BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

SEPT. 12 and 19, 1930.*

L-GENERAL; PLANT; MACHINERY.

Coefficient of heat transfer from the internal surface of tube walls. A. EAGLE and R. M. FERGUSON (Proc. Roy. Soc., 1930, A 127, 540-566).—Full details are given of the apparatus and technique used for measuring the coefficient of heat transfer k from a heated brass tube to water flowing through it. The principal innovations in the present method are (a) the direct heating of the tube by a low-tension alternating current, and (b) the discarding of the use of thermocouples to obtain the temperature of the water, this being calculated for any cross-section from the amount of heat put into the water up to that cross-section. No definite value of k is obtainable till the temperature distribution over the cross-section has reached its limiting form. The water temperature was varied from about 5° to 60°, the water velocity from 30 to 330 cm./sec., the inside diameter of the tube from 1.02 to 3.56 cm., and the heat flow rates from 0.30 to 1.50 g.-cal./sq. cm./sec. It is shown that the limiting coefficient is, apart from a simple factor, a function of Reynolds' number $\tau \equiv \rho v d/\mu$. and $\sigma \equiv \mu s/c$. The results for very small rates of heat flow, H, can be expressed in the form $\rho vs/k_0 = A +$ $B(\sigma-1) - C(\sigma-1)^2$, where A, B, and C are positive functions of τ only and k_0 is the value of k when H = 0. This holds for all values of σ up to about 15, and for values of τ from about 5000 to ∞ . A theory, agreeing with experiment, is given showing the difference between k_0 and $k_{\rm H}$ when τ is large, and a simple empirical rule for the difference when τ is smaller. L. L. BIRCUMSHAW.

Rapid film evaporator for unstable liquors and extracts. O. ZAHN (Chem. Fabr., 1930, 285-286).-The evaporator is built up of a number of superimposed elements each consisting of a distributing plate surrounded by a circular gutter, from which the liquid overflows, passing down the sides of a funnel to fall upon the centre of the next plate. A central vertical shaft rotates the plates. Separate heating chambers are provided for each compartment, so that temperature can be controlled as required, and the vapours can be drawn off separately and fractionally condensed if necessary. The liquid passes through the evaporator in 2-5 min., only 20-30 litres being in the apparatus at one time, and an evaporation of 80-90 kg. of steam per hr. per sq. in. of heating surface is obtained without vacuum. C. IRWIN.

Life of filter cloths. M. WERNER (Chem. Fabr., 1930, 277-279, 286-287).-Twill filter cloths may be treated with sodium nitrate and mixed acids so as to contain 12-12.5% N. The nitrated cloth is much more resistant to acid than is untreated cloth, but as it is explosive when dry it must be kept under water. Nitration beyond the point mentioned results in a total "Intermediate the set of this set of Abstracts will appear in next week's issue.

loss of mechanical strength. Tests were made of the strength of treated and untreated cloth after exposure to sulphuric and hydrochloric acid at various temperatures and concentrations. The initial strength is reduced by nitration, but the reduction in strength by time of exposure or by rise of temperature is very much less. The life of the cloth is in either case reduced by increase in concentration, and more rapidly by hydrochloric acid than by sulphuric acid. It is estimated that the life is increased 50 times by nitration when used in acid solutions. Nitrated cloth can be used in 20% sulphuric acid at 40°, 20% hydrochloric acid at 20°, or 10% hydrochloric acid at 40°. C. IRWIN.

Comparison between horizontal and vertical centrifugals. G. OEHLER (Chem. Fabr., 1930, 265-266).—A horizontal centrifugal machine yields an even layer of solid matter around the container, whilst a vertical machine deposits the solid layer parabolically. A method of calculating the capacity of a vertical centrifuge is worked out. Theory indicates that in consequence of this distribution a vertical machine should be less efficient than a horizontal one. Comparative tests on machines of the two types with common salt, Glauber's salt, sodium bicarbonate, and potassium carbonate are described. These showed that under similar conditions the residual moisture in material from the horizontal centrifugal was 70-90% of that from vertical machines. Measurements of liquid separated are in agreement with this result. C. IRWIN.

Centrifugal concentration. H. A. DOERNER (U.S. Bur. Mines Tech. Paper 457, 1929, 39 pp.) .- Experiments in a laboratory tube-centrifuge proved that the separation of minerals effected was due to centrifugal concentration, and not merely to free or hindered settling. Using a machine of semi-commercial size, the possibility of such separation on a large scale was demonstrated and the various factors involved were ascertained.

C. A. KING.

Determination of particle size in pulverised substances. K. KASAI (Sci. Papers Inst. Phys. Chem. Res., Tokvo, 1930, 13, 135-183).-An absolute value of the surface area of large fractionated glass particles is determined from the rate of dissolution in hydrogen fluoride. The surface of a smaller particle relative to that of the larger ones is determined by adsorption. These particles are conveniently conceived as ellipsoids, the axis of the ellipsoid being used to specify any given set of particles. A. B. D. CASSIE.

Method of measuring granular material by volume. H. WINKELMANN (Chem. Fabr., 1930, 269-270).-A description of the Lea apparatus, which is claimed to give an accuracy of $\pm 2\%$. C. IRWIN.

Classification of plastics and definition of certain properties. E. KARRER (J. Rheology, 1930, 1, 290—297). —The meaning of the terms solidity, elasticity, viscosity, and plasticity is discussed, and these properties are made the basis of a comparison of the plastic state with the ideal liquid and solid state. Plastics are classified according to their method of preparation as mechano-, chemo-, solvo-, thermo-, and cheo-plastics.

T. H. MORTON.

Search for a general law of the flow of matter. M. REINER (J. Rheology, 1930, 1, 250-260).—Mathematical. The use of empirical formulæ for the representation of viscous flow is criticised, and it is shown that by using a generalised expression connecting velocity gradient with shearing force it is possible to arrive at an expression which permits the derivation of a numerical law for capillary or rotating-cylinder viscosimeters which is independent of the instrument.

T. H. MORTON.

Kinetic energy correction in fluid flow. S. B. STONE (J. Rheology, 1930, 1, 240—249).—A mathematical investigation of the modification of the flow of fluids through a capillary tube by an energy term which is extended to include, not only the usual kinetic energy of efflux, but also the rotational energy of suspended particles and the energy absorbed in the change of colloidal structure. It is shown that a fluid may obey Poiseuille's law without obeying the fundamental (Newton's) viscosity law. T. H. MORTON.

New viscosimeter. A. KÄMPF (Kolloid-Z., 1930, 51, 165–167).—The viscosimeter described earlier (cf. Kämpf and Schrenk, A., 1930, 1014, originally made for work on artificial silk, is suitable for the general investigation of highly viscous liquids. E. S. HEDGES.

Testing and calibration of the new Kämpf viscosimeter. O. SCHRENK (Kolloid-Z., 1930, 51, 167-171).—Tests on the Kämpf viscosimeter (cf. preceding abstract) show that it is comparable in accuracy with any existing viscosimeter.

E. S. HEDGES.

Influence of the proximity of a solid wall on the consistency of viscous and plastic materials. G. W. S. BLAIR (J. Physical Chem., 1930, 34, 1505— 1508; cf. B., 1930, 351).—Theoretical. The case of material streaming through a tube and having a layer showing modified consistency constants near the wall of the tube is discussed. L. S. THEOBALD.

