorific value of gas. R. ASHWORTH and W. R. D. TILDESLEY (B.P. 356,425, 12.8.30).—The lever admitting a diluent to the gas is operated by a governor, the position of which is maintained normally by an exhaustor, but is controlled by an air-supply valve, operated in turn by the arm of a recording gas calorimeter.

A. B. MANNING.

[Continuous] manufacture of oil gas. E. A. DIETERLE (U.S.P. 1,798,372, 31.3.31. Appl., 22.4.24).—Atomised oil, with or without the addition of steam, is passed over the outside of vertically spaced banks of

tubes through which hot gases of combustion are being passed.

D. K. MOORE.

Recovery of pressure gas from oil wells. L. N. YATES, Assr. to SINCLAIR OIL & GAS CO. (U.S.P. 1,798,774, 31.3.31. Appl., 19.6.30).—In the automatic intermittent pumping of oil from wells by means of gas pressure, the gas released when the well chamber has been emptied is divided into two parts, one released at high pressure and one at low pressure. The former is free from, but the latter contains, oil vapours.

D. K. MOORE.

[Synthetic] production of acetylene. D. A. BRADING, Assr. to M. BRADING (U.S.P. 1,797,400, 24.3.31. Appl., 26.3.25).— C_2H_2 is produced by passing preheated H_2 and finely-divided C through an electric arc. The H_2 employed is preferably that derived from the electrolysis of H_2O .

D. K. MOORE.

Carrying out catalytic oxidations. J. Y. JOHNSON. FROM I. G. FARBENIND. A.-G. (B.P. 355,308, 14.4.30).—Compounds of C, *e.g.*, CO, or the exhaust gases from Diesel engines etc., are oxidised by passing them, admixed with air, at the ordinary or slightly raised temp. over catalysts consisting of the manganites of the heavy metals, the earth metals, or the rare-earth metals, *e.g.*, of Cu, Fe, Ni, Zn, etc. The manganites may be mixed with one another or with other substances, *e.g.*, Co oxide, $Fe(OH)_3$, or metals such as Fe, Zn, or Al, in order to produce a catalyst of any desired activity.

A. B. MANNING.

Separation of carbon monoxide from mixed gases containing hydrogen. OESTERR.-AMERIKANISCHE MAGNESIT A.-G. (B.P. 355,861, 16.6.30. Austr., 18.6.29).—CO is eliminated from water-gas etc. by passing the gas, admixed with steam, over a mixture of C and MgO or $MgCO_3$ at a temp. above the decomp. temp. of $MgCO_3$, but not above 500° . The reaction $CO + H_2O \rightarrow CO_2 + H_2$ may be accelerated by heating the first portion of the contact material to 750° , provided that the gases afterwards pass over the second portion at not above 500° .

A. B. MANNING.

Collection of sulphur from gases. A. M. CLARK, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 355,832, 31.5. and 18.8.30).—The mist or fume of finely-divided S obtained by cooling a gas containing S vapour is maintained at a moderately high temp., *e.g.*, between the initial condensation temp. and 100° , for sufficiently long to allow the S particles to attain a coarser state of division; the S is then separated from the gas by filtration or settling. It is desirable to adjust the dust content of the initial gas, *e.g.*, by filtration followed by the addition of a regulated quantity of the unfiltered gas, in order to provide the optimum number of condensation nuclei for the process.

A. B. MANNING.

Obtaining a condensate from gases. N. V. DE BATAAFSCHE PETROLEUM MAATS. (B.P. 355,413, 16.6.30. Holl., 29.6.29).—In separating a condensate from a gas, either by compression or adsorption, the efficiency of the process is increased by first adding to the gas a substance which has a b.p. below that of the lowest-boiling of the components of the desired condensate, and is also to a considerable extent condensed therewith; it is subsequently removed from the condensate and again utilised in a further separation. Thus in the separation of

benzine from casing-head gas the added substance is preferably C_3H_8 . A. B. MANNING.

Treatment of gas-purification products. F. W. SPERR, JUN., ASSR. to KOPPERS Co. (U.S.P. 1,798,912, 31.3.31. Appl., 7.10.26).—The froth, consisting of S and Fe oxide, obtained by the aeration of the spent alkaline liquid used for the absorption of H_2S in gas manufacture, is subjected to violent aeration in a flotation machine. The tailings, containing Fe oxide, is returned to the first aeration vessel, whilst S in a high state of purity is removed from the froth by filtration. A recovery of 90% of the S and 80% of the Fe or other compound is attainable. D. K. MOORE.

Boilers for heating tar and tar compounds. G. S. CLARK (B.P. 356,235, 7.5.30).—The boilers or heating tanks are provided with electrical heaters detachably mounted within tubes fixed horizontally in the tanks. The resistance of the elements is such that they do not get red hot at the voltage for which they are designed to work. A. B. MANNING.

Treatment of asphalts. H. D. ELKINGTON. FROM N. V. DE BATAAFSCHE PETROLEUM MAATS. (B.P. 355,430, 30.6.30).—The stickiness or tackiness of asphalts is decreased by treating them in the molten condition with 3–10% of a resinate, sulphonate, naphthenate, or linoleate etc. of Mn, Co, Pb, or other heavy metal. A. B. MANNING.

Extraction of phenol, phenol homologues, and other hydroxy-aromatic compounds from tar oils and mineral oils. J. G. PEAKE (B.P. 355,445, 9.7.30).—Aq. alkaline solutions containing the impure phenoxides etc. are distilled under reduced pressure to remove volatile impurities, and then acidified to liberate the phenols etc., which are subsequently fractionated at appropriate temp. and pressures. A. B. MANNING.

(A) Production of tar compositions for road construction and otherwise for use as coatings. (B) Production of bituminous compositions. AMBER SIZE & CHEM. Co., LTD. (B.P. 355,937 and Addn. B.P. 356,003, [A] 18.8.30, [B] 13.10.30. Ger., [A] 16.8.29, [B] 11.10.29).—(A) Tar compositions of increased "wetting capacity," liquid at room temp. and usable in any weather, are prepared by adding to the usual prepared tars 3–20% of materials, e.g., Dippel's oil, bone oil, or shale oil, containing aromatic hydroxy-compounds and N-bases. (B) Bituminous substances other than tar, e.g., petroleum pitches, may be similarly treated. A. B. MANNING.

Treatment [cracking] of [petroleum] oils. C. B. BUERGER, ASSR. to GULF REFINING Co. (U.S.P. 1,796,138, 10.3.31. Appl., 23.2.23).—Oil is maintained under cracking temp. and pressure in a vertical column and a portion is continuously removed, forcibly circulated through heating tubes, and returned to the main bulk of oil at a point below that of withdrawal and under conditions allowing C, tar, and heavy residue oil to settle and be withdrawn. The vapours before final condensation are scrubbed with replenishing oil, which is supplied to the heating coil in admixture with that portion of the oil being circulated from the main supply. H. S. GARLICK.

Treatment [cracking] of hydrocarbon oils. J. W. COAST, JUN., and G. T. GRANGER (U.S.P. 1,786,053, 23.12.30. Appl., 11.12.26).—Crude oil is pumped into the top of a distilling column (A), the vapours from which pass into a fractionating column (B) near the bottom, whilst the vapours from B are condensed to yield motor spirit. The liquid from the bottom bubbler of A is pumped through a skimming still in which it is heated, and the liquid and vapour are passed into an expansion vessel (C) from which the liquid flows into a storage tank to be used as fuel. The vapours from C pass into A below the bubbler plates, the vapours rising through the bubblers, whilst the liquid, mixed with the condensate from B, which also flows into A below the bubbler plates, is pumped through a still in which it is cracked under pressure. The vapours and liquid therefrom are forced into a second expansion vessel from which the vapours enter A below the bubbler plates, whilst the liquid passes into C. The liquid in the bottom of A is recirculated through the cracking still. The process considerably reduces the accumulation of coke in the stills and pipes. D. K. MOORE.

Treatment [cracking] of petroleum oils. W. M. CROSS, ASSR. to GASOLINE PRODUCTS Co., INC. (U.S.P. 1,785,073, 16.12.30. Appl., 28.8.25).—Oil heated to 315–370° is pumped into a vessel under 600–2000 lb./sq. in. pressure. Air is forced into this vessel through a perforated pipe and the combustion of a little of the oil raises the temp. to 370–540° and cracking occurs. After a period of digestion the oil is discharged into a still, and on releasing the pressure about 90% passes over as vapour and is condensed. The introduction of the air enables the oil to leave the heating coil at a lower temp., thereby reducing coke formation, minimises the production of unsaturated hydrocarbons, and promotes the formation of anti-detonating compounds, e.g., hydroxy- and aromatic compounds. D. K. MOORE.

Apparatus for distilling [crude] oil. R. F. GILDEHAUS, JUN. (U.S.P. 1,788,947, 13.1.31. Appl., 10.8.25).—Vac. stills, heated by radiant heat instead of by contact with furnace gases, are arranged in series so that a gravity flow through the series can be obtained. Good heat transference is obtained by maintaining a circulation of oil in each still. Equalising lines are provided so that the same vac. is maintained in the stills and charging tanks. T. A. SMITH.

Apparatus for distilling [hydrocarbon] oils. J. R. SCHONBERG, ASSR. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,791,937, 10.2.31. Appl., 28.5.25).—Two drums are mounted one above the other with heating flues extending through them. Combustion gases are passed through the flue in the lower drum prior to any substantial contact of the gases with the outside shells of the drums, then through the flue in the upper drum, and finally around the upper drum to a stack. The upper drum has an inlet for liquid, a pipe for conveying liquid from the upper to the lower drum, and a vapour line communicating with each drum. H. S. GARLICK.

Distillation of hydrocarbon oils. P. L. KRAUEL, ASSR. to STANDARD OIL Co. (U.S.P. 1,789,004, 13.1.31. Appl., 3.1.27).—Oil, after being heated in a conduit,

is passed into a vaporising drum, where the volatile fractions are removed. The residual oil is passed along with inert gas to a fractionating column where further vaporisation is brought about by means of steam. The vapours from the column are returned to the oil stream before it enters the vaporising drum.

T. A. SMITH.

Separation of [petroleum oil] emulsions. F. R. MOSER, Assr. to N. V. DE BATAAFSCHE PETROLEUM MAATS. (U.S.P. 1,788,684, 13.1.31. Appl., 3.9.24. Holl., 19.7.24).—High-boiling mineral oil, after pretreatment with H_2SO_4 (d 1.83) to remove resin-forming materials, is sulphonated by means of oleum. The reaction products form colloidal suspensions with H_2O and can be used to bring about the separation of petroleum emulsions.

T. A. SMITH.

Conversion of hydrocarbons. J. J. JAKOWSKY, Assr. to C. & C. DEVELOPING Co. (U.S.P. 1,792,744, 17.2.31. Appl., 22.7.24).—A substantially saturated vaporous mixture of mineral oil hydrocarbons is passed through a walled zone maintained above the crit. gasifying point of the motor fuel it is desired to produce, but below that of materially higher-boiling products, while simultaneously passing a high-tension, silent electrical discharge through the vapours. By such means the non-gaseous constituents are driven towards the walls and are converted, the gaseous constituents pass through the zone substantially without interruption, and a motor fuel is condensed from the volatile products leaving the converting zone.

H. S. GARLICK.

Refining of mineral oils. A. LACHMAN, Assr. to RICHFIELD OIL Co. OF CALIFORNIA (U.S.P. 1,790,622, 27.1.31. Appl., 22.6.27).—Cracked gasoline vapours at 150° are passed upwards through a mass of porous material over which flows a continuous stream of 70—85% $ZnCl_2$ solution. Steam is added to replace the H_2O removed by the vapours and prevents the clogging of the apparatus. Stable water-white distillates are obtained without the use of H_2SO_4 , and the loss does not exceed 2%. The product may require treatment with a small quantity of alkali to remove H_2S .

T. A. SMITH.

Purification of cracked petroleum vapours. C. B. WATSON and R. C. OSTERSTROM, Assrs. to PURE OIL Co. (U.S.P. 1,793,885, 24.2.31. Appl., 21.8.28).—Cracked petroleum vapours are continually passed to a fractionating zone into the upper part of which finely-divided fuller's earth or similar material is introduced and allowed to fall in substantially dry state in counter-current relation to the vapours. The heavier particles of oil and purifying agent are removed from the bottom of the fractionating zone, whilst the partly purified vapours are removed from the top to a separating zone. Finely-divided purifying agent is introduced into the vapours between the fractionating and separating zones from which the purified vapours are removed.

H. S. GARLICK.

Refined viscous hydrocarbon oil. T. H. ROGERS, Assr. to STANDARD OIL Co. (U.S.P. 1,793,134—5, 17.2.31. Appl., 7.11.28. Renewed 31.7.30).—Acid formation and increase of emulsibility in use of highly refined viscous hydrocarbon oils are prevented by the addition of (A)

small proportions of a naphthol, e.g., 0.2% of β -naphthol, or (B) $<0.1\%$ of an aromatic compound having more than one OH group attached to the ring, e.g., 0.04% of pyrogallol.

H. S. GARLICK.

Treatment of sulphur-containing [hydrocarbon] oils. H. G. M. FISCHER and W. J. ADDEMS, Assrs. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,789,335, 20.1.31. Appl., 8.5.26).—Hydrocarbons containing mercaptans are refined by treatment with a heavy-metal sulphide, alkali, and sufficient S to convert the major portion of the mercaptans into polysulphides. After treatment the oils are distilled to obtain distillates practically free from S. A final treatment with a small quantity of "doctor" solution may be necessary.

T. A. SMITH.

Continuous method for sweetening petroleum. H. H. CANNON and W. W. GARY, Assrs. to CANNON-PRUTZMAN TREATING PROCESSES, LTD. (U.S.P. 1,789,167, 13.1.31. Appl., 21.1.29).—Oil containing mercaptans is refined by treatment with slaked lime or the hydroxide of metal of group II, PbO , diatomaceous earth, and S. The refining material is separated in the form of a filter cake, which will purify further large quantities of unrefined oil.

T. A. SMITH.

Treatment of hydrocarbon oil with metallic halides. J. L. COOLEY, Assr. to STANDARD OIL Co. OF CALIFORNIA (U.S.P. 1,795,761, 10.3.31. Appl., 1.12.26).—The oil is passed through a heating coil where it is raised to reaction temp. and anhyd. $AlCl_3$ or equiv. metal halide catalyst is forced into the stream of hot oil. Low-boiling oils are removed by passage through a flashing chamber from which the main bulk of oil is introduced into one end of a conversion chamber or still maintained at sufficient temp. and pressure to cause decomp. of the oil. Simultaneously the separated vapours from the flashing chamber are withdrawn and discharged into the reaction chamber through a distributor at a lower point so that they rise upwardly through the contents of the still, which thereby are agitated. Mechanical agitators may also be provided to break up tarry matter and coke in the chamber. Part of the mixture in the still is passed to a stratifying zone from which the spent $AlCl_3$ residue or tar is withdrawn.

H. S. GARLICK.

Petroleum-treating system. S. J. DICKEY and E. W. ROTH, Assrs. to GEN. PETROLEUM CORP. OF CALIFORNIA (U.S.P. 1,792,003, 10.2.31. Appl., 15.11.26).—Oil is passed under pressure through a series of tanks into the last of which is introduced a mixture of purified oil and fresh treating reagent. A mixture of purified oil and reagent sludge is drawn in each instance from the relatively next succeeding tank of oil and is introduced into each of the preceding tanks.

H. S. GARLICK.

Conversion of residues obtained on sweetening petroleum distillates. H. G. M. FISCHER, Assr. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,795,278, 3.3.31. Appl., 25.8.27).—Residue oil containing alkyl polysulphides obtained by catalytic treatment of sour petroleum distillates with S followed by distillation under reduced pressure to produce a sweetened distillate and a residue oil containing hydrocarbon-S compounds,

is heated to $>177^\circ$, but below the temp. of vaporisation of a substantial part of the residue oil, to form a vapour comprising H_2S and hydrocarbon-S compounds of lower b.p. than those originally present, which may be separated by appropriate means. H. S. GARLICK.

Treating [dewaxing of] viscous hydrocarbon oil. R. E. MANLEY, ASSR. to TEXAS CO. (U.S.P. 1,792,234, 10.2.31. Appl., 15.4.27).—Wax-bearing, hydrocarbon lubricating oil is mixed with a suitable more volatile carrier oil, derived from a naphthenic-base crude and less volatile than kerosene, and distilled under reduced pressure, thereby removing the carrier oil and more volatile low-melting wax together. The remaining oil is cooled and chilled to ppt. the high-melting wax. H. S. GARLICK.

Separation of paraffin from petroleum oils. J. VERNER, ASSR. to STANDARD OIL DEVELOPMENT CO. (U.S.P. 1,789,347, 20.1.31. Appl., 16.8.27).—Cylindrical filters are arranged in a container which is also fitted with heating tubes. Chilled wax-containing oil is pumped through the vessel, the scale being retained. After sufficient wax has collected, steam is passed through the heating tubes and the molten slack separately collected. T. A. SMITH.

Purification of [lubricating] oil. L. H. CLARK, ASSR. to SHARPLES SPECIALTY CO. (U.S.P. 1,788,911, 13.1.31. Appl., 16.12.25).—Used lubricating oil is treated at $80-95^\circ$ with a dil. solution of Na_2SiO_3 , $Na_3Al_2O_4$, or Na_3PO_4 containing a small proportion of colloidal substance. The mixture is then centrifuged and the oil freed from light constituents by distillation in steam. T. A. SMITH.

Production of hydrocarbon vapour or gas under pressure for burners and the like. H. GAMARD (B.P. 355,683—4, [A] 22.5.30, [B] 23.5.30. Fr., [A] 30.5.29).—(A) The gasifying device consists of a tube depending into a reservoir of the liquid hydrocarbon, heated either electrically or by heat conveyed from the burner by a surrounding conducting tube. An insulating layer of air separates the heated tube from the bulk of liquid in the reservoir. The outlet orifice for the gas is formed by a jet disposed above the level of the liquid in the reservoir. (B) The gasifying tube and electrical heater are designed to form a separate unit which can be removed, exchanged, or replaced in the reservoir as desired. A. B. MANNING.

Resolution of hydrocarbon vapour. F. A. HOWARD and N. E. LOOMIS, ASSRS. to STANDARD OIL DEVELOPMENT CO. (U.S.P. 1,797,145, 17.3.31. Appl., 25.10.27).—A mixture of hydrocarbons, chiefly compounds of the gasoline range, from a cracking process is subjected to partial condensation under superatm. pressure to produce a first condensate requiring the usual chemical treatment with H_2SO_4 or "doctor" solution, and a second vapour which requires no chemical treatment and has an end-point of approx. $150-215^\circ$. This is separated into a gas and liquid products substantially free from normally gaseous hydrocarbons which are subsequently blended with the chemically treated first condensate. H. S. GARLICK.

Separation of the oxidation products of solid hydrocarbons, waxes, etc. J. Y. JOHNSON. From

I. G. FARBENIND. A.-G. (B.P. 352,512, 13.1.30).—The crude oxidation product is centrifuged, with or without diluent, at a temp. at which the constituents to be removed are liquid; preferably high-speed sieve centrifuges lined with wool or flannel filters or with fine-meshed Al sieves are used. C. HOLLINS.

Refining of wax-containing oil by distillation. SHARPLES SPECIALTY CO., ASSEES. OF L. D. JONES (B.P. 356,172, 28.4.30. U.S., 14.6.29).—The vapour of the oil is passed into a fractionating tower consisting of groups of bubble trays forming alternately rectifying and stripping sections. Part of the reflux from any rectifying section is passed to the next lower rectifying section, whilst the remainder is passed into the stripping section and then withdrawn from the tower. By regulation of the temp. and quantity of reflux, part of the wax is obtained in one of the fractions from which it is deposited on cooling in a cryst. form removable by filter-pressing, whilst the remainder is obtained in an adjacent fraction from which it is deposited in an amorphous state removable by centrifuging. D. K. MOORE.

Recovery of paraffin wax from materials containing the same. J. Y. JOHNSON. From I. G. FARBENIND A.-G. (B.P. 365,205, 4.6.30. Addn. to B.P. 291,817; B., 1928, 613).—Substances containing paraffin wax, e.g., hydrogenation and distillation products of coal, are treated with a mixture of a lower alkyl formate, e.g., HCO_2Me , and one or more org. solvents, e.g., C_6H_6 , CS_2 , CCl_4 , to produce white paraffin wax. D. K. MOORE.

Lubricant. D. P. BARNARD, ASSR. to STANDARD OIL CO. (U.S.P. 1,796,857, 17.3.31. Appl., 19.10.27).—A lubricating oil suitable for the lubrication of an internal-combustion engine under operating conditions is mixed with a relatively small amount (5–10%) of a volatile, substantially non-inflammable diluent, preferably a chlorinated hydrocarbon derivative, b.p. below 120° , e.g., CCl_4 , in order to ensure ease of starting with elimination of the diluent without fire risk after a relatively short time of full-load operation. H. S. GARLICK.

Manufacture of sulphonic lubricating material. H. L. JOHNSON, ASSR. to STANDARD OIL DEVELOPMENT CO. (U.S.P. 1,795,491, 10.3.31. Appl., 8.9.24).—A lubricant especially adapted for use in the die-drawing of metals comprises a metallic (Na) salt of the green sulphonic acid obtained from the sludge formed by treating petroleum lubricating oil with conc. H_2SO_4 (15–30%), a normally solid, non-mineral, substantially unsaponified oleaginous material, e.g., tallow (1–15%), and H_2O , the materials being heated to 82° to effect a homogeneous mixture. H. S. GARLICK.

Slushing grease. A. H. BRANSKY, ASSR. to STANDARD OIL CO. (U.S.P. 1,795,993, 10.3.31. Appl., 2.3.25).—A rust-preventative consists of a mixture of wax (e.g., montan or carnauba) of high m.p., or saponification products thereof, and an oil-sol. compound (20–60%) derived from the sulphonation of hydrocarbon oils with conc. H_2SO_4 , brought to suitable consistency by the addition of hydrocarbon oil. H. S. GARLICK.

Filter element [for oil]. Distillate-chilling apparatus. Gas scrubber. Viscosity indicators.

Antifriction bearing.—See I. Treatment of basic or acidic substances.—See III. HCN. $(\text{NH}_4)_2\text{SO}_4$.—See VII. Material for building etc.—See IX.

III.—ORGANIC INTERMEDIATES.

Determination of *m*-xylene in mixed xylois. H. P. REICHEL (Chem.-Ztg., 1931, 55, 744).—To 5 c.c. of the mixed xylois are slowly added 20 c.c. of glacial AcOH, 25 c.c. of HNO_3 (*d* 1.5), and 40 c.c. of H_2SO_4 (*d* 1.83), and the whole is kept at 15° for 30 min. by ice water. The mixture is heated on the water-bath for 1—2 hr., cooled, and diluted with 450 c.c. of H_2O , and, after keeping for $\frac{1}{2}$ hr., the mixed crystals are filtered and washed with H_2O . These, consisting of 2 : 4 : 6-trinitro-*m*-xylene and 2 : 3 : 5-trinitro-*p*-xylene, are digested on a water-bath for 30 min. with 100 c.c. of COMe_2 . The 2 : 4 : 6-compound which crystallises from the cooled solution is collected on a filter and dried; 0.6 g. is added to the observed wt. to allow for its solubility in COMe_2 . C. RANKEN.

Naphthenic acid soaps.—See II. Determination of CH_2O .—See XX.

PATENTS.

Manufacture of alcohols [from oxidised hydrocarbons]. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 352,537, 11.4.30).—The products obtained by destructive air- or O_2 -oxidation of liquid hydrocarbons or fractions of such products are heated under pressure with large excess of H_2 in presence of a catalyst (Ni or Co). Mixtures of alcohols of high m.p. containing C_{10} — C_{15} and useful in ointments and for prep. of wetting agents (by sulphonation) are obtained. C. HOLLINS.

Production of amides. SOC. FRANÇ. DE CATALYSE GÉNÉRALISÉE (B.P. 352,517, 5.3.30. Fr. 7.12.29).—Formamide, prevented from dehydration to HCN by the presence of NH_3 under pressure, is heated at 150—300° with MeOH to give NH_2Ac , and, generally, with R·OH to give R·CO· NH_2 . C. HOLLINS.

Acetaldehyde condensation reactions. E. J. BOAKE and L. W. E. TOWNSEND (B.P. 352,056, 29.3.30).—In the conversion of MeCHO into aldol or paraldehyde the heat of reaction is wholly or partly controlled by supplying the necessary H_2O by endothermic dehydration of a hydrated salt, which is preferably a catalyst for the condensation. Pure MeCHO, *e.g.*, is stirred at 10° with an equal wt. of $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$, or with a mixture of $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ and a little anhyd. Na_2CO_3 at 15—16°, to give aldol. For paraldehyde a mixture of $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ and NaHSO_4 at 12—18° is used. C. HOLLINS.

Preparation of aliphatic acid anhydrides especially acetic anhydride. G. B. ELLIS. From C. F. BOEHRINGER & SÖHNE G.M.B.H. (B.P. 352,176, 22.5.30).— $\alpha\alpha'$ -Diacetoxydiethyl ether, or the crude product from $\alpha\alpha'$ -dichlorodiethyl ether and AcOH or an acetate, is heated (preferably in a solvent, *e.g.*, decahydronaphthalene, COMe_2 , or EtOH) in presence of a non-basic catalyst (ZnCl_2 , SnCl_2 , SO_2), whereby the ether is decomposed smoothly into MeCHO (2 mols.) and Ac_2O (1 mol.), which are separated by distillation. Thus $\alpha\alpha'$ -dichlorodiethyl ether is converted into acetate by

heating with AcOH in C_6H_6 at 80° for 4—5 hr., the C_6H_6 is distilled off, and the residue heated with 0.2% of ZnCl_2 in AcOH; the yield of Ac_2O is 75% of the theoretical. C. HOLLINS.

Manufacture of [β]chloropropionic esters. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 352,802, 8.9.30).—Acrylonitrile is treated with HCl and the β -chloropropionitrile obtained is converted into esters by means of an alcohol and HCl. The Me, Et, CH_2Ph , $\text{OH}\cdot\text{CH}_2\cdot\text{CH}_2$, $\text{ClCH}_2\cdot\text{CH}_2$, and $\text{EtO}\cdot\text{CH}_2\cdot\text{CH}_2$ esters are thus prepared in 92—98% yields. C. HOLLINS.

Production of pure high-grade vinyl chloride. I. G. FARBENIND. A.-G. (B.P. 352,842, 13.10.30. Ger. 18.10.29).— $\alpha\alpha\beta$ -Trichloroethane is treated above 50° with fine or coarse Zn, Fe, or Al in presence of H_2O ; *e.g.*, it is passed into an aq. suspension of Zn dust at 50—60°, or is heated with H_2O and Fe filings at 100—120°/5—6 atm., or is passed with steam over Fe filings at 300°. C. HOLLINS.

Manufacture of acetals. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 352,474, 4.4.30).—Non-carboxylated mono- or poly-hydric alcohols or phenols (except MeOH) are converted into acetals by combination with vinyl ethers, preferably in presence of acid catalysts (H_2SO_4 , BF_3 , H_3PO_4 , SOCl_2 , NaHSO_4 , α -chlorodiethyl ether, CaCl_2) and a solvent (Et_2O , CHCl_3 , or excess of the alcohol). The following preps. are described: ethylidene Et *n*-Bu ether, b.p. 151—152°, from vinyl Et ether, BuOH, and H_2SO_4 ; ethylidene Ph Et ether, b.p. 83—84°/10.5 mm., from vinyl Et ether, PhOH, and $\text{EtO}\cdot\text{C}_2\text{H}_4\text{Cl}$; ethylidene Et β -chloroethyl ether, b.p. 53—56°/10 mm., from vinyl Et ether, ethylene chlorohydrin, and SOCl_2 ; glycol $\alpha\alpha'$ -diethoxydiethyl ether, b.p. 97°/13 mm., from vinyl Et ether and $\text{EtO}\cdot\text{C}_2\text{H}_4\text{Cl}$; ethylidene cholesteryl Et ether from vinyl Et ether, cholesterol, and $\text{EtO}\cdot\text{C}_2\text{H}_4\text{Cl}$. C. HOLLINS.

Manufacture of alkyl- or aryl-oxyethylidene esters [α -alkoxy- or aryloxy-alkyl esters]. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 352,070, 4.4.30).—A vinyl aryl or alkyl ether is treated with an org. or a non-oxidising inorg. acid in presence of accelerating agents (BF_3 , H_2SO_4 , HCl, SOCl_2 , NaHSO_4 , KHF_2 , CaCl_2 , α -chlorodiethyl ether, etc.), at raised temp. and pressure, if desired, and in a diluent. Vinyl Et ether and HCl at 0° give α -chlorodiethyl ether, b.p. 92—95°; α -chloroethyl *n*-Bu ether, b.p. 120—130°, is similarly prepared and gives with KOAc α -*n*-butoxyethyl acetate, b.p. 166—172°. Ph α -chloroethyl ether, b.p. 79—81°/12 mm., α -ethoxyethyl acetate, b.p. 128—130°, and salicylate, b.p. 84—85°/0.025 mm., and α -*n*-butoxyethyl salicylate, b.p. 92—93°/0.006 mm. (decomp.), are also described. C. HOLLINS.

Treatment of basic or acidic substances produced by destructive hydrogenation. IMPERIAL CHEM. INDUSTRIES, LTD., W. R. MADEL, and E. W. FAWCETT (B.P. 355,213, 18.2.30).—The crude basic or acidic substances, *e.g.*, phenols, mixtures of quinoline and isoquinoline, are separated into their components by selective extraction or fractional crystallisation in light petroleum at low temp., *e.g.*, —10° to —40°.

A. B. MANNING.

Manufacture of complex salts [of pyrocatechol-disulphonic acids]. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 351,971, 1.4.30).—An alkali salt of pyrocatecholdisulphonic acid or its OH derivatives is treated in aq. solution with aq. CaCl_2 or $\text{Ca}(\text{NO}_3)_2$ and either $\text{Ca}(\text{OH})_2$ or caustic alkali; or the alkali salt is acidified and then neutralised with $\text{Ca}(\text{OH})_2$. The salts contain Na and Ca, the latter being in part attached to phenolic and in part to sulphonic O. They are suitable for injection. C. HOLLINS.

Manufacture of *m*-hydroxydiarylaminocarboxylic acids. W. W. GROVES. From I. G. FARBENIND. A.-G. (B.P. 352,644, 20.5.30. Addn. to B.P. 333,783; B., 1930, 1016).—A *m*-hydroxydiarylamine carrying Me *meta* or *para* to the OH group is carboxylated. Products from 5-methyl- (m.p. 195°), 4'-chloro-5-methyl- (m.p. 158°), 6-methyl- (m.p. 179°), 4'-chloro-6-methyl- (m.p. 200°), and 4':6-dimethyl- (m.p. 204°) derivatives of 3-hydroxydiphenylamine are described. C. HOLLINS.

Hydrogenation of aromatic compounds [dihydro-eugenols]. BOOTS PURE DRUG CO., LTD., and J. MARSHALL (B.P. 352,663, 28.5.30).—Eugenol, isoeugenol, and corresponding *o*-compounds are treated with H_2 in presence of Cu at 250–270° or of Ni at 150–170°, whereby only the side-chain double linking is reduced. 4-*n*-Propylguaicol, m.p. 18–19°, and the 6-isomeride, m.p. 24°, are prepared in pure state. C. HOLLINS.

Manufacture of a quinine double salt. H. MEFFERT (B.P. 352,115, 15.4.30).—Quinine lactate and Ca lactate are cryst. together from mixed solutions, with or without addition of Na citrate. The prep. of quinine lactate from the sulphate is described. C. HOLLINS.

Washing, cleansing, emulsifying, and wetting-out agents. DEUTS. HYDRIERWERKE A.-G. (B.P. 356,694, 30.4.30. Ger., 30.4.29).—Piperidine, hydrogenated quinoline bases, or their homologues and/or substitution derivatives are combined with org. sulphonic acids, e.g., Turkey-red oil; the products are sol. in all org. solvents and suitable for use as boring and textile oils etc. [Stat. ref.] E. LEWKOWITSCHE.

Manufacture of α -naphthol. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 352,568, 16.4.30).—1-Keto-1:2:3:4-tetrahydronaphthalene is dehydrogenated by heating with S at 190–200°, especially in presence of Se, As_2O_3 , Sn, or ZnO with diphenylguanidine. C. HOLLINS.