Two new ultrafiltration funnels for rapid filtration. S. R. ZINZADZE (Kolloid-Z., 1930, 51, 164—165).— Two ultrafilters, one for quantitative and the other for qualitative work, and particularly rapid in action, are described. They are also applicable to electro-ultrafiltration. E. S. HEDGES.

Mercury volumeter. J. F. McMAHON (J. Amer. Ceram. Soc., 1930, 13, 363-367).—The Goodner mercury volumeter (*ibid.*, 4, 288) has been improved by the addition of a counterbalance, a light signal, and a dipping device. The apparatus is fully described and illustrated. The advantages claimed are more speedy manipulation, no string marks, cleaner mercury, and better suspension of the briquettes in mercury.

R. J. CARTLIDGE.

Many-sided illumination in the dark field. C. SPIERER (Kolloid-Z., 1930, 51, 162—163).—A special immersion objective lens and dark field condenser are described. E. S. HEDGES.

New consistometer and its application to greases and oils at low temperatures. R. BULKLEY and F. G. BITNER (Bur. Stand. J. Res., 1930, 5, 83-96).— See B., 1930, 674.

PATENTS.

Gas-fired furnace. W. A. MORTON (B.P. 331,315, 3.5.29).—In a reverberatory or similar furnace the flues for gas, air, and waste gases are all at one end of the furnace, and are separated by relatively thin walls, so that some preheating of both air and gas is effected therein; the air is further preheated in a recuperator.

B. M. VENABLES.

Tunnel kilns. WOODALL-DUCKHAM (1920), LTD., and A. McD. DUCKHAM (B.P. 331,109, 8.7.29).—In a tunnel kiln having a travelling platform vertical rollers or other squeezing means are provided at the point where the platform enters or re-enters the kiln to press back any loose material projecting beyond the normal width of the platform. B. M. VENABLES.

Feeding finely-divided solid material into highpressure vessels. F. B. GRANT, H. HARPER, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 330,988, 22.3.29). —The material is conveyed in a pocket formed in the side of a ram which passes through a gland longer than the pocket. The ram may be rotated through 180° after entering the vessel so that the material drops out by gravity, but a blast of gas under a pressure greater than that in the vessel is also supplied through a borehole in the ram to clear out the pocket.

B. M. VENABLES. [A] Method and apparatus for cooling air. [B] Air-treating devices. H. A. GILL. From COOLING & AIR CONDITIONING CORP. (B.P. 331,218-9, 25.3.29).--(A) Two sets of water sprays and a refrigerating system comprising condenser, evaporative cooler, and compressor are provided. The water from the first set of sprays passes through the condenser and thence to waste; the water of the second set of sprays passes in a closed circuit through them and the cooler. (B) Centrifugal spraying devices for atomising scrubbing liquid are described. [Stat. ref.] B. M. VENABLES.

Heat-exchanging apparatus. M. PAVNE (B.P. 331,392, 4.7.29).—Discs of sheet metal slit radially or strip slit longitudinally are used in the construction of gills for attachment to heat-exchanging tubes.

B. M. VENABLES. Heat-exchange apparatus. G. W. WATTS, ASST. to STANDARD OIL CO. (U.S.P. 1,741,043, 24.12.29. Appl., 27.7.25).—Gas is removed from a space in a heat exchanger, which should contain liquid only, by means of a Venturi throat inserted in the outlet pipe for the liquid. A side entry to the throat is connected by a small pipe to the place in the exchanger where the gas is most likely to collect. B. M. VENABLES.

Temperature-regulating apparatus. L. D. WEILL (B.P. 299,714, 29.10.28. Belg., 28.10.27).—The apparatus comprises a heat-sensitive device (thermometer) actuating a primary relay, a secondary relay with adjustable timing attachment, and a power switch for the heaters. When the secondary relay is operated (through the primary) by a rise of temperature it cuts off or reduces the heat supply, which remains reduced for a definite period of time, at the end of which the timer restores the heating current; if meanwhile the temperature has not fallen, the secondary relay again operates and reduces the current for another definite period, and so on until the temperature has fallen below a fixed limit, when all parts return to normal with heating current on. The device is stated to reduce the lag between the fall of temperature of the thermometer and that of the furnace. B. M. VENABLES.

Roller and other grinding mills. BRINJES & GOODWIN, LTD., C. F. N. SEAMAN, and F. ATHERTON (B.P. 330,923, 18.3.29).—In a grinding mill for paint etc. the rollers or discs are adjusted to a definite clearance by the rotation of cams by hand levers which are provided with a quick release. The grinding elements are held together by springs which are strong enough to provide pressure when necessary to grind occasional hard lumps. B. M. VENABLES.

Grinding mills. H. DRYSDALE (B.P. 330,989, 23.3.29).—A pair of rubbing convex and concave surfaces are given relative rotation about axes that form an angle with each other. One surface, preferably the convex and larger one, is rotated about a horizontal axis, and the axis of the other is so inclined that its periphery coincides (or nearly so) with the periphery of the first at one point. The inclined member may be stationary and the machine may be made in double form, having pairs of members both sides of a driving means. B. M. VENABLES.

Grinding and pulverising machines. V. BOOTH (B.P. 331,384, 26.6.29).—A disc grinder with one fixed and one rotating disc is provided with a circumferential screen between which and the edges of the discs are paddles attached to the rotating disc which work the undersize through the screen and deflect the oversize through ports formed in an end wall, preferably back into the feed hopper which communicates with the centre of the discs. B. M. VENABLES.

Evaporation of liquids. E.M.S. INDUSTRIAL PROCESSES, LTD., R. A. STOKES, and E. G. L. ROBERTS (B.P. 330,931, 20.12.28).—An evaporator or crystalliser is formed from a number of troughs abreast through which the material flows transversely. Paddles are provided for stirring and to assist the solid matter over the ridges. B. M. VENABLES.

Desuperheating of steam. BRIT. ARCA REGULA-TORS, LTD., and T. LINDSAY (B.P. 331,361, 12.6.29).— Water is heated by indirect interchange with either the superheated steam before or the desuperheated steam after passing through the apparatus, and when thus raised nearly to its b.p. this water is sprayed into the steam. B. M. VENABLES.

Cooling towers. FILM COOLING TOWERS (1925), LTD., and W. A. SCOTT (B.P. 331,011, 10.4.29).—The lower ends of wooden masts of cooling towers which are subject to rapid rotting are formed of material impervious to water, such as concrete, and are spliced to the upper parts. B. M. VENABLES.

Manipulation of liquids. P. CHARMAT (B.P. 309,541, 3.4.29. Fr., 12.4.28).—Liquids such as champagne, beers, etc. which are saturated with gas under pressure and have, e.g., to be filtered without reduction of pressure and without contact with air, are stored in a container with a flexible diaphragm or balloon to each side of which separate inlet-outlet pipes are connected. Except for a gas space to allow for temperature changes, the vessel is always kept full, the liquid being withdrawn from one side of the diaphragm, passed through the treatment plant, and returned to the other side of the diaphragm, which is sufficiently extensible for the total volume of the liquid to be stored on either side of it. B. M. VENABLES.

Centrifugal separators. H. W. FAWCETT (B.P. 330,958, 3.1.29).—A centrifugal separator for treating, e.g., wool-washing liquor is provided with peripheral outlets for sludge which may be screened by cross-wires, and adjacent to them are interior jets of an auxiliary liquid, preferably valueless water, which are supplied through separate conduits from an axial inlet and small bowl. Provision is made for dividing the bowl for ultimate cleaning, packed joints being provided in the auxiliary conduits. B. M. VENABLES.

Electrically-driven centrifugal apparatus. Soc. ANON. CONSTRUCTIONS ELECTRIQUES PATAY (B.P. [A] 270,723, 4.5.27. Fr., 7.5.26. [B] Addn. B.P. 330,836, 11.9.29. Fr., 4.5.29).—A motor drives a centrifuge through a spring coupling; in (B) means are provided for regulating the tension of the spring.

B. M. VENABLES.

Apparatus for catalytic transformation of gases. Soc. ANON. D'OUGRÉE-MARIHAVE (B.P. 309,169, 19.3.29. Belg., 7.4.28).—An apparatus for the oxidation of ammonia or other catalytic reactions comprises a heat interchanger, a catalyst chamber, and a dust collector for saving particles of catalyst; an adjustable proportion of the hot outgoing gases is finally passed through the heat interchanger. B. M. VENABLES.

Air-purifying apparatus. MINE SAFETY APPLI-ANCES Co., Assees. of A. L. DOTTER (B.P. 307,428, 6.3.29. U.S., 7.3.28).—Untreated sawdust or other subdivided cellulosic material of large surface is used in a respirator. B. M. VENABLES.

Removal of soot and other solid particles from smoke and fumes. BRIT. THOMSON-HOUSTON Co., LTD., Assees. of W. R. WHITNEY (B.P. 307,805, 13.3.29. U.S., 13.3.28).—Acetone is added to the water that is used to remove soot either by direct sprays or from electrodes. Electrostatic apparatus is described.

B. M. VENABLES.

Instrument for indicating or recording sp. gr. of gases. W. WILSON (B.P. 331,112, 10.7.29).—The gas is admitted at a constant volume-rate and pressure to a floating bell, the outlet from which comprises a fixed orifice obstructed by a taper needle which rises and falls with the bell. The bell is counterpoised by a device that compensates for the varying depth of immersion of the bell so that the internal pressure is maintained constant, and, since a heavier gas will need a larger orifice to discharge it, the bell rises with increase of density and operates a pointer moving over a scale.

B. M. VENABLES.

Lubrication of bearings and lubricants therefor. W. B. D. PENNIMAN (B.P. 306,532. 25.1.29. U.S., 23.2.28).—Oil of low viscosity, about 50 Saybolt instead of the usual 250, is preferably used, and about 10% of lard, palm, or castor oil, or metallic soap, or oils treated with sulphur or oxygen, is added.

B. M. VENABLES.

Heat transferrer. R. UHDE, Assr. to HEISSDAMPF-GES.M.B.H. (U.S.P. 1,768,222, 24.6.30. Appl., 19.12.28. Ger., 29.12.27).—See B.P. 303,172; B., 1930, 124.

Drying of moist material. O. SÖDERLUND and T. GRAM, ASSTS. to TECHNOCHEMICAL LABS., LTD. (U.S.P. 1,766,843, 24.6.30. Appl., 11.10.29. U.K., 7.10.26).— See B.P. 286,743; B., 1928, 352.

Mixing or stirring machine. E. CHRISTIANSEN (U.S.P. 1,767,346, 24.6.30. Appl., 24.9.29. U.K., 10.1.29).—See B.P. 327,465; B., 1930, 537.

Atomiser for liquids. R. ELSÄSSER, ASST. to SIEMENS-SCHUCKERTWERKE A.-G. (U.S.P. 1,764,437, 17.6.30. Appl., 8.3.28. Ger., 15.3.27).—See B.P. 287,105; B., 1928, 658.

Securing temporary intimate contact between immiscible liquids [without emulsification]. L. D. JONES, ASST. to SHARPLES SPECIALTY CO. (Re-issue 17,719, 1.7.30, of U.S.P. 1,575,116, 2.3.26).—See B., 1926, 397.

Filter for liquids under pressure. G. JAVITCH (U.S.P. 1,764,567, 17.6.30. Appl., 4.4.29. Fr., 5.4.28). —See B.P. 309,143; B., 1930, 126.

Cleaning of filters. E. FOLTA (U.S.P. 1,768,314, 24.6.30. Appl., 21.3.29. Czechoslov., 2.4.28).—See B.P. 308,974; B., 1930, 126.

Apparatus for continuous distillation of difficultly distillable liquids. H. A. VON STADEN, A. BERENBRUCH, and A. HÖHN, ASSTS. to I. G. FARBENIND. A.-G. (U.S.P. 1,766,699, 24.6.30. Appl., 28.9.27. Ger., 11.9.26).—See B.P. 288,775; B., 1928, 431.

Recovery and use of heat from furnace gases of variable temperature. SUPERHEATER Co., LTD. From COMP. DES SURCHAUFFEURS (B.P. 332,274, 16.4.29).

[Firebridge construction for] consuming smoke in boiler and like furnaces. J. NEWNES (B.P. 332,023, 14.6.29).

Heat-exchange apparatus. A.-G. BROWN, BOVERI & Co. (B.P. 310,327, 16.4.29. Ger., 23.4.28).

Heat-exchanging apparatus. [Air and gas heaters.] W. E. Kochs & Co., LTD. From H. Föge (B.P. 332,280, 17.4.29).

[Gilled] heat-exchanging apparatus. H. JUNKERS (B.P. 332,455, 16.9.29. Ger., 26.10.28).

Heat-exchanging device [for radiators etc.]. J. M. HARRISON (B.P. 331,982, 13.5.29).

[Corrugated] refractory brick for heat-exchange apparatus. J. CHATWIN. From VEREIN. STAHLWERKE A.-G. (B.P. 332,092, 9.8.29). Absorption cooling devices. SCHWARZWALDWERKE LANZ G.M.B.H. (B.P. 332,160, 2.11.29. Ger., 30.11.28).

Device for regulating amount of flow or rate of feed of powdered, granular, or lump material to crushing or pulverising mills etc. BRIT. "REMA" MANUF. Co., LTD., and P. HOWDEN (B.P. 332,382, 3.7.29).

Absorption refrigerating apparatus. Electrolux, Ltd., Assees. of Platen-Munters Refrigerating System Art. (B.P. 311,273, 23.4.29. Swed., 8.5.28).

Refrigerators and refrigerating apparatus. BRIT. THOMSON-HOUSTON CO., LTD., Assees. of C. STEENSTRUP (B.P. 318,932, 12.9.29. U.S., 12.9.28).

Refrigerating apparatus. KELVINATOR CORP., Assees. of F. R. ERBACH (B.P. 310,464, 6.3.29. U.S., 26.4.28).

[Reinforced concrete] construction of watercooling towers. L. G. MOUCHEL & PARTNERS, LTD., and A. T. J. GUERITTE (B.P. 332,268, 18.3.29).

[Coupling for] centrifugal machines. S. K. D. M. VAN LIER (B.P. 331,323, 8.5.29. Holl., 12.3.29).

Gas washer (U.S.P. 1,752,045).—See II. Kilns (B.P. 331,224—5).—See VIII. Gas purification (B.P. 309,149 and U.S.P. 1,752,920). Electrical precipitation plants (B.P. 331,699).—See XI. Drying of grass (B.P. 327,409).—See XVI. Boiler feed water (B.P. 331,778).—See XXIII.

II.—FUEL; GAS; TAR; MINERAL OILS.