Manufacture of halogenated cyclic ketones of the acenaphthene series. W. W. GROVES. From I. G. FARBENIND. A.-G. (B.P. 352,597, 30.4.30. Addn. to B.P. 342,373; B., 1931, 476).—Acenaphtha-5:6-indandione [5:6-malonylacenaphthene] and its derivatives, especially the monoimides, are halogenated, e.g., with KClO_3 and HCl, SO_2Cl_2 , or halogens. The simple monoimide gives on chlorination a trichloro-compound, $\begin{matrix} \text{CH}_3 \\ | \\ \text{C}_{10}\text{H}_4 \\ | \\ \text{CH}_2 \end{matrix} \begin{matrix} \diagup \\ \text{C}:\text{NCl} \\ \diagdown \\ \text{CO}-\text{CCl}_2 \end{matrix}$, m.p. about 180°, which is hydrolysed by hot AcOH to the dichloro-diketone; the dibromo-bromoimide, m.p. 169° (decomp.), and a chlorinated product from the 3-chloro-derivative are described. C. HOLLINS.

Manufacture of ω -aminomethylbenzanthrone. I. G. FARBENIND. A.-G. (B.P. 352,626, 12.5.30. Addn. to B.P. 249,883; B., 1927, 572).—Benzanthrone is condensed in PhNO_2 with chloromethylphthalimide in presence of ZnCl_2 at 130–150° and the product, m.p. 288°, is hydrolysed, e.g., with aq. NaOH, to give ω -aminomethylbenzanthrone, m.p. 154–156°.

C. HOLLINS.

Production of di- and isodi-benzanthrones. SELDEN CO., ASSEES. OF L. C. DANIELS (B.P. 352,076, 4.4.30. U.S., 4.4.29).—Furfuraldehyde or furyl alcohol is used in place of dextrin etc. as the reducing agent in the alkaline fusion of benzanthrone. C. HOLLINS.

Solutions for cooling systems etc.—See I. C_2H_2 , PhOH etc. from oils.—See II.

IV.—DYESTUFFS.

PATENTS.

Manufacture of [polymethine] dyes. [Photographic sensitisers.] F. M. HAMER, and ILFORD, LTD. (B.P. 351,555, 28.3.30).—A glutamic aldehyde, produced *in situ* from a pyridinium salt, is condensed with a heterocyclic NH_4 (other than pyridinium) salt carrying a reactive α - or γ -Me group to give dyes which are photo-sensitisers for infra-red rays; e.g., 1-*o*-dinitrophenylpyridinium chloride in EtOH is treated hot with NaOEt in EtOH and then at once with 2-methyl-benzthiazole ethiodide (2 mols.). C. HOLLINS.

Manufacture of acid wool dyes [from naphthalic anhydride]. I. G. FARBENIND. A.-G. (B.P. 352,139, 29.4.30. Addn. to B.P. 299,721; B., 1929, 455).—Naphthalic or an aminonaphthalic anhydride is condensed with a hydroaromatic amine or with a hydrazine and sulphonated or converted into a sulphamic acid; or the sulphonic or sulphamic group may be present in the starting material. Examples are: sulphonated 4-amino-1:8-naphthalic anhydride with hydrazine (greenish-yellow), phenylhydrazine (yellow), cyclohexylamine (greenish-yellow), or *p*-cyclohexylaniline (yellow); 4-amino-1:8-naphthalic cyclohexylimide sulphonated with oleum at 100° (greenish-yellow). C. HOLLINS.

Manufacture of halogen-containing vat dyes of the dibenzanthrone series. I. G. FARBENIND. A.-G. (B.P. 351,948, 25.1.30. Ger., 27.4.29).—Chlorobromodibenzanthrones are obtained by treating halogenated dibenzanthrones (except I-derivatives) with halides of Fe, Al, Sb, Hg, with or without further halogenating agents, catalysts, solvents, diluents, or substances which lower the m.p. (Ca, Sr, and Ba halides). Examples are: dibromodibenzanthrone with FeCl_3 in $\text{C}_6\text{H}_3\text{Cl}_3$ at 140–150°, or with AlCl_3 , NaCl, and I at 180°, or with HgCl_2 in $\text{C}_6\text{H}_4\text{Cl}_2$, or with FeCl_3 in collidine at 120°, or with FeCl_3 and FeBr_3 in $\text{C}_6\text{H}_3\text{Cl}_3$ at 140–150°; monobromodibenzanthrone with FeCl_3 in $\text{C}_6\text{H}_3\text{Cl}_3$ at 140–150°; tribromodibenzanthrone with FeCl_3 and NaCl at 150°; tetrabromodibenzanthrone or dichlorotetrabromodibenzanthrone with FeCl_3 in $\text{C}_6\text{H}_3\text{Cl}_3$ at 140–150°; pentabromodibenzanthrone with SbCl_5 in $\text{C}_6\text{H}_3\text{Cl}_3$ at 80–100°; bromonitrodibenzanthrone with FeCl_3 in $\text{C}_6\text{H}_3\text{Cl}_3$ at 120–130°. The products are blue or navy-blue vat dyes fast to rain drops. C. HOLLINS.

Manufacture of stable reduction compounds of vat dyes. W. W. GROVES. From I. G. FARBENIND. A.-G. (B.P. 352,283, 1.8.30. Addn. to B.P. 334,878 and 334,920; B., 1930, 1144).—6 : 6'-Diethoxythioindigo is reduced as described in the prior patents.

C. HOLLINS.

Manufacture of chromiferous [azo] dyes. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 352,004, 31.1.30).—An aminosulphosalicylic acid (e.g., the 5 : 3- or 3 : 5-compound) is diazotised and coupled with resorcinol, and the product is prechromed to give a leather brown. [Stat. ref.]

C. HOLLINS.

Manufacture of polyazo [direct] dyes. J. R. GEIGY A.-G. (B.P. 352,368 and Addn. B.P. 352,878, [A] 29.11.30, [B] 1.12.30. Ger. [A, B], 29.11.29).—(A) An aminodisazo compound, $A \rightarrow B \rightarrow C$, in which A is an amino-carboxylic or -sulphonic acid of the C_6H_6 or $C_{10}H_8$ series and B and C are α -naphthylamine or Cleve acid, is diazotised and coupled with a monoazo dye obtained by coupling J -acid in acid medium with a diazotised arylamine (D). In the examples: $A = 4$ -chlorometanilic acid, $B = C =$ Cleve acid, and $D =$ metanilic acid; $A = 2 : 4 : 8$ -naphthylaminedisulphonic acid, $B = \alpha$ -naphthylamine, $C =$ Cleve acid, and $D = 5$ -aminosalicylic acid. The shades are greenish-blue. (B) Greener shades are obtained by using 2-ethoxy-naphthylamine-6-sulphonic acid as third component; e.g., metanilic acid \rightarrow Cleve acid \rightarrow 2-ethoxy- α -naphthylamine-6-sulphonic acid \rightarrow J -acid \leftarrow metanilic acid (blue-green).

C. HOLLINS.

Photographic bleach-out layers.—See XXI.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Porosity : a primary property of textiles. I. N. H. CHAMBERLAIN. II. H. J. WOODS (J. Soc. Dyers and Col., 1931, 47, 289—292).—Schofield's views (B., 1931, 152, 798) are criticised. This author's observations on the milling of wool fabrics do not establish any fundamental law of felting. The equations chosen to express some of his results are considered to be unsuitable and the conclusions drawn from the experimental data to need radical revision.

B. P. RIDGE.

Porosity : a primary property of textiles. J. SCHOFIELD (J. Soc. Dyers and Col., 1931, 47, 292—293).—A reply to the criticisms of Chamberlain and Woods (cf. preceding abstract).

B. P. RIDGE.

Determination of solubility number : micro-method for measuring the extent to which a cellulose material has been chemically modified or degraded. C. R. NODDER (J. Text. Inst., 1931, 22, 416—424 r).—The material is first boiled for 6 hr. with a 2% solution of NaOH, and the solubility of the dry product on treatment with 10N-NaOH at 15° and subsequent dilution to 2N is determined by oxidation of 2 c.c. of the filtered solution with CrO_3 . The solubility no. is the % of cellulose dissolved by this treatment under the stated conditions, and its measurement affords a reliable means of estimating the extent to which the material has been degraded by chemical attack. For the initial stages of such attack the cuprammonium viscosity method is the more sensitive,

but when the degree of attack is high the reverse obtains. The amount (0.1 g.) of material required is very small and the method is very suitable for use with linen goods.

B. P. RIDGE.

Effect of sulphite-cooking on the weight of the wood-pulp fibres. A. LAMPEN and I. KOSKINEN (Zellstoff u. Papier, 1931, 11, 573—575).—The wt. of the individual fibres decreases progressively with increasing degree of decomp. of the pulp, as indicated by decreasing Tingle and Bergmann Cl nos., but the decrease in wt. is more rapid than corresponds with the decrease in yield found in technical cooking. A method of estimating the wt. of 10^6 single fibres is described, and with hard pulps the discrepancy may be due to the difficulty of effecting complete separation of the fibres before they are counted.

B. P. RIDGE.

Mechanical properties and testing of rayon yarns. E. BERL and H. STAUDINGER (Chem.-Ztg., 1931, 55, 749—752).—In the measurement of breaking load and extensibility, the atm. temp. and humidity, length of specimen, and rate of fall of the lower grip on the testing machine should be standardised, whilst before conditioning the yarns in the required atm. they should be dried at 105° in order to avoid hysteresis effects. The slower the rate of breaking, the smaller is the breaking load up to a velocity of 25 cm./sec., beyond which the effect of time is small. Dry strength also decreases progressively with increasing humidity. For all varieties of yarn the wet strength is proportional to the dry strength, and since for measurement of the former the control of humidity and temp. and drying the yarn are unnecessary, this test is to be preferred for technical purposes. Before measuring wet strength, the yarns should be steeped for 20 min. in a 0.5% solution of Nekat AE.

B. P. RIDGE.

Measurement of viscosity of solutions of cellulose in cuprammonium hydroxide solution. A capillary tube viscosimeter. R. W. KINKEAD (J. Text. Inst., 1931, 22, 441—415 r).—The cellulose solutions are prepared separately in a bottle which is connected to a bulb containing a coarse, fritted glass filter and thence to a capillary viscosimeter and reservoir. The air in the system is replaced by H_2 and the solution is filtered through the bulb before passing to the viscosimeter. In this way the insol. portion of substances such as linen may be retained for analysis, and clogging of the capillary is prevented. Any number of determinations of the time of flow can be made, and kinetic energy corrections are generally unnecessary.

B. P. RIDGE.

Rate of deformation of cellulose nitrate-camphor films under static stresses. J. G. McNALLY and S. E. SHEPPARD (J. Physical Chem., 1931, 35, 2498—2507).—Curves showing the rate of extension under const. stress plotted against time of cellulose nitrate films containing up to 50 wt.-% of camphor have the same shape for the different camphor contents, but the stress corresponding with similar rates of elongation varies with the composition of the films; $\log R = kS$ approx., where R is the rate of extension for a stress S . An increase in camphor content of the film causes a progressive decrease in the stress at which extension

commences, up to a content of 35%; from 35 to 50% no shift in the curves takes place. Below 35% of camphor, celluloid consists of cellulose nitrate + a cellulose nitrate-camphor complex, and above, of camphor + the complex. L. S. THEOBALD.

Stability test for cellulose nitrate film. J. P. LAWRIE (J.S.C.I., 1931, 50, 377—378 T).—A modified form of "German heat test" at 135° and the apparatus (B.E.S.A. No. 2 D. 8) subsequently used are described. Details and results of a series of physical, photographic, and chemical tests are given. It is concluded that ageing of the nitrate film base, as indicated by the stability test, does not materially affect the coated emulsion over a prolonged period of time. Results of the heat test on films of varying age, some over 20 years, are given and several modifications are suggested for the improvement of the test.

Softeners for cellulose acetate. H. MESSER (J.S.C.I., 1931, 50, 386—387 T).—Condensation products of low-boiling solvents and softeners (for cellulose acetate) with bigger appropriate mol., in order to give non-volatile H₂O-insol. liquid softeners, are described. In this connexion compounds made from glycerol derivatives, COMe₂, and esters, with dicarboxylic and hydroxy-carboxylic acids and NH₂Ph are discussed.

Crude fibre.—See XV. **Storage of nitrocellulose.**—See XXII.

PATENTS.

Production of cellulose from fibrous vegetable material. O. C. G. S., and O. H. STRECKER (B.P. 354,462, 7.6.30. Ger., 7.6.29).—An improved phenoxide process (B.P. 284,846; B., 1928, 364) is described. The hot liquor containing, e.g., 5—6% of NaOH, is introduced in batches simultaneously at the top and bottom of the digester to destroy enzymes and aerobic ferments present in the wood. The temp. is then held at 110—125° for about 2 hr. without addition of alkali, after which heating is discontinued and about 25% of the liquor is removed and replaced by an equal vol. of aq. NaOH sufficiently conc. to bring the proportion of NaOH in the liquor to 6—6.5%. This alkali is added over a period of 0.5—1 hr. in such a way that contact of uncombined NaOH with the cellulose is avoided. The temp. is then raised to 170—175° and digestion continued for a further 3 hr. The liquor should at all times contain at least a 50% excess of phenolic substances. Hydrocarbons formed during digestion are distilled off during or after the cook to prevent staining of the cellulose. Surplus spent liquor is treated with CO₂, optionally after boiling with Ca(OH)₂ to remove colloidal impurities, and the precipitated phenolic substances are used either for preparing fresh cooking liquor or for biological purposes, e.g., as fertilisers.

D. J. NORMAN.

Manufacture of cellulose derivatives. L. LILLENFELD (B.P. 356,776, 14.3.30).—Bleached or unbleached cellulose or a conversion product of cellulose is treated with a halogenated olefine in the presence of alkali. Thus matured or unmatured alkali-cellulose (containing aq. NaOH) is autoclaved for 3—4 hr. at 90—100° with C₂HCl₃, C₂H₂Cl₂, or C₂H₃Cl, optionally in the presence

of a catalyst, e.g., a salt of Cu, Fe, Ni, etc. The resulting product, after purification by, e.g., dissolution in 5—8% aq. NaOH and precipitation with acid, is obtained as a white powder insol. in H₂O and org. solvents, but sol. in 5—10% aq. NaOH to a clear viscous solution suitable for the manufacture of filaments, films, etc. or for use as a sizing or thickening agent for textiles.

D. J. NORMAN.

Production of artificial materials [rayon] by wet spinning from solutions of organic derivatives [acetate] of cellulose. BRIT. CELANESE, LTD., W. A. DICKIE, and P. F. C. SOWTER (B.P. 340,324, 5.11.28 and 11.4.29).—A 20—25% solution of cellulose acetate in COMe₂ is extruded through spinnerets into a coagulating liquid containing a high proportion (25—65%) of a solvent for the cellulose acetate, e.g., diacetone alcohol, Et tartrate or lactate, together with a volatile solvent, e.g., COMe₂. Mixtures mentioned are 1:1 diacetone alcohol—EtOH, 30:15:55 diacetone alcohol—COMe₂—H₂O; 60:40 diacetone alcohol—H₂O, and 45:65 H₂O—Et lactate. The plastic filaments may be stretched before drying and an oil incorporated with the cellulose acetate solution to improve the lustre of the rayon.

A. R. POWELL.

Production of artificial materials by wet-spinning processes from solutions of organic derivatives of cellulose. BRIT. CELANESE, LTD., W. A. DICKIE, and P. F. C. SOWTER (B.P. 340,325—6 and 340,436—7, [A] 18.1.29, [B] 11.4.29, [C, D] 5.11.28. Addns. [A—D] to B.P. 340,324; preceding).—Modifications of the parent patent consist in (A) effecting coagulation and/or subsequent treatment with a large proportion (60—100%) of a non-solvent plasticiser (triaryl phosphates), preferably diluted with a solvent (acetone) and/or a non-solvent. To render the filaments plastic and capable of coalescence so that they can be stretched, a solvent (diacetone alcohol, diethyl tartrate, ethyl lactate), which is less volatile than the non-solvent of the coagulating bath (water), together with a more volatile solvent (acetone), is (c) incorporated in the spinning solution, wholly or in part in place of solvents in the coagulating bath, or in (d) is used as a secondary bath after coagulation, or is present in the coagulating bath initially, or introduced therein by the spinning solution, the filaments being lubricated during coagulation or secondary treatment and excess of solvent removed by washing with water, salt, or weaker solvent solutions. In (B) the filaments produced by the various processes, after leaving coagulating or subsequent treatment baths above atmospheric temperature, are dried in a chamber by a countercurrent of air.

F. R. ENNOS.

Manufacture of artificial threads and other products from cellulose compounds. L. LILLENFELD (B.P. 356,286, 10.3.30. Addn. to B.P. 335,906; B., 1931, 153).—The reaction product of cellulose xanthate with one or more halogen derivatives of di- or poly-hydric alcohols described in the prior patent is isolated by precipitation with an acid, acid salt, or alcohol, or spontaneously. The product is washed if desired, and, optionally after reconversion into a sol. xanthate, is dissolved and spun as usual.

F. R. ENNOS.

Manufacture of fine artificial fibres by the wet-spinning process. I. G. FARBENIND. A.-G. (B.P. 356,427, 13.8.30. Ger., 14.8.29).—The thread is drawn from the spinning nozzle by two rollers the peripheral speed of which is such that the draught or degree of stretching between the nozzle and the first roller is < 1 , whilst that between the first and second rollers is > 1 , the total draught being $>$ or < 1 . F. R. ENNOS.

Spinning of cuprammonium silk by the stretch-spinning process. BRIT. BEMBERG, LTD. (B.P. 356,457, 28.8.30. Ger., 29.8.29).—The jet of precipitating liquid is deviated from the rectilinear path of the thread, before or at the outlet of the spinning apparatus but before the collecting or guiding device, by means of a siphon or suitably inclined rod or strip.

F. R. ENNOS.

Spinning of artificial silk. I. G. FARBENIND. A.-G. (B.P. 334,030, 29.7.29. Ger., 2.10.28).—Unripened alkali-cellulose (viscose) solutions with an alkali : cellulose ratio of $> 1:1$ are spun into a bath containing coagulating salts and not more than 47% of H_2SO_4 . The resulting filaments are stretched while in the coagulating bath.

A. R. POWELL.

Spinning of artificial silk. I. G. FARBENIND. A.-G. (B.P. 335,675, 30.7.29. Ger., 8.11.28. Addn. to B.P. 334,030; preceding).—Viscose made from unripened alkali-cellulose, in which the proportion of alkali to cellulose is greater than 1 : 1, is spun into a bath containing an ammonium salt (sulphate, acetate, etc.), with or without the addition of a small amount of acid and of another neutral salt (sodium sulphate, acetate, etc.); the formed threads are subsequently stretched and passed through a dilute acid bath.

F. R. ENNOS.

Manufacture of hollow artificial silk. I. G. FARBENIND. A.-G. (B.P. 356,327, 16.6.30. Ger., 14.6.29).—A solution of cellulose acetate in a solvent, *e.g.*, $COMe_2$, with at least 20% of a non-solvent (excluding $EtOH$), *e.g.*, $PhMe$, is preheated before spinning into an atm. at a temp. below the b.p. of the non-solvent, where it is subjected to accelerated but localised evaporation by suitable means.

F. R. ENNOS.

Manufacture of filaments, bristles, straw, etc. from organic esters of cellulose. BRIT. CELANESE, LTD. (B.P. 356,170, 27.3.30. U.S., 27.3.29).—By using org. esters of cellulose containing < 2 ester groups per $C_6H_{10}O_5$, *e.g.*, cellulose acetate containing 40–48% (particularly 45–48%) of $AcOH$, filaments are obtained which have a moisture regain of about 7%, a safe ironing point 25–30° above normal, and an increased affinity for dyes.

D. J. NORMAN.

Manufacture of [lustrous] filaments etc. from cellulose derivatives [by wet spinning]. BRIT. CELANESE, LTD. (B.P. 356,343, 20.6.30. U.S., 25.6.29).—A solvent or latent solvent for the cellulose derivative at high temp., which is not readily sol. in the spinning bath, is added to the spinning solution and the filaments are subsequently heated to 90–125°. $C_2H_4Cl_2$, CH_2Cl_2 , $PhCOMe$, triacetin, or Bu tartrate are suitable when spinning into H_2O , or diethylene glycol when into kerosene. Alternatively, ordinary spinning solutions may be used, the length of travel or time of contact of the

filaments with the coagulating liquor being so adjusted that the filaments retain a proportion of solvent.

D. J. NORMAN.

Manufacture of [delustred] artificial threads and filaments and products therefrom. COURTAULDS, LTD., and C. DIAMOND (B.P. 356,299, 10.6.30).—A solution, in a volatile org. solvent, of an org. derivative of cellulose and a compound of a hydroxy-amine with a fatty acid (hydroxyethyl oleate) is dry-spun and the product afterwards treated with hot soap solution.

F. R. ENNOS.

Manufacture of (A) articles, (B) products, from cellulose esters or ethers. BRIT. CELANESE, LTD., W. A. DICKIE, and P. F. C. SOWTER (B.P. 355,298 and 355,330, 21.5.30).—The solution obtained by heating an org. derivative of cellulose with a polyhydric alcohol, *e.g.*, ethylene glycol, is (A) extruded through a suitable nozzle and coagulated either by cooling or by passage through a liquid (H_2O or polyhydric alcohols), which is maintained above room temp. and contains a solvent or plasticiser for the cellulose derivative and/or salts or sugars; or (B) cooled, freed from part of the alcohol, and crushed to yield a moulding powder.

F. R. ENNOS.

Production of artificial filaments, ribbons, and like materials. BRIT. CELANESE, LTD., and W. I. TAYLOR (B.P. 355,652, 11.4.30. Addn. to B.P. 327,740; B., 1930, 609).—The liquid (H_2O , paraffin, glycerin, olive oil, etc.) is applied to the materials during an early stage of drying and while they contain a relatively high proportion of solvent, to give them improved extensibility, tenacity, type and regularity of cross-section, levelness of dyeing, etc.

F. R. ENNOS.

Production of foils, filaments, etc. from alkaline aqueous cellulose solutions. WOLFF & Co. KOMM.-GES. AUF AKT., E. CZAPEK, and R. WEINGAND (B.P. 355,424, 25.6.30. Ger., 2.7.29).—Viscose solutions or cuprammonium solutions of cellulose may be spun at higher concentrations than are normally possible if they are heated to a temp. lower than the coagulation temp., *e.g.*, to about 50°, before entering the spinning nozzle or slot. By adjusting the temp. of the spinning solution it is possible to vary the thickness of the film.

D. J. NORMAN.

Manufacture of ribbons, films, and tapes, or straw-like products of cellulose derivatives. BRIT. CELANESE, LTD. (B.P. 354,233, 5.5.30. U.S., 9.5.29. Addn. to B.P. 328,312).—The pliability of the products is improved by adding 2.5–10% of a high-boiling solvent to the solvent liquid used for moistening the filaments. Coalescence is then effected by application of both heat and pressure. Waterproof properties are imparted by passing the ribbons during or after coalescence between smooth rollers coated with, *e.g.*, carnauba wax. Various methods of producing ornamental effects are described.

D. J. NORMAN.

Production of artificial silk. GLANZSTOFF-COURTAULDS GES.M.B.H. (B.P. 354,964, 14.7.30. Ger., 31.7.29).—The thread from washed and dried spinning cakes is directly wound off overhead on to cross-wound bobbins, the thread layers of the cakes having previously been loosened by washing (cf. B.P. 344,279; B., 1931, 437).

H. ROYAL-DAWSON.

Apparatus for production of artificial filaments and the like. BRIT. CELANESE, LTD. FROM CELANESE CORP. OF AMERICA (B.P. 355,720, 24.2.30).—The spinning jet is provided with an annular depression on the side to which the spinning solution is supplied, and on the other side with a central circular depression into which a reinforcing member engages to support the centre of the jet and prevent its distortion. F. R. ENNOS.

Manufacture of sheet materials having a basis of cellulose esters or ethers. H. DREYFUS (B.P. 355,732, 21.5.30).—A homogeneous mixture of the cellulose derivative with a plasticiser is rendered fluid by heat in the substantial absence of volatile solvents, and is drawn off through an adjustable aperture in the heating tank between two similar water-cooled rolls rotated synchronously in opposite directions. The resulting sheets are conditioned by means of gases (moist air) and/or vapours (solvents or non-solvents) and cut to the desired shape. F. R. ENNOS.

Production of kraft-simulating pulp. G. A. RICHTER, ASSR. TO BROWN CO. (U.S.P. 1,792,510, 17.2.31. Appl., 1.7.25).—"4-4"-pulp as obtained by digesting wood with a liquor containing 4% each of free and combined SO_2 at 160° and 75–95 lb./sq. in. for 10–11 hr. is digested at 82–100° for 2–7 hr. with 3–12% of NaOH on the wt. of pulp. The resulting pulp has the colour and strength characteristics of kraft pulp. D. J. NORMAN.

Production of fibrous thermoplastic sheets. H. WADE. FROM BAKELITE CORP. (B.P. 356,260, 5.6.30).—A reactive resin, *e.g.*, of the PhOH-aldehyde type is mixed with 5–45 wt.-% of a plasticiser, preferably a dialkyl ester of an org. acid, *e.g.*, Et or Bu oxalate, tartrate, phthalate, and then rendered substantially infusible and insol. by heat. This product is comminuted and incorporated with paper pulp in a beater. The resulting dried sheets are then superimposed and bonded together by heat and pressure. D. J. NORMAN.

Manufacture of [duplex] waterproof foil. NON-INFLAMMABLE FILM CO., LTD., and G. A. STALEY (B.P. 356,146, 28.5.30).—A layer containing nitrocellulose waterproofed by inclusion of a wax (Japan wax), a fat (lanoline), or paraffin wax, together with oil-sol. resins (phthalic anhydride-glycerol resin, PhOH-aldehyde condensation products, or natural resins) is superimposed by casting on a cellulose acetate film. F. R. ENNOS.

Manufacture of [waterproof] paper. A. NATHANSON (B.P. 356,277, 6.6.30. Ger., 7.6.29).—Anhydrides, acid chlorides, or other esterification-inducing derivatives of org. acids of high mol. wt., *e.g.*, stearic anhydride, are used as waterproofing agents. They may be applied as emulsions or as a 0.1–5% solution. The treated paper remains waterproof after extraction with volatile solvents. D. J. NORMAN.

Rendering paper and cardboard impermeable. PAPETERIES NAVARRE SOC. ANON. (B.P. 357,039, 7.1.31. Fr., 20.10.30).—The material is impregnated with an alkaline caseinate solution containing a high proportion, *e.g.*, 5%, of CH_2O and a volatile substance capable of retarding coagulation, *e.g.*, NH_3 . After exposure to air to allow evaporation of the NH_3 and coagulation of the caseinate the material is dried and heated to 120°. An

after-treatment with aq. $\text{Al}(\text{OAc})_3$ (*d* 1.035) containing about 10% of CH_2O may be given. D. J. NORMAN.

Preparation of coating material for paper. C. ARNOLD. FROM I. F. LAUCKS, INC. (B.P. 356,287, 17.4.30).—Oleaginous seeds, *e.g.*, soya bean, cottonseed, castor seed, tung nut, etc., preferably oil-mill press-cake, are ground and extracted with, *e.g.*, 2 litres of 0.5% $\text{Ca}(\text{OH})_2$ solution per 100 pts. of meal at 15° for about 12 hr. The separated liquor is then heated to 50° and its p_{H} is adjusted to 4 with dil. H_2SO_4 to ppt. the protein. This is collected, washed, and dried at about 32°. Other alkalis, *e.g.*, NaOH or Na_2SO_3 , may be used in the preliminary extraction, but a subsequent prolonged treatment with dil. aq. $\text{Ca}(\text{OH})_2$ is necessary to modify the protein so that the dried product is readily dispersible in aq. Na_2CO_3 , $\text{Na}_2\text{B}_4\text{O}_7$, etc. These proteins are particularly suitable for coating mixtures containing satin-white since they are unaffected by free CaO. D. J. NORMAN.

Manufacture of abrasive articles such as sandpaper or the like. A. E. WHITE. FROM MINNESOTA MINING & MANUFACTURING CO. (B.P. 356,183, 1.3.30).—A mixture of abrasive particles with a liquid waterproofing adhesive, consisting of a drying oil (linseed or tung oil), rosin, mineral dryers, and thinners, is applied to a flexible backing and the whole dried at 55–65°. The abrasive surface is subsequently treated with a sizing compound, of similar composition to the adhesive but with a larger proportion of thinners, which is also applied to the back of the sheet, before, during, or after application of the abrasive mixture. [Stat. ref.] F. R. ENNOS.

Manufacture of tracing cloth. R. SCHWICKERT A.-G., and O. HUBER (B.P. 357,068, 2.3.31. Ger., 11.7.30).—Uniform transparency is obtained by using as the base material fabrics made from squirted or drawn filaments, *e.g.*, real or artificial silk. D. J. NORMAN.

Kaolin [for paper].—See VIII. **Paper strips for films.**—See XXI. **Nitrocellulose.**—See XXII. **Waste pulp liquors.**—See XXIII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Dyeing of hosiery composed of mixed fibres. H. MUDFORD (J. Soc. Dyers and Col., 1931, 47, 222–225).—Real silk-cotton hose are degummed by boiling for 1 hr. in a 0.8% soap solution, rinsed, and dyed simultaneously with direct and neutral dyeing acid colours; degumming and dyeing may also be effected in the same bath. The difficulty of the formation of "green streaks" on the fibre when most neutral-dyeing acid reds are employed is not encountered when Coomassie Red GS, Neutral Silk Red GDL, Cloth Red 3G extra, Fast Red G for silk, and Acid Anthracene Red 3BL are used. The difficulty of obtaining uniform delicate tints on viscose silk-mercerised cotton is reduced when dyeing is effected in hard water or in a dye liquor containing Na_2SO_4 in excess; suitable dyes are Chlorazol Orange Brown XS, Fast Red FGS, and Black ES. The presence of a real silk thread necessitates a previous degumming in a 0.2% soap solution and the use in dyeing of neutral dyeing acid dyes, otherwise a mottled thread results. Full blacks are produced with Chlorazol Blacks ES and LFS

after-treated with CH_2O . The chief difficulty in dyeing viscose silk—unmercerised cotton is that in deep shades the viscose dyes deeper than the cotton; this tendency is minimised by dyeing at low temp. and using the min. amount of Na_2SO_4 and suitable dyes (*e.g.*, Chlorazol Orange POS, Fast Red KS, and Black BKS for compound shades; Chlorazol Brown LFS and Icyl Navy B for gunmetal shades, the last-named dye having a greater affinity for the cotton; Chlorazol Black SDS developed with *m*-phenylenediamine and shaded with Chlorazol Fast Green PLS for black). Icyl Blue 2RS has a much greater affinity for cotton than viscose silk. In Celta (viscose) silk—mercerised cotton hose the Celta dyes to a much paler shade than the cotton with most direct dyes; Chlorazol Drab RHS, Brown GMS, and Black FFS must be used. Viscose silk—wool is scoured at 50° or below in a bath containing 2–3 pts. of soap and 1–2 pts. of aq. NH_3 per 1000 pts. and dyed with direct and neutral-dyeing acid colours; direct colours are to be preferred since they give better penetration. Suitable dyes are Chlorazol Browns LFS and PBS, Orange Brown XS, Fast Red FGS, and Fast Black BKS; Chlorazol Blacks ES and LFS (for full blacks). Wool—real silk is degummed in a soap liquor at about 80° , 3% of Permalin N being added to reduce felting of the wool, and then dyed with direct colours. The dyeing of Visylka, Celfect, and wool—viscose silk—cellulose acetate silk hose is also outlined.

A. J. HALL.

Study of kiering processes using a potentiometer. P. P. VIKTOROV and B. GOLDBERG (Textilber., 1931, 12, 638–641).—Theoretically, in the kiering of raw cotton, the amounts of NaOH consumed in saponifying natural fats and waxes, in combining with the decomp. products of the pectin impurities, and in decomposing proteins are in the ratio 41 : 700 : 850, and in these reactions only 50% of the usual amount of NaOH present is utilised. Large-scale trials with a partly purified cotton showed that only 20% of the NaOH initially present was utilised in removing the impurities, whilst 60% was absorbed as in mercerising processes; the remainder appeared to be ineffective. In these determinations it was found advantageous to use potentiometric methods since the kier liquors were highly coloured. Purification of the cotton during kiering, as measured by the increasing reducing power of the kier liquor, is complete after 4 hr., but it is considered advisable to continue kiering for the usual 8 hr. The absorption of alkali from the kier liquor is almost complete within the first hr.

A. J. HALL.

Effect of valency of electrolytes in direct dyeing. P. P. VIKTOROV (Izvest. Tekstil. Prom., 1930, 9, No. 6–7, 73–76).—The effect of an electrolyte is special to each dye. By proper proportioning of electrolytes having multivalent cations they can be used advantageously.

CHEMICAL ABSTRACTS.

Use of sodium silicate for the cottonisation and cleaning of fibres. P. P. VIKTOROV (Izvest. Tekstil. Prom., 1930, 9, No. 6–7, 80–81).—The cottonisation of kender or flax fibres by means of a bath of NaOH and Na silicate is described. The following baths are specified: (1) NaOH 10 g., 38% Na silicate 10 g., per litre; (2) NaOH 30 g., 38% Na silicate 30 g., NaHSO_3 (*d* 1.33) 10 g.

CHEMICAL ABSTRACTS.

Removal of stains from hosiery goods. H. L. LONG (J. Soc. Dyers and Col., 1931, 47, 287–289).—Stains are classified into five groups: tannin basis (tea etc.), albumin basis (blood, egg, etc.), chemical (inks, Fe mould), oily (oils, paints), and mildew, whilst the reagent to be used depends on the nature of the stain and the material. Removal should first be attempted with H_2O , then with solvents, acids, and finally with bleaching agents. Tannin or albumin stains frequently yield to washing with H_2O below 100° , or with aq. NaCl. Chemical stains generally require bleaching, and if a metal is present acid treatment is necessary. For Fe stains $(\text{CO}_2\text{H})_2$, $\text{Na}_2\text{S}_2\text{O}_4$, or, preferably, HF should be used. Cu stains should be treated with KCN prior to bleaching. Oil or grease stains are emulsified by scouring with soap and alkali or removed by a solvent. Oleic acid is superior to the former as an emulsifier. Mildew is removed with H_2O_2 or KMnO_4 followed by $(\text{CO}_2\text{H})_2$. B. P. RIDGE.

Textile soaps.—See XII.

PATENTS.

Dyeing of esters or ethers of cellulose or its transformation products. I. G. FARBENIND. A.-G. (B.P. 352,099, 9.4.30. Addn. to B.P. 304,739; B., 1930, 506).—Acetate silk etc. is dyed in yellow shades with the sulphamic acid of a 4-amino-1:8-naphthalic imide or substituted imide, *e.g.*, the ethylimide, phenylimide, 4-*m*-xylylimide. C. HOLLINS.

Impregnated and coated fabric. H. WADE. From BAKELITE CORP. (B.P. 356,818, 14.6.30).—In a flexible article embodying rubber-coated fabric, *e.g.*, a tyre or fire hose, the fabric is impregnated first with a flexible resinoid (*e.g.*, a resinoid of the phenol-oil-methylene type) or with a reactive phenol-methylene resin capable of conversion into the former; the resinoid-impregnated material is then coated with rubber. The strength and wear-resisting qualities of the fabric are markedly increased. D. F. TWISS.

Manufacture of fireproof porous material [fabrics and textiles]. H. HOPKINSON, Assr. to BRUNSENE CO. OF MASS. (U.S.P. 1,797,865, 24.3.31. Appl., 11.10.28).—Canvas etc. is impregnated successively with solutions containing a Pb salt [$\text{Pb}(\text{OAc})_2$] and a sol. chloride (AlCl_3); if desired, it may then be immersed in a solution containing a sol. borate, phosphate, carbonate, tungstate, or fluoride.

L. A. COLES.

Making artificial silk yarn of diminished lustre. N. V. HOLLANDSCHE KUNSTZIJDE IND. (B.P. 356,749, 6.6.30. Holl., 3.2.30).—Delusted viscose silk is spun from viscose solutions to which not more than 10% (calc. on the cellulose) of H_2O -insol. terpenes or terpene alcohols (preferably in the form of an aq. emulsion prepared by the aid of Turkey-red oil) has been added either during or directly after dissolving the cellulose xanthate (*cf.* B.P. 183,476; B., 1924, 51).

A. J. HALL.

Treatment of textile materials. BRIT. CELANESE, LTD., S. M. FULTON, and G. C. TYCE (B.P. 355,794, 24.5.30).—After the application of a treating liquid, *e.g.*, size, the yarn is wound in the form of a hank, and dried during the winding operation by a current of

heated air concentrated thereon by means of a surrounding casing.
F. R. ENNOS.

Rendering textiles water-repellant. A. NATHAN-SOHN (B.P. 355,256, 16.4.30. Ger., 19.4.29).—Textiles such as cotton, artificial silk, and wool are partly esterified with a higher fatty acid, *e.g.*, stearic or palmitic acid, under mild conditions such that no caustic alkali and little or no condensing agent is required (cf. B.P. 313,616; B., 1930, 815).
A. J. HALL.

Coated textile fabric. J. J. CLIFFORD, ASST. to STEADFAST RUBBER CO., INC. (U.S.P. 1,792,277, 10.2.31. Appl., 31.1.27).—A fibrous fabric coated with a rubber compound is rendered non-adherent, *e.g.*, by a suitable varnish, and is then embossed with the desired design with the aid of heat. An oil-free pasty mixture of pigment, nitrocellulose, and a solvent with affinity for both rubber and nitrocellulose is wiped into the depressions of the embossed surface, and the completed fabric is vulcanised.
D. F. TWISS.

[Device for uniformly] varnishing webs of cellulose hydrate. KALLE & Co. A.-G. (B.P. 357,436, 8.12.30. Ger., 27.12.29).

Alcohols.—See III. Cellulose derivatives.—See V. Fumigant.—See XVI.

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

Effect of adsorbent powders on the solubility of phosphoric acid in ammonium citrate. R. DUBRISAY (Ann. Falsif., 1931, 24, 400—402).—The effect of adding adsorbent powders to equilibrium mixtures of CaHPO_4 or superphosphate and NH_4 citrate has been studied. Paraffin black, and to a smaller extent talc or kaolin, adsorbs NH_3 and, by lowering the $[\text{H}^+]$, increases the amount of sol. P_2O_5 . Kieselguhr appears to be without action. When HCl is substituted for NH_4 citrate the action of adsorbents is less marked, but, owing to the fixation of HCl, they increase the $[\text{H}^+]$ and decrease the amount of P_2O_5 dissolved.
T. MCLACHLAN.

Solubility of phosphates in neutral ammonium citrate solution. K. D. JACOB, K. C. BEESON, L. F. RADER, JUN., and W. H. ROSS (J. Assoc. Off. Agric. Chem., 1931, 14, 263—283).—When the wt. of sample used for the determination of available P_2O_5 in H_2O -insol. phosphates by the official method ("Methods of Analysis," A.O.A.C., 1925, p. 4) was decreased by 0.5-g. steps from 2.0 g. to 0.5 g. there was a progressive decrease in the citrate-insol. P_2O_5 in CaHPO_4 , $\text{Ca}_3(\text{PO}_4)_2$, $\text{Mg}_3(\text{PO}_4)_2$, heavily ammoniated superphosphates, raw, steamed, and naphtha-extracted bone, basic slag, and calcined phosphate. MgHPO_4 and MgNH_4PO_4 were completely sol. when 2.0 g. were used, CaHPO_4 and $\text{Mg}_3(\text{PO}_4)_2$ when 1.0 g. was used, whilst $\text{Ca}_2\text{P}_2\text{O}_7$ and $\text{Mg}_2\text{P}_2\text{O}_7$ were only slightly sol. In the cases of "C.P." Fe and Al phosphates significant decreases in the insol. material (which varied from 1.0% to 55.5% of the total H_3PO_4) were not obtained. Impure Fe and Al phosphates precipitated from crude H_3PO_4 were almost completely sol. Acidulated phosphates untreated with aq. NH_3 , and commercial phosphate rock showed no

significant decrease. The solubility of the P_2O_5 in uncalcined bone approximated closely to that of the P_2O_5 in $\text{Ca}_3(\text{PO}_4)_2$, being thrice as sol. as that in $3\text{Ca}_3(\text{PO}_4)_2 \cdot \text{Ca}(\text{OH})_2$. When 2.0 g. were used, 65—75% of the P_2O_5 in $\text{Ca}_3(\text{PO}_4)_2$ was insol., whereas when 0.5 g. was used only 18—36% was insol. 0.5—1.0 g. of high-grade basic slag treated with 100 c.c. of neutral NH_4 citrate solution showed the same solubility as that found by the official method, using 2% citric acid solution.
W. J. BOYD.

Alkali content of chalk. WERNER (Farben-Chem., 1931, 2, 402—403).—Extraction of numerous natural chalks with hot H_2O and titration of the filtrate with HCl invariably yields an alkali val. corresponding to a max. of 0.03 mg. of KOH per g. of chalk. As it is improbable that this alkalinity is due to the presence of free CaO, it is suggested that it really represents the solubility of CaCO_3 in H_2O .
A. R. POWELL.

Electrometric analysis of solutions of hypochlorites. M. ABRIBAT (Bull. Soc. chim., 1931, [iv], 49, 1119—1138).—A Pt electrode gives reproducible potentials when immersed in acidified hypochlorite solutions. Commercial samples can be titrated electrometrically with dil. HCl, and the free alkali, carbonate, hypochlorite, and free HOCl ascertained from sharp inflexions in the curve.
C. W. DAVIES.

Electrolytic production of potassium ferricyanide. V. P. ILINSKI and N. P. LAPIN (J. Appl. Chem., Russia, 1930, 3, 981—998).—A solution of $\text{K}_4\text{Fe}(\text{CN})_6$ saturated at 50° is electrolysed at 55° (anode c.d. 5, cathode 20—50 amp.), using an Fe cathode and Ni anode with (cathode c.d. 150—200 amp. without) asbestos diaphragm. K_2SO_4 , if present, is removed. After crystallisation the process is repeated, the solution being evaporated to dryness after the fourth cycle. Solubility diagrams of $\text{K}_4\text{Fe}(\text{CN})_6$ — K_2SO_4 and of $\text{K}_4\text{Fe}(\text{CN})_6$ — $\text{K}_3\text{Fe}(\text{CN})_6$ mixtures are given.

CHEMICAL ABSTRACTS.

Production of copper sulphate from Ural copper ores and tailings. I. G. STSCHERBAKOV and M. M. NARKEVICH (Tzvet. Met., 1930, 5, 1159—1167).—The yield with NH_3 solution generally increases with the Cu content (0.2—4.5%); addition of $(\text{NH}_4)_2\text{CO}_3$ or NH_4Cl is advantageous, but the concentration (1—6%) of the NH_3 has little influence. CHEMICAL ABSTRACTS.

Determination of lead and copper in Bordeaux-lead arsenate mixtures. J. C. BUBB (J. Assoc. Off. Agric. Chem., 1931, 14, 260—262).—The sample (1.0 g.) is heated with 50 c.c. of 33% AcOH on the steam-bath for 5—10 min. 0.5 g. of $\text{Ca}_3(\text{AsO}_4)_2$ is added and then conc. HNO_3 dropwise with stirring until any blue coloration clears up and the PbHAsO_4 is white. After being heated for a few min. the solution is cooled, the HNO_3 present nearly neutralised with conc. aq. NH_3 , and left at room temp. for 20 min. The mixture is filtered, the PbHAsO_4 washed free from Cu with hot H_2O and dissolved in 25 c.c. of HNO_3 , and the Pb determined by the official method ("Methods of Analysis," A.O.A.C., 1925, p. 58). The filtrate is neutralised by conc. aq. NH_3 and the Cu determined iodimetrically (1 c.c. \equiv 0.005 g. of Cu). The method is more rapid than the official method. W. J. BOYD.

Storage of carbon monoxide. A correction. O. H. WAGNER (*Brennstoff Chem.*, 1931, 12, 352; cf. B., 1931, 438).—In a calculation in the previous paper too high a value was assumed for the bulk density of Cu_2Cl_2 ; it follows that the vol. of CO which can be stored in a cylinder packed with Cu_2Cl_2 is only 2.3 and not 4 times that which can be compressed into the empty cylinder under the same pressure (150 atm.). A. B. MANNING.

Obtaining oxides of nitrogen from ammonia *via* nitrate. D. A. EPSTEIN (*Udobr. Urozhai*, 1930, 2, 749—751).— NH_3 (20%) and air together were passed over soda-lime containing Co and Ni; the product contained 27% NaNO_3 . CHEMICAL ABSTRACTS.

Study of Travers' method for determination of fluorine with reference to insecticides. C. M. SMITH, E. H. HAMILTON, and J. J. T. GRAHAM (*J. Assoc. Off. Agric. Chem.*, 1931, 14, 253—260).—Travers' method (B., 1921, 873 A, 904 A) slightly modified gives low results in the presence of Al and Fe, and is useless in the presence of borax. Attempts to expel the B as MeBO_3 by evaporation with MeOH and conc. HCl were only partly successful. NaF containing > 20% CaO gives seriously low results. A modified method is described which gives accurate results in presence of CaO. To 0.5 g. of sample 20—25 c.c. of water, 0.3 g. of finely-divided precipitated SiO_2 , and a few drops of methyl-orange are added. The mixture is carefully acidified with conc. HCl, 2 c.c. in excess being added. It is boiled for 1 min., cooled, and 4 g. of solid KCl are dissolved in it. Next 25 c.c. of 95% EtOH are added, and after keeping for 1 hr. with frequent stirring it is filtered through a Gooch crucible containing a disc of filter paper covered by a pad of asbestos. The ppt. is washed with alcoholic KCl (made by dissolving 60 g. of KCl in 400 c.c. of H_2O , adding 400 c.c. of 95% EtOH, and neutralising to phenolphthalein) until the washings are neutral to phenolphthalein. The ppt. is then titrated with 0.2N-NaOH free from carbonate, the titration being completed with the fluoride solution actively boiling (1 c.c. of 0.2 N-NaOH \equiv 0.005700 g. F). The presence of S, starch, flour, tobacco, talc, *p*-dichlorobenzene, C_{10}H_8 , cresols, coal-tar neutral oils, Paris green, or $\text{Ca}_3(\text{AsO}_4)_2$ does not interfere. The presence of pyrethrum or $\text{Pb}_3(\text{AsO}_4)_2$ leads to high results, that of AlCl_3 , K alum, kaolin, or diatomaceous earth to low results, and of FeCl_3 to slightly low results. W. J. BOYD.

Determination of iodine in iodised common salt. A. GRONOVER and E. WÖHLICH (*Z. Unters. Lebensm.*, 1931, 61, 306—314).—For a qual. test of the uniformity of distribution of I, a thin layer of the salt is spotted with a starch- NaNO_2 mixture. For the quant. determination a modification of Fellenberg's method (B., 1923, 1068 A; 1931, 391) is recommended. To 100 c.c. of filtered salt solution (100 g. in 500 c.c.) are added 1 c.c. of N-HCl and 1 c.c. of saturated Br water, the mixture being boiled gently for 10 min. with replacement of the evaporated H_2O . After cooling to 10°, 1.5 c.c. of 85% H_3PO_4 and 0.2 g. of KI are added and the mixture is kept in the dark for 3 min., when it is titrated with 0.004N- $\text{Na}_2\text{S}_2\text{O}_3$, 1 c.c. of starch being added immediately before the end-point. Fe and Mn salts cause an apparent increase in the I content, which may be neglected at the concentrations usually encountered, but

when appreciable amounts are present the effects may be eliminated by adding 1—2 drops of 10% $(\text{CO}_2\text{H})_2$ solution. H. J. DOWDEN.

Removing NO from coke-oven gas.—See II. **Calcined MgO .**—See IX. **SrSO_4 as rubber filler.**—See XIV. **Cr-tanning liquors.**—See XV. **Na aluminate in water treatment.**—See XXIII.

PATENTS.

Preparation of phosphoric anhydride and phosphoric acid. METALLGES. A.-G. (B.P. 357,026, 3.12.30. Ger., 6.1.30).— P_2O_5 is prepared by introducing powdered P through nozzles into a combustion space and causing the P to impinge on to a rapidly rotating distributing disc. Air enriched with O_2 (to increase the concentration of P_2O_5 in the waste gases) is simultaneously admitted as combustion gas. The P_2O_5 may afterwards be converted in known manner with H_2O into H_3PO_4 . F. YEATES.

Production of concentrated phosphoric acid. KUNSTDÜNGER-PATENT-VERWERTUNGS A.-G. (B.P. 357,041, 9.1.31. Swed., 29.1.30).—During the concentration of H_3PO_4 produced from phosphate rock with the formation of CaSO_4 , the residual unprecipitated CaSO_4 which crystallises out during evaporation is continuously removed and returned to the leaching plant, thus preventing the formation of hard crusts on the heating surfaces of the apparatus used. F. YEATES.

Production of soda and potassium hydroxide. CHEMIEVERFAHREN GES.M.B.H. (B.P. 356,821, 4.6.30. Ger., 13.7.29. Cf. B.P. 343,691 and 354,451; B., 1931, 488, 924).—The combined liquors in the process described in B.P. 354,451 are treated for the removal of NH_3 and, by cooling, of part of the NH_4Cl before use in the NH_3 -soda process, and SrO, obtained by calcining the SrCO_3 , is used for treating the K_2SO_4 , so that KOH is obtained instead of K_2CO_3 . L. A. COLES.

Manufacture of ammonia by the contact process. A. MENTZEL (B.P. 356,645, 16.2.31).—Pure H_2 is produced electrolytically at such a high pressure that, after admixture with N_2 at atm. pressure, the mixture will be at sufficient pressure to effect combination after passing through a series of contact stages. W. J. WRIGHT.

Manufacture of ammonium sulphate. H. J. HODSMAN and A. TAYLOR (B.P. 356,283, 30.5.30).—Aq. $(\text{NH}_4)_2\text{SO}_3$ solution, produced by combining NH_3 or NH_3 liquor with SO_2 , is passed down a tower in counter-current to hot gases containing free O_2 . A heavy-metal compound, preferably a ferrous salt, may be added to the liquor as a catalyst, the liquor being kept at a suitable degree of alkalinity or acidity. Oxidation of the solution is completed electrolytically, electrolysis being arrested before any thiocyanates or thiosulphates become oxidised. W. J. WRIGHT.

Manufacture of ammonium sulphate. H. J. HODSMAN and A. TAYLOR (B.P. 356,757, 30.5.30).—Aq. $(\text{NH}_4)_2\text{SO}_3$ solution is oxidised electrolytically in presence of a sol. chloride (preferably NH_4Cl). The $(\text{NH}_4)_2\text{SO}_3$ solution is prepared as in B.P. 356,283 (cf. preceding abstract), and may be partly oxidised before electrolysis by passing gases containing free O_2 , such as products of combustion; catalysts (FeSO_4) may be used. F. YEATES.

Manufacture of ammonium sulphate. F. A. F. PALLEMAERTS, and UNION CHIM. BELGE SOC. ANON. (B.P. 356,580, 27.11.30).— CaSO_4 and $(\text{NH}_4)_2\text{CO}_3$ in the requisite proportions are mixed in a wet-grinding mill, the product being either transferred to reaction vessels for completion of the reaction and subsequently filtered, or filtered direct after leaving the mill. W. J. WRIGHT.

Production of ammonium sulphate [and sulphur]. H. KOPPERS A.-G., Assees. of F. KRUPP A.-G. (B.P. 356,739, 6.5.30. Ger., 21.5.29).— $(\text{NH}_4)_2\text{SO}_4$ and S are produced from suitable mixtures of NH_4 salts ("neutral thionate salts" and "acid thionate salts") by heating aq. solutions of such salts in vessels susceptible to attack by H_2SO_4 (e.g., Ni-Cr-steel vessels) and maintaining in the resultant products to the end of the operation a small quantity of the initial unconverted materials. (Cf. B.P. 309,565; B., 1930, 323.) F. YEATES.

Production of mixed [fertiliser] salts containing ammoniacal and nitrate nitrogen jointly. RUHR-CHEMIE A.-G. (B.P. 356,759, 3.3.30. Ger., 2.3.29).—Hydrated or anhyd. solutions of NH_4NO_3 in NH_3 (Divers' liquid) are treated with hydrated or anhyd. acids (carbonic acid being excluded) or acid salts until the NH_3 present is neutralised. The process may be so controlled that a dry or almost dry finished product is released. F. YEATES.

Removal of iron and iron compounds from substances containing iron. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 356,523, 6.10.30).—The Fe is extracted in the form of chloride by means of an org. solvent (e.g., ethers, aldehydes, ketones, or org. halogen compounds) in which the remainder of the substance is insol., conversion into chloride being effected, if necessary, by introducing gaseous HCl with the solvent or by treatment prior to extraction. W. J. WRIGHT.

Evaporation of liquids.—See I. **Catalytic oxidations.** Separation of CO from gases. S from gases. **Gas-purification products.**—See II. **Complex salts.**—See III. **Steel resistant to chemicals.**—See X. **Fertiliser.** **Fungicidal solution.**—See XVI. **Waste pulp liquors.**—See XXIII.

VIII.—GLASS; CERAMICS.

Properties of glass-tank refractories. H. SCHILLING (Chem.-Ztg., 1931, 55, 691).—Such refractories should react neutral towards the glass and should be as dense and as free from pores as possible. This is obtained by using a material containing as much SiO_2 as the glass, the remainder being all or nearly all Al_2O_3 ; the material should be as fine-grained as possible and fired at a high temp. after shaping. A. R. POWELL.

Scientific basis of glass melting. W. E. S. TURNER (J. Soc. Glass Tech., 1930, 14, 368—394 T).—A comprehensive review of previous work dealing with (a) physical changes, thermal changes, m.p., mutual solubility of materials, volatilisation; (b) chemical changes, decomp. and dissociation processes, and interaction during melting. The author favours the isothermal heating of reaction mixtures in air rather than in a current of CO_2 . A study of the rate of heating, as practised by the Tammann school, might be useful,

but left much to be desired in sensitiveness and needed a very finely-divided mixture, which then did not compare with the ordinary grade of glass-making material.

M. PARKIN.

Effect on properties of soda-lime-silica glass of repeated melting in platinum. The X-ray pattern. W. E. S. TURNER (J. Soc. Glass Tech., 1930, 14, 351—353 T).—X-Ray examination of four of the glasses of one of the series (III) dealt with in a previous paper by Turner and co-workers (B., 1930, 460) failed to show any difference of pattern, thus confirming, since the specimens covered the range of remelting treatment, the findings of Turner etc. that, provided no change in chemical composition occurs, remelting causes no change in physical properties. M. PARKIN.

Thermal endurance of glass. W. J. A. WARREN (J. Soc. Glass Tech., 1930, 14, 313—329 T).—The expression proposed by Gould and Hampton (B., 1930, 989) is modified by the present author to $B = \theta l^\alpha$, where l is the thickness in the bottom of the beaker along the course of fracture, and α is a const. (0.36—0.4 for beakers 1.4 mm. thick; 0.5 for those 1.1 thick), and B and θ are as before. M. PARKIN.

Problems of safety glass manufacture. T. PESCH (Chem.-Ztg., 1931, 55, 730—731).—The use of a synthetic resin for the intermediate layer gives brilliance, transparency, and good adhesion, but its resistance lies within narrow limits of temp. Celluloid is relatively unaffected by low temp., but becomes discoloured by heat or sun rays. A satisfactory material has been produced in Germany from cellulose acetate. The problems associated with its use, e.g., the selection of suitable softening agents and the avoidance of shrinkage, are discussed. A method of testing safety glass consists in placing a circular disc of the glass on a conical tinned container filled with H_2O and dropping a steel ball on the centre of the disc from a given height. A stereophotographic method has been developed for determining liability to shrinkage. W. J. WRIGHT.

Some effects of thermal shock in causing crazing of glazed ceramic ware. H. G. SCHURECHT and D. H. FULLER (J. Amer. Ceram. Soc., 1931, 14, 565—571).—Thermal-shock crazing is caused in some cases by the development of craze-like cracks in the body itself, and bodies resistant to thermal shock are found to be less liable to craze when glazed. Glazed ware, in general, is more resistant to thermal shock when the glaze is under high compression rather than low compression or tension. High- SiO_2 bodies are more resistant to thermal shock than low- SiO_2 bodies, but there is no connexion between crazing and adsorption of the body or moisture crazing. The tendency to craze increases with the degree of lustre of the glaze. A suggested accelerated thermal-shock test is to cool repeatedly from 120° in air to H_2O at room temp. J. A. SUGDEN.

Use of lepidolite in zincless glazes. H. A. DAVIS and R. L. LUEDERS (J. Amer. Ceram. Soc., 1931, 14, 562—564).—Addition of lepidolite improves the resistance to crazing and the surface texture without destroying the colour. Such zincless glazes may be produced well within the range of safety from moisture crazing.

J. A. SUGDEN.

Coloured jewellery enamels for art-school use. K. E. SMITH (J. Amer. Ceram. Soc., 1931, 14, 588—589).—Successful enamel compositions are given and the enamelling technique is briefly described.

J. A. SUGDEN.

Origin of the colour produced on red bodies by zinc vapour. A. MCK. GREAVES-WALKER (J. Amer. Ceram. Soc., 1931, 14, 578—582).—Petrographic examination showed that the green colour given to red burning bodies by Zn vapour is due, not to the presence of a green mineral, but to a yellow Zn glaze with a bluish (reduced) zone beneath it. If the bluish zone is re-oxidised during cooling, the green colour is lost. To obtain the best colours the coal used should not produce considerable fine ash, only pig or moss Zn should be used (scrap Zn gives yellows), and strongly reducing conditions should be maintained during cooling.

J. A. SUGDEN.

Suggested method for determining plasticity of clays, and some applications. E. J. C. BOWMAKER (J. Soc. Glass Tech., 1930, 14, 330—348 r).—A modified Pfefferkorn apparatus (Sprechsaal, 1924, 57, 297; 1925, 58, 183) is described, and by its use it is found that by plotting the amount of H₂O (g. per 100 g. of dry clay) against the deformed height of the cylinder, substantially straight-line graphs were obtained, from which it appeared that the plasticity $P = R(R - r)$, where R and r are the amounts of H₂O corresponding to zero and complete deformation, respectively. Plotting P against the % clay in the mixtures studied gave smooth curves from which it was possible to determine the point at which an increase of grog content caused an appreciable decrease in plasticity. So long as the proportion of clay is sufficient to bind the mixture, coarse grog influences plasticity less than fine. In comparing various clays, results from mixtures made with clays sieved to 100-mesh did not tally with the accepted views on plasticity, whereas those using the fraction lying between 20- and 40-mesh did.

M. PARKIN.

PATENTS.

Lehrs for annealing glassware. BRIT. HARTFORD-FAIRMONT SYND., LTD., Asses. of H. A. WADMAN (B.P. 356,920 and 357,075, [A, B] 25.8.30. U.S., 29.8.29).—In [A] a heat- or ventilation-control device sensitive to draughts of the order of 10 ft./min. is described. Though described for convenience as a thermostat, its action is independent of temp. It comprises a vertical flame which, in the complete absence of horizontal currents, will strike the centre point of a double thermostat; a draught either way will deflect the flame to one or the other arm of the thermostat and initiate appropriate control. In (B) a system of ventilation of a Lehr is described.

B. M. VENABLES.

Apparatus for making glass. H. F. HITNER, Assr. to PITTSBURGH PLATE GLASS Co. (U.S.P. 1,799,371, 7.4.31. Appl., 23.5.27).—The ends of an elongated tank terminate in transverse bays, at the ends of which Fe-Cr plates serve as electrodes. A baffle of refractory material extends vertically through the glass in the tank near to the electrodes. Three-phase current is employed for melting and fining the batch.

C. A. KING.

Apparatus for treating [firing] ceramic ware. F. M. HARTFORD, Assr. to HARROP CERAMIC SERVICE Co. (U.S.P. 1,799,980, 7.4.31. Appl., 10.4.30).—The conveyor units in a tunnel kiln consist of flat plates of refractory material which are caused to slide along the floor. The floor has channels or flues so that the heating gases may be proportioned at will between direct heating of the articles to be fired and indirect heating by conduction through the conveyor plates on which the ware is stacked.

C. A. KING.

Decoration of ceramic articles, e.g., glass, glazed porcelain, stoneware, and the like. DEUTS. GOLD- U. SILBER-SCHNEIDANSTALT VORM. ROESSLER (B.P. 308,226, 19.3.29. Ger., 19.3.28).—The articles are coated first with the colour or lustre in the usual way, then with solutions containing glycerol, chloral hydrate, or ethylene glycol, together with colloids, e.g., gum arabic, and, if desired, colouring materials. The top layer contracts on drying and heating and the lower layer is thereby caused to produce a network effect on the ware. A. R. POWELL.

Production of coloured patterns on metallic articles. DEUTS. GOLD- U. SILBER-SCHNEIDANSTALT VORM. ROESSLER (B.P. 335,789, 4.11.29. Ger., 9.11.28. Addn. to B.P. 308,226; preceding).—The surface of the article is covered with a ceramic enamel or lustre and, when this has dried, a covering layer is applied by painting or spraying with a solution containing glycerol 14, gum arabic 12, sugar 5, alcohol 20, and water 49%. The articles are then heated slowly to the temperature at which the enamel fuses; during this heating the gum layer contracts and produces in the colour layer a network or veining effect which is fixed when the enamel melts.

A. R. POWELL.

Altering the physical properties of finely-divided silicious mineral matter [kaolin]. R. ILLNER (B.P. 338,726, 18.11.29. Austr., 13.12.28).—Kaolin suspensions, e.g., from the elutriation of china clay, are coagulated with Ca(OH)₂ or with Al₂(SO₄)₃ and the coagulum is neutralised with H₂SO₄, bleached with Na₂S₂O₄, and made slightly acid with H₂SO₄, so that the particles of kaolin are coated with an adsorbed film of CaSO₄ or Al₂O₃. Blue colouring matter, e.g., ultramarine or a dye, may be incorporated to produce a whiter product suitable for the paper or textile industries. A. R. POWELL.

Improving the physical properties of kaolin. R. ILLNER (B.P. 338,730, 18.11.29. Austr., 15.6.29. Addn. to B.P. 338,726; preceding).—A suspension of kaolin in dilute sulphuric acid is successively treated with sodium hyposulphite, blown with air, and nearly neutralised with calcium hydroxide; a catalyst, e.g., sodium nitrate, may be added before the blowing, and a vat dye, e.g., indanthrene-blue, before the blowing or after the addition of the calcium hydroxide.

L. A. COLES.

Manufacture of insulating bodies for sparking plugs. SIEMENS & HALSKE A.-G. (B.P. 356,983, 24.10.30. Ger., 13.3.30).—A mixture of finely-ground Al₂O₃ with an acid, e.g., HCl, is moulded with the insertion of metal spindles in divided plaster moulds; when the articles have partly set, they are removed, dried, and fired to sintering point, i.e., at least 1600°.

L. A. COLES.

Refractory [bricks etc.] and their manufacture. S. S. COLE, Assr. to KOPPERS. CO. (U.S.P. 1,798,972, 31.3.31. Appl., 29.6.27).—Refractory bricks, *e.g.*, of SiO_2 or magnesite, possess greater strength and lower porosity if a sol. Fe compound together with an org. substance which prevents precipitation of the Fe in alkaline solution be added to the batch. As example, a batch may consist of ganister 200 pts., FeCl_3 2 pts., lactic acid 1 pt., $\text{Ca}(\text{CNS})_2$ 1 pt., CaO 4 pts., and H_2O 24 pts. C. A. KING.

Furnace linings.—See I. Sandpaper.—See V.

IX.—BUILDING MATERIALS.

Volume changes in brick masonry materials. L. A. PALMER (J. Amer. Ceram. Soc., 1931, 14, 541—564).—Vol. changes due to temp., the alternate wetting and drying, freezing and thawing of various mortars and bricks, together with the changes during the setting and hardening of the mortars, were measured. The differential vol. changes between the brick and mortar due to temp. (under average climatic conditions) are small compared with those due to moisture content. The least vol. change occurs in mortars containing only CaO and SiO_2 , but is larger than that occurring in well-fired brick. As far as shrinkage and expansion are concerned it is not worth while to use a 1 : 4 in preference to a 1 : 3 mortar, nor to use a 1 CaO : 1 cement : 6 SiO_2 mortar. Considerable variation in vol. change was noted among the masonry cements and was greater than that among the Portland cements. The vol. changes during the setting of mortars, although greater than the subsequent changes, are less destructive to masonry. The addition of Ca stearate to mortars decreases the rate at which the vol. changes occur, but does not alter their magnitude. J. A. SUGDEN.