Chemistry of coal. VI. Benzenoid constitution as shown by oxidation with alkaline permanganate. W. A. BONE, L. HORTON, and S. G. WARD (Proc. Roy. Soc., 1930, A, 127, 480-510; cf. Bone and Quarendon, B., 1926, 305).-A detailed examination has been made of the alkaline permanganate oxidation of the residues from the benzene-pressure extraction of five typical coals of widely different geological ages and maturities. It is found that, under suitable conditions of concentration and temperature, the entire coal substance in any case may be oxidised so that the whole of its carbon is transformed into a mixture of carbonic, acetic, oxalic, succinic, and benzenecarboxylic acids, the first and last always being the main products ; and from the fact that the proportions of the benzenecarboxylic acids do not seem to vary materially from one coal to another, it would appear that the maturing process, whatever its chemical nature may have been, has not destroyed the essential chemical structure of the coal substance. A detailed investigation of the complex mixture of acids produced by the oxidation was carried out in the case of three of the coals. Under suitable conditions, 100 pts. of the original coal substance yield about 3-7 pts. of acetic acid, 15-35 (usually about 20) pts. of oxalic acid, and 33-50 pts. of benzenecarboxylic acids of mean composition closely approximating to that of a benzenetricarboxylic acid. From this mixture of benzenoid acids, all except two of the twelve possible benzenecarboxylic acids have been isolated, including the three phthalic, the three benzenetricarboxylic acids, two out of the three possible tetracarboxylic acids, and

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the penta- and hexa-carboxylic acids. Moreover, in the cases of Morwell and Busty coals, complete "carbon balances " worked out for the oxidation under optimum conditions showed a very similar distribution of the original carbon in the coal substance among the various products, viz., 42% as carbon dioxide, 2% as acetic acid, 7% as oxalic acid, and 48% as benzenecarboxylic acids. In each case nearly one third of the original carbon appeared as C₆-rings in the oxidation products. A study of the "stepwise" alkaline permanganate oxidation of the coal substance led to the conclusion that complex colloidal "humic" acids are the initial oxidation products, the simpler crystalline benzenoid and oxalic acids arising subsequently from their further oxidation. This was confirmed by experiments showing that on separate oxidation, 100 pts. of these humic acids yield about 60 pts. of a mixture of benzenecarboxylic acids, 20 pts. of oxalic acid, 3 pts. of acetic acid, and I pt. of succinic acid. The transition from the humic to the benzenecarboxylic acids is probably not direct, but occurs through intermediate crystalline acids more complex than the latter. Since the benzene-pressureextracted "residues" constitute $85-98\cdot5\%$ of the original coal substance, and about one third of the carbon in such residues appears as C₆-rings in the oxidation products, it is inferred that a considerable part of the original coal substance is of a benzenoid character. Also 57-67% of the benzene-pressure extracts from Morwell brown coal and the Estevan lignite is composed of phenols and phenolic esters, and the constituents which are mainly responsible for the " coking propensities " of bituminous coals are essentially benzenoid in character. Such results suggest that the coal substance may have arisen through condensations of phenolic and aminocompounds with aldehydic compounds. Preliminary experiments on the effects of progressive carbonisation of the coal substance on the relative yields of the oxidation products indicate that, with Estevan and Busty coal residues, the yields of benzenoid acids increase with carbonisation up to 500-600°, after which they diminish; considerable yields of benzenoid acids are, however, obtained even with material that has been fully carbonised at 1000°. L. L. BIRCUMSHAW.

Chlorine content of coal and its distribution in the products of carbonisation. W. A. DAMON (66th Ann. Rep. Alkali etc. Works, 1929, 21-28).-A series of analyses show the water-soluble chlorine content of different coals to range from 0.002% to 0.355%. It tends to increase with fineness of division of the coal. The greater part of this reappears in the tar and first liquor condensed, and at one coke-oven works ammonium chloride (3 lb. per ton of coal) is manufactured by a system of spraying the gas. In gas works the bulk of the ammonium chloride is also in the first liquor condensed in the hydraulic main; if such liquor is evaporated the ammonium chloride produced contains tar acids and darkens on exposure to light. These impurities can be removed by agitating the liquor with lead carbonate. The chlorine content of tar is found to be in proportion to that of liquor emulsified with it, but once it has been deposited in the tarin a solid state it is very difficult to remove by washing. The ammonium chloride content of tar may be determined by adding to 20 g. of tar 2-3 g. of sodium stearate; 2 g. of lime and 3 g. of precipitated chalk are then added and the whole is charred over a small flame, powdered, and extracted with water. The aqueous extract is neutralised with nitric acid, boiled with 10 c.c. of hydrogen peroxide, and the chlorine content determined by titration. C. IRWIN.

Mineral constituents of coal and their influence on the determination of ash. F. SCHUSTER (Brennstoff-Chem., 1930, 11, 237-239).—Determinations of the carbonate-carbon dioxide and the ash from nine gas coals have been made. The alkalinity of the ash, determined by titration, was considerably less in each case than corresponded with the amount of calcium oxide calculated from the carbonate content of the coal. Since sulphur dioxide may be absorbed from the combustion of the coal itself and also from the heating gases of the muffle, the furnace should be so designed that contact of sulphur-containing gases with the ash is avoided, and should preferably be electrically heated. A. B. MANNING.

Sulphate content of coal ash. F. SCHUSTER (Brennstoff-Chem., 1930, 11, 262-263; cf. preceding abstract).-By burning coals in an atmosphere free from sulphur compounds it has been shown that the sulphate content of the ash is derived principally from the sulphur present in the coal in other forms, e.g., as pyrites. The original sulphate content of the coals investigated was negligible. The following formula is suggested for calculating the true percentage of mineral constituents from the ash: mineral constituents = ash $+CO_2$ (as carbonate) + $(0.335 \times FeS_2) + SO_3$ (in the ash), all quantities being expressed as percentage of the coal. It is assumed that the loss of water of hydration from the ash is compensated, within the limits of error, by the gain due to oxidation of ferrous to ferric oxide. When coke is burned the mineral constituents increase in weight due to oxidation of the iron and to the formation of sulphate. A. B. MANNING.

Apparatus for determining tendency of coal and other materials to self-ignition. D. J. W. KREULEN (Brennstoff-Chem., 1930; 11, 261-262).—The apparatus is constructed of an aluminium block, 80 mm. high and 50 mm. in diam., having a central boring 20 mm. in diam. for the sample of coal, which rests therein on a copper gauze support. A current of oxygen is passed through a channel bored in the block, down through the coal, and thence to an outlet. The block is heated by a burner, and temperature measurements are made on two thermometers, one in the coal and the other in a special boring in the block. The coal is prepared by briquetting the finely-powdered average sample and carefully breaking the briquettes down to 10-20-mesh (per cm.) size. A. B. MANNING.

Classification of Canadian coals. E. STANSFIELD and J. W. SUTHERLAND (Trans. Canad. Inst. Min. Met., 1929, 32, 360–388).—Various systems of coal classification are discussed. C. W. GIBBY.

Constant factors for the calculation of the calorific value of Cape Breton coals from proximate analysis data. J. L. BOWLBY (Trans. Canad. Inst. Min. Met., 1929, 32, 469-490).—A comparison of

various formulæ. The expression preferred is $Vx + 145 \cdot 5C + 40 \cdot 5S = B$.Th.U. per lb., where V is the volatile matter, C the fixed carbon and S the sulphur percentage, and x is an arbitrary constant depending on the colliery. C. W. GIBEY.