Action of some aggregates on Portland cement. P. P. BUDNIKOV and M. I. NEKRICH (Tech. Novosti, 1930, 3, No. 17—18, 41—45).—Gypsum, dolomite, and marl act as densening agents and as absorbents. The particles of admixtures are enveloped by the colloidal gel; they do not lower, but sometimes increase, the mechanical strength. CHEMICAL ABSTRACTS.

Action of kerosene on Portland cement. V. I. NAZAROV (Stroit. Mat., 1930, No. 9—10, 31—37).—The tensile strength is lowered. After 3 months kerosene penetrated 0.2—0.3 cm. into cement walls. CHEMICAL ABSTRACTS.

Slag cement without clinker. P. P. BUDNIKOV and V. M. LEZHOEV (Stroit. Mat., 1930, No. 9—10, 19—27).—When the clinker is replaced by gypsum fired at 700°, anhydrite cement, or Estrich gypsum, the setting and hardening of slag cement are increased, and the mechanical properties are good. CHEMICAL ABSTRACTS.

Chemical examination and mechanical testing of caustic burnt magnesia, Sorel cement, and artificial stone. C. BÜTTNER (Chem.-Ztg., 1931, 55, 689—690, 710—711).—In the analysis of calcined MgO , combined H_2O is determined by heating at 190° and "loss on ignition" by heating at 1300° to expel CO_2 and SO_3 , which may be collected in KOH and the SO_3

determined as BaSO_4 . Free CaO is determined by titration with HCl after extraction with 10% sucrose solution. An outline of methods for the analysis of MgO — MgCl_2 cements and of artificial stone made from these cements with a sawdust filling is given, together with some details of methods of testing the strength and setting time of such mixtures. A. R. POWELL.

Identification of wood by chemical means. I. H. E. DADSWELL (Counc. Sci. Ind. Res., Australia, Pamph. No. 20, 1931, 16 pp.).—The use of aq. or EtOH extracts in colour tests with certain reagents is of limited value on account of the wide variation in the amount of extractable material in different samples of one species. Ash, alkalinity, differences in cellulose content, and behaviour of EtOH extracts on dilution with H_2O have been used to separate karri, jarrah, tallow-wood, blackbutt, and white mahogany, and a simple test depending on the precipitation of differently coloured substances on heating an EtOH extract of the wood with 1% NaOH solution serves to distinguish between red box and red gum. The burning-splinter test is reliable for differentiating between karri and jarrah only when sound heartwood which has not been pretreated with inorg. preservatives is used. B. P. RIDGE.

Chemistry of Australian timbers. I. Lignin determination. W. E. COHEN and H. E. DADSWELL (Counc. Sci. Ind. Res., Australia, Pamph. No. 22, 1931, 27 pp.).—Eucalypts, hemlock, and spruce woods contain substances of an extraneous nature which are insol. in C_6H_6 — EtOH and remain with lignin when it is isolated by the standard procedure. These substances are dissolved by dil. solutions of NaOH without attack of the wood structure or of the lignin of hemlock and spruce. Previous extraction of the wood powder with 0.125N- NaOH for 80 min. at 98—100° enables reasonable vals. for the lignin content of jarrah, red ironbark, and mountain ash to be obtained. B. P. RIDGE.

Manufacture and testing of asphalt paving materials. D. M. WILSON (S.C.I., Chem. Eng. Group, Oct., 1931, 14 pp.).—Such materials can be divided, according to the manner in which they are laid, into the following classes: compressed, slab, mastic, and steam-rolled asphalts. The method of manufacture of each is fully described and typical specifications for the ingredients are given. Methods of testing of raw materials for asphalt paving and of the finished material are also examined. Bitumen is usually tested for penetration, ductility, m.p. (ring-and-ball), loss on heating, and viscosity (Engler). The relative proportions of the different grain sizes of the mineral aggregate can be obtained by sieving, but, owing to the varied classification of sieves, the determination is made preferably with a "flourometer" (the Mayntz-Petersen instrument is described). The manufactured material should be checked for bitumen content. Methods are given for determining the penetration of the bitumen as it exists in road surfaces. With steam-rolled mixtures it is necessary to know if bitumen is present in slight excess of the amount required to fill the voids and coat the grain surfaces, and an improved method of making the pat-stain test is given. Under mechanical tests, details of the moulding of test pieces and methods of

determining the hardness no., deformation, and tensile strength are described. H. S. GARLICK.

Principles of manufacture of mastic asphalt. A. W. ATTWOOLL (Proc. Chem. Eng. Group, 1930, 12, 113—120).

Applications of mastic asphalt in a chemical works. D. McDONALD (Proc. Chem. Eng. Group, 1930, 12, 121—131).

Determining bitumen in asphaltic materials.—See II.

PATENTS.

Plaster for walls and the like. E. N. and K. N. CRAIG (B.P. 356,711, 4.6. and 30.8.30).—A liquid or semi-liquid magnesian cement, which may contain fillers, pigments, etc., is sprayed on to wall surfaces preferably previously rendered with cement and sand, or on to tiles, slabs, etc.; the cement when partly set may be air-blasted to produce a ripple effect, or finished with paint, varnish, etc. L. A. COLES.

Manufacture of [heat-]insulating material. A. J. RUSS, Assr. to ARMSTRONG CORK Co. (U.S.P. 1,799,255, 7.4.31. Appl., 15.4.27).—A facing layer approx. $\frac{1}{4}$ in. thick, comprising, e.g., 50% of Portland cement, 46.75% of screened river sand, and 3.25% of asbestos fibre, is laid dry in a mould and covered with an aq. paste containing a mixture of, e.g., 52.6% of kieselguhr, 45.2% of $\text{Ca}(\text{OH})_2$, and 2.2% of asbestos fibre; the blocks so formed are cured by treatment with steam. L. A. COLES.

Tenacious and fireproof composition. C. MARCZINCZEK (U.S.P. 1,800,024, 7.4.31. Appl., 12.3.28).—A mixture of approx. 45% of volcanic cinders, 20% of cement, 5% of $\text{Ca}(\text{OH})_2$, 5% of gypsum, 25% of finely-ground pumice, and sufficient H_2O to cause the mass to set, is used for making walls, floors, etc., or is worked into slabs or blocks. L. A. COLES.

Manufacture of building blocks and the like. OESTERR.-AMERIKANISCHE MAGNESIT A.-G., and K. ERDMANN (B.P. 356,001, 10.10.30).—A slightly compressed rope of, e.g., wood-wool is passed through an emulsion bath, excess emulsion is squeezed out as the rope leaves the bath, and the rope is then divided, by "flinging forks" moving in an elliptical path, into portions which are thrown by the forks on to a conveyor for transference to the moulds. L. A. COLES.

Production of composite slab for building purposes. W. SIEBERT (B.P. 356,466, 1.9.30).—A grooved wooden centre portion is covered on both sides with an asbestos-cement composition, metal, or artificial stone. C. A. KING.

Manufacture of building units. H. C. BYLAND and F. L. ORMESHER, Assrs. to CEMROC, INC. (U.S.P. 1,796,559, 17.3.31. Appl., 15.9.28).—A plastic mixture comprising concrete, NH_4 stearate, CaCl_2 , pigments (if desired), and H_2O is subjected in a mould to a sudden blow of, e.g., 1000 lb. and then to a sustained pressure of, e.g., 75 tons, after which the block is removed from the mould and air-dried. L. A. COLES.

Production of a material more particularly for building and street structural purposes. ALUM-

INIUMERZ BERGBAU U. IND. A.-G. (B.P. 356,797, 10.6.30. Ger., 10.6.29).—Bituminous material free from inorg. substances is mixed or melted with finely-divided bauxite; the product may be used, e.g., for making pavements or roofing felts, or for sealing joints in earthenware pipes. L. A. COLES.

Manufacture of sheathing lumber from redwood bark. E. R. DARLING, Assr. to PACIFIC LUMBER Co. (U.S.P. 1,797,901, 24.3.31. Appl., 22.6.29).—The comminuted bark is successively dry-sieved, ground with water, wet-sieved, and boiled under pressure with a solution of a salt forming insol. tannates [e.g., $\text{Al}_2(\text{SO}_4)_3$ solution]; the fibres are then washed, sized, and formed into boards. L. A. COLES.

Uniting wood and other surfaces. C. ARNOLD. From I. F. LAUCKS, INC. (B.P. 356,137—8, 25.3.30).—(A) The surface of plywood is coated with powdered soya-bean flour or other oleaginous seed flour or vegetable, and in the presence of sufficient natural or added moisture two or more plies are pressed together with or without heating. (B) A dry, H_2O -dispersible protein, e.g., blood or lactalbumin, may be used as an adhesive, and is coagulated with a dry protein or an agent such as paraformaldehyde. C. A. KING.

Rotary kiln. [Concrete] mixer.—See I. **Compositions for roads etc.**—See II. **Fungicidal solution [for wood].**—See XVI.

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

Manufacture of malleable cast iron. S. S. NEKRYTI (Vestn. Metalloprom., 1930, 10, 78—96).—Tests on threaded unions show that addition of 30—35% of scrap Fe and 10—15% of filings to the melt affords white Fe suitable for casting and cementation. During cooling from the max. cementation temp. to 800—810° graphite nuclei are formed, and ferrite grains are subsequently deposited about them.

CHEMICAL ABSTRACTS.

Action of molecular nitrogen on iron-carbon alloys. H. H. GRAY and M. B. THOMPSON (J.S.C.I., 1931, 50, 353—357 r).—The action of mol. N_2 on steel was investigated at temps. ranging from 100° to 1100°. Microscopical and analytical evidence is cited to show that up to 700° the chief effects are nitride formation and attack on pearlite. From 700° to 800° there is a zone of max. decarburisation. At 850° in medium-C steels there is formed a transparent cryst. layer containing N and having a duplex structure. Above 850° this transparent layer is formed more easily and the decarburisation is less marked. The C interferes with the formation of the transparent layer. Six photomicrographs are shown.

Production of low-carbon semi-steels. II. M. HORIKIRI (J. Iron Steel Inst. Japan, 1930, 16, 935—960, 1063—1086).—The C in semi-steels is absorbed by contact of Fe with C; hence the quantity of coke should be minimal and the oxides should be reduced with Si. Fe high in Si dissolves only a little C. There is no significant relation between the depth of the cupola hearth and the C absorbed. CHEMICAL ABSTRACTS.

Determination of martensite and austenite in quenched and tempered steels by means of X-ray analysis. S. SEKITO (Sci. Rep. Tôhoku, 1931, 20, 368—376).—The quantity of austenite in a quenched steel is determined by comparing the intensity of the 200 $K\alpha$ line of austenite with that of the 111 $K\alpha$ line of Au; similarly, martensite may be determined from the intensities of the 112 $K\alpha$ martensite line and the same Au line. Between 100° and 170° the tetragonal α -martensite is completely converted into the body-centred β -phase. Residual austenite is converted into β -martensite only slowly below 200°, but rapidly at 220—240°; β -martensite decomposes into ferrite and cementite at 220—280°.

A. R. POWELL.

Determination of retained austenite in quenched steels. K. TAMARU and S. SEKITO (Sci. Rep. Tôhoku, 1931, 20, 377—394).—The proportion of austenite in steels quenched under varying conditions has been determined by X-ray analysis and by saturation magnetisation. For any given steel the austenite content increases with rise of quenching temp. to a max. at 950—1050°, then decreases, and is greater when oil is the quenching medium than when H_2O is used. This is attributed to the accelerating effect of the stresses set up by the more severe H_2O quench on the austenite-martensite transformation, and is still more marked if the steel is subsequently cooled in liquid air; in this treatment one third of the residual austenite of a 0.89% C steel quenched from 1000° is converted into martensite when oil is used and one fourth when H_2O is used as the quenching medium.

A. R. POWELL.

Structure of nodular troostite. N. T. BELAIEV (Iron and Steel Inst., Sept., 1931. Advance copy, 19 pp.).—Primary nodular troostite has a lamellar structure similar to that of lamellar pearlite, but the interlamellar distance, Δ_0 , is 100 $m\mu$ and thus can be resolved only under high magnifications and with lenses of high aperture. The hardness of troostite is about 450, and hence Green's formula, $H \times \Delta_0 = 79.59$, does not apply. Lamellar structures having a hardness between those of troostite and pearlite (200—300) correspond to sorbite, which also does not follow Green's rule, but has Δ_0 below the crit. val. of 260 $m\mu$ and is formed within crit. cooling rates of 5—15°/sec. These distinctions between pearlite, troostite, and sorbite are considered sufficient to justify these substances being recognised as distinct and different constituents of steel.

A. R. POWELL.

Origin of the banded structure of a hot-worked hypo-eutectoid steel. F. C. THOMPSON and R. WILLOWS (Iron and Steel Inst., Sept., 1931. Advance copy, 26 pp.).—From the results of earlier workers, amplified by their own tests, the authors conclude that the banded structure found in hot-worked mild steel is due to the presence of O in solid solution. The phenomenon is not produced by slag bands or P in electrolytic Fe carburised and heat-treated in vac., but oxidation of mild steel followed by carburisation often produces a laminated structure analogous to that found in ordinary rolled mild steel. Rapid cooling inhibits the banding effect, slow cooling accentuates it, and heating in CO removes it to a depth slightly exceeding the zone of

visible carburisation without changing the distribution of visible inclusions and without removal of P. The available evidence suggests that the original cause of the differential O concentration lies in the coring of the crystals during solidification, and is not due to mechanical work other than the distortion of the dendritic structure.

A. R. POWELL.

Effect of surface conditions produced by heat-treatment on the fatigue-resistance of spring steels. G. A. HANKINS and M. L. BECKER (Iron and Steel Inst., Sept., 1931. Advance copy, 42 pp.).—The most important factor in the production of a low fatigue-resistance of unpolished spring steels appears to be the presence of a thin, soft, outer layer due to decarburisation during heat-treatment. Removal of this layer by polishing restores the fatigue-resistance to its normal value. Heat-treatment in a normal furnace atm. or in vac. (0.01—1 mm.) results in a diminished fatigue-resistance, as also does treatment in fused baths containing alkali chlorides alone or with carbonates or graphite. Normal fatigue-resistance is obtained by heat-treatment in cyanide baths or, in the case of Si-Mn steel, in a neutral or CO atm. The fatigue-resistance of Cr-V steel is only 80% of the normal after heat-treatment in CO, but is normal after immersion in a cyanide bath. For large specimens the steel should be covered with powdered graphite and annealed at 950° for hardening.

A. R. POWELL.

Diffusion of tin into iron, with special reference to the formation of columnar crystals. C. O. BANNISTER and W. D. JONES (Iron and Steel Inst., Sept., 1931. Advance copy, 23 pp.).—From experiments on the rate of diffusion of Sn into Armco Fe in an atm. of H_2 it is concluded that at temps. below the Ac3 point and at higher temps. up to the extent necessary to inhibit the γ -phase (2% Sn) diffusion proceeds by interchange or interpenetration of atoms without reorientation of the lattice, that subsequent diffusion produces a new phase (α -solid solution) by the formation of a new lattice, and that the nuclei of this new phase are immediately absorbed by the growing crystals, as fast as they are formed, by the advancing solute. This explains the formation of columnar crystals of α -Fe only at temps. above the Ac3 point, the absence of recrystallisation on cooling, and the absence of the "diffusion line" when diffusion occurs above the A4 point. The mechanism of diffusion can be expressed by the equations $(y - y_1)^2 = mt$ and $V = n(a^T - 1)$, where y and y_1 are the distances from the origin of two zones of const. concentration, t is the time, V the rate of diffusion, T the abs. temp., and n and a are experimentally determined consts.

A. R. POWELL.

Constitution of the iron-tin alloys. C. A. EDWARDS and A. PREECE (Iron and Steel Inst., Sept., 1931. Advance copy, 27 pp.).—The system has been examined by thermal analysis in a H_2 atm. and by micrographical examination. At the Fe end the liquidus falls in an almost straight line from the m.p. of Fe to 1110° at 51% Sn, then remains horizontal to 80% Sn, and finally falls slowly at first and then very steeply to the m.p. of Sn. Between 50% and 80% Sn there is a gap of immiscibility in the liquid phase. The solubility of Sn in solid Fe increases with

rise of temp. from about 10% at 300° to 18% at 760°, then decreases up to the m.p. of Fe. The system contains three compounds only: Fe₂Sn which is stable between 760° and 900°, but reacts with Sn at 800° to form FeSn; this is stable below 800°, but reacts with Sn below 496° to form FeSn₂. The last-named compound has been prepared as very pure crystals which decompose into FeSn and Sn when heated above 496°. Fe₃Sn does not exist, and the thermal transformations which occur at 760° and 800° are not due to polymorphic changes in FeSn₂ (cf. A., 1926, 475), but result from the decomp. of Fe₂Sn and formation of FeSn, respectively. The solid solubility of Fe in Sn is <0.01% at room temp. A. R. POWELL.

Determination of vanadium in high-speed steel. E. FÄRBER (Chem.-Ztg., 1931, 55, 691).—The steel is boiled with 5% H₂SO₄ until the Fe has dissolved, leaving a residue containing all the V and W. This residue is dissolved in HCl with a little HNO₃ and the solution evaporated to ppt. WO₃. The filtrate is evaporated with HNO₃, HPO₄, and H₂SO₄ until fumes of SO₃ are copiously evolved. After cooling, the V₂O₅ is reduced by double evaporation with HCl; the solution is then diluted and titrated with KMnO₄. A. R. POWELL.

Determination of manganese in cobalt steels. F. SPINDECK (Chem.-Ztg., 1931, 55, 723).—The steel is dissolved in HCl and the Fe oxidised with HNO₃ and precipitated with ZnO. An aliquot part of the solution is treated with Br and aq. NH₃ in excess and boiled to ppt. Mn(OH)₄. The ppt. is washed free from Cl⁻, dissolved in H₂SO₄ and H₂O₂, and oxidised with AgNO₃ and (NH₄)₂S₂O₈ to HMnO₄, which is titrated with Na₂HAsO₃. A. R. POWELL.

Corrosion of cans. T. N. MORRIS and J. M. BRYAN (Food Manuf., 1931, 6, 100—102).—O₂ increased the corrosion of Fe by 0.5% citric acid (+ Na citrate) solution at low more than at high acidities. Sn was not attacked by non-oxidising org. acids, but was readily attacked in presence of O₂. The behaviour of Sn plate was similar to that of Sn-Fe couples. Substances in unrefined beet sugar inhibit the corrosion of Fe; in beet sugar and agar-agar that of Fe and Sn; and in inverted cane sugar that of Sn. SO₂ accelerated the corrosion of Fe at p_H 2.4 and retarded it at p_H 5.5. SO₂ makes Fe permanently anodic to Sn, since a film of Sn sulphide is formed. CHEMICAL ABSTRACTS.

Brinell ball hardness tests. M. ICHIHARA (Tech. Rep. Tôhoku, 1931, 10, 25—41).—The cross-sectional curves of the impressions formed by a spherical ball in the Brinell hardness test may be represented by the empirical formula $y = K_a e^{-ax} - K_b e^{-bx}$, which is applicable with an error of <0.002 mm. to all the common metals. The consts. K_a , a , K_b , and b vary with the degree of internal stress; K_a , a , and b decrease with increasing deformation by cold-work, but K_b increases. For annealed Cu, Al, or bronze $K_a < K_b$, but for steel, cast Fe, Sn, and Zn, both hard-worked and annealed, $K_a > K_b$ owing to the difficulty of completely removing the internal stresses in these metals by annealing. The "annealing degree" of a metal is given by the expression $2x/d$, the value of x being that at

which y has its max. value. Under ordinary annealing conditions the annealing degree of Cu is 3, of mild steel 0.32, and of high-C steel 0.26. A. R. POWELL.

Diameter measurement of certain Brinell indentations in cold-rolled metal. H. O'NEILL (Inst. Metals, Sept., 1931. Advance copy, 4 pp.).—Measurements are found to differ by 3—4%, according to whether vertical or oblique lighting is used. The min. observation should be recorded, and the use of "dark-ground" objectives is to be preferred. C. A. KING.

Effect of cold-working on the magnetic susceptibility of metals. K. HONDA and Y. SHIMIZU (Sci. Rep. Tôhoku, 1931, 20, 460—488).—The magnetic susceptibility of both diamagnetic and paramagnetic metals is reduced by cold-work to an extent which is linearly proportional to the resulting increase in d . Cu, which is normally a weak diamagnetic metal, becomes weakly paramagnetic with severe cold-work. Annealing at a temp. above that at which internal stress is relieved restores the susceptibility to its original value. All these facts may be explained by Honda's theory of magnetism. A. R. POWELL.

Rendering visible filed-out impressions in metals. O. MEZGER, B. SCHÖNINGER, and E. ELBEN (Z. angew. Chem., 1931, 44, 651—652).—Filed-out impressions of numbers or designs in metal articles may be rendered visible again by suitable etching if the original design was produced by stamping with a steel die, as the greater deformation produced by the stamping causes these parts to be more readily etched than the remaining (softer) metal. For steels 1 : 1 HNO₃-HCl, 1 : 9 fuming HNO₃-EtOH, or 10% FeCl₃ solutions are the most suitable etching reagents. Cu, brass, and bronze are etched with 10% FeCl₃ solution to which a little KClO₃ solution may be added, and Al is etched with 10% MnCl solution in conc. HCl or first with 40% HF and then with conc. HNO₃. Ag and Ni alloys should be etched with conc. HNO₃ or with HNO₃ in EtOH followed by a short immersion in HCl-FeCl₃ solution. A. R. POWELL.

Crystallisation [of aluminium alloys] at pressures up to 20,000 atmospheres. G. WELTER (Z. Metallk., 1931, 23, 255—259).—Castings of Cu- and Zn-Al alloys, and of silumin, cetal, and lautal, made under pressures of 12,000—20,000 atm., have a homogeneous, fine-grained structure free from segregations and with an extraordinarily regular distribution of the alloying constituents; the hardness, tensile strength, and ductility are all simultaneously increased. Thus for the German Zn-Al alloy, pressure increases the hardness from 49 to 85, the tensile strength from 19.5 to 26.5 kg./sq. mm., and the elongation from 13 to 20%; for silumin the corresponding increases are from 54 to 73, from 21 to 27.7 kg./sq. mm., and from 10 to 15%. The effect of high-pressure casting on silumin is to displace the eutectic composition still further towards the Si end and to raise the m.p. The Na modification treatment raises the eutectic composition from 11 to 13% Si and reduces the m.p. from 575° to 565°, whereas at 12,000 atm. pressure the eutectic composition is raised to 16% Si and the m.p. to above 600° without addition of Na and the grain size is more uniform.

Pressure also increases the solid solubility of Si in Al to 3% Si at 600°. A. R. POWELL.

Annealing of aluminium and aluminium alloys. H. NISHIMURA and G. SHINODA (J. Wednesday Soc., Japan, 1927, 5, 476—488).—In cold-worked Al and Al alloys elasticity was recovered at 90—180°. Annealing at 250° gives rise to recrystallisation.

CHEMICAL ABSTRACTS.

Influence of iron on [the properties of] duralumin. W. KROENIG (Z. Metallk., 1931, 23, 245—249).—With increasing Fe content the hardness and tensile strength of aged duralumin is reduced to an extent which is greater the higher is the quenching temp. Immediately after quenching, Fe-rich duralumin has a lower strength and hardness than a similar alloy with a low Fe content, but during ageing the strength increases to the same extent irrespective of the amount of Fe present, although the hardness rises less rapidly with a high than with a low Fe content. This behaviour is attributed to the action of the Fe in reducing the solid solubility of CuAl_2 in Al at high temp. Fe up to 0.9% forms a eutectic in duralumin which appears to contain CuAl_2 and this eutectiferous CuAl_2 has only a small tendency to dissolve in solid Al. No evidence in support of the theory that Fe retards the separation of CuAl_2 from Al could be obtained. A. R. POWELL.

Influence of variations in heat treatment and ageing on duralumin. A. VON ZEELEDER (Inst. Metals, Sept., 1931. Advance copy, 13 pp.).—If Avional-D (3.85—3.94% Cu, 0.53% Mg, 0.47% Mn, 0.56% Si, 0.3% Fe), a material comparable with duralumin, is quenched in cold H_2O , considerable distortion ensues. Quenching in a bath at 50° eliminates distortion. Ageing at 50° produces no ill-effects. Ageing at 145° is accompanied by serious changes in electrochemical potential, resistivity, tensile properties, and corrodibility. The temp. changes which occur during the time interval between removal of the metal from the furnace and quenching are studied. E. H. BUCKNALL.

Unsoundness in aluminium sand-castings. I. Pinholes: their causes and prevention. II. Effects of using metal previously subjected to corrosive conditions. D. HANSON and I. G. SLATER (Inst. Metals, Sept., 1931. Advance copies, 29 pp. and 12 pp.).—I. H_2O vapour in the furnace atm. or bubbled into molten Al or Al alloys rapidly produces extensive pinholing and unsoundness; this may be removed by treatment with dry N_2 or dry Cl_2 , but preferably by a 1:1 mixture of these gases, at a temp. just above the m.p., but below 700°. In large melts made in a gas-fired crucible furnace the rate of absorption of gases at 760° (the usual pouring temp.) is usually greater than the rate at which they can be removed by the N_2 - Cl_2 treatment. The TiCl_4 treatment removes gases and refines the grain structure of "Y"-alloy, but is not so effective with the 12% Si alloy or with Cu-Al alloys. Castings of Al alloys containing Zn can be obtained free from pinholes by heating the alloy at 950° until Zn commences to vaporise. S, Se, and Te are insol. in Al and, in general, give rise to unsoundness in sand-castings, although in some cases Se and Te appear to be beneficial.

II. Castings made from Al or Al alloys which have been exposed to corrosive conditions are generally unsound and contain many pinholes; the extent of the unsoundness depends on the type of corrosion and the length of time the metal has been subjected to these conditions. It is suggested that the metal has adsorbed nascent H liberated by the electrolytic action inducing the corrosion; this H is liberated, on remelting and casting, in the mol. condition and thus produces pinholes. Treatment of the corroded metal with N_2 at 500° or anodic pickling before melting fails to prevent formation of pinholes in the castings. A. R. POWELL.

Properties of a copper-nickel-aluminium alloy. I, II. T. SAITO (J. Wednesday Soc., 1927, 5, 433—442, 465—471).—The properties of the Cu-Ni (10%)—Al (2%) alloy were improved by heat treatment. Hardening by quenching and tempering is the result of the separation of the β - from the α -phase. Corrosion tests were carried out. CHEMICAL ABSTRACTS.

Drawing of non-ferrous wires. E. L. FRANCIS and F. C. THOMPSON (Inst. Metals, Sept., 1931. Advance copy, 25 pp.).—The tension required is proportional to the max. stress of the material and independent of the speed over a range of 20—600 ft. per min. The pull depends on the reduction of area effected. The best lubricant was a Na soap with not less than 75% of fatty acid and free from H_2O or glycerin. Diamond dies require less power than those of WC, which in turn require only about $\frac{1}{4}$ that of steel dies. C. A. KING.

Experiments in wire-drawing. I. Behaviour of a composite rod. W. E. ALKINS and W. CARTWRIGHT. II. Relation between reduction of area by cold-drawing and tensile strength of H.-C. copper. W. E. ALKINS (Inst. Metals, Sept., 1931. Advance copy, 11 pp. and 9 pp.).—Examination of composite round rods of high-conductivity (H.-C.) Cu built up by drawing a number of tubes over a solid core and then drawing through dies of different angle showed that all the layers undergo a proportionate reduction in area. Reduction was found to commence and to finish earlier nearer the centre of the rod. Through dies tapering at 5° the tensile strength/reduction of area curve of Cu is approx. rectilinear for reductions up to 15% and above this forms part of a rectangular hyperbola. The max. reduction possible at a single draft from annealed rod is about 56%, and successive drafts with 40% reduction can be effected. C. A. KING.

Work-hardening capacity and elongation properties of copper. H. O. NEILL and J. W. CUTHBERTSON (Inst. Metals, Sept., 1931. Advance copy, 17 pp.).—Specimens of H.-C. copper (> 99.92% Cu) have been reduced 0—60% at one pass by cold-rolling. After ageing for 6 yrs. at room temp., tensile and indentation tests have been made which have been followed by attempts to deduce values for the work-hardening capacity from the results of the tests. It is found that reliable criteria of this property are afforded by the "uniform elongation" val., the "extensibility," and the elongation on $\leq 15\sqrt{A}$. In the main the results indicate a great loss in cold-working capacity in the first 25% reduction by rolling. E. H. BUCKNALL.

Physical testing of copper and copper-rich alloys in the form of thin strip. M. COOK and E. C. LARKE (Inst. Metals, Sept., 1931. Advance copy, 17 pp.).—Tensile tests on strip material (H.-C. copper, 95:5 Cu:Zn, 70:30 Cu:Zn, 64:36 Cu:Zn, and 80:20 Cu:Ni) of thickness ≤ 0.02 in. gave consistent results, both in the annealed state and after various degrees of cold-rolling. Test results on material 0.01 in. thick were not reliable. Hardness vals. given by the Vickers diamond indentation test appeared more valuable than other hardness measurements. Cupping tests do not give sufficiently easily understandable results for use in specifications. The tabulated results of tensile and hardness tests indicate the average performance of good commercial materials. E. H. BUCKNALL.

Flotation of copper oxide ores. DAVIDOVICH and N. M. LUBMAN (Tzvet. Met., 1930, 5, 977—991).—Sulphurisation produces a thin film of sulphide which permits separation by flotation (yield 60—83% Cu).

CHEMICAL ABSTRACTS.

Use of magnesite in the copper-melting furnaces of the Krasny Vyborjets plant. D. D. VOIEIKOV (Tzvet. Met., 1930, 5, 1039—1048).—Despite sensitivity to variations in temp. and to discontinuity of expansion, successful use is recorded.

CHEMICAL ABSTRACTS.

Hydrometallurgical treatment of Ural nickel ores. G. G. URAZOV and M. M. ROMANOV (Tzvet. Met., 1930, 5, 1136—1144).—Ni may be extracted from washed ores containing 0.9—5.68% Ni by means of gaseous SO₂ or SO₂ solution. CHEMICAL ABSTRACTS.

Refining of zinc obtained by distillation at Alagir. N. P. ASEEV, V. V. DOLIVO-DOBROVLSKI, and B. F. GRASHCHENKO (Tzvet. Met. Suppl., 1930, 5, No. 5, 1—40).—The best liquation temp. is 450°. The rate of separation of Pb increases with decrease in the Fe content. A second liquation affords no appreciable improvement. By liquation the Pb content can be reduced to 0.83% and the Fe to 0.028%. No solid solution of Fe in Zn was observed; the microstructure showed the formation of crystals of FeZn₇ when the Fe content exceeded 0.06%. Redistillation may reduce the Fe content to 0.05%. Cd can be removed only by fractional distillation.

CHEMICAL ABSTRACTS.

Effects of cold-rolling and of heat-treatment on some lead alloys. H. WATERHOUSE and R. WILLOWS (Inst. Metals, Sept., 1931. Advance copy, 23 pp.).—Cold-rolling of Pb alloys with small quantities of Sn, Sb, or Cd increases the hardness of initially soft alloys and decreases that of initially hard alloys, so that alloys having a Brinell hardness of 5—18 in the cast condition have a hardness of 8—11 after rolling, and this may be further reduced to 6—8 by storage at the ordinary temp. The rate of self-annealing depends on the composition of the alloy and the temp., alloys containing Sn softening rapidly, whilst those containing Sb alone or Sb and Cd soften only slowly. The latter class of alloys age-harden after quenching from 240°, whereas those containing Sn or Sn and Cd age-harden only slightly and temporarily after this treatment. Cold-rolling hardens soft aged alloys and softens age-hardened alloys. Alloys most susceptible to age-hardening contain 2—3% Sb, 1%

Cd + 2% Sb, or 1.5% Cd + 0.5% Sb; they all age-harden after casting in chill moulds. As the mechanical properties of these alloys are equal to those of Pb-Sb alloys with 5—12% Sb, it is suggested that they may be more serviceable for accumulator grids than the alloys with higher Sb. A. R. POWELL.

Spectrographic assay of some alloys of lead. D. M. SMITH (Inst. Metals, Sept., 1931. Advance copy, 15 pp.).—By direct comparison of the spark spectra of Pb alloys containing Sb, Cd, or Sn, alone or together, with the spark spectra obtained from standard alloys containing known amounts of these elements, results with an accuracy of $\pm 10\%$ are obtained when the constituents are present in the range 0.1—1%. Application of the logarithmic sector method to alloys containing up to 3% Sn gives results within the same range of accuracy. A. R. POWELL.

Reduction of lead carbonate ores by means of gases. V. A. VANYUKOV, N. N. MURACH, and P. K. PIGROV (Tzvet. Met., 1930, 5, 1145—1150).—H₂ reduces the enriched (60% Pb) ore more rapidly and at a lower temp. than CO, but fritting and slagging take place more rapidly with CO. CHEMICAL ABSTRACTS.

Micro-determination of lead dust in factories. K. P. KHOKHRYAKOV (Arb. Leningrad Inst. Gewerbehyg., 1930, 3, No. 4, 13—26).—Unless members of group III are present (error 20%) colorimetric determination, using the Arnold-Menzel-Trillat reagent, is recommended. Most accurate results are obtained by determining the Pb as PbI₂, PbCrO₄, or K₂CuPb(NO₃)₆.

CHEMICAL ABSTRACTS.

Determination of tin in antifriction alloys. A. A. BOCHVAR and V. N. MASLENNIKOV (Tzvet. Met., 1930, 5, 500—503).—Reduction is rapidly effected with Cd; the end-point of the titration is sharp.

CHEMICAL ABSTRACTS.

Determination of silver in gold bars. F. MICHEL (Chem.-Ztg., 1931, 55, 731—732).—Results of 95 assays of alloys of electrolytic Au, Ag, and Cu in various proportions showed errors varying from —12.6 to +9.6 in the Ag content, low amounts being obtained with low, and the reverse with a high, Au content. The high Ag results were due to persistence of Pb, and were reduced, but still appreciably high, when the Pb was decreased, whilst altering the temp. of cupellation also reduced the errors in the Ag content. To compensate for these errors, it is necessary to make a preliminary assay and then conduct a test on an alloy of the proportions found, so as to obtain a correction factor. W. J. WRIGHT.

Conditions that cause changes in the composition of plating baths, and possible remedies. F. C. MATHERS (Monthly Rev. Amer. Electroplaters' Soc., 1929, 16, No. 12, 9—24).—To avoid irregular corrosion, the anode should be very pure and thoroughly annealed; Zn and Cd should be amalgamated. Fe should be excluded. Excess of free acid, cyanide, etc. should be minimal. High c.d. is preferable, and stirring is advantageous when anode corrosion is poor.

CHEMICAL ABSTRACTS.

Effect of presence of nitric acid in chromium-plating baths. N. P. LAPIN and L. N. GOLTZ (J. Appl.

Chem., Russia, 1930, 3, 1151—1153).—A higher c.d. and more current are required, and a dull greyish deposit is obtained.

CHEMICAL ABSTRACTS.

Chromium-plating of pure aluminium and its alloys. K. ALTMANNBERGER (Chem.-Ztg., 1931, 55, 709—710).—The Al article is first cleaned by a cathodic pickle in dil. alkali to remove grease, and then immersed in a conc. solution of ZnO in NaOH, whereby it becomes coated with a smooth, bright, adherent film of Zn. After rinsing in cold H₂O, the article is plated with Ni in a bath containing 100 g. of NiSO₄·7H₂O, 150 g. of Na citrate, 150 g. of Na₂SO₄·10H₂O, 100 g. of H₃BO₃, and 250 g. of citric acid per litre. Finally the article is plated with Cr in any of the usual CrO₃ baths.

A. R. POWELL.

Analysing chromium[-plating] solutions. J. L. NEWELL and W. H. KEEFE (Metal Ind., N.Y., 1931, 29, 206—207).—A complete scheme for the determination of CrO₄^{''}, Cr^{'''}, SO₄^{''}, Cu^{''}, Fe^{'''}, Ni^{''}, and Zn^{''} in such solutions is given.

CHEMICAL ABSTRACTS.

Zinc plating. R. W. RICE (Monthly Rev. Amer. Electroplaters' Soc., 1930, 17, No. 1, 29—33, 35).—Acid and cyanide electro-galvanising baths are specified.

CHEMICAL ABSTRACTS.

Protection of magnesium alloys against corrosion. H. SUTTON and L. F. LE BROCCQ (Inst. Metals, Sept., 1931. Advance copy, 20 pp.).—Metal coatings applied by calorising, sherardising, metal-spraying, or electrodeposition of Zn or Cu fail to increase the resistance of Mg to sea-water. Immersion of the cleaned metal in solutions of chromates or dichromates effects substantial improvement, particularly if supplemented by a cellulose enamel. A preferred bath contains 1.5% of K₂Cr₂O₇, 1% of potash alum, and 0.5% of NaOH and is used at 95°. Lanoline was effective as a film on the metal, but does not allow of an enamel over-coating. Cleaning Mg by means of dil. HNO₃ results in considerable dimensional losses, and finely-machined fittings should be treated with hot NaOH.

C. A. KING.

Rapid determination of arsenic in white metals. K. L. ACKERMANN (Chem.-Ztg., 1931, 55, 702).—The alloy is dissolved in HNO₃, the solution evaporated to dryness, the residue heated to decompose nitrates, and the resulting oxides are distilled with conc. HCl and Cu₂Cl₂. The As in the distillate is determined with I in the usual way.

A. R. POWELL.

Relative safeties of mild and high-tensile alloyed steels under alternating and pulsating stresses. B. P. HAIGH (Proc. Chem. Eng. Group, 1929, 11, 9—19).

Caustic embrittlement. W. S. COATES (Proc. Chem. Eng. Group, 1930, 12, 142—146).

Treatment of flotation concentrates preparatory to zinc smelting. S. ROBSON (Proc. Chem. Eng. Group, 1929, 11, 58—71).

Welding in chemical works. J. R. BOOER (Proc. Chem. Eng. Group, 1930, 12, 80—89).

CuSO₄ from Cu ores etc.—See VII. **Varnishes on phosphatised Fe.**—See XIII.

PATENTS.

Open-hearth furnace. R. L. LEVENTRY (U.S.P. 1,798,611, 31.3.31. Appl., 8.4.21).—Air is drawn from any convenient point in the uptake from the regenerator by means of a high-pressure steam or air nozzle and is directed into the gas port. The fuel gas is delivered from the sides immediately in front of the air delivery, and so an intimate contact of the gases results in a short intensive flame.

C. A. KING.

Open-hearth furnace. S. H. MCKEE (U.S.P. 1,798,618, 31.3.31. Appl., 24.6.21).—For the better contact of air and fuel gas the forward ends of the air ports lying on either side of the gas port are divided by a partition. When supplying air to the furnace, a hinged deflector diverts the air to the sub-channel nearest to the gas port, and when the furnace is reversed the deflector lies in a recess in the furnace wall and allows the full area of the port for the passage of the flue gases.

C. A. KING.

Down-blast oil-smelting furnace. M. S. ROGERS, Assr. to F. E. KENNEDY (U.S.P. 1,799,643, 7.4.31. Appl., 6.2.29).—The inner walls of a stack furnace of increasing dimensions towards the bottom are provided with a continuous, well-defined, helical recess in which burners are arranged at different positions. The stack discharges into a converter chamber which connects with the main chimney.

C. A. KING.

Reduction [of ores] and reducing furnaces. S. L. MADORSKY, Assr. to GATHMYS RES. CORP. (U.S.P. 1,796,871, 17.3.31. Appl., 3.3.28).—Reducing gases are passed through a molten ore, e.g., Fe₃O₄, in a relatively deep hearth and then over molten ore in a shallow hearth partly to reduce it and maintain the temp. Ore is conveyed from the shallow to the deep hearth for final reduction by means of a connecting duct.

C. A. KING.

Metal-recovering furnace. T. D. STAY and H. O. BURROWS, Assrs. to ALUMINUM CO. OF AMERICA (U.S.P. 1,797,276, 24.3.31. Appl., 25.6.26).—The hearth of a closed furnace chamber extends outside the furnace to form two exposed portions for the rapid submersion of a scrap-metal charge and for the removal of slag. Burners near to the top of the side wall direct the flame in an inclined direction on to the metal, thus causing agitation of the bath; the spent gases leave on the same side as, but at a lower level than, the burners. Mechanical means are provided for submerging the scrap metal.

C. A. KING.

Metals-reduction bomb. W. P. KIERNAN, Assr. to WESTINGHOUSE LAMP Co. (U.S.P. 1,795,780, 10.3.31. Appl., 25.4.28).—For the reduction of difficultly-reducible metals, e.g., Th, by the Ca-CaCl₂ method, a cylindrical bomb of Ni-Cr-Fe alloy is used. A ground tapered stopper capable of being hermetically sealed permits the insertion of a "pure" Fe liner which contains the charge and proves the most resistant to the corrosive action of the reducing process.

C. A. KING.

Manufacture of briquettes or non-moulded lumps of comminuted minerals [iron ore] for metallurgical purposes. L. L. SIMPSON, Assr. to NEW ERA IRON & STEEL CORP. (U.S.P. 1,729,496, 24.9.29. Appl., 15.11.23).—Fine Fe ores are briquetted with a binder

comprising 2—3% of kieselguhr, 0.5—1% of NaOH, 0.5—1.25% of $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$, and 9—12% of H_2O , based on the wt. of ore. A. R. POWELL.

Manufacture of cast iron articles. FORD MOTOR CO., LTD. (B.P. 356,795, 6.6.30. U.S., 21.6.29).—Valve tappets are made of Fe containing 3.4—3.7% C, 2.5—2.9% Si, <0.1% S, 0.4—0.48% P, and 0.6—0.8% Mn, cast in chill moulds, annealed at 925—955°, machined to shape, and hardened by oil-quenching from 845—955°. A. R. POWELL.

Utilising scrap iron by welding whilst avoiding loss by burning. T. GOLDSCHMIDT A.-G. (B.P. 356,652, 13.3.31. Ger., 26.3.30).—The scrap is formed into bundles which are heated to welding temp. in a bath of Na silicate slag and then welded by shingling, hammering, or rolling. A. R. POWELL.

Articles made from steel alloys capable of resisting chemical attack. F. KRUPP A.-G., and H. KOPPERS A.-G. (B.P. 356,264, 5.6.30. Ger., 13.6.29).—Articles resistant to H_2SO_4 , SO_2 , and thiosulphate solutions are made from steel containing 17—40 (17—19)% Cr, 25—6 (8—10)% Ni, 0.02—0.5 (0.02—0.2)% C, and 0.2—3% Mo. The articles are rendered passive by annealing at 950—1200° and quenching in H_2O . A. R. POWELL.

Silicon steel. V. B. BROWNE (U.S.P. 1,784,811, 16.12.30. Appl., 13.2.30).—Scrap Fe is melted in an electric furnace and refined to remove completely the Si and most of the C; it is then covered with a fused slag containing 70% CaO and 30% Al_2O_3 and treated with several additions of a mixture of Al powder and CaO to remove O and S. The requisite quantity of ferro-silicon is then added to give a steel with 3.5—4.5% Si, and after removing the slag the metal is cast. Sheet prepared from the castings is very ductile and has a high permeability. A. R. POWELL.

[Nickel-iron] magnetic alloys. CALLENDER'S CABLE & CONSTRUCTION CO., LTD., and S. BECKINSALE (B.P. 355,456, 14.7.30).—High-permeability magnetic alloys comprise 25—80% Ni, 15—60% Fe, 0.05—10% Ag, <10% Cu, and 0.1—10% Mn. For wire and strip the alloy contains 78% Ni, 21—1% Fe, 0.05% Cu, 0.7% Mn, and 0.1% Ag, and for dust cores either (a) 77% Ni, 20% Fe, 0.05% Cu, 0.75% Mn, 2% Ag, and 0.2% Si, or (b) 37.5% Ni, 57% Fe, 1% Cu, 0.5% Mn, 3% Ag, and 1% Si. A. R. POWELL.

Concentration of [copper silicate] minerals by froth flotation. L. W. FERRIS (U.S.P. 1,784,280, 9.12.30. Appl., 11.12.28).—The ore is heated to redness, cooled, ground, and subjected to flotation in the usual way. A. R. POWELL.

Lead-calcium alloys for sheathing cables. STANDARD TELEPHONES & CABLES, LTD., Assees. of G. M. BOUTON (B.P. 356,801, 12.6.30. U.S., 30.10.29).—Pb alloys with 0.02—0.1% Ca are extruded at above 225°, cooled rapidly, and aged to have a tensile strength below 4500 lb./sq. in. A. R. POWELL.

Coating of metal bodies with tungsten bronzes and/or molybdenum bronzes. EGYESÜLT IZZO-LAMPÁ ÉS VILLAMOSSÁGI RÉSZVÉNYTÁRSASÁG (B.P. 355,334, 22.5.30. Hung., 23.12.29).—The metal article

is made the cathode in a hot conc. solution of an alkali or alkaline-earth metal salt of a meta- or poly-tungstic and/or molybdic acid, e.g., $\text{BaW}_4\text{O}_{13} \cdot 9\text{H}_2\text{O}$.

A. R. POWELL.

Electrodeposition of chromium. R. AUERBACH, ASSR. to CHROMEPLATE, INC. (U.S.P. 1,730,349, 8.10.29. Appl., 22.6.27. Ger., 30.6.26).—Cr-plating baths are treated with a small proportion of a salt of an acid having a dissociation const. less than the first dissociation const. of H_3PO_4 , e.g., CrPO_4 or an oxalate or acetate.

A. R. POWELL.

Electroplating of aluminium and its alloys. AUTOMATIC TELEPHONE MANUFG. CO., LTD., C. A. VELARDE, and E. SMITH (B.P. 356,443, 20.8.30).—The Al article is cleaned first in an alkaline bath, then in dil. acid, and finally plated with Ni in any suitable bath. The plated article is heated for 10—15 min. in a non-oxidising atm. at 475—525°. After cooling, the surface may be polished and plated with Cu or Cr.

A. R. POWELL.

Handling furnace residues. Solutions for storage vessels etc.—See I. Furnace for coal analysis. Lubricant [for die-drawing]. Slushing grease.—See II. Smelting furnace. Crucibles for fused electrolytes.—See XI.

XI.—ELECTROTECHNICS.

Electric furnaces for heat treatment. A. G. LOBLEY (Proc. Chem. Eng. Group, 1930, 12, 90—95).

Kiering processes.—See VI. Analysis of hypochlorites. $\text{K}_3\text{Fe}(\text{CN})_6$.—See VII. Plating baths. Zn. Cr on Al.—See X.

PATENTS.

Electric furnace for smelting of metals. E. F. RUSS (U.S.P. 1,793,137, 17.2.31. Appl., 26.3.30. Ger., 12.3.29).—An electric furnace for smelting metals in grooves filled with liquid metal and ending above in a hearth space, co-operating with a conducting bridging web having tubular projections on the side turned away from the groove mouth and provided with slits at its lower end, is claimed. J. S. G. THOMAS.

[Electric] furnace. J. F. BAKER, ASSR. to WESTINGHOUSE ELECTRIC & MANUFG. CO. (U.S.P. 1,795,921, 10.3.31. Appl., 23.6.26).—A motor-driven conveyor arranged within an annular chamber carries a number of pivotally-mounted hearths, and tilting means are arranged to tilt each hearth when it arrives opposite the outlet and to operate only when the driving motor is inactive. J. S. G. THOMAS.

Induction furnace. P. H. BRACE, ASSR. to WESTINGHOUSE ELECTRIC & MANUFG. CO. (U.S.P. 1,795,926, 10.3.31. Appl., 27.7.26).—The furnace comprises a crucible arranged within an induction coil in the direct path of the magnetic axis of the coil, a cylindrical core member composed of metallic, magnetic, radially-spaced laminations arranged outside the coil, and means for arch-binding the laminations. J. S. G. THOMAS.

Crucibles for electrolysis of fused electrolytes. H. BARON, From SIEMENS & HALSKE A.-G. (B.P. 357,032, 23.12.30).—Radial, internal wall channels and intercommunicating transverse channels are arranged

in the wall of a conducting crucible, *e.g.*, of graphite, which is closed by a hollow metal plate through which air or other cooling fluid can be circulated.

J. S. G. THOMAS.

Manufacture of oxide cathodes for electric-discharge tubes. EGYESÜLT IZZOLÁMPA ÉS VILLAGMOSZÁGI RÉSZVÉNYTÁRSASÁG (B.P. 356,715, 6.6.30. Hung., 23.12.29).—A core, *e.g.*, of W, Mo, or Ni, is coated with W- and/or Mo-bronze, *e.g.*, by electrolysis of BaW_3O_9 , prior to deposition of alkaline-earth metal vapour on the core.

J. S. G. THOMAS.

Luminous electric-discharge tubes. CLAUDE NEON LIGHTS, INC., Asses. of L. L. BECK (B.P. 356,745, 5.6.30. U.S., 30.11.29).—A gas-discharge tube having a thermionic cathode, *e.g.*, a hollow Cu, Fe, or Ni cylinder or cone coated with Ba suboxide, supplied with current corresponding to a discharge c.d. of 0.03—1.25 amp. per sq. cm. of tube cross-section, and a gas filling composed of He and not more than 8% of Ne, together with not more than 0.5% of A, Kr, or Xe, is claimed.

J. S. G. THOMAS.

[Electrodes for gas-filled] luminous tube. J. E. GROSS (U.S.P. 1,797,683, 24.3.31. Appl., 28.6.29).—A powdered mixture composed of a metallic nitrate, *e.g.*, $Ti(NO_3)_4$, and graphite is covered with a sol. silicate, *e.g.*, Na silicate, and heated electrically on a support to form a solid mass.

J. S. G. THOMAS.

[Low-pressure] electron-emission device. S. RUBEN, Assr. to RUBEN PATENTS Co. (U.S.P. 1,799,645, 7.4.31. Appl., 27.11.26).—The cathode consists of a fused and cast mixture of Fe_3O_4 , Cr_2O_3 , and SrO.

J. S. G. THOMAS.

Electric-discharge devices. SCHERING-KAHLBAUM A.-G. From C. SPAETH (B.P. 356,689, 3.3.30. U.S., 2.3.29).—A gas-filled discharge device comprising regulatable electrical means for evaporating into the gas, *e.g.*, Ne, and maintaining a supply of a monatomic material, *e.g.*, Hg, from a side chamber away from the path of the main discharge, whereby the light emitted is maintained of any desired const. colour, is claimed.

J. S. G. THOMAS.

Manufacture of electric incandescence lamps etc. L. D. LOCKWOOD, Assr. to WESTINGHOUSE LAMP Co. (U.S.P. 1,795,785, 10.3.31. Appl., 4.2.29).—Oxidation of enclosed metal parts of the lamp is prevented by introducing into the envelope during the baking process a reducing gas, *e.g.*, a mixture of N_2 , H_2 , and CO prepared from water-gas, which is reactive below 450°.

J. S. G. THOMAS.

[Electrode for] photoelectric cells. N. V. PHILIPS' GLOEILAMPENFABR. (B.P. 356,895, 5.8.30. Holl., 26.2.30. Addn. to B.P. 319,650; B., 1930, 775).—An alkali metal, *e.g.*, Cs, deposited upon a unimol. layer of a compound, preferably an alkali-metal oxide, *e.g.*, Cs_2O , is claimed.

J. S. G. THOMAS.

[Internal coating for] photoelectric cells. STANDARD TELEPHONES & CABLES, LTD. From MATÉRIEL TÉLÉPHONIQUE (B.P. 356,802, 12.6.30).—Alkali metal, *e.g.*, K, introduced into the interior of the wall of the bulb by electrolysis of a molten alkali-metal salt contained within the bulb immersed in a bath of similar molten salt, is liberated from the wall on to the internal

surface of the bulb by reversing the direction of electrolysis. Preferably, the internal surface of the wall is coated with Mg by evaporating Mg in an atm. of H_2 within the bulb, before the direction of electrolysis is reversed.

J. S. G. THOMAS.

[Gas filling for] photoelectric cells. GRAMOPHONE Co., LTD., and W. F. TEDHAM (B.P. 356,747, 5.6.30).—The filling consists of Xe and/or Kr, at a pressure of 80 μ or less of Hg.

J. S. G. THOMAS.

Effecting chemical reactions between gases. F. LECHLER, Assr. to INTERNAT. PRECIPITATION Co. (U.S.P. 1,796,110, 10.3.31. Appl., 13.9.27. Ger., 24.11.26).—Apparatus for passing gases through a silent electric discharge and in contact with a catalyst, and for maintaining such a relation between the direction of the discharge and the position of the catalyst that the electric wind due to the discharge tends to move the gases into contact with the catalyst, is claimed.

J. S. G. THOMAS.

Electrical precipitators [for separation of suspended particles from gases]. H. A. WINTERMUTE and C. W. J. HEDBERG, Assrs. to RESEARCH CORP. (U.S.P. 1,798,511 and 1,798,964, 31.3.31. Appl., [A] 4.5.26, [B] 1.5.29).—(A) The apparatus comprises a collector electrode assembly of the graded-resistance type composed of parallel plates with embedded rods the ends of which project beyond the vertical ends of the plates, and an end wall at each side of the group of parallel plates and co-operating therewith to define a number of gas passages. (B) Gases are subjected to the action of the electric discharge, first in the absence of electrode-flushing liquid and then with the collecting electrodes flushed with H_2O . A form of collecting electrode and supports therefor are claimed.

J. S. G. THOMAS.

Protection of electrical apparatus. M. BUCHHOLZ (U.S.P. 1,796,746, 17.3.31. Appl., 29.10.27. Ger., 2.11.26).—Gases or vapours produced by decomp. of insulating material diffuse through a porous wall into a chamber separated from the apparatus to be protected, and create therein a change of physical conditions, *e.g.*, of temp. or pressure, whereby an electrical circuit including an alarm or cut-out is closed.

J. S. G. THOMAS.

[Cathode-ray] electric-discharge tubes. TELEFUNKEN GES. F. DRAHTL. TELEGRAPHIE M.B.H. (B.P. 356,978, 22.10.30. Ger., 9.11.29).

High vacua in valves.—See I. C_2H_2 . Boilers for tar etc.—See II. NH_3 . $(NH_4)_2SO_4$.—See VII. Apparatus for making glass. Insulators for sparking plugs.—See VIII. Magnetic alloys. Alloys for cables. Coating metals with bronzes. Cr- and Al-plate.—See X. Irradiation of milk. Preservation of substances.—See XI. Synthesis of vitamins.—See XX.

XII.—FATS; OILS; WAXES.

Cacao butter. VIII. Use of interferometry in fat analysis. H. P. KAUFMANN (Chem. Umschau, 1931, 38, 265—267; cf. B., 1931, 934).—Interferometric measurements emphasise small differences in n_D . Pressed cacao butters (n_D^{40} 1.4570—1.4575) showed differences of —50 to +46 scale divisions from an arbitrary zero val.

("Stollwerk" expressed fat). Extracted fats (cf. B., 1931, 123) gave readings +430 to +512 and mixtures of extracted and expressed fats (having normal chemical characteristics) +80 to +410. Although useful, the test cannot therefore detect with certainty small additions of extracted fat to pressed fats with vals. near the upper limits. E. LEWKOWITSCH.

Crismer's index and the critical temperature of solubility of fats in alcohol of varying concentration. E. DE'CONNO and L. FINELLI (Annali Chim. Appl., 1931, 21, 365—373).—The Crismer index must be determined with EtOH the sp. gr. of which has been determined by means of the crit. temp. of solubility, using a mixture of mineral oil and vaseline. The correction to be applied for obtaining the correct Crismer index with EtOH of varying concentration is not a const., but is a variable which is not proportional to the % of H₂O. The validity of the correction proposed by Crismer for the acidity of the fat is confirmed. O. F. LUBATTI.

Factors influencing the choice of textile soaps. W. GARNER (Ind. Chem., 1931, 7, 409—413).—The technical properties of soaps, sulpho-compounds, etc. are discussed. E. LEWKOWITSCH.

Analysis of refined [olive] oils. II. Second-treatment oils. G. MAROGNA (Ann. R. Staz. Chim. Agrar. Sperim., 1931, Pubbl. No. 277, 329—348).—Fifteen "sansa" or second-treatment olive oils have been analysed. In general, their sp. gr. exceeds that of expressed oil; the refractometer reading is often above 63 or, for superior qualities, 64 and the Tortelli thermo-sulphuric val. is frequently above 50. The Blarez test for arachis oil mostly results in a cryst. and often partly gelatinous ppt., which adheres to the glass vessel. With the Bellier test for arachis oil a pulverulent cryst. ppt. is formed at temps. above 18° and a persistent opalescence above 40°. The I and sap. vals. are near the lower limiting values for the expressed oils and unsaponifiable matter is in larger proportion. Tests of general character, based on treatment of the oils with strong acids, give the same indications as mixtures of olive and seed oils. The Fachini-Morawski test is of value for the identification of extracted oils, either alone or mixed in large proportion with expressed oils, but becomes less definite for small proportions of the extracted oils. Under Wood's light most second-treatment oils show bluish colour and fluorescence, but refined expressed oils cannot be distinguished from refined second-treatment oils in this way. T. H. POPE.

Cooking of tung oil. E. FONROBERT and C. BOLLER (Farben-Ztg., 1931, 36, 2196—2197, 2239—2240; 37, 15—17).—In an investigation of the suitability of tung oils for use in varnish, the parabolic relation between temp. and time of gelation showed that below 200° and above 280° gelation is excessively slow and rapid, respectively. Samples of tung oil were therefore heated to gelation point under standard conditions at 10° intervals between these two temp., portions being withdrawn from the bulk at appropriate intervals during the heating at each temp. and tested for sp. gr., n_D , and viscosity. Tabulated results are given and graphed against time. The "Albertol number," a new

criterion devised for tung oil stand oil, is the wt.-% of Albertol 111L that has to be added to the oil (to which 0.1% of Co as resinate has been added) in order to give a non-frosting film when stoved in the oven described in British Standard Specification 256. This test, when applied to the above oils, showed that the most desirable oil from the point of view of varnish making is one obtained by brief heating at 280°. S. S. WOOLF.

Composition of Philippine kapok-seed oil. A. O. CRUZ and A. P. WEST (Philippine J. Sci., 1931, 46, 131—137).—Pods of *Ceiba pentandra*, Gaertner, consist of 17% of a superior floss and 32% of seeds, yielding about 25% of oil on pressing. The clear oil obtained (after treatment with kieselguhr, Suchar, and talc powder) had d_4^{20} 0.9109, n_D^{30} 1.4678, I val. (Hanus) 95.6, sap. val. 192.1, unsaponifiable matter 0.78% (I val. 82.4), acid val. 7.39, saturated acids (Pb salt-Et₂O method) 18.64% (corr.), unsaturated acids 75.71% (corr.) (I val. 123.9). The composition of the oil is given as: acids %: myristic 0.46, palmitic 15.17, stearic 2.23, arachidic 0.79, oleic 47.68, linoleic 28.03. The Halphen reaction is positive.

E. LEWKOWITSCH.

Changes in dispersions of sulphonated oils on heating. W. SCHINDLER and E. RÖMER (Collegium, 1931, 349—358).—5% emulsions of a sulphonated fish oil remained stable even after heating for 1 hr. at 100°, but 12% emulsions were completely broken down. Emulsions of 2 pts. of sulphonated oil and 1 pt. of mineral oil were stable to heat at all concentrations. Stability to heat was increased by adding NH₃ to the oil or the H₂O, but the dispersed oil was not so fine when NH₃ and oil were emulsified as with the oil alone. The greatest degree of dispersion was produced by oil in dil. aq. NH₃, but not by mixtures of mineral and sulphonated oils. Dispersions of a highly sulphonated castor oil were only slightly affected by heat, but dispersions of this with mineral oil were stable to heat treatment only at considerable dilution. A lightly sulphonated oil (neatsfoot) was very sensitive to heat; a 5% emulsion separated at 60°. In some cases the degree of dispersion and heat-stability were diminished by adding NH₃. A greater improvement was produced by mixing the NH₃ with the oil than by dispersing the oil in dil. aq. NH₃. D. WOODROFFE.

Coconut oil industry. A. E. WILLIAMS (Engineering, 1931, 132, 481—484).

Petroleum soap. Naphthenic acid soaps.—See II. CO from paint.—See XIII. Fat of frozen bacon. **Rancidity changes in fats.** Determining fat in ice cream.—See XIX.

PATENTS.

Apparatus for treating soya beans. T. SATOW (U.S.P. 1,799,256, 7.4.31. Appl., 23.1.26).—In order to preserve the proteins in the cake, the (cracked) seed is dried by hot air until the H₂O content is reduced to 12.5—13% before extracting with light petroleum at not above 45° in a steam-heated rotary drum (details given). The solvent is removed from the extracted meal by hot dry air, the temp. being raised to 115—120°.

E. LEWKOWITSCH.

Oleic acid [*n*-butyl] ester. W. J. BANNISTER, ASSE. TO COMMERCIAL SOLVENTS CORP. (U.S.P. 1,796,231, 10.3.31. Appl., 16.5.30).—Oleic acid is esterified with *n*-BuOH in the presence of a catalyst, preferably H_3PO_4 . The product is purified by washing, distillation, etc. *n*-Bu oleate has boiling range (10–18 mm. Hg) 235–245°, f.p. –12° (opaque) or –26.4° (solid), d_{20}^{20} 0.864, I val. 58.3, sap. val. 134.0. E. LEWKOWITSCH.

Improved soap. D. DE NAGY (B.P. 356,847, 27.6.30).—The mash prepared by treating potatoes with dil. H_2SO_4 , pressing, and neutralising with dil. alkali is boiled with (15%) alkaline lye until it becomes saponaceous; a small amount (*e.g.*, 8%) of palm oil and more lye containing 5% of NEt_4OH are added and saponification is completed by further boiling. Casein and aq. NH_3 may be added. E. LEWKOWITSCH.

Lubricants. Slushing grease.—See II. Washing etc. agents.—See III. Material for coating paper.—See V. Castor oil condensation product.—See XIII.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

“Chalking” of paint [films]. C. P. VAN HOEK (Farben-Ztg., 1931, 36, 737–738).—Wagner's views on the cause of chalking are criticised. The assumption of a mechanical effect due to pigment-rich surface layers is considered untenable, the existence of such homogeneous strata (postulated also by Wolff and Blom) being queried. The non-chalking of aluminium paint is instanced in this connexion. The author attributes chalking entirely to weathering of the binding vehicle, and denies that chalking can be regarded in any case as a source of durability, on the grounds that a chalking surface is always water-absorbent etc. He further disagrees with Wagner on the relation of “wetting of pigments” to chalking, and instances the chalking of oleophilic white lead and the non-chalking of the more oleophobic zinc oxide as arguments against the view that a well-wetted pigment will not yield a chalking surface layer. The effect of ultra-violet light is also discussed (*cf.* B., 1931, 259). S. S. WOOLF.

Determination of carbon monoxide produced from paint in confined spaces. F. H. NEWINGTON (J.S.C.I., 1931, 50, 371–375 T).—Following a fatal accident in a “bulge” on board one of H.M. ships, an investigation was made into the possibility of the presence of CO in the atm. of confined spaces generally on board ships. An apparatus was devised for the determination of small amounts of CO by the I_2O_5 method which could be used *in situ*. Appreciable amounts, reaching a concentration of 0.2%, were found, particularly in freshly painted spaces, and subsequent investigation showed that the CO was derived from the linseed oil of the paint during drying. The atm. in a sealed empty drum which had contained boiled linseed oil was found to contain over 0.3% CO and to be almost entirely deficient in O_2 .

Aluminium stearate in paint technology. H. WOLFF and J. RABINOWITZ (Farbe u. Lack, 1931, 36, 428–429).—A general account is given of the functions of Al stearate (*a*) as a pigment-suspending agent, *e.g.*, for retarding the setting of Pb_3O_4 , (*b*) in reducing the oil absorption of pigments, leading to improved rust-resist-

ance of paints made therefrom (particularly if the stearate be mixed with a little white spirit before incorporation with the pigment), and (*c*) as a “matting” agent in varnish, in which connexion, although an improvement in the H_2O -resistance of an ester gum varnish was noted, statements that Al stearate improves varnishes containing acid resins, *e.g.*, rosin, were not confirmed. S. S. WOOLF.