Steaming of horizontal chamber ovens. G. M. GILL (Gas World, 1930, 93, 99—101).—The possibility of adding steam to charges in horizontal chamber ovens increases the flexibility of this type of plant. Modifications to a setting for this purpose involved passing steam into each oven at eight points near the base, where special moulded bricks were built in to the recuperators to form a number of channels. Steam at the rate of 14 lb./min. was admitted during the first 20 hrs. and 220 lb./min. during the last 4 hrs. of carbonisation; the therm yield per ton of coal was considerably increased and further advantages are anticipated from improved design. R. H. GRIFFITH.

Origin and decomposition of carbon disulphide in gas making. III. Chemical and thermodynamic effects in formation of organic sulphur compounds. W. J. HUFF and J. C. HOLTZ (Ind. Eng. Chem., 1930, 22, 639-645; cf. B., 1928, 77).-The formation of organic sulphur compounds by the action of heated carbon (from sucrose) on hydrogen sulphide in low concentration in different gases has been investigated. The formation of carbon disulphide is always accompanied by that of important quantities of other sulphur compounds of carbon, possibly the monosulphide when the gas stream consists mainly of nitrogen and also the oxysulphide when it contains water vapour, the oxides of carbon, or oxygen. The formation of sulphur-carbon compounds increases with an increase in the concentration of hydrogen sulphide or with a rise in temperature, but is inhibited by hydrogen. The data support Lewis and Lacey's criticisms (A., 1915, ii, 767) of Koref's conclusions (A., 1910, ii, 289). The addition of copper, iron, or zinc in the form of oleates to a sulphur-bearing oil before cracking decreases the amounts of hydrogen sulphide and other gaseous sulphur compounds which L. S. THEOBALD. are formed.

Carbonising and briquetting Saskatchewan lignite. W. G. HEPTINSTALL (Trans. Canad. Inst. Min. Met., 1929, 32, 395-404).—A detailed description of the use of the Lurgi process for lignite containing 30% of moisture. C. W. GIBBY.

Dehydration of gas. W. S. DOLE (Gas J., 1930, 191, 258-260).—The performance of compression plant for dehydration of coal gas or of oil gas is described for two small American works. Resulting diminution in blockage complaints and, presumably, greater life of mains and fittings contribute to balance the additional running costs of about 1¹/₂d. per 1000 cub. ft.

R. H. GRIFFITH.

Conversion of methane or coke-oven gas into acetylene by the electric discharge. K. PETERS and A. PRANSCHKE (Brennstoff-Chem., 1930, 11, 239— 247; cf. B., 1929, 703).—Improved forms of discharge tube suitable for the continuous treatment of larger quantities of gas are described. With increased rates of passage the consumption of electrical energy falls to a minimum of about 12 kw.-hrs./m.³ of acetylene produced, for rates of passage of 1000—1200 litres/hr. About 38% of the electrical energy expended is then utilised in the transformation of methane into acetylene. The percentage of acetylene in the product passes through a maximum as the rate of passage is increased; at the higher rates corresponding with the minimum energy consumption it varies from about 4% to 8% as the methane content of the original gas increases from 25% to 95%. The energy consumed by the pump maintaining the necessary low pressure amounts to 2—3 kw.-hrs./m.³ of acetylene produced. A. B. MANNING.

Adsorption of benzol vapour by mixed adsorbents. J. K. CHOWDHURY and H. N. PAL (J. Indian Chem. Soc., 1930, 7, 451-464).—Activated bauxite containing varying percentages of ferric oxide shows a slight increase in adsorptive capacity, whilst bauxite on which silica gel has been precipated shows a large increase (from 8% to 38%). The adsorptive power is unaffected in presence of hydrogen sulphide, carbon monoxide, ethylene, or small amounts of water vapour; the presence of tarry matter does not interfere with regeneration of the adsorbent by roasting. It is suggested that "silicalised bauxite" should prove a suitable substance for recovery of benzol from coal gas. J. R. I. HEPBURN.

Viscosity-temperature diagram [of mineral oils]. C. WALTHER (Petroleum, 1930, 26, 755—757).—The diagram described is obtained from the equation log log $V_k = -m(\log T - 2 \cdot 309) + \log \log V_{k50^\circ}$, where V_k denotes the kinematic viscosity, m is a characteristic temperature factor for each oil, and T is the absolute temperature. A diagram is constructed in which log log V_k , log T, V_k , and $^{\circ}E$ are represented on the four sides of a rectangle. The value of M (log log V_k between 0° and 100°) for the oil can be found from the diagram. It can also be applied to determine the viscosity of an oil at a third temperature when the viscosities at two temperatures are known. A similar equation is derived, by means of which the viscosity curves of mixtures of two or more oils may be found. W. S. E. CLARKE.

Cracking processes in the Russian petroleum industry. L. SINGER (Petroleum, 1929, 25, 893-906; 1930, 26, 482-491).-Three types of cracking processes are described which serve for the production of (i) fuel oil of a better quality as regards η and cold test, cracking being carried out at 425° and under 10-60 atm.; (ii) benzine and fuel oil, and (iii) benzine and coke, in which treatment is carried out at 450° and 20 atm. These processes were utilised in the cracking of Grosni and Surakhani mazouts, and of various heavy crude oils. The results obtained with Grosni mazout show that gentle cracking (first method) causes a decrease in the cold test of the fuel oil obtained. In the second method, with a 1% yield of coke, 35% of cracked benzine is obtained; the quantity of coke formed is independent of the temperature, but is constant with equal benzine yields. With 15% of coke in the third method 57% of cracked benzine is produced. The following conclusions have been reached: (a) Greater yields of light products cause an excessive formation of coke and deteriorate the quality of the residue. (b) The velocity of the

reaction is doubled for each rise in temperature of 10° . (c) The rate of coke formation depends on the chemical composition of the cracked petroleum products. Paraffinic products yield less coke than paraffin-free or asphaltic products. Kerosene yields practically no coke, solar and spindle oils very little, machine and cylinder oils large quantities, and tars greatly increase the formation of coke. (d) Increase of pressure causes a decrease in the content of unsaturated hydrocarbons, paraffin hydrocarbons yield no coke on cracking, whilst aromatic hydrocarbons tend to give significant quantities. (e) The extent of the production of cracked benzines and kerosenes from heavy crude oil and mazout is practically the same. (f) The details of a cracking process are determined not so much by the yields of cracked benzines (which are the same for a given temperature and cracking time with heavy crude oils and mazout) as by the yields of coke, which vary for different petroleum products. The cracking of Grosni oil tar and paraffin tar is not important, on account of excessive quantities of coke formed.

W. S. E. CLARKE.

Efficiency in the distillation of light oils from crude oil. A. A. ASHWORTH (J. Inst. Petroleum Tech., 1930, 16, 40-48).—The efficiency of a refinery is arrived at by means of a system of distillation (based on a number of specified temperatures) in which a series of definite cuts is obtained which are subsequently combined, chiefly arithmetically, so as to give the maximum value of the products obtained from the crude oil. The points finally selected at which cuts should be made are the following: (1) initial b.p. of the crude to 97° , (2) $97-136^{\circ}$, (3) $136-175^{\circ}$, (4) 175-200°, (5) 200-280°, or to the point necessary to give a limiting sp. gr. of 0.825 for the kerosene, (6) from the end of cut (5) to 300°. A special fractionating apparatus was used in which the reflux ratio was controlled by varying the insulation and thence the cooling of the column. Crude oil (100 g.) was added to the flask, distillation commenced without any insulation on the column and slowed down to about 2 drops/sec. within 5° of the first cut point until the temperature was reached; the receiver was then changed. The weight, volume, and sp. gr. of the cut were measured. When cut (2) had distilled, so much of it was blended with (1) as was necessary to make a light benzine which would distil 60% up to 100° in an Engler flask. Generally 52% of (1) and 48% of (2) were required. The distillation was continued, the remainder of cut (2) was blended adequately with cut (3), the remainder of (3) with (4), etc., so as to obtain the specified products. Insulation was necessary for the last two cuts. Specifications of standard products as denoted by the cuts are given, *i.e.*, light and heavy benzines, white spirit No. 1, kerosene, and gas ol. Special products, e.g., aviation benzine, were produced from the light benzine by removing part of cut (2); medium heavy benzine was a mixture of light and heavy benzines, white spirit No. 2, and kerosene distillate. For refinery plant a pipe-still was used in which all light oils were vaporised prior to fractionation ; such a still gave an efficiency of 97—98% in the light-oil distillation. W. S. E. CLARKE.