Weatherproof paints. W. VAN WÜLLEN-SCHOLTEN (Farben-Ztg., 1931, 36, 2084–2085).—The use of paints based on Na_2SiO_3 is adversely criticised. The disadvantages of such paints include poor resistance to the acids in the air of industrial regions, presence of $CaCO_3$ as usual pigment for cheapness, restriction of range of coloured pigments that may be used owing to the alkalinity of the vehicle, tendency to bloom, etc. S. S. WOOLF.

Evaluation of “chalking” of paint [films]. R. KEMPF (Farben-Ztg., 1931, 36, 2158–2159).—A reply to Wolff's recent criticism (B., 1931, 895) of the evaluation of chalking data by integration of results. Whilst the limitations of the procedure are admitted, it is pointed out that although chalking is a continuous process the main effects are seasonal and the time intervals used in Kempf's current experiments are short enough to enable any significant changes to be recorded. The relations between loss of wt. and degree of chalking are also briefly discussed. S. S. WOOLF.

Comparative investigation of driers. ANON. (Farben-Ztg., 1931, 36, 2200–2201).—A summary is given of a publication by H. WOLFF on the behaviour of driers, with special reference to the different forms in which they are encountered, *e.g.*, resinates, linoleates, “soligenates,” the last-named showing advantages particularly over resinates. The drying action on linseed oil under various conditions of humidity and temp., the alteration of drying power with storage of the “boiled oil,” the effect on stand oil, the influence of light irradiation, the effects of driers on swelling and the mechanical properties of the films, etc. receive consideration. S. S. WOOLF.

Ink tests. O. MEZGER, H. RALL, and W. HEES (Z. angew. Chem., 1931, 44, 645–651).—For the detection of Cr in ink-writing the latter is destroyed with NaOCl solution containing $BaCl_2$, whereby $BaCrO_4$ is deposited on the paper in place of the ink marks; treatment of the paper with a solution of diphenylcarbazine and HCl in EtOH restores the writing in a violet tint. Cl' is detected in the ink by treating the writing with HNO_3 containing $AgNO_3$ and $NaNO_2$ or $KMnO_4$ to destroy the colouring matter; after washing with dil. HNO_3 , the paper is immersed in alkaline CH_2O or in alkaline $Na_2S_2O_4$, when the $AgCl$ first formed is reduced to black Ag. A similar method is used for detecting SO_4^{2-} by converting it into $PbSO_4$ and then into PbS. The Fe compounds may be removed from ink-writing by treatment with HCl and $BaCl_2$; the $BaSO_4$ formed by the SO_4^{2-} which is always present in the ink or paper adsorbs the dye, whilst the Fe is removed by the acid and the nature of the dye can then be detected by appropriate tests. By making the chloride test on old writing it is possible to obtain a good idea of the age of the writing,

as the chloride slowly diffuses with age away from the writing until eventually it penetrates right through the paper. Sulphates behave in a similar manner.

A. R. POWELL.

Incorporation of dry pigments into the medium.

A. W. C. HARRISON (J. Oil Col. Chem. Assoc., 1931, 14, 162—171).—Media are classified and the characteristics of each group outlined. The importance of using linseed oil with a degree of free acidity to suit the type of pigment paste being prepared is emphasised. Composite media should be mixed and stored for a considerable period before use, and should be so compounded as to give exactly the desired qualities with pigments usually incorporated in it. Methods of mixing are discussed and the principal properties of dry constituents enumerated.

F. C. HARWOOD.

Lacquers for aircraft and their testing.

O. MERZ (Farben-Ztg., 1931, 36, 2156—2158, 2197—2199).—The requirements of such lacquers and the respective merits of cellulose acetate and nitrate are summarised, mention also being made of the use of cellulose ethers for this work. Details of the cellulose esters, plasticisers, solvents, diluents, and pigments used and typical formulations are given. The physico-mechanical testing of these lacquers is described in full, testing of films on glass, general suitability for "doping" including wt. applied, tensile strength, elasticity, burning tests, durability, all being considered. Details of application of the above lacquers and the use of oil varnishes as "dopes" are also included.

S. S. WOOLF.

Acid-resistance of varnishes on phosphatised iron.

F. KOLKE (Farben-Ztg., 1931, 36, 2235—2238).—Normal and phosphatised Fe plates coated with each of 6 lacquers (3 PhOH-CH₂O synthetic resin varnishes, shellac, bitumen, and cellulose ester—all except the last-named being stoved) were immersed in 3% H₂SO₄, HCl, AcOH, and H₃PO₄, and observed after 1, 2, 3, 5, and 7 days. The tabulated results and photographs of the panels after 7 days are given. With the exception of AcOH, the acid-resistance of the phosphatised panels is not higher, but generally lower, than that of the unphosphatised panels. As phosphate treatment (*e.g.*, "Parkerising," "Bonderising," "Atrament" process [I.G.]) improves durability as regards normal weathering, resistance to H₂O and sea-water, etc., this result is considered to be due to the sp. action of the acids on the phosphate coatings.

S. S. WOOLF.

Cooking of tung oil.—See XII. Pine-needle oil.—See XX. Storage of nitrocellulose.—See XXII.

PATENTS.

Preparation of solutions of cellulose esters containing insoluble pigments. G. B. ELLIS. From SOC. POUR LA FABR. DE LA SOIE "RHODIASETA" (B.P. 356,740, 9.5.30).—Finely-ground pigments suspended in a "homogenising liquor," *e.g.*, a solvent mixture containing, if desired, a small amount of cellulose acetate, are forced under pressure and at high speeds, *e.g.*, 50—300 m./sec., through one or more narrow orifices, further quantities of cellulose acetate etc. being subsequently added for conversion of the intermediates into varnishes, films, or filaments.

S. S. WOOLF.

Manufacture of destructively distilled castor oil condensation product. E. C. HOLTON, Assr. to SHERWIN-WILLIAMS Co. (U.S.P. 1,799,420, 7.4.31. Appl., 14.12.28).—Castor oil is destructively distilled (under reduced pressure if desired) down to 60—80% by wt. of the charge, esterified with excess of glycerin, and condensed with phthalic anhydride to yield a clear homogeneous product suitable for use in varnishes etc.

E. LEWKOWITSCH.

Refining of natural [wood] and artificial resin.

W. SCHULTZE, Assr. to A. SCHULTZE & Co. OELFABR., and H. SCHUBERT, TEXTILWERKE (U.S.P. 1,793,967, 24.2.31. Appl., 7.11.27. Ger., 23.9.27).—Pale resin is obtained by distilling (dead) wood rosin in a high vac. (8 mm. pressure or less); 80—85% of the distillate (yield 80%) is obtained at 230—255°.

E. LEWKOWITSCH.

Production of resin-acid derivatives. CHEM. FABR. DR. K. ALBERT G.M.B.H. (B.P. 356,742, 4.6.30.

Ger., 19.8.29).—Abietic (resin) acid or one of its pyro- or halogenated or oxidised derivatives is converted into the anhydride (by treatment with Ac₂O) and this is treated with alcohols, phenols, amides, amines, or esters to yield abietic esters, amides, etc. The derivative formed is separated from the equiv. abietic acid regenerated by distillation or washing processes etc.

E. LEWKOWITSCH.

Derivatives of polyhydric alcohol-polybasic acid condensation products. IMPERIAL CHEM. INDUSTRIES, LTD., and W. BAIRD (B.P. 356,738, 6.5.30).

—Resins of the glycerol-phthalic anhydride type (prepared at temp. >150° with or without a fatty ingredient, and having an acid val. >30) are treated with aq. NH₃ or its substitution derivatives, *e.g.*, triethanolamine, piperidine; the products give clear aq. solutions which dry to adherent films on stoving at 100°.

E. LEWKOWITSCH.

Laminated products. BAKELITE CORP., Assees. of R. P. COURTNEY (B.P. 356,769, 7.6.30. U.S., 8.6.29).

—A resinoid composition sheet is bonded to a base material, *e.g.*, a metal, by a rubber cement obtained, *e.g.*, by heating rubber with 4—5% of conc. H₂SO₄ or an equiv. amount of a sulphonic acid derivative for 4—10 hr. at 120—140°, or by treating rubber with a PhOH-oil condensation product partly advanced to the infusible condition.

S. S. WOOLF.

Water paints [for cement, stucco, etc.]. A. E. WHITE. From J. V. REARDON (B.P. 357,119, 14.3.30).

—See U.S.P. 1,749,923; B., 1930, 726.

[Apparatus for] manufacture of moulded articles from synthetic resin and like materials. M. M. EATON and J. C. VREDENBURG (B.P. 357,194, 20.3.30).

—See VI.

Thermoplastic sheets. Sandpaper.—See V. Impregnated fabric.—See VI.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Strontium sulphate as a rubber filler. J. R. SCOTT (India-rubber J., 1931, 82, 442—444).—Powdered natural SrSO₄ (celestine) gives vulcanised rubber mixings of higher tensile strength, greater extensibility, and better resilience and permanent set than powdered barytes and approximating to those yielded by precipitated BaSO₄. The ageing qualities of the rubber

containing SrSO_4 are better than those of the rubber with either form of BaSO_4 . The n of SrSO_4 is nearer than that of barytes to that of rubber and its pigmenting val. is less.

D. F. TWISS.

Reclaimed rubber. A. T. McPHERSON (U.S. Bur. Standards, Circ. 393, 1931, 22 pp.).—A review.

PATENTS.

Manufacture of rubber. GOODYEAR TIRE & RUBBER Co. (B.P. 356,933, 3.9.30. U.S., 5.10.29).—Rubber with good ageing qualities is obtained by vulcanisation in the presence of a substance of the formula $\text{S}_2\langle\begin{smallmatrix} \text{R} \\ \text{R}' \end{smallmatrix}\rangle\text{NH}$ in which R and R' are C_6H_4 or C_{10}H_6 nuclei, e.g., dithiophenyl- β -naphthylamine, m.p. 140° (decomp.).

D. F. TWISS.

Improvement of age-resisting properties of rubber and rubber-like substances. IMPERIAL CHEM. INDUSTRIES, LTD., A. J. HAILWOOD, and F. J. SIDDLE (B.P. 356,923, 27.8.30).—The age-resisting properties are improved and vulcanisation is facilitated by incorporating an NH_2 derivative of a diaryl oxide, e.g., 4:4'-diaminodiphenyl ether, with or without the additional presence of other substances possessing anti-ageing properties.

D. F. TWISS.

[Softening] treatment of rubber stock. H. L. MORAN (U.S.P. 1,790,875, 3.2.31. Appl., 16.12.27).—The stock is softened preparatory to subsequent operations by subjecting it for a definite period to the proper degree of heat in a special tank of hot water through which it passes on a conveyor moving at the appropriate speed.

D. F. TWISS.

Manufacture of rubber products. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 354,841, 17.5.30).— ZnO produced from precipitated Zn compounds at a temp. below incandescence and containing a small proportion of Al_2O_3 , e.g., 1–6%, imparts high mechanical resistance in vulcanised rubber, particularly towards tearing.

D. F. TWISS.

Treatment of rubber [for age-resistance]. W. S. CALCOTT and W. A. DOUGLASS, Assrs. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 1,790,794, 3.2.31. Appl., 17.9.29).—By the interaction of a primary arylamine, CH_2O , and NaHSO_3 and treating the resulting product with a phenolic compound (cf. G.P. 109,498), a mixture is obtained of which the main constituent is a hydroxybenzylarylamine of the general formula $\text{R}\cdot\text{NH}\cdot\text{CH}_2\cdot\text{R}'\cdot\text{OH}$, where R is an aryl group which may contain an alkyl substituent, and R' is an aryl group which may contain an alkyl or alkoxy-substituent. Examples of the prime products, which are effective antioxidants, are *p*-hydroxy-*m*-methoxybenzylamine and *p*-hydroxybenzyl- β -naphthylamine.

D. F. TWISS.

Age-resisting vulcanised rubber. W. SCOTT Assr. to RUBBER SERVICE LABORATORIES Co. (U.S.P. 1,792,042, 10.2.31. Appl., 23.9.29).—The S derivatives of the reaction product of a ketone and a naphthylamine are used as antioxidants for rubber. E.g., the acetone- α -naphthyl obtained from COMe_2 and α -naphthylamine in the presence of I is heated with an equimol. proportion of S at 150° and a little I; the antioxidant product is a hard black resin.

D. F. TWISS.

Rubber composition and preservation of rubber. M. C. REED, Assr. to B. F. GOODRICH Co. (U.S.P. 1,793,635, 24.2.31. Appl., 5.4.30).—The *as*-diarylhydrazines, e.g., *as*-diphenylhydrazine, are applied as antioxidants for rubber.

D. F. TWISS.

Vulcanisation of rubber. L. B. SEBRELL and D. N. SHAW, Assrs. to GOODYEAR TIRE & RUBBER Co. (U.S.P. 1,792,770, 17.2.31. Appl., 18.11.24).—Vulcanisation is accelerated by amidoximes and their aldehyde derivatives; examples cited are *o*-tolylamidoxime, $\text{Me}\cdot\text{C}_6\text{H}_4\cdot\text{C}(\text{NH}_2)\cdot\text{NOH}$, and the ethylidene derivative, m.p. 125° , of *p*-tolylamidoxime.

D. F. TWISS.

Vulcanisation of rubber. A. A. SOMERVILLE, Assr. to R. T. VANDERBILT Co. (U.S.P. 1,791,876, 10.2.31. Appl., 30.12.27).—Scorching or premature vulcanisation of rubber mixtures containing ultra-accelerators is prevented by the presence of a small proportion (e.g., 1% on the rubber) of a suitable peroxide such as PbO_2 or BaO_2 .

D. F. TWISS.

Rubber vulcanisation accelerator. W. SCOTT, Assr. to RUBBER SERVICE LABORATORIES Co. (U.S.P. 1,792,041, 10.2.31. Appl., 22.5.25).—Vulcanisation is accelerated by the reaction product of CH_2O and crotonaldehydedianiline.

D. F. TWISS.

Vulcanisation accelerators [for rubber] and application thereof. IMPERIAL CHEM. INDUSTRIES, LTD., H. M. BUNBURY, W. J. S. NAUNTON, and W. A. SEXTON (B.P. 353,580, 17.5.30).—Diarylenethiazyl monosulphides obtained by action of 2-chloroarylenethiazoles on the alkali salts of 2-mercaptoarylenethiazoles are valuable vulcanisation accelerators and give particularly good results when used in conjunction with a basic org. accelerator such as diphenylguanidine.

D. F. TWISS.

Recovery of waste materials [containing rubber]. E. WOOD (B.P. 355,871, 23.6.30).—Rubberised materials such as motor tyres are disintegrated dry, e.g., in a mill provided with revolving hammers; the cotton and rubber scrap are then separated from each other by screening or by means of a centrifugal machine.

D. F. TWISS.

Coated fabric.—See VI. Laminated products.—See XIII.

XV.—LEATHER; GLUE.

Evaluation of bating materials. A. KÜNTZEL and B. POTOTSCHNIG (Collegium, 1931, 475–495).—Nine commercial bating materials were compared by seven different methods of testing, viz., Fuld-Gros, Boidin, Löhlein-Volhard, Schneider-Ulček, gelatin m.-p. determination, Willstätter-Waldschmidt-Leitz, and the EtOH titration of the collagen decomp. products. The results obtained agreed only where the same substrate was used. Collagen and gelatin acted as similar substrates, but were not completely replaceable by casein or milk. A method based on a collagen or gelatin substrate should be used. The casein-substrate methods are simpler and more exact than the others and the Löhlein-Volhard method (Oppenheimer, "Fermente," 4, 119) is better than the Fuld-Gros or Schneider-Ulček methods.

D. WOODROFFE.

Fat-liquoring [of leather]. W. SCHINDLER and K. KLANFER (Collegium, 1931, 339–349; cf. B., 1928,

763).—Only part of the fat absorbed by different pieces of chrome leather fat-liquored with sulphonated castor, cod, and neatsfoot oils, respectively, was extracted with CCl_4 . The residue varied directly as $(\beta + \delta)$ in the different sulphonated oils. Most of the fat was extracted with CCl_4 from leathers which had been fat-liquored with soap fat-liquors. The unextracted fat was recoverable in every case by decomposing the leather with conc. NaOH . Misleading results are obtained if the fat contents of chrome leathers are judged by the amount extracted with CCl_4 . A portion of the combined SO_4 in chrome leather, which had previously been neutralised with NaHCO_3 , was always removed during fat-liquoring, but some of the combined SO_4 in the sulphonated oil used combined with the leather and could be only partly removed by treatment with a boiling conc. solution of NaHCO_3 . At higher p_{H} the SO_4 lost by the leather greatly exceeded that gained from the fat-liquor. Relatively more SO_4 was removed from the leather by sulphonated oils than would be anticipated from their composition. A commercial sulphonated oil, which was very acid when stable, removed a large amount of SO_4 at p_{H} 4.2. There was no evidence of any hydrolysis of the sulphonated fat esters.

D. WOODROFFE.

Analytical chemistry of chrome [tanning] liquors. F. L. HAHN (Collegium, 1931, 429—438).—A special pipette for determining their sp. gr. is described. Br-NaOH is recommended for oxidising the chrome liquor in the Cr determination. The excess of NaOBr is decomposed with thiocyanate. The colorimetric determination of Cr in the oxidised solutions is discussed. For this determination, a portion of the chrome liquor is treated with HNO_3 and AgNO_3 , $\text{K}_2\text{S}_2\text{O}_8$ is added, the mixture heated on the water-bath, cooled, made up to 100 c.c., NH_3 or HNO_3 added to produce a pure yellow colour, and the Cr determined colorimetrically. The SO_4 in $\text{Cr}(\text{SO}_4)_3$ liquors is not completely titratable in the usual acid determination, so that the figure is merely a control.

D. WOODROFFE.

Chrome tanning. X. Glucose-chrome liquors. E. STIASNY and M. ZIEGLER. XI. E. STIASNY and E. GERGELY. XII. **Composition of chromium tanning extracts.** E. STIASNY, E. GERGELY, and A. DEMBO (Collegium, 1931, 438—444, 444—458, 458—474; cf. B., 1930, 158).—X. More glucose is required when H_2SO_4 is run into $\text{Na}_2\text{Cr}_2\text{O}_7$ -glucose mixture than when glucose solution is added to $\text{Na}_2\text{Cr}_2\text{O}_7$ - H_2SO_4 , and still more if $\text{Na}_2\text{Cr}_2\text{O}_7$ solution is run into glucose- H_2SO_4 in order to reduce Cr^{VI} to Cr^{III} in each case. Only volatile acids are formed when glucose solution is added to $\text{Na}_2\text{Cr}_2\text{O}_7$ - H_2SO_4 solution, the yield increasing as the amount of added glucose is increased. A proportion of oxalic acid is formed when H_2SO_4 is run into a $\text{Na}_2\text{Cr}_2\text{O}_7$ -glucose solution or when $\text{Na}_2\text{Cr}_2\text{O}_7$ solution is added to glucose- H_2SO_4 . More volatile acids are formed by adding the H_2SO_4 to the other ingredients than by the other methods of reduction. A greater amount of glucose containing dextrin is required to effect the reduction than of dextrin-free glucose.

XI. The nature of the compounds formed when solutions of $\text{Na}_2\text{Cr}_2\text{O}_7$ are reduced with SO_2 varies with the concentration of the solution. $\text{Cr}_2(\text{S}_2\text{O}_6)_3$ was the chief

product in dil. solution, whereas in highly conc. solutions of $\text{Na}_2\text{Cr}_2\text{O}_7$, the product consisted almost entirely of "olated" dihydroxo-trisulphato-chromate, which was converted on heating or ageing the dil. solution into Cr sulphates with uncharged or cationic Cr complexes. The tanning properties of such liquors depend largely on their method of manufacture and the previous history of the liquor.

XII. Anionic Cr complexes are invariably formed when the Cr-tanning liquors are conc. and solid products are prepared therefrom. Their properties depend on the no. of OH and SO_4 groups in the complex as well as on the nature of the cation. The SO_4 is masked when a solution of K_2SO_4 and chrome alum is conc. and allowed to crystallise, its precipitation figure with NH_3 then being ∞ ; the solubility of the product in H_2O and p_{H} of its solution diminished as the solution was aged before evaporation. The composition and properties of the resultant Cr-tanning liquors were affected by the method used for dissolving the solid extracts, ageing, dilution, and by the duration of the heating if they were dissolved hot. These factors affected the migration of the SO_4 radicals from the Cr complexes. Better tannage and penetration were obtained by use of cold-prepared basic Cr-alum liquor than with a solution of the derived solid product.

D. WOODROFFE.

Effect of synthetic tannins on the detection of sulphite-cellulose waste-liquor in vegetable tanning extracts by the [Procter-Hirst] aniline-hydrochloric acid, cinchonine, and fluorescence tests. Committee Report. O. GERNGROSS and H. HERFELD (Collegium, 1931, 524—538).—1% of sulphite-cellulose waste-liquor can be detected in a vegetable tannin extract by the Procter-Hirst reaction, 3% by the cinchonine test, but not less than 10% by the fluorescence test. Positive reactions are given by all three tests in presence of synthetic tans or if the extract has been sulphited in presence of sawdust, but not by sulphiting in presence of phlobaphens or resins. A min. of 5% of sulphite-cellulose waste can be detected by the Procter-Hirst reaction if the extract has been made from damaged or decayed material.

D. WOODROFFE.

Free [mineral] acids in the analysis of vegetable [tanned] leathers. II, III. V. KUBELKA and K. ZIEGLER (Collegium, 1931, 544—550, 550—557; cf. B., 1931, 819).—II. Slightly more acid was extracted by the continuous extraction of 20 g. of leather with 1 litre of H_2O at 42° than by Innes' method, but the "difference figure" was not materially changed. Not only this figure, but also the actual p_{H} of the original solution should be considered, since strong acids can be present only if the difference figure exceeds 0.7 and the p_{H} of the original solution is < 3 . When leathers were treated with known amounts of different acids, a portion of the acid was always neutralised by the leather. The aq. extracts of all leathers to which $> 0.75\%$ of HCl or H_2SO_4 had been added were turbid and the turbidity increased as the amount of added acid was increased, probably due to decomp. of the leather substance. This turbidity of the aq. extract may be used as a criterion of the presence of an injurious amount of strong acid.

III. Inconcordant results are obtained by the Atkin-Thompson method and the three readings are often not on a straight line when the graph becomes an approximation. This method is of equal qual. val. with the Innes method. The Atkin-Thompson crit. figure 2.5 for the p_H at zero dilution is shown to be too low. Innes' method is more reliable. D. WOODROFFE.

Decay of bookbinding leather. R. W. FREY and I. D. CLARKE (J. Amer. Leather Chem. Assoc., 1931, 26, 461—482).—Bookbinding leathers were weakened by exposure to air and light, and pyrocatechol tannages were weakened more than pyrogallol tannages. The S content and Procter-Searle figures of the leathers were increased by such exposure. Least deterioration was shown by three leathers tanned with pyrogallol tannins. Bookbinding leathers should be rendered less porous to air and less absorptive to S compounds in the air by treatment with dressings. D. WOODROFFE.

Effect of [sulphuric] acid on vegetable-tanned leather. Committee report. T. BLACKADDER (J. Amer. Leather Chem. Assoc., 1931, 26, 482—490).—Vegetable-tanned leathers are hydrolysed by the H_2SO_4 in them, thus increasing their content of H_2O -sol. N. Greater deterioration is found in leathers containing H_2SO_4 at higher R.H. (85%). A discussion of the report is included. D. WOODROFFE.

Combination of collagen with dyes. G. A. BRAVO and F. BALDRACCO (Annali Chim. Appl., 1931, 21, 355—365).—Known amounts of 12 direct dyes of tested purity were dissolved in H_2O and measured portions (100—200 c.c.) were transferred to glass-stoppered 500-c.c. flasks. Hide powder (collagen), from three different sources, in amounts between 0.25 and 4.0 g. was added; after shaking, the powder was allowed to be acted on for 48 hr. The filtered liquid was then examined with a Pulfrich photometer to determine the residual concentration of the dye. The amount taken up by the collagen was determined by difference from the photometric examination of the original solution. It was confirmed that together with adsorption a true chemical reaction also occurs. From this reaction the equiv. wt. of collagen was found to be 740. O. F. LUBATTI.

PATENT.

Chromiferous dye.—See IV.

XVI.—AGRICULTURE.

Mechanism of the buffer action of soils. P. B. MYERS and G. M. GILLIGAN (Delaware Agric. Exp. Sta. Tech. Bull., 1930, No. 11, 37 pp.).—Removal of bases from soil by electro dialysis results in a loss of buffer capacity, the $[H^+]$ increasing steadily as the bases are removed. The $[H^+]$ of the soil colloid is an index of the degree of saturation with bases. Acids added to soil react with the salts of colloidal acids. The free colloidal acids formed are sufficiently weak to permit only a slight change in reaction of the system. Acid added in excess of that required to react with the cations of the colloidal salts is very incompletely ionised through the agency of the common ion of the cryst. salts formed. The resulting change in p_H of the system is small.

A. G. POLLARD.

Occurrence of nitrites in soils. G. S. FRAPS and A. J. STERGES (Texas Agric. Exp. Sta. Bull., 1930, No. 412, 15 pp.).—Nitrites occur in soil cultures and field soils in amounts greater than is generally assumed, and may persist for several weeks even where no recent addition of N material has occurred. The presence of $CaCO_3$, $MgCO_3$, and a H_2O content of approx. 50% of the max. capacity favour nitrite formation in soils.

A. G. POLLARD.

Sulphur as a soil amendment. G. S. FRAPS (Texas Agric. Exp. Sta. Bull., 1930, No. 414, 56 pp.).—The S contents of numerous soils and crops are recorded. Application of S to soil increased the intake of S by plants and in some cases of P, but not of K or N. Oxidation of S in soils had no effect on the availability of P or K, but increased the permeability to H_2O , particularly on black alkali soils.

A. G. POLLARD.

Behaviour of colloidal humic-mineral complexes in an electric field. C. ANTONIANI (Atti R. Accad. Lincei, 1931, [vi], 13, 524—526).—Soil treated with 5% HCl and extracted with 10% NaOH solution yielded a complex which, after purification with 5% KCl solution to remove clay, sedimentation, and electro-dialysis, contained: org. matter 82.75, Fe_2O_3 5.05, Al_2O_3 4.35, SiO_2 4.65, and P_2O_5 2.90%. After being flocculated at the isoelectric point (p_H 7.4), the complex was brought back to the disperse state by addition of NaOH and placed in an electric field (0.36 volt/cm.), anodic migration then occurring. Gradual increase of the $[OH^-]$ resulted in increase of this migration to a max., followed by decrease to zero and by change to cathodic migration. Hence in alkaline dispersion the humic colloid, which is the essential protector of the complex, exerts its protecting action only over a definite range of $[OH^-]$. T. H. POPE.

Mutual coagulation of colloids in the soil. V. N. SIMAKOV (Pochvovedenie, 1929, 24, Nos. 1—2, 22—77).—Mutual coagulation takes place between 0.577 and 1.27 mol. MnO_2 per mol. $Fe(OH)_3$, between 2.757 and 3.452 mol. SiO_2 per mol. $Fe(OH)_3$, or between 3.753 and 8.045 g. of Na-saturated soil per g. of $Fe(OH)_3$. There are two zones at which a stable mixture of the two colloids exists, $Fe(OH)_3$ or the soil suspension being in excess. Mutual coagulation takes place between 0.085 and 0.447 mol. MnO_2 per mol. Al_2O_3 . The coagulation vals. of the sols are calc. in terms of another or of a combination. CHEMICAL ABSTRACTS.

Rapid determination of organic carbon in soils. E. BORTINI (Annali Chim. Appl., 1931, 21, 374—387).—0.5 g. of dry soil is refluxed with 100 c.c. of 10% aq. KOH. After cooling, to 50 c.c. of the filtrate are added 50 c.c. of 0.1N- $KMnO_4$, 50 c.c. of H_2O , and 4 c.c. of 25% H_2SO_4 . The liquid is boiled for $\frac{1}{2}$ hr., excess (50 c.c.) of 0.1N-oxalic acid is added, and, after boiling again, the excess of acid is back-titrated with 0.1N- $KMnO_4$. The no. of c.c. of $KMnO_4$ required multiplied by 2, called x , represents the amount of $KMnO_4$ used up by the org. matter dissolved by KOH. The residue insol. in KOH remaining on the filter is transferred to a flask and treated with the same amount of reagents and in the same manner as the filtrate. The no. of c.c. of 0.1N- $KMnO_4$ used up is indicated by y . Then % org.

$C = 0.03 \times 2(x+y)$. The approx. content of org. matter in the soil is obtained by multiplying the % C by the factor 2.3.

O. F. LUBATTI.

Determination of carbon dioxide in soil carbonates. A modification of the official method. W. M. SHAW (J. Assoc. Off. Agric. Chem., 1931, 14, 283—292).—In the official method ("Methods of Analysis," A.O.A.C., 1925, p. 24) aspiration for 30 min. at 4 litres per hr. is insufficient, but at 6 litres is sufficient to remove all the CO_2 from the reaction flask, in the case of precipitated CaCO_3 . Dolomite ground to 60—100-mesh requires aspiration for 2 hr. The superiority of Ascarite as absorbent for CO_2 at the higher rate of flow is confirmed. The vitiating effect of org. matter on the determination when the decomp. is carried out at room temp. is completely removed by the addition of FeCl_2 or SnCl_2 . At 100° the effect of the org. matter is not entirely eliminated, SnCl_2 being more effective than FeCl_2 . The method described permits the rapid determination of carbonate- CO_2 in soils where an error of 0.01% may be tolerated, the sample being boiled with SnCl_2 -HCl solution and the CO_2 absorbed by Ascarite. W. J. BOYD.

Neubauer's method as applied to the determination of the availability of phosphate materials. S. F. THORNTON (J. Assoc. Off. Agric. Chem., 1931, 14, 292—295).—The availability of 13 phosphatic materials in both acid soil and neutral sand has been studied by an adaptation of the Neubauer method (B., 1929, 571). There is poor correlation with the results obtained by the Official neutral citrate method ("Methods of Analysis," A.O.A.C., 1925, p. 24), but pot tests show that the Neubauer method gives valuable indications as to the true availability of phosphates. W. J. BOYD.

Neubauer's method for determining potash and assimilable phosphoric anhydride in soils. M. SARTORI (Ann. R. Staz. Chim. Agrar. Sperim., 1931, Pubb. No. 270, 249—256).—The soils examined were: red puzzuolana, granular tufa, highly humic, CaO-rich, and CaO-free. In comparison with the results of cultural experiments on wheat and maize, the biological method gave satisfactory indications of the P_2O_5 content for the first 3 soils and the citric acid method for the humic soil; the boiling conc. HNO_3 method yielded discordant results for all the soils. Neubauer's and the citric acid methods for K_2O agreed with the cultural tests for all except the red puzzuolana, with which the citric acid method was the best; for the humic, CaO-rich, and CaO-free soils the boiling conc. HNO_3 method gave results differing from those of the biological or citric acid method. T. H. POPE.

Mobility of soil-phosphoric acid; a consideration of Eschenhagen's work. H. NEUBAUER (Z. Pflanz. Düng., 1931, 10B, 409—410; cf. B., 1931, 856).—The necessity of an analysis of seed used in control experiments in the seedling method for determining root-sol. P in soils is emphasised. A. G. POLLARD.

Simple electro dialysis cell for routine determination of exchangeable bases in soils. M. L. M. SALGADO and G. W. CHAPMAN (Soil Sci., 1931, 32, 199—215).—Convenient apparatus is described. Results are in close general agreement with those obtained by leaching with $N\text{-NH}_4\text{OAc}$. A. G. POLLARD.

Determination of the degree of saturation of soils with bases. R. H. WALKER, B. J. FIRKINS, and P. E. BROWN (Iowa Agric. Exp. Sta. Res. Bull., 1931, No. 139, 157—176).—Comparison is made of recognised methods for determining the replaceable bases in soils. Electro dialysis methods give irregular results where $< 100\text{-g.}$ samples are examined. No correlation exists between the replaceable H^+ of soils (Hissink) and their $p\text{H}$. Parker's methods for determining the base-exchange capacity and replaceable H^+ of soils gave more satisfactory results than any other methods examined.

A. G. POLLARD.

Effect of drying and of ultra-violet light on soils. A. E. MORTENSON and F. L. DULEY (Soil Sci., 1931, 32, 195—198).—The initial increase in the NH_3 content of soils caused by drying or ultra-violet treatment is greater where these treatments are most severe. Subsequently the NH_3 content falls to a very low value. Corresponding changes in the NO_3^- content are of the reverse order, the finally increased values being enhanced by the action of ultra-violet light. The H_2O -sol. Ca content of soil is raised by drying, the effect increasing with the intensity of the drying process. The values are still further increased by ultra-violet treatment, which is more active on undried than on dried soils. The rate of settling of aq. soil suspensions was increased by drying, and to a still greater extent by ultra-violet light treatment. A. G. POLLARD.

Utilisable water capacity and the mobility of water in soils. F. SEKERA (Z. Pflanz. Düng., 1931, 22A, 87—111).—A method for determining the H_2O capacity (W) of soil is described. The value W denotes H_2O held in pore spaces of < 2 mm. equiv. diam. Larger pore spaces remain air-filled. The "static water" in soils (W — hygroscopic H_2O) is that available to micro-organisms. H_2O available to plants averages 72—75% of the static H_2O . A. G. POLLARD.

Alcohol method for determining moisture content of soils. G. J. BOUYOUKOS (Soil Sci., 1931, 32, 173—179. Cf. B., 1927, 887; 1930, 474).—The satisfactory nature of the method is confirmed. A shaking machine is described for the rapid and complete dispersion of the soil, this being essential for accurate working.

A. G. POLLARD.

Moisture equivalent as a measure of the field capacity of soils. F. J. VEIHMEYER and A. H. HENDRICKSON (Soil Sci., 1931, 32, 181—193).—The moisture equiv. of soils (Briggs and Shantz) is a satisfactory measure of field capacity (H_2O retained by a field soil after drainage of gravitational H_2O) in the case of fine-textured soils. In sandy soils (moisture equiv. < 12 — 14%) the field capacity is relatively the higher value. The permanent wilting % in soil is not a linear function of the moisture equiv. Applications to irrigation practice of moisture equiv. vals. are recorded and discussed. A. G. POLLARD.

Experimental investigations with Mitscherlich's physiologico-mathematical method on the action of fertilisers. S. D. DI DELUPIS (Ann. R. Staz. Chim. Agrar. Sperim., 1931, Pubb. No. 278, 69 pp.).—Experiments with wheat grown on various soils, under various climatic conditions and during the four seasons 1926—

1930, gave results corresponding closely with the values, 0.122 and 0.6, given by Mitscherlich for the coeffs. of the fertilising actions of N and P_2O_5 , respectively. The few discordant data obtained are capable of ready explanation. The influence of various factors on the availability of N and P_2O_5 is discussed. T. H. POPE.

Decomposition of soil organic matter and its bearing on the question of manuring. A. S. CORBET (J. Rubber Res. Inst. Malaya, 1931, 3, 5—27).—The rate of CO_2 production for soils and pure cultures of micro-organisms is examined and expressed mathematically. Application of artificial fertilisers up to 3 cwt. per acre had no appreciable effect on the microbiological activity of soil. A. G. POLLARD.

Chemical and microbiological study of Lufkin fine sandy loam in relation to productiveness. E. B. REYNOLDS (Texas Agric. Exp. Sta. Bull., 1931, No. 421, 30 pp.).—The nitrifying capacity of this soil was a better index of its productivity than any other factor examined and was positively correlated with the total N and total and available H_3PO_4 . Continuous growing of cotton or maize tended to reduce the nitrifying power. Applications of nitrogenous materials, cottonseed meal, superphosphate, or ground rock phosphate increased the NO_3^- produced and then nitrifying power of the soil. Under laboratory conditions liming increased the nitrifying power, but the increased nitrifying power was not more significantly correlated with cotton yields than the nitrifying power of the unlimed soil. A. G. POLLARD.

Growth, behaviour, and maintenance of organic foods in Bahia grass. W. A. LEUKEL and J. M. COLEMAN (Florida Agric. Exp. Sta. Tech. Bull., 1930, No. 219, 56 pp.).—The top growth of Bahia grass removed by frequent cutting had a more uniform and higher N content and a narrow ratio of total hydrolysed carbohydrate : total N throughout the season than when the plant was grown to maturity. A. G. POLLARD.

Sources of nitrogen for potato fertilisers in Aroostook county. B. E. BROWN, F. V. OWEN, and E. R. TOBEY (Maine Agric. Exp. Sta. Bull., 1930, No. 354, 38 pp.).—In a 16-year average $(NH_4)_2SO_4$ produced higher yields of potatoes than did $NaNO_3$, but differences are largely due to climatic factors. The increased yield obtained by applying part of the N in an org. form is not great. Leuna saltpetre, NH_4NO_3 , NH_4Cl , NH_4 phosphates, $Ca(NO_3)_2$, and urea compare favourably with $NaNO_3$ as sole sources of N. $CaCN_2$ is satisfactory if used in moderate quantities. The reaction and H_2O -retaining capacity of soils are important factors in determining the efficiency of the various N fertilisers. A. G. POLLARD.

Fertilising with leucite. G. TOMMASI and S. D. DI DELUPIS (Ann. R. Staz. Chim. Agrar. Sperim., 1931, Pubb. No. 279, 29 pp.).—Experiments on wheat, maize, beans, potatoes, etc., grown over a period of several years on soils which Neubauer's method showed to be lacking in potash, indicate that the beneficial effect of leucite is lower during the first year, but equal to or higher than that of KCl during the second year. Leguminous crops profit most from the application of leucite. For wheat, the leucite is best applied to the preceding

crop, especially if this is leguminous, as this appears to accelerate the solubilisation and, hence, the utilisation of leucitic potash. T. H. POPE.

Exhaustion of soil phosphate. M. POPP and J. CONTZEN (Z. Pflanz. Düng., 1931, 22A, 1—20).—In pot experiments with soils receiving N and K, the utilisation of P by crops decreased steadily in successive seasons. Grass, but not lucerne, utilised difficultly-sol. P, thus increasing the relative utilisation vals. in a succession of crops. Manuring with P had no effect on the % utilisation by crops of K and N, but manuring with K and N increased the utilisation of P. In unmanured soils the K taken up by plants in 11 years was greater than that initially sol. in 10% HCl. The K of fertilisers applied to soils was more completely utilised where heavier dressings of N fertilisers were used. No evidence of the exhaustion of soil P occurred in 11 years' cropping. The use of rye for determining the assimilable P in soils by the seedling method is unsuitable for grassland tests and rye grass should be substituted. A. G. POLLARD.

Influence of lime on recovery of total nitrogen in field crops. J. G. LIPMAN, A. W. BLAIR, and A. L. PRINCE (Soil Sci., 1931, 32, 217—233).—In a 5-year rotation the recovery of N in crops was of the order: forage crops (mostly legumes) > maize > vegetables or potatoes. In general, liming increased both crop yield and the total N recovered, the effects of Ca- and Mg-limestones being practically the same. With legumes CaO increased the % N of the crop. A. G. POLLARD.

Use of sodium chlorate as a weed-killer. M. HESSENLAND and F. FROMM (Chem.-Ztg., 1931, 55, 589—590).—In using $NaClO_3$ solutions as weed-killer it is recommended that the liquid be coloured with an acid wool dye so that an estimate can be made of the amount of solution which is absorbed by the linen overalls of the workers. This is of importance because of the increased fire hazard. Experiments show that linen overalls are more satisfactory than cotton or fire-proofed material, as the fire hazard is increased appreciably only after four soakings with the $NaClO_3$ solution (1—2%). A. R. POWELL.

Relationships between soil maps and Niklas' cropping charts in Bavaria. E. OSTENDORFF (Z. Pflanz. Düng., 1931, 10B, 410—417).—The average yields of various crops are discussed in relation to soil type. A. G. POLLARD.

Fertilising tomatoes, sweet corn, and musk melons in a 3-year rotation. J. W. LLOYD (Illinois Agric. Exp. Sta. Bull., 1931, No. 364, 18 pp.).—In manurial trials the use of P (notably as steamed bone-flour) was of prime importance for tomatoes. K decreased the yield of melons but was without effect on the other crops. $NaNO_3$ and dried blood increased tomato yields, but did not affect the other crops. $(NH_4)_2SO_4$ decreased yields in all 3 cases. A. G. POLLARD.

Effect of calcium and phosphorus contents of soils in W. Washington on the calcium and phosphorus components of oats and red and white clover. H. F. HOLTZ (Washington Agric. Exp. Sta. Bull., 1930, No. 243, 45 pp.).—The Ca content of oats

is closely proportional to that in residual upper glacial depression deposits and org. soils, but in no other soil types. The P content of oats varies directly with that of the soil in all types except the residual and lower glacial, but is less closely related to the available than to the total P content. The P content of red clover is closely proportional to the available P content of org. soils. The Ca and P contents of oats is less in eastern than in western areas, but that of red clover is practically the same in both areas. Many oat samples and some of red clover had sufficiently low Ca and P contents to create the risk of deficiency decreases in live stock.

A. G. POLLARD.

Control of bunt in wheat. F. D. HEALD and E. F. GAINES (Washington Agric. Expt. Sta. Bull., 1930, No. 241, 30 pp.).—The efficiency of seed treatments for spring wheats was in the order $\text{CH}_2\text{O} > \text{CuSO}_4 > \text{CuCO}_3$. Fumigation was unsatisfactory owing to inefficient distribution. For winter wheats the order of efficiency was $\text{CuSO}_4 > \text{CuCO}_3 = \text{org. Hg. compounds} > \text{CH}_2\text{O}$. Moderate to high soil-moisture content favoured field infection with bunt. This may be minimised by early sowing.

A. G. POLLARD.

Control of soft rot (water blister) of pineapples caused by *Theilaviopsis paradoxa*. B. T. DICKSON, H. R. ANGELL, and J. H. SIMMONDS (J. Counc. Sci. Ind. Res., Australia, 1931, 4, 152—161).—Stem infection of pineapples with soft rot is largely prevented by treatment of the cut stems with borax, H_3BO_3 , or CaOCl_2 , within 5 hr. of cutting. Salicylic and benzoic acids gave complete control; these acids dissolve in the stem juices and penetrate in minute amounts into the core, but not the flesh, of the fruit. PhOH is conveniently applied by brushing the stem with an EtOH solution of not $> 10\%$ concentration, or by rubbing in a mixture of 4 pts. of kaolin and 1 pt. of acid.

A. G. POLLARD.

Factors affecting the mineral content of [South Australian] pastures. A. E. V. RICHARDSON, H. C. TRUMBLE, and R. E. SHAPTER (Counc. Sci. Ind. Res., Australia, Bull., 1931, No. 49, 47 pp.).—In pot cultures of barley, *Lolium*, and *Trifolium*, N assimilation and the absorption of mineral nutrients were most active at the tillering stage. Photosynthesis reached a max. just before flowering, and transpiration losses were greatest during the final growth stages. The % of N, P, and K, and, to a smaller extent, of Ca and Mg, fell continuously from tillering to maturity. The total absorption of N, P, and K per unit of H_2O used declined from the initial growth stage to maturity. The major differences in the composition of individual species grown on different soils are attributable to differences in the available supply of nutrients in the soils. The P content of herbage is increased by applications of sol. P fertilisers only on P-deficient soils and other mineral constituents were not appreciably affected. The effect of superphosphate on growth, P intake, and H_2O requirement was greatest in the early growth stages and least at maturity, and also it was greater in a relatively dry than in a wet soil. On a soil of low H_2O content the dry-matter production of *Lolium subulatum* was low, but its protein, Ca, and Mg contents at maturity were higher than on wet soils.

A. G. POLLARD.

Chemical composition of pasture grasses under different systems of management. T. W. EVANS (Welsh J. Agric., 1931, 7, 255—267).—Analyses of grasses cut or grazed at 4-, 14-, and 30-day intervals are recorded. The protein content of herbage increased and the proportion of fibre decreased with the intensity of grazing. The CaO content reaches a max. in July, whilst that of H_3PO_4 rises continuously throughout the season. The nutritive ratio tended to become narrow with increasing intensity of grazing, but the differences were not great. Under all conditions the nutritive ratio was narrower at the end than at the beginning of the season.

A. G. POLLARD.

Increasing soil acidity as a means of controlling black root-rot of tobacco. W. L. DORAN (Massachusetts Agric. Exp. Sta. Bull., 1931, No. 276, 118—146).—Application of H_2SO_4 , HNO_3 , $\text{Al}_2(\text{SO}_4)_3$, or S to soil reduced the injury to tobacco by *Thielavia basicola*. H_3PO_4 was without effect.

A. G. POLLARD.

New protection against stored grain insects. W. P. FLINT and C. O. MOHR (Illinois Agric. Exp. Sta. Bull., 1930, No. 359, 376—388).—Insect injury to maize is prevented by dipping in lubricating oil emulsions made with K oleate. Germination was not affected and treated grain was fed to cattle without injury.

A. G. POLLARD.

Oil sprays for dormant use. A. SPULER, F. L. OVERLEY, and E. L. GREEN (Washington Agric. Exp. Sta. Bull., 1931, No. 247, 27 pp.).—Lubricating oil fractions (Saybolt 100—120 sec.) are suitable for dormant spraying. Refinement beyond 50% unsaponifiable val. is unnecessary. The effectiveness of emulsions is not markedly affected by the emulsifier used. The size of the dispersed oil droplets in the emulsion and its stability control the amount of oil retained by the leaves of the plant. Quick-breaking emulsions deposit more oil and cause correspondingly greater injury to plants. Miscible oil emulsions up to 4% concentration do not usually injure trees even when applied at the crit. period of bud development.

A. G. POLLARD.

Termite damage and recommendations for its prevention and control. S. F. LIGHT, M. RANDALL, and F. G. WHITE (California Agric. Exp. Sta. Circ., 1930, No. 318, 64 pp.).—Methods of dry-powder injection, fumigation, and ground treatment are described.

A. G. POLLARD.

Sodium bisulphate as a disinfectant against *Salmonella pullorum* in poultry-yard soils. P. W. ALLEN and M. JACOB (Tennessee Agric. Exp. Sta. Bull., 1930, No. 143, 14).—Protection of poultry from infection by *S. pullorum* from contaminated soil is obtained by the application of 1 gal. of 5% NaHSO_4 solution per sq. ft. of soil. The consequent growth of grass on the soil is not affected.

A. G. POLLARD.

Citric-solubility of phosphates. Determination of Pb and Cu in Bordeaux mixtures.—See VII.

PATENTS.

Composition serving as a fertiliser and agricultural pest destroyer. E. DEDOLPH (B.P. 356,195, 31.5.30. Can., 1.6.29).—A finely-ground mixture of

limestone with 1—50% S and 5% of a mixture of some or all of the following minerals is claimed: Mn ores, Fe or Cu sulphides or oxides, CuFeS_2 , ZnS, ZnO, FeAsS, MgCO_3 , and KI. A. R. POWELL.

Manufacture of a fungicidal and insecticidal composition [solution of arsenious acid]. L. P. CURTIN, Assr. to WESTERN UNION TELEGRAPH CO. (U.S.P. 1,785,074, 16.12.30. Appl., 25.1.27).— As_2O_3 is boiled with a 0.025—1% solution of Na_2CO_3 or with a 0.05% solution of $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$, whereby a 2.5—12.5% solution of As_2O_3 is obtained which is useful as a weed-killer or for the impregnation of wood. A. R. POWELL.

Insecticide and fumigant. R. C. ROARK and R. T. COTTON, Assr. to U.S.A. (U.S.P. 1,791,429, 3.2.31. Appl., 23.2.29).—Ethylene oxide in a concentration of 2 lb./cu. ft. of space is an effective fumigant for wheat, fabrics, etc., and is relatively non-toxic to man. (Cf. B., 1928, 732.) E. LEWKOWITSCH.

[Residues from] cellulose from vegetable fibres.—See V. HCN. Mixed fertiliser salts.—See VII. Treated garbage.—See XXIII.

XVII.—SUGARS; STARCHES; GUMS.

Decolorising "greens" from refined loaf sugar with norit. I. F. ZELIKMAN and A. I. SICHKARENKO (Nauk. Zapiski Tzuk. Prom., 1930, 10, 403—417).—Treatment with norit (regeneration described) gave sugar of quality lower than that of refined sugar of middle quality. Regenerated norit gave poor results. Decolorisation of refinery greens with bone-black is preferred. CHEMICAL ABSTRACTS.

Determination of sugars in marzipan containing "Convertit" and "Invertin." F. HÄRTEL (Z. Unters. Lebensm., 1931, 62, 253—255).—These substances are added to marzipan to keep it moist and soft, and consist principally of invertase, which produces gradual inversion of the sucrose. Merck's "Invertin" (solids 31.5 g., ash 0.72 g./100 c.c.) contains no diastase or zymase, and 3 drops will invert 50 c.c. of 20% sucrose in 2 hr. at 55°. Since addition of H_2O to the marzipan initiates rapid enzyme action, solutions in hot H_2O , which destroys the enzyme, should be used for polarimetric sugar determinations, or a reading should be taken immediately and again after the inversion period. Since lactose is not attacked by these preparations they may be used for determinations of sucrose in its presence (e.g., in condensed milk or milk chocolate). J. GRANT.

General rules for the evaluation of commercial sugar products. F. HÄRTEL (Z. Unters. Lebensm., 1931, 62, 242—252).—In view of the lack of such rules, proposals concerning the prep., the addition of mineral fillings, artificial colouring, sweetening, and flavouring agents, and the purity of the other constituents are scussed in detail for numerous types of confectionery. J. GRANT.

Physical chemistry of starch and bread-baking. VII. X-Ray spectra of the two constituents of starch: amylopectin and amylose. J. R. KATZ and T. B. VON ITALLIE (Z. physikal. Chem., 1931, 155, 199—207; cf. B., 1930, 1126).—Amylopectin and amylose prepared from starch paste both give in the

fresh state the same X-ray diagram, viz., a V-spectrum which is definitely a crystal spectrum. Retrogradation results in the appearance of a B-spectrum and the complete or partial disappearance of the V-spectrum. R. CUTHILL.

Corrosion of cans.—See X.

XVIII.—FERMENTATION INDUSTRIES.

Production and nitrogenous nutrition of bakers' yeast. H. CLAASSEN (Chem.-Ztg., 1931, 55, 742—744).—Attention is drawn to Henneberg's experiments (B., 1910, 1029, 1125), which showed that, if the amount of N in the fermentation liquid was increased by 45—60% by the addition of NH_4 salts, the N content of the re-produced yeast was increased by 6—35%. The yeast had a greater fermentative power, and its action in the baking oven was improved. The addition of NH_4 salts to worts, the N of which was solely in the org. form, did not decrease, but actually increased, yeast reproduction. Wohl and Scherdel (B., 1921, 191 A) submitted only one new fact: that org. N could be replaced by $(\text{NH}_4)_2\text{HPO}_4$ without decreased yeast production, provided not more than 50% of the total N was replaced. C. RANKEN.

Composition of Italian beer. G. FIANO (Annali Chim. Appl., 1931, 21, 388—396).—Italian beers are of the Pilsen, Munich, and Vienna type. Analytical data are given. O. F. LUBATTI.

Detection of benzoic acid as methyl ester. L. PICK (Z. Unters. Lebensm., 1931, 61, 358).—Conversion into the Et ester by Rohrig's method often fails to detect BzOH in wine and meat. Reliable results are obtained if the acid is transformed into the Me ester by stirring an Et_2O extract in the case of wine, or a purified aq. extract in the case of meat, with a few drops of Me_2SO_4 . H. J. DOWDEN.

PATENT.

Manufacture of proteinases free from peptidases. KALLE & Co. A.-G. (B.P. 356,638, 2.2.31. Ger., 31.1.30).—Peptidases are destroyed by keeping for several hr. the solution of mixed proteinases and peptidases the p_{H} of which has been adjusted to 3—4 by added acid. The optimum p_{H} of the proteinases is thereafter obtained by adding alkali to the solution, and the product is worked up into a dry preparation. C. RANKEN.

XIX.—FOODS.

Slimy gluten of wheat, caused by an insect. E. BERLINER (Mühlenlab., 1931, No. 1, 1; No. 4, 25—26).—Wheat with slimy gluten and of such poor baking qualities that edible bread cannot be produced therefrom has been observed during the last few years in consignments from Eastern Europe, Italy, and Spain. It is produced by the attack of *Aelia rostrata* and *Eurygaster integriceps* while the grain is milky. Grains so attacked have a low protein content and show punctures made by the insect on the surface. A small proportion of slimy gluten has a noticeable effect on the quality of the flour. W. J. BOYD.

Determination of total phosphorus, lipoid phosphorus, and phytosterols in ground wheat products. A. LEULIER and H. CREVAT (J. Pharm. Chim.,

1931, [viii], 14, 214—217).—The refuse grain is much richer in P, phosphatides, and sterols than the flour (75% of the whole grain), which contains only about 33% of the total P and about 55% of the total sterols. About 70% of the total lipid P remains in the flour.

E. H. SHARPLES.

Action of benzoyl peroxide as a bleaching agent for flour in the manufacture of rye bread. H. DILLER (Z. Unters. Lebensm., 1931, 62, 255—265).— Bz_2O_2 lowers the (gasoline) colour value of rye flour by 25—50%, but also decreases the fermentation power, yeast activity, loaf vol., pore size, elasticity val., and digestibility; the H_2O content and acidity are raised and the fermentation period is increased by 20%. Its use is therefore disadvantageous both to baker and consumer.

J. GRANT.

Determination of water in maize. U. FABRIS (Z. Unters. Lebensm., 1931, 61, 354—357).—Drying at 100—110° for 24 hr. or at 100° for 5 hr. gives almost identical results. The Brown-Duval method of heating with mineral oil at 180° for 20—25 min. and measuring the H_2O distilled gives low results. More accurate vals. are given by distilling on an oil-bath with turpentine oil (100 g. of maize with 150—200 c.c. of oil) and measuring the H_2O after 150 c.c. have been collected. By using H_2O -saturated turpentine and making a correction of +0.2 c.c., vals. are obtained which agree almost exactly with those given by vac. drying.

H. J. DOWDEN.

Effect of various methods of preparation on the digestibility and feeding value of cereals. N. HANSSON (Bied. Zentr., 1931, B, 3, 243—274).—In feeding trials with pigs the digestibility of maize and other cereals was increased (up to 18%) by grinding. Values for "flaked" maize were similar. The digestibility and feeding val. of whole or ground cereals was not increased by soaking in H_2O and was only slightly increased by cooking. The feeding of maize (up to 75% of the concentrates) to pigs did not affect the firmness of the lard produced.

A. G. POLLARD.

Digestibility by sheep of the constituents of the nitrogen-free extract of feeds. G. S. FRAPS (Texas Agric. Exp. Sta. Bull., 1930, No. 418, 15 pp.).—Feeding-stuffs known to be of high feeding val. are characterised by high contents of starch or of starch and sugar combined, or, if starch is low, of high protein val. The N-free extract of low-value feeding-stuffs contains high proportions of pentosans and of residual N-free extract. The N-free extracts of some feeding-stuffs contain notable amounts of non-carbohydrates. The digestibility of pentosans averages 50—60% in a no. of feeding-stuffs. The pentosans in crude fibre are digested to a less extent than the total pentosans or the pentosans in the N-free extract. The residual N-free extract is usually digested to a greater extent than are the pentosans.

A. G. POLLARD.

Comparative value of kale and maize silage for milk production. I. R. JONES and P. M. BRANDT (Oregon Agric. Exp. Sta. Bull., 1930, No. 272, 34).—The substitution of kale for maize silage in the rations for milch cows affected the yield of milk and of butter fat to a greater extent than was indicated by a comparison of

the digestible crude proteins and total digestible nutrient contents of the two materials.

A. G. POLLARD.

Silage (a) from sunflowers, (b) with the addition of urea. P. BRIGL and C. WINDHEUSER (Bied. Zentr., 1931, B 3, 220—242).—Sunflowers for silage should be cut when the seed reaches the milk-ripe condition. The product has a higher crude fibre content than that made from maize. Addition of urea (1—2%) to a maize-roots mixture produced a good silage free from butyric acid. Detailed analyses are recorded.

A. G. POLLARD.

Utilising the soya-bean crop in livestock feeding. W. B. NEVENS (Illinois Agric. Exp. Sta. Circ., 1931, No. 369, 44 pp.).—Essential points in the compounding of rations containing soya bean for cattle, sheep, horses, pigs, and poultry are recorded.

A. G. POLLARD.

Soya beans as a substitute for tankage in fattening spring pigs on legume pasture. C. M. VESTAL (Indiana Agric. Exp. Sta. Bull., 1930, No. 341, 14 pp.).—Soya beans may be substituted for tankage provided mineral supplements are used.

A. G. POLLARD.

Variability, accuracy, and adaptability of some common methods of determining the keeping of milk. IV. Correlation studies. V. Broader aspects of variability. A. H. ROBERTSON and J. M. FRAYER (Vermont Agric. Exp. Sta. Bull., 1930, No. 317, 154 pp.; No. 318, 54 pp. Cf. B., 1931, 991).—IV. Comparative tests of a very large number of samples by the methylene-blue and various bacteriological methods are recorded and discussed.

V. Limits of error are discussed.

A. G. POLLARD.

Refractometry of the lead serum [in analysis] of milk. S. ROTHENFUSSER (Z. Unters. Lebensm., 1931, 62, 202—209).—The serum is prepared by shaking 50 c.c. of milk with 2.5 c.c. of $Pb(OAc)_2$ and filtering; this provides a rapid method for refractometric analysis which may be used in the cold and with acid milk, and a serum from which excess of reagent may easily be removed. Compared with the $CaCl_2$ serum, the acidity, solids, and sp. gr. are less, the ash and N higher, whilst n may be slightly less or, for acid milks, slightly higher (± 0.08). Tables give the fall in n for sera from milk containing up to 100% H_2O (2.5 for addition of 10% H_2O). Additions of H_2O may also be followed from the fall in Cl content of the serum, but the P content is too small to be of use. Determinations have been made of the change in n of H_2O after shaking with solutions of fat in $C_2H_3Cl_3$ and other solvents.

J. GRANT.

Relationship between the sugar and chlorine content of milk and its refractometer figure. T. SUNDBERG (Svensk Kem. Tidskr., 1931, 43, 198—202).—The relationship between the lactose and Cl content of milk (expressed as g./100 c.c. of milk) can be represented by the equation $l = 7.06 - 18Cl$, whence $l = 7.06$ if $Cl = 0$, and $Cl = 0.392$ if $l = 0$. If the refractometer vals. of solutions corresponding to the above concentrations be plotted, a curve is obtained which runs parallel to that actually connecting the refractometer val. of milk with its lactose content; the difference in position of the two curves is due to the presence of other substances in the milk. The tables previously

given by Ackermann and Schulze for determining lactose in milk from the refractometer reading are unsatisfactory in the case of unadulterated milk high in Cl. Determinations of lactose and Cl should be carried out, not with raw milk, but with the serum obtained by treatment of the milk with $\text{Ca}(\text{OAc})_2$ and AcOH . H. F. HARWOOD.

Copper serum [for the refractometric analysis] of milk. A. BECKEL (Z. Unters. Lebensm., 1931, 62, 170—198).—The serum produced by addition to 30 c.c. of milk of 1.5 c.c. of 17.5% CuSO_4 in the cold is more sensitive to changes in n^{20} with % H_2O than the CaCl_2 serum, added H_2O (W) being given by $100(n_1 - n_2)/(n_2 - \alpha)$; where $\alpha = 12$ (for $n_2 > 39$) to 16 (for $n_2 < 20$), and n_1 and n_2 are the vals. for the original (stall) sample and watered milk, respectively. Heated milk gives lower n vals., depending on the temp., and acid milk higher vals. Cl' (C mg./100 c.c.) may be determined (after Drost) by titration of 11 c.c. of milk in the presence of 10 c.c. of AgNO_3 , HNO_3 , and Fe alum with NH_4CNS , the concentration of which is adjusted so that 1 c.c. $\equiv 10$ mg. Cl/100 c.c. of milk. The refractometer Cl val. (A) is then given by $n + 0.06 \times (C - 100)$. Since $100d = 54.5 + 1.5(A - 40)$, where d is the f.-p. depression, W may also be found from $100 \times (A_1 - A_2)/(A_2 - \beta)$, where A_1 and A_2 refer to the original and watered milks, respectively, and β is 6 (for $A_2 > 37$) and 10 (for $A_2 < 24$). The accuracy is 1% for 0—50% additions of H_2O . A is min. in late Aug. and max. in Dec. Milk may also be characterised by (a) $Q = 100 \times (n - \gamma)/C$, where γ is 15.4 (for $A > 41$ or 25—30) to 15.0 (for $A = 35$ —39); (b) $S = 0.1C/(\text{g. lactose}/100 \text{ c.c.})$. Tables and curves are given relating d with A , and (a) with (b), and for the consts. In spite of fluctuations in n and C , the frequency-distribution const. of A (6%) is as high as that of d . J. GRANT.

Preservation of milk for examination. RÜDIGER (Z. Unters. Lebensm., 1931, 62, 198—202).—A number of org. and inorg. preservatives were tested and 0.07% paraformaldehyde was found to be the most generally suitable. After 3 days at 16—24°, the microscopical characteristics, n , and Cl content were unchanged, and tests for uterine diseases were still effective. Catalase, however, was killed, and the acidity was increased slightly, so that its original value could not be determined. NaOBz (1—1.5%) will preserve milk for 48 hr. without affecting catalase activity. J. GRANT.

Creaming of milk pasteurised at high temperatures. J. C. MARQUARDT and A. C. DAHLBERG (New York State Agr. Expt. Sta., Tech. Bull., 1931, No. 180, 26 pp.).—Milk heated to temps. between 65.6° and 72.8° and held for varying periods (< 10 sec. to > 10 min.) at such temps. has been studied in relation to the effect on the creaming properties. This relationship is expressed by the equation $Y = 20.0468 - 0.1289X$, where Y is the time in min. of exposure to the temp. X . Absolute uniformity could not be obtained in the results, since different milks showed different "heat induction" periods, i.e., the periods of time during which milk could be heated before creaming properties were affected. E. B. HUGHES.

Non-acid Babcock method for determining fat in ice cream. O. R. OVERMAN and O. F. GARRET

(Illinois Agric. Exp. Sta. Bull., 1930, No. 360, 393—406).—The sample is mixed with a solution of BuOH , EtOH , and aq. NH_3 and subsequently treated with a solution of Na_3PO_4 and NaOAc . The customary Babcock apparatus and technique are utilised.

A. G. POLLARD.

Packaged ice cream. K. E. WRIGHT (Massachusetts Agric. Exp. Sta. Bull., 1930, No. 269, 196—206).—The texture of ice cream was controlled mainly by the temp. of the product at the beginning of the hardening process. The improvement produced by additions of gelatin was the result of the subsequent ageing of the gelatin. A. G. POLLARD.

Vitamin-A content of milk chocolate. A. SCHEUNERT and J. RESCHKE (Z. Unters. Lebensm., 1931, 61, 337—340).—Nutritional experiments with rats proved that both Nestlé's and Peter's milk chocolate contain appreciable amounts of vitamin-A. H. J. DOWDEN.

Action of "Absorbo" filters on coffee infusions. F. E. NOTTBOHM and F. MAYER (Chem.-Ztg., 1931, 55, 721—723).—Filtration of coffee infusions through normal and special "Absorbo" filters removes at the most 10% of the total caffeine content, but certain bitter constituents which detract from the flavour and aroma are removed almost completely, as well as part of the substances which produce the characteristic coffee flavour. A. R. POWELL.

Determination of citric acid [in coffee]. P. A. CLIFFORD (J. Assoc. Off. Agric. Chem., 1931, 14, 298).—When the method of Hartmann and Hillig (B., 1930, 392) was applied for this purpose, the pentabromoacetone was found to be contaminated by $\text{EtOH-Et}_2\text{O}$ -sol. material. A method is described whereby the pentabromoacetone is volatilised from the impurity in a current of warm air, and its wt. determined by difference. The sublimate may be collected and its m.p. found. Pentabromoacetone has m.p. 73—74°. W. J. BOYD.