Synthetic fuels and lubricating oils. A. W. NASH (J. Inst. Fuel, 1930, 3, 347-353).-The sources and methods available for the production of synthetic fuels and lubricating oils are discussed. The light-oil fractions of low-temperature carbonisation tar could be treated to give a motor fuel with valuable "antiknock" properties. A lubricating oil has been prepared by low-temperature distillation of Shirebrook bastard cannel coal. The oil possesses lubricating properties comparable with mineral oils. The lighter fractions of the oil from the Bergius hydrogenation process for coal can yield valuable motor spirits which will probably contain "anti-knock" substances. The lubricating oils from the Bergius process will need to be freed from phenol. By the use of catalysts in berginisation the I. G. Farbenindustrie claim to obtain greater flexibility. Recently it has been shown that oxides of zinc, nickel, cobalt, and copper may be used in place of iron oxide. Zinc oxide increases the oil yield. Alkaline-earth chlorides and aluminium chloride have been shown to extend the scope of high-pressure hydrogenation. The reduction of carbon monoxide by hydrogen at atmospheric and high pressures with or without catalyst is also a possible source of fuel. The cracking of natural gas and the use of gaseous fuel are also discussed.

H. E. BLAYDEN.

Bleaching and desulphurisation of mineral oils with silica gel and bleaching earths. E. BOSSHARD and W. WILDI (Helv. Chim. Acta, 1930, 13, 572-586; cf. A., 1929, 256).-The bleaching properties of various bleaching earths and silica gels have been studied with mineral lubricating oils, and the gels have been found inferior to the best earths. Conversely the gels are more effective than the natural earths in desulphurising petroleum solutions of amyl sulphide and its homologues. When wetted with alcohol the various earths produce widely differing amounts of heat, which are proportional to the capacity for bleaching and desulphurisation, and are due to the unequal amounts of active surface in the different specimens. The method of preparation of silica gels influences their activity. Those made from concentrated solutions show increased bleaching capacity (adsorption of colloids) but diminished capacity for desulphurisation (adsorption of crystalloids). Gels with fine pores are the best sulphide adsorbents. Adsorption of ethyl, propyl, butyl, and amyl sulphides on prepared silica gels shows that the substance with the lowest mol. wt. is most easily taken up; the heats of wetting decrease in the same order. The bleaching and desulphurisation of a crude petroleum with silica gels of different pore sizes bears out the above results.

F. L. USHER.

Physical properties and constitution of mineral lubricating oils. W. BIELENBERG (Z. physikal. Chem., 1930, 149, 42—50).—A comprehensive examination of refractivity data for certain homologous series of hydrocarbons has shown that the refractivity-mol. wt. graphs differ considerably in form from those given by Kyropoulos (B., 1929, 931). This author's deductions from these curves in connexion with the determination of the constitution of certain mineral oils are therefore invalidated. R. CUTHILL.

Relationship between calorific value and other characteristics of residual fuel oils and cracked residuums. W. F. FARAGHER, J. C. MORRELL, and J. L. Essex (Ind. Eng. Chem., 1929, 21, 933-941).-Experimental results establish that the relationship between the calorific value in B.Th.U./lb. and the A.P.I. gravity of straight-run fuel oil and cracked residuum is linear. New formulæ for calculating the calorific value per lb. of dry oil were determined as follows: $17,010 + (90 \times ^{\circ}A.P.I.)$ for straight-run fuel oils and $17,645 + (54 \times ^{\circ}A.P.I.)$ for cracked residuums, whether of the normal or flashed type. The calculated values are accurate to within 30 B.Th.U. of the values obtained by precision calorimetric methods. Combustion analyses show an average C: H ratio of 8.66 for the normal residuum, 9.22 for flashed residuum, and 7.08 for straight-run fuel oils. The calorific value calculated from the Dulong formula gives higher results than those determined experimentally for straight-run fuel oils and residuum. The net calorific values calculated for several straight-run fuel oils and the two residuums showed about 1200 B.Th.U./lb. less than the observed or gross calorific values as the result of the correction for the latent heat of vaporisation of water. The source of the oil, the amount of coke formed by Engler distillation, the volatility, the benzene-soluble material, etc. do not appear to affect the calorific value so long as the A.P.I. gravity is not altered. The benzenesoluble material separated from a flashed or a normal residuum contains organic matter of which 40-45% is soluble in such organic solvents as chloroform, carbon tetrachloride, carbon disulphide, aniline, etc. The dissolved matter has the same C/H ratio as the residuum itself; in the insoluble matter the ratio is about 18 and the ash and sulphur contents are high. The benzenesoluble material has a composition corresponding to 1.3% of petrolenes, 98.7% of asphaltenes (contaminated with inorganic matter), 10.0% of carbenes, 33.8% of asphaltenes insoluble in carbon tetrachloride, 42.6% of carbonaceous material insoluble in carbon disulphide and combustible in oxygen at 700°, and 12.3% of insoluble and non-combustible matter.

H. S. GARLICK.

Cracking process without coke formation. M. NAPHTALI (Brennstoff-Chem., 1930, 11, 247-249).-H. Wolf's "Carburol" process is briefly described. The oil is heated under pressure in the cracking coil for a definitely controlled time. The cracked oil passes thence through a specially constructed expansion valve, and is immediately mixed with fresh oil or cooled distillate. In this way the cracking process is stopped just before coke formation begins. A continuous turbulent flow of oil is maintained through the cracking coil, the heating of which is carefully controlled to avoid overheating of the oil at any point. The chamber into which the oils pass acts as a dephlegmator, wherein they are distilled, the lighter and intermediate fractions passing through a second dephlegmator to the condensers, while the heavy residual oil is discharged to a tank. This oil may be used as fuel oil or for the production of road material. The intermediate fractions may be returned for further treatment. Some results of tests on a crack ng plant of this type are tabulated. No formation of coke was observed in the cracking coil, valve, or the vessel wherein the residual oil is separated. A. B. MANNING.

Cracking of saturated gaseous hydrocarbons, W. VON PIOTROWSKI and J. WINKLER (Petroleum, 1930, 26, 763-780) .- An investigation of the pyrolysis of the propane-butane fractions of gas oil, of degasolined Boryslaw natural gas, and of the gas from a Cross highpressure distillation plant in a specially constructed oven made of chrome-nickel steel shows that hydrocarbons with 2 to 5 carbon atoms can be decomposed under optimum temperature and time conditions so as to give the maximum yields of unsaturated hydrocarbons. The optimum temperature and heating periods for a pure propane-butane mixture (so-called gas oil) are 730° and 8 sec., for Cross cracked gas containing methane and ethane 740-760° and 10 sec., and for a Boryslaw natural gas containing only a few of the higher homologues 780° and 11 sec. The reacting gases show a tendency, on remaining in contact with the separated carbon, to extensive decomposition and further deposition of carbon. Cracking temperatures above 800° (e.g., 870°) tend to yield aromatic hydrocarbons (up to 22%, calc. on the gas oil). Butadiene is found amongst the products of decomposition from gas oil at about 700°, accompanied above 800° by a little acetylene.

W. S. E. CLARKE.

Separation of bitumen from Alberta bituminous sands. K. A. CLARK (Trans. Canad. Inst. Min. Met., 1929, 32, 344-359).-Separation may be effected by the use of hot water, after first treating the dried sand with calcium oleate and water. The efficiency is improved by preliminary mixing of the sand with dilute sodium silicate solution and heating to 85° before washing. All reagents which favour the formation of oil-in-water emulsions have a similar effect. The emulsion is unstable, and the bitumen rises to the surface as a froth. The silt can be coagulated by the addition of calcium chloride equivalent in amount to the sodium silicate. The separated bitumen may be dehydrated by breaking the emulsion with phenol and adding enough salt to increase the density of the aqueous layer so that the bitumen rises to the surface. C. W. GIBBY.

Oleum deelinæ [dee oil]. W. KESSLER (Pharm. Ztg., 1930, 75, 808).—The preparation is merely a highly purified and very viscous yellow vaseline oil.

S. I. LEVY.

Steel mains and corrosion. JEAVONS and PINNOCK. —See X. Brown coal and crop growth. KISSEL.— See XVI.

PATENTS.

Fuel composition. A. MONTELS (B.P. 329,924, 30.8.29).—A solid fuel is formed by briquetting a mixture of sawdust or tannin dust, crude petroleum, tar residues, and a concentrated solution of glue.

A. B. MANNING.

Briquette. R. T. GOODWIN, ASST. to STANDARD OIL DEVELOPMENT CO. (U.S.P. 1,749,378, 4.3.30. Appl., 18.2.26).—Coal is briquetted by means of the material precipitated by treating the heavy oil residues from cracking processes etc. with dilute acids (cf. U.S.P. 1,660,295; B., 1928, 326). These materials have fusing pt. between 160° and 230°, and are 15-30% soluble in carbon disulphide. A. B. MANNING.

Production of carbon granules. STANDARD TELE-PHONES & CABLES, LTD. From WESTERN ELECTRIC Co., INC. (B.P. 329,652, 21.2.29).—A mass of carbonisable material is broken up into particles which assume a spherical shape due to surface tension, and these are then hardened and carbonised. The material may consist of cellulose dissolved in zinc chloride solution, the hardening being effected by immersion in alcohol. Fusible phenolic condensation products or artificial resins form other suitable initial materials; they are granulated and melted, the molten particles allowed to assume the spherical shape, hardened by being slowly heated to about 270°, and then carbonised. The granular carbon produced is suitable for use in variable-resistance units for telephone transmitters etc.

A. B. MANNING.

Manufacture of absorbent carbonaceous material. O. L. BARNEBEY and M. B. CHENEY (U.S.P. 1,751,612, 25.3.30. Appl., 19.5.21; cf. U.S.P. 1,541,099; B., 1925, 581).—Carbonaceous material, e.g., coconut shells, rice husks, wood, etc., is incompletely charred at $350-500^{\circ}$ to form a preliminary product containing preferably 20-40% of tarry matter, and this is treated at $500-900^{\circ}$ with an oxygenated gas, e.g., carbon dioxide or steam, to complete the carbonisation and remove all tarry matter. A. B. MANNING.

Manufacture of decolorising or activated carbon. T. A. GOSKAR (B.P. 329,630, 19.2.29).-The raw carbonaceous material is "pugged" or macerated in a moist condition, and then formed by extrusion into pellets, which are charged into a vertical chamber wherein they are successively dried, carbonised, and activated. The first drying zone is formed by a section of the chamber which has louvred walls, and across which a current of hot combustion gases is passed. A second drying zone is heated externally by the gas and vapours rising from the carbonising zone. Carbonisation is effected by passing the hot gases from the activating chamber through the material. The activating zone is maintained at 900-1200°, and means are provided for supplying water to be vaporised within the zone to produce therein an activating atmosphere of superheated steam. Valves are provided for discharging the material evenly from the activating cham-A. B. MANNING. ber.

Manufacture of highly active absorption carbon. I. G. FARBENIND. A.-G. (B.P. 306,490, 20.2.29. Ger., 21.2.28).—Wood chips, shavings, etc. are boiled with a solution of the activating agent, e.g., zinc chloride, the hot liquid is drained off, and the wood again soaked with the cold solution. Instead of boiling with the solution, an equivalent swelling of the wood may be produced either by prolonged immersion, with stirring, in the hot solution, or by first boiling with water and then soaking in a cold or hot solution of the activating agent. A. B. MANNING.

Manufacture of smokeless fuel. C. VIEU (Assr. to COMP. DES MINES DE VICOIGNE, NOEUX, & DROCOURT) and L. MOURGEON (U.S.P. 1,752,044, 25.3.30. Appl., 22.6.26.

Fr., 27.6.25) .- The apparatus comprises a number of heating or distillation chambers for the fuel, each having an inlet and outlet for the heating fluid, and a distributing valve consisting of a hollow outer cylinder having ports in the periphery and an inner rotatable cylinder closely fitting within the other and having channels therein. The ports in the outer cylinder are connected by conduits to the inlets and outlets of the heating chambers, and the channels in the inner cylinder are so arranged that a number of the heating chambers are traversed by the heating fluid in series, while the others, which are disconnected, are being charged or discharged. By turning the valve a freshly charged chamber is brought into the series, and that in which distillation is complete is disconnected. A. B. MANNING.

Treating solid hydrocarbon-containing material. H. M. ROBERTSON (B.P. 329,674, 23.1.29).-Oil shales, coal briquettes, etc. are subjected to heat treatment in a tunnel retort wherein they pass successively through an oxidising and vaporising chamber at about 290°, a carbonising chamber at about 540°, and a cooling chamber. The heat evolved in the cooling chamber is used to preheat the air supplied in the oxidising and vaporising chamber. This air is further heated by being conveyed through pipes passing through the carbonising chamber. The latter is heated by the hot combustion gases from suitably arranged furnaces, these gases being conveyed through flue pipes running horizontally along both sides of the chamber. Provision is made for supplying steam to the carbonising and the cooling chambers. The vapours evolved in the first chamber and the products of carbonisation from the second chamber are withdrawn separately.

A. B. MANNING.

Distillation of coal for the production of hard and large coke. E. ROSER (B.P. 306,092, 13.2.29. Ger., 15.2.28).—Dry coal poor in bitumen, *e.g.*, brown coal, peat, or dust coal, or the coke obtained by the distillation of brown coal or peat, is mixed with wet fuel rich in bitumen, *e.g.*, coal, and the loose mixture is pressed or rammed into a retort and distilled at 600°.

A. B. MANNING.

Heat-treatment of granular carbonaceous material. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 329,957, 26.1. and 17.5.29).-The material, e.g., brown coal, is passed through an inclined bundle of tubes which is rotated with its upper end in a stationary bunker charged with the granular material, and so designed that the material covers the whole cross-sectional area of the bundle. The tubes are mounted in a heating space traversed by hot gases, and are fitted in a gastight manner to perforated end-plates. The collecting chamber for the semi-coke is provided with an offtake for the volatile products. By mounting the bundle of tubes in a rotatable high-pressure drum, through which a heating medium can be passed, and suitably modifying the charging and discharging means, the apparatus can be utilised for the heat-treatment of carbonaceous materials with gases under pressure. A. B. MANNING.