Microscopical pollen analysis of honey. IV. Foreign honey. C. GRIEBEL (Z. Unters. Lebensm., 1931, 61, 241—306; cf. B., 1930, 740).—To assist in the detection of imported honey, the botanical characteristics, colour, shape, and size of a number of foreign pollen grains are described and illustrated by photomicrographs. An index to more than 400 varieties is given. H. J. DOWDEN.

Bitter honey from Gallura [Sardinia]. A. SANNA (Annali Chim. Appl., 1931, 21, 397—402).—This honey has an aromatic flavour, the taste is decidedly but pleasantly bitter, and the colour lemon-yellow. The taste is attributed to the presence of arbutin, which the bees obtain from the leaves and flowers of *Arbutus unedo*, L. O. F. LUBATTI.

Composition and digestibility of turnips. F. HONCAMP and W. SCHRAMM (Bied. Zentr., 1931, B, 3, 208—219).—Newer varieties of turnips have no greater differences in their contents of dry matter and crude nutrients than those produced by soil and climatic conditions, and the digestibility of the nutrients is not essentially different. The digestible protein content is higher than the usually accepted val. (averaging 0.4—0.5%). Turnips having high dry matter contents as a result of cultural practices show an increased

starch equiv. Losses of nutrient val. during winter storage are considerable. A. G. POLLARD.

Feeding value of sugar-beet tops. F. HONCAMP and W. SCHRAMM (Bied. Zentr., 1931, B, 3, 174—207).—A satisfactory conc. foodstuff may be obtained from washed beet leaves by ensilage or artificial drying. Washing the leaves prior to ensilage produced a better material than washing the ensiled leaves. Detailed analyses and digestibility trials with sheep are recorded. A. G. POLLARD.

Judging the quality of raspberry juices. H. WÜSTENFELD and C. LUCKOW (Z. Unters. Lebensm., 1931, 61, 341—345).—A "strength" test has been developed which consists in progressive dilution until the taste and odour become just imperceptible. The vals. for a number of samples of different origin varied between 1:667 and 1:250. Colour measurements on the Ostwald colorimeter fell within fixed limits, and the common adulterants (cherry and currant juices) were found to be of identical colour but different depth. Artificial essences are distinguishable on dilution by their ethereal perfume. Storage for a year does not appreciably affect the "strength" test vals., although it produces changes in general quality and in colour. H. J. DOWDEN.

Refractometric studies on fruit juices. H. ECKART (Z. Unters. Lebensm., 1931, 61, 346—353; cf. B., 1926, 460).—The vals. of n_D for the juice of a no. of fruits have been determined, especially raspberries of different qualities. The average val. for the juice of fresh ripe raspberries (fit for dessert) is 1.3462, for second-quality fruit (for preserves) 1.3422, and for low-quality fruit 1.3367, the decrease being approx. proportional to the time which has elapsed since the gathering. Adulteration of the fruit juice with H_2O has a similar influence, the addition of 50% reducing n_D from 1.3473 to 1.339. The construction and application of a hand refractometer are described. H. J. DOWDEN.

Pickling green olives. W. V. CRUESS (California Agric. Exp. Sta. Bull., 1930, No. 498, 42 pp.).—Best results were obtained by the use of a lye containing 1.7—2.0% of NaOH for 5—6 hr., followed by washing for 20—48 hr. Fermentation was facilitated by the addition of a starter of active green-olive brine, of small amounts of vinegar, or of lactic acid. Addition of dextrose aided fermentation and increased acidity. A. G. POLLARD.

Rancidity changes and the flavour of fats. C. R. BARNICOAT (J.S.C.I., 1931, 50, 361—365 r).—The effect of free fatty acids and of atm. oxidation of the unsaturated constituents on the flavour of fats was investigated. Addition of the free acids in proportion up to 10 or 15% was found to have no harmful effect on the flavour of beef kidney or brisket fat, mutton kidney fat, or lard. The active O and Kreis vals. at which rancidity became perceptible varied greatly (a) for a given fat exposed to different conditions of temp. and light, and (b) for fats of different composition when subjected to identical conditions. Exposure to direct sunlight and the relative absence of acids less saturated than oleic both favour the early production of rancidity. It is probable that the substances responsible for the odour and flavour of oxidised fats at ordinary temp.

are products of the oxidation of oleic acid rather than of linoleic or linolenic acids.

Reddening of boned codfish. J. HANZAWA and S. TAKEDA (Arch. Mikrobiol., 1931, 2, 1—22).—In salted cod which had reddened during storage indole and skatole, but not ptomaines or H_2S , were observed. In so-called sound fish H_2S was present and a H_2S -producing bacillus could be isolated. The red pigment is produced by *Torula Wehmeri*. A. G. POLLARD.

Preservative experiments with fish. A. BEHRE and G. ULEX (Z. Unters. Lebensm., 1931, 62, 58—80).—The preservatives tested (which included BzOH, its esters, and its substituted derivatives, hexamethylenetetramine, and H_2O_2) doubled the keeping properties of jellied and Bismarck herrings and of sliced tinned salmon and its substitutes (dyed sea salmon); crab preps. could be kept for 3 months. The effect was most marked during the winter months. Jellied herrings and crab preps. were kept for 3 months in the presence of 0.05% of hexamethylenetetramine; 0.15% of H_2O_2 , which is toxic to anaerobes, was found most suitable for jelly preps. which are susceptible to "jelly-illness." For tinned salmon and its substitutes *p*- is preferred to *o*-hydroxybenzoic acid, though the latter is a better preservative but objectionable on medical grounds. Fried herrings required no preservative, the temp. of the oil being of greater importance. Addition of gherkins, onions, etc. usually lowered the keeping properties. J. GRANT.

Determination of water-soluble mineral matter in foodstuffs by dialysis. F. W. SIEBER and H. DIETMANN (Z. Unters. Lebensm., 1931, 62, 266—271).—10 g. of sample (ground with sand if necessary) are dialysed overnight into 200 c.c. of H_2O , the process is repeated for 3 hr. with fresh H_2O , and the total dialysate diluted to 500 c.c. Aliquot portions are titrated for the Cl⁻ determination (Mohr), whilst for the KNO_3 determination they are reduced with Zn, Fe, and NaOH, and the resulting NH_3 is removed by distillation and titrated with 0.1N-HCl (methyl-orange). The method gave results which were higher by 0.1% or less than those obtained by an ashing process for chlorides in milk, salted egg-yolk, and cheese, and for $NaNO_3$ in meat, but gave low results (0.5%) for chlorides in salted meat. Cheese gives low results if not de-fatted. J. GRANT.

Rapid determination of crude fibre in feeding-stuffs. K. SCHARRER and K. KÜRSCHNER (Bied. Zentr., 1931, B, 3, 302—310).—The sample (1—3 g.) is heated under reflux for 30 min. with 75 c.c. of 70% AcOH 5 c.c. of conc. HNO_3 , and 2 g. of $CCl_3 \cdot CO_2H$. The residue is collected on a Gooch crucible, washed with EtOH and Et_2O , dried at 100—110°, and weighed. A. G. POLLARD.

Corrosion of cans.—See X. Cacao butter.—See XII. Marzipan. Starch and bread-baking.—See XVII. Bakers' yeast. Detection of BzOH.—See XVIII. Rhubarb.—See XX.

PATENTS.

Treatment of cereals and other starch-containing food substances. T. S. KELSEY (B.P. 356,794, 6.6.30).—The starch cells are softened by steam and disrupted by passage through cooled steel rollers. After

further disintegration, moisture is removed by a cyclone separator. E. B. HUGHES.

Baking [especially of sweetened bakery goods]. A. W. WAHL, Assr. to E. W. STEWART & Co. (U.S.P. 1,795,980, 10.3.31. Appl., 15.2.30).—Pectin, either dry or in solution, is incorporated in the mix before baking in the proportion of 1 pt. of pectin to 20 pts. of flour. E. B. HUGHES.

Preparation of bread and the like for wrapping. AUTOMATIC BREAD BAKING CO., LTD., F. HAWKINS, and W. MULLER (B.P. 356,791, 5.6.30. Austral., 6.6.29).—The hot bread is placed in a vac. chamber in order to remove excess of moisture before wrapping. E. B. HUGHES.

Treatment of residue remaining after extracting soluble substances from malt grain. M. M. KOLLER (U.S.P. 1,799,142, 31.3.31. Appl., 12.10.27).—The pressed liquor from spent grain is subjected to electrolysis, which effects complete precipitation of the suspended solids free from fermentation and in usable form as live-stock food. E. B. HUGHES.

Pasteurisation of milk. AKTIEB. SEPARATOR (B.P. 357,064, 24.2.31. Swed., 1.3.30).—Milk is pasteurised at 80° by means of steam at reduced pressure. The steam is at a temp. only a few degrees higher than the highest temp. of the milk. Suitable apparatus is claimed. E. B. HUGHES.

Production of vitamin-containing pasteurised milk of low bacterial content. R. R. GRAVE (U.S.P. 1,798,413, 31.3.31. Appl., 14.10.27).—Cows are milked mechanically, and the milk is held at bod temp. for $\frac{1}{2}$ —1 hr. to allow bacterial action, then pasteurised, and bottled under reduced pressure. The whole process takes place in one plant, access of air being prevented. E. B. HUGHES.

Treatment of liquids [e.g., milk] by irradiation. V. C. FROM, C. D. ROWLEY, and A. W. LARSKY (B.P. 346,682, 15.10.29).—Milk is treated simultaneously at just below the pasteurisation temp., preferably 49°, but in any case below 60°, with radiation from ultra-violet and from an infra-red lamp immersed in the milk at opposite sides of the container, whereby the bacteria content is reduced without adverse effect on taste or other properties of the milk. A. R. POWELL.

Treatment of substances with a view to their purification, preservation, or sterilisation. V. C. FROM and C. D. ROWLEY (B.P. 356,783, 10.5., 3 and 11.10.30, and 19.1.31).—Apparatus for subjecting perishable organic solids or liquids (e.g., milk, liquid egg) to intense sound waves of frequency near or above the highest audible frequency is claimed. J. S. G. THOMAS.

Preservation of fruits, vegetables, grain, & other organic substances. S. A. KAPADIA (B.P. 356,844, 24.6.30).—An apparatus is described for preserving fruits etc. by maintaining them in a refrigerating chamber containing gases produced by a coke liquid-fuel-fired furnace or the like. The gases should be free from CO. E. B. HUGHES.

Preservation of fresh fruit and vegetables by gas inhibition and refrigeration. C. BROOKS (U.S.P. 1,798,781, 31.3.31. Appl., 15.12.30).—Spoilage occurring during the first 24 hr. after warm fruits or vegetables

are loaded into a refrigerator car may be avoided by placing solid CO₂ on top of the shipment. The CO₂ content of the air thereby rises 25—30% in $\frac{1}{2}$ hr. and the temp. falls; at the end of 24 hr. the CO₂ content is 10%, and in the meantime the standard means of refrigeration has the processes of spoilage under control. E. B. HUGHES.

Treatment of fruit for prevention of decay. H. R. FULTON and J. J. BOWMAN (U.S.P. 1,797,572—3, 24.3.31. Appl., 19.11.27).—Fresh fruit, particularly citrus fruit, is treated for 1—10 min. at 15.5—54.4° with a 1—5% solution of (A) Na₂Al₂O₄, (B) MnSO₄, to prevent stem-end rot, blue-mould rot, etc. E. B. HUGHES.

Manufacture of pectin solution from apple pomace. E. R. DARLING and H. F. MACMILLIN, Assrs. to HYDRAULIC PRESS MANUFACTURING CO. (U.S.P. 1,799,140, 31.3.31. Appl., 6.9.27).—Crushed apples are treated with an enzyme to convert starch into sugar, after which palatable juice is expressed first at ordinary pressures and then under high (500 lb.) pressure; the broken mass is then mixed with 10% of hot H₂O, with or without 2½% of vinegar, and hydraulic pressure of 1000 lb. or more applied, yielding a clear water-white conc. pectin solution. E. B. HUGHES.

Production and purification of [vegetable] phosphatides. H. BOLLMANN (B.P. 356,384, 15.7.30. Ger., 21.10.29).—Phosphatides, together with the associated oil, are treated with H₂O₂, excess of the latter together with H₂O being removed by subsequent distillation under reduced pressure. Considerable improvement in colour is obtained without impairing the taste or other qualities of the phosphatides. Capacity for emulsification is much improved. E. B. HUGHES.

Fumigant.—See XVI. Synthesis of vitamins.—See XX.

XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Study of rhubarb and determination of some of its constituents. P. VALAER (Amer. J. Pharm., 1931, 103, 495—503).—Free and combined emodin are determined by a modification of the Bornträger reaction. Free emodin is determined by making the solution just acid with 0.1N-H₂SO₄ and extracting with Et₂O. The yellow colour of the Et₂O extract is read in a Lovibond tintometer, using a $\frac{1}{8}$ -in. cell. The Et₂O extract is mixed with an equal vol. of aq. NH₃ solution and, after $\frac{1}{2}$ hr., diluted to 5 times its vol. with H₂O, the red colour of the NH₃ solution being read in a $\frac{1}{8}$ -in. cell. Total emodin is determined by preliminary hydrolysis before extraction with Et₂O. Before hydrolysis the yellow and red readings are in the ratio 1:1, whilst after hydrolysis the ratio is 6:5. A method which yields gravimetric results is not considered so satisfactory. T. MCLACHLAN.

Knudson and Dresbach's colorimetric evaluation of *Digitalis* leaves. B. J. OCKELOEN and J. C. TIMMERS (Pharm. Weekblad, 1931, 68, 820—824).—Satisfactory results were obtained by matching the colour of the alkaloid picrate solution against K₂Cr₂O₇ solutions, the titre of which gives a measure of the val. of the *Digitalis* prep. (Cf. A., 1922, ii, 882.) S. I. LEVY.

Determination of formaldehyde in certain [pharmaceutical] preparations, and making up

Liquor formaldehydi saponatus, D.A.B. VI. J. BÜCHI (Pharm. Ztg., 1931, 76, 1063).—The influence of the presence of EtOH, MeCHO, and COMe₂ on the results obtained by five selected methods of analysis is recorded. Application of the results to analysis of the above prep. showed a CH₂O content too low by 3%; loss of CH₂O is found to occur by the action of the KOH during prep. and a modified way of making up is suggested. S. I. LEVY.

Philippine pine-needle oil from *Pinus insularis* (Endlicher). I. DE SANTOS, A. P. WEST, and P. D. ESQUERRA (Philippine J. Sci., 1931, 46, 1—5; cf. B., 1931, 935, 768).—Steam-distilled needles (and twigs) of the Benguet pine yielded only 0.043% of dextro-rotatory greenish-yellow oil having d_{4}^{20} 0.0582, $[\alpha]_{D}^{20}$ +20.53°, n_{D}^{20} 1.4700, acid val. 1.38, sap. val. 7.67, esters (as bornyl acetate) 1.75%; 4.9% and 85.3% distil below 155° and 164°, respectively. The oil is sol. in 10 pts. of 90% EtOH and appears to consist largely of α - and β -pinene. E. LEWKOWITSCH.

Root-rot in tobacco.—See XVI.

PATENTS.

Synthesis of vitamins. C. M. RICHTER (B.P. 356,793, 6.6.30).—Vitamins-A and -D are synthesised in cholesterol, out of contact with O₂, on exposure, in a transparent (e.g., quartz) vessel, to infra-red or ultra-violet light. Infra-red light favours production of vitamin-A; ultra-violet that of vitamin-B. [Stat. ref.] J. LEWKOWITSCH.

Alcohols. Complex salts [for injection]. Quinine double salt.—See III.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Optical methods for reducing the effects of photographic plate graininess, with special reference to spectral-line and star-image measurements. F. E. WRIGHT (J. Opt. Soc. Amer., 1931, 21, 485—496).—A crit. review. A method for producing an oscillating image by means of an electromagnet is described. J. LEWKOWITSCH.

Cellulose nitrate film.—See V.

PATENTS.

Protective paper strips for photographic film rolls for daylight loading. I. G. FARBENIND. A.-G. (B.P. 356,981, 23.10.30. Ger., 25.10.29).—One or more layers of parchmented paper, coloured in the usual manner, are used. J. LEWKOWITSCH.

Manufacture of photographic bleaching-out layers. W. W. GROVES. From I. G. FARBENIND. A.-G. (B.P. 352,196, 2.6.30).—Thio- or seleno-xanthonium dyes are used instead of pyronine dyes to give a comparatively pure white bleach-out. Examples are: 3:7-diamino- (yellow-red) and 3:7-tetramethyldiamino-10-cyano- (blue) -thioxanthonium chlorides, and 3:7-diamino-1:4:6:9-tetramethyl- (purple), 3:7-tetraethyldiamino-9-cyano-2:8-dimethyl- (purple), 3-amino-7-dimethylamino-1:4-dimethyl- (purple), 1-chloro-3-amino-7-dimethylamino- (red-violet), and 3-amino-7-dimethylamino-2-methoxy- (purple) -selenoxanthonium chlorides. C. HOLLINS.

Development of light-sensitive layers. E. GRONAU, Assr. to E. DIETZGEN Co. (U.S.P. 1,798,414, 31.3.31. Appl., 17.11.25. Ger., 6.1.25).—The layer is moistened with a fine film of liquid (aq. NH₃) and treated with NH₃ gas at the same time. Suitable apparatus is described. J. LEWKOWITSCH.

Production of negatives by other means than photography. G. J. R. JOYCE (B.P. 356,850, 28.6.30).—Carbon duplicating paper through which writing or line-drawings have been traced is mounted on glass or celluloid and used as a negative. J. LEWKOWITSCH.

Photographic printing. I. G. FARBENIND. A.-G. (B.P. 356,701, 8.5.30. Ger., 8.5.29).—An optical system is described whereby a print may be made through a lenticular surfaced "negative" film on to another lenticular film without lateral inversion, and with correct tone-value reproduction, with or without a colour screen. Special diaphragms may be employed to minimise diffraction effects. (Cf. B.P. 353,121.) J. LEWKOWITSCH.

Photographic etching. A. B. DAVIS, Assr. to KEYSTONE WATCH CASE CORP. (U.S.P. 1,797,210—1, 17.3.31. Appl., [A] 16.12.26, [B] 9.11.28).—(A) A light-sensitive resist for etching is prepared by treating asphalt, pine resin, etc. in one step with SCl₂ in CS₂ solution. The light-insensitive portions are removed by washing with an ether. Aldehydic substances, e.g., lavender oil, may be added. (B) Application of the above. J. LEWKOWITSCH.

Polymethine dyes as sensitisers.—See IV.

XXII.—EXPLOSIVES; MATCHES.

Storage of nitrocellulose. W. FERMAZIN (Chem.-Ztg., 1931, 55, 729—730).—A determination of the swelling capacity of nitrocellulose gives a truer interpretation of its condition during storage than do stability tests, since it is effected at more nearly corresponding temp. A simple apparatus, comprising a movable wt. and scale, is described. The max. swelling was 32.3% in 95% and 13.1% in 75% alcohol, 7% in aq. glycerin, 4% in CHCl₃, and 12.2% in H₂O. Swelling is influenced by impurities in the nitrocellulose rather than by its N content or fibre length, and increases with temp. In conjunction with the Bergmann-Junk stability test, a determination of the swelling provides an adequate safeguard against risk from decomp. Nitrocellulose wetted with 35% of a damping medium may lose 5—8% of this medium through gravity separation in 3 months, and the rate of separation increases with the sp. gr. and b.p. of the liquid. If the nitrocellulose is treated with 35% of 40—60% EtOH or BuOH there is no appreciable separation after 4 months. W. J. WRIGHT.

Cellulose nitrate film.—See V.

PATENTS.

[Manufacture of high-density] nitrocellulose [from cellulose pulp]. N. PICTON, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 356,252, 5.6.30. Addn. to B.P. 336,235; B., 1931, 46).—Pulp-board made from cotton cellulose is cut up and nitrated as in the prior patent. Hard pulps may require up to 80% of HNO₃ in the acid mixture to ensure penetration, or soft pulps up to 40%. D. J. NORMAN.

Propellent powders. W. W. TRIGGS. From E. I. DU PONT DE NEMOURS & Co. (B.P. 356,256, 5.6.30).—Nitrocellulose, containing preferably $> 12.9\%$ N, is combined with a polynitrotoluene, *e.g.*, dinitrotoluene, and a high-boiling org. ester, *e.g.*, Bu phthalate, both the polynitrotoluene and the org. ester being solvents for the nitrocellulose, non-volatile, non-hygroscopic, and insol. in H_2O , and their mixture being liquid below 80° . A suitable composition consists of nitrocellulose 80—85, dinitrotoluene 10, Bu phthalate 7—10, and $NHPh_2$ 1 pt. The powder has good stability, even after H_2O treatment.

W. J. WRIGHT.

Explosive compositions. A. STETTbacher (B.P. 356,772, 11.6.30).—A plastic explosive of high brisance, but having a low sensitiveness to shock, is produced by incorporating 5—90% of finely-cryst. pentaerythritol tetranitrate with a mixture of 4—70% of nitroglycerin and 2—20% of dinitroglycol, gelatinised with 0.5—8% of collodion cotton, and adding 10—70% of nitrate or perchlorate of NH_4 , Na, or K. Wood meal, vaseline, or aromatic nitrohydrocarbons may be added.

W. J. WRIGHT.

Percussion caps and the like. H. W. BROWNSDON, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 356,765, 28.5.30).

XXIII.—SANITATION; WATER PURIFICATION.

Two-stage [sewage] sludge digestion. I. Plant design and operation. A. M. BUSWELL, H. L. WHITE, and H. E. SCHLENZ. **II. Solids balance.** A. M. BUSWELL and G. E. SYMONS. **III. Gas, grease, and cellulose balance.** A. M. BUSWELL and E. L. PEARSON. **IV. Use of tank liquor instead of sludge for seeding.** A. M. BUSWELL, G. E. SYMONS, and F. L. PEARSON. **V. Determination of settling solids.** A. M. BUSWELL, A. L. ELDER, C. V. ERICKSON, and G. E. SYMONS (Ill. State Water Survey Bull., 1928—1929, No. 29, 17—27, 28—60, 61—76, 77—81, 82—91).—I. Diagrams and descriptions are given.

II. There can be obtained 63% digestion of total solids, 75% liquefaction, 63% digestion of protein, 83% digestion of SO_4 , and a dehydration of 5% of total solids.

III. Grease digests to give gas.

IV. Seeding of a tank with liquor from another tank caused gasification to start immediately.

V. A method is described. CHEMICAL ABSTRACTS.

Sodium aluminate in modern water treatment. R. B. BEAL and S. STEVENS (J.S.C.I., 1931, 50, 307—313 τ).—The factors involved in the production of a properly treated water together with the limitations of the simple lime-soda softener are surveyed. By the use of small quantities of Na aluminate the flocculent Mg aluminate ppt. is formed, having unique power to coagulate the finely-divided ppt. produced in the lime-soda softener. Previous attempts using acid coagulants have not been very successful, except in problems of clarification, owing to the increased hardness produced, thus necessitating larger quantities of softening reagents, as well as increasing the total solids fed to the boiler. Na aluminate increases very greatly the speed of chemical precipitation without over-treatment, and the reaction is brought to completion. Mg is removed completely in the softener, and the attendant formation of sol.

basic Mg compounds, which result in after-precipitation in filter-beds, pipe-lines, heaters, etc., is eliminated. By the use of Na aluminate, SiO_2 , one of the worst of the scale-forming substances, is removed as an insol. aluminosilicate. Improved clarification and longer life of filter-beds are possible. Na aluminate solutions are also used in boiler plants where for some reason a softener has not been installed. Sufficient excess alkalinity is produced to prevent scale and corrosion. The Mg aluminate and aluminosilicates coagulate the finely-divided ppts., which are thus prevented from adhering to the boiler metal, and, in view of their size, drier steam is produced. Scale-formation and corrosion due to pollution of the condensate by raw water, and the access of Mg salts at this point, can be eliminated by conditioning the feed-water with a caustic solution of Na aluminate to form flocculent aluminates in the boiler. The CO_3/SO_4 and the Na_2SO_4 alkalinity ratios are discussed together with the relationship between the total solids and suspended solids which can be carried in a boiler water, since priming and foaming is a function of the surface tension of the water and the condition in which the suspended matter exists. Coagulation by the use of Na aluminate has important applications in the removal of colour and turbidity from water and of oil from condensate. Double coagulation with Na aluminate and alum is finding extended use for these purposes.

Effect of heating and boiling on the temporary hardness of water. A. V. FILOSOFOV (J. Appl. Chem., Russia, 1930, 3, 1055—1061).—Evolution of CO_2 begins at 55° ; during heating from 55° to 100° the rate of decrease of hardness is const. On boiling, the decrease in hardness is at first rapid, but is negligible after 30—35 min. The results are expressed mathematically.

CHEMICAL ABSTRACTS.

Filter-sand studies at Denver [waterworks]. O. J. RIPPLE (J. Amer. Water Works' Assoc., 1931, 23, 1317—1319).—Experiments showed that the coarsest sand filter (effective size 0.61 mm.) gave the best results of the sand filters, but a combined sand and coal filter (15 in. of sand at the bottom, effective size 0.50 mm.; 24 in. of coal on top, effective size 0.83 mm.) gave best results of any.

C. JEPSON.

Filter sand [for water]. J. W. ARMSTRONG (J. Amer. Water Works' Assoc., 1931, 23, 1292—1310).—Experimental graded sand filters of varying grain size were treated with a common influent of pretreated water. With this particular water the floc breaks up and adheres closely to fine-grained sand (0.33—0.45 mm. diam.) and tends to form a thin but hard crust which is not broken up when washing and forms mud-banks and balls in the bed. With coarser beds the floc settles lighter, is not broken up, penetrates deeper but is easily removed by washing, and gives longer filter runs. It is suggested that for pressure filters the size of sand grain generally used could be materially increased without adversely affecting the clarity of the effluent and with greater economy in working.

C. JEPSON.

Filtering materials [for waterworks] at St. Louis. A. G. NOLTE (J. Amer. Water Works' Assoc., 1931, 23, 1311—1316).—Experiments similar to those with filter sand (cf. preceding abstract), carried out at

St. Louis, indicate that the filters containing the greatest proportion of sand between 0.5 and 1.0 mm. gave the best results as judged by the quality of effluent and the length of filter run. C. JEPSON.

Filtering materials for waterworks. W. E. STANLEY (J. Amer. Water Works' Assoc., 1931, 23, 1282—1291).—An introduction to a series of investigations carried out at various centres at the request of a Committee of the Sanitary Engineering Division of the American Society of Civil Engineers. An attempt has been made to standardise the equipment used, which consisted of glass-tube filters ($1\frac{3}{4}$ in. diam.), and the mode of expression of results, which included consideration of sand sizes, washing rates, penetration of floc, length of filter run, filter depth, etc., and are believed to be applicable to large-scale plant.

C. JEPSON.

Manganese in water, its occurrence and removal. R. S. WESTON (J. Amer. Water Works' Assoc., 1931, 23, 1272—1282).—The chief objections to the presence of Mn in potable waters are its liability to cause brown stains on clothing etc. and its interference with the o-tolidine test for Cl_2 . But for the latter, its presence in many waters would have been unsuspected, as the amount present rarely exceeds 3 p.p.m. and is usually < 1 p.p.m. In industry it affects the bleaching process and is liable to cause a coating on the insides of pipes and aqueducts. It may readily be removed at reasonable cost by the methods in common use for the removal of Fe, provided suitable pretreatment is given.

C. JEPSON.

Water-purification problems in mining and manufacturing districts. C. F. DRAKE (J. Amer. Water Works' Assoc., 1931, 23, 1261—1265).—The main difficulty experienced in the mining districts of Pennsylvania is due to rapid variations produced by irregular discharges of acid water from coal mines. Purification of such river water for potable purposes requires plant capable of dealing with peak conditions and the use of large amounts of Na_2CO_3 to produce neutrality.

C. JEPSON.

Carbonate number in water analysis. O. MAYER (Z. Unters. Lebensm., 1931, 62, 271—291).—A rapid scheme of analysis based mainly on the determination of the "carbonate number" ($1000 \times$ carbonate hardness expressed as mg. CaO per 100 c.c./total solids) is described. "Lime-aggressive CO_2 " is determined from the increase in the alkalinity val. of the filtered H_2O after 24 hr. in contact with finely-powdered washed marble. Analytical data illustrating the author's methods are given for 91 waters. J. GRANT.

Determination of nitrate in drinking water. W. MULDER (Pharm. Weekblad, 1931, 68, 995—997).—The intensity of the colour obtained by Schering's Na salicylate method is proportional to the NO_3^- concentration and the colour is stronger than that given by phenol-sulphonic acid. The correction factor necessary in presence of Cl^- is valid if not more than 2 mg. of Cl^- are present; with more Cl^- the correction becomes a const. factor, and accurate results may therefore be obtained by colorimetric comparison if sufficient Cl^- be added to both solutions. NO_2^- , at high concentrations, intensifies the colour. H. F. GILLBE.

Determining F in insecticides.—See VII. **Determining Pb dust in factories.**—See X.

PATENTS.

Treatment of sewage. W. RUDOLFS, Assr. to NAT. ALUMINATE CORP. (U.S.P. 1,797,879, 24.3.31. Appl., 16.5.29).—The addition of small amounts (3.0—5.0 p.p.m.) of Fe^{+++} salts to sewage or effluents is claimed to facilitate the separation of suspended solids and to produce a more granular type of sludge. C. JEPSON.

Increasing the rate of anaerobic digestion of sewage solids. W. RUDOLFS, Assr. to NAT. ALUMINATE CORP. (U.S.P. 1,797,157, 17.3.31. Appl., 16.5.29).—The addition of 1.0—5.0 p.p.m. of $\text{Na}_2\text{Al}_2\text{O}_4$ or Na_3AlO_3 to sewage containing approx. 20.0 p.p.m. of suspended matter accelerates the rate of digestion of the carbohydrate materials in the resultant sludge. The production of CH_4 is increased, giving a higher thermal val. to the resultant gas, and the time required for complete digestion at room temp. is reduced by 30—40%.

C. JEPSON.

Apparatus for treating organic material [e.g., garbage]. J. H. FEDELER (U.S.P. 1,797,335, 24.3.31. Appl., 12.2.27).—The garbage, after being freed from tins etc. and dried by squeezing between rollers, is passed on a series of endless belts through zig-zag chambers in countercurrent to hot air. The dried material is reduced in bulk and may be used as a fertiliser or as a source of heat for the process. C. JEPSON.

Treatment of wastes. F. W. SPERR, JUN., Assr. to KOPPERS Co. (U.S.P. 1,799,444, 7.4.31. Appl., 29.3.26).—Atm. nuisance due to H_2S is prevented by aerating screened and detritus-free sewage in the presence of $\text{Fe}(\text{OH})_3$, $\text{Ca}(\text{OH})_2$, and a foam-producing agent, e.g., saponin or pine oil. The Fe_2S_3 produced is oxidised and the liberated S suspended in the froth which also prevents the escape of H_2S . After sedimentation the effluent is passed on for the necessary further treatment and the sludge is returned to the incoming sewage as in the activated-sludge process. C. JEPSON.

Treatment of waste [pulp] liquors. D. D. PEEBLES, Assr. to PEEBLES PROCESSES, INC. (U.S.P. 1,797,585, 24.3.31. Appl., 28.7.26).—The waste liquors from soda- and sulphate-pulp processes, after concentration to about 40—50% of solids in a vac. evaporator, are circulated through a dehydrator until the concentration reaches 90% of solids. This material is burned in a smelting furnace along with Na_2SO_4 with production of Na_2CO_3 for conversion into NaOH. Sufficient heat is generated to operate the whole plant, and all foul gases are discharged into the hot zone of the furnace and destroyed. C. JEPSON.

Impregnation of filters [for gas- and smoke-masks]. H. A. KUHN and W. A. BOYLE (Assr.) (U.S.P. 1,798,164, 31.3.31. Appl., 28.10.26).—The filter is formed by impregnating a foraminous cellulose tissue with a finely-divided C product, e.g., lampblack or activated C passing 100-mesh. C. JEPSON.

[Automatic] apparatus for mixing and delivering liquids [disinfectants for cisterns]. O. COWLEY and E. J. DICKER (B.P. 357,311, 10.7.30).

Furnaces for waste materials.—See II. **Sterilisation.**—See XI. **Fumigant.**—See XVI.