Low-temperature carbonisation retorts. C. T. DRIGENKO and L. SELIGMAN (B.P. 329,827, 14.5.29).— A vertical retort is provided with a central rotary shaft having agitating and propelling blades at intervals, and an extractor at the lower end. The charge is heated by a current of a carrier gas which enters the retort at the top and leaves at the bottom. The shaft and blades are hollow and serve to distribute the carrier gas, which can enter the shaft at the top, throughout the charge. The carrier gas leaving the retort is stripped of oil, preheated, and recirculated. A. B. MANNING.

Arrangement for heating coke ovens. A. OTT (U.S.P. 1,748,187, 25.2.30. Appl., 6.6.25. Ger., 7.6.24).— A perforated hollow column of fireproof material extends up the centre of each vertical heating flue, and serves to distribute the air supply thereto in order to lengthen the flame and bring about uniform heating of the oven. Hollow cap-shaped gas-distributing means are provided around the lower ends of the hollow columns. The device may be used for heating a coke oven or other type of furnace. A. B. MANNING.

Coke oven. C. OTTO (U.S.P. 1,748,142, 25.2.30. Appl., 20.3.25).—The burner opening in the flue is raised to such a height that the air, which is supplied at the bottom of the flue, is flowing uniformly upward without eddies when it reaches the burner, the end of which is tapered in order to avoid the formation of further eddies. The burners may extend to different heights in adjacent flues. The arrangement permits uniform heating in a vertical direction when the oven is heated with rich gas, and avoids deposition of carbon in the flue. A. B. MANNING.

Tunnel nozzle for rectangular coke ovens. A. S. KNOWLES, ASST. to TAR & PETROLEUM PROCESS CO. (U.S.P. 1,745,996, 4.2.30. Appl., 27.5.27).-A rectangular, sole-fired coke oven is heated by means of separate. parallel, adjacent combustion flues. Below each flue are two hair-pin regenerators which alternately and periodically supply air to and receive the products of combustion from the corresponding flue. Gas is admitted at each end of the flue alternately through the usual burner pipes. In order to produce a uniform heating in long ovens tunnel nozzles are provided in each flue for distributing the air supplied from one regenerator and for discharging the waste gases to the other. Each nozzle communicates with the corresponding regenerator through a supplementary opening in the floor of the flue, and consists of an open-bottom tunnel, closed at the front end, open at the rear end, and provided with auxiliary openings in the top. A. B. MANNING.

Cooling of coke. D. TYRER, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 329,751, 23.3.29).—The hot coke is charged into a relatively deep chamber at the bottom of which an enlarged space is provided in which the partly cooled coke is sprayed with a regulated amount of water. The steam thus produced rises up the column of hot coke, cools the intermediate layers, and reacts with the hot upper layers to form water-gas. The amount of water used is just sufficient to cool the coke to 200°. A. B. MANNING.

Devices for improving the working of pressure gas producers. K. KOLLER (B.P. 309,874, 16.4.29. Hung., 16.4.28).—The internal cross-sectional area of the producer is diminished step-wise at the top and a central charging cylinder and a gas-discharge connexion open into the portion of diminished cross-section. The charging cylinder is of such length that the gas-discharge connexion opens into the producer above the cone of inclination of the coal leaving the charging cylinder, whereas the lower horizontal boundary of the cone of coal extends above the lower edge of the diminished upper portion of the producer. A. B. MANNING.

Grates for gas producers. GIBBONS BROTHERS, LTD. From O. PISTORIUS (B.P. 329,776, 9.4.29).—The grate is conical and consists of a number of superimposed concentric rings of continuously increasing diameter, each resting on a flange on the ring below. A number of comparatively small orifices and nozzles are provided in the grate inclined to the radii and widening inwardly and downwardly. A. B. MANNING.

Manufacture of water-gas. D. J. Young, Assr. to YOUNG-WHITWELL GAS PROCESS CO. (U.S.P. 1,751,501-3, 25.3.30. Appl., [A] 25.11.24, [B] 6.7.25, [C] 26.3.26. Cf. U.S.P. 1,468,190; B., 1923, 1013 A).-(A) The plant consists of a water-gas generator, a carburettor, and a superheater. After the blasting run water is introduced into the superheater, and the steam produced is passed successively through the superheater, the carburettor, and the fuel bed, the water-gas being withdrawn from the bottom of the generator. The process permits the use of raw coal, lignite, etc. as fuel. (B) A similar process may be used for the production of uncarburetted water-gas, the carburettor being either omitted or used simply as a second superheater. (c) Various modifications in the method of running a plant comprising a generator, a primary heat interchanger (carburettor), a secondary heat interchanger (superheater), and a wash box are described. The air-blasting run may be continued until the fuel bed and heat interchangers are hotter than in the usual water-gas process ; steam may then be introduced at the top of the secondary heat interchanger and passed in the reverse direction to that usually employed through both heat interchangers and finally through the incandescent fuel in the generator. Other gases may be used in place of steam, water or oil may be introduced into the heat interchangers and vaporised therein, etc. A. B. MANNING.

Water-gas manufacture. F. W. STEERE, Assr. to SEMET-SOLVAY ENGINEERING CORP. (U.S.P. 1,752,036, 25.3.30. Appl., 22.12.24).—The plant, which operates without any outside source of steam, comprises a generator, a superheater, and a wash box. The blow gases are used to heat the superheater. The steam for the "down run," generated by spraying water into the top of the superheater, passes down through the superheater and thence down through the fuel bed. An "up run" is effected at suitable intervals by spraying water into the bottom of the generator.

A. B. MANNING. Manufacture of combustible gas containing hydrogen and carbon monoxide. G. WIETZEL, Assr. to I. G. FARBENIND. A.-G. (U.S.P. 1,751,117, 18.3.30. Appl., 17.9.25. Ger., 1.12.22).—A pulverulent solid fuel is gasified by a continuous exothermic process with the aid of a gas containing a higher percentage of free oxygen than atmospheric air. A. B. MANNING.

Gas washer. F. H. WAGNER, Assr. to BARTLETT HAYWARD Co. (U.S.P. 1,752,045, 25.3.30. Appl., 28.6.27).-The gas is passed up through a vertical cylindrical washer wherein it is compelled to take a tortuous path through various sprays, water-curtains, and wetted screens. A number of shallow pans are supported at intervals within the casing in such a way as to leave annular spaces for the passage of the gas. A conical pumping and spraying element, attached to a central rotating shaft, dips into the water in each pan and sprays it laterally into intimate contact with the gas. Extending outwardly from the spraying element and below the perforated portion thereof is a series of vanes which act as a fan and throw the gas outwardly into pockets formed by a series of perforated plates attached to the casing. A current of washing water passes down through the apparatus. It falls from overflow tubes in each pan on to rotating plates which overlie the spraying elements and distribute the water on to perforated plates over the above-mentioned pockets through which the gas is forced.

A. B. MANNING.

Removing or recovering sulphur from fluids [gases]. PREMIX GAS PLANTS, LTD., and A. DOCKING (B.P. 329,973, 25.1.29).—Producer gas leaving the scrubbers at about atmospheric temperature is heated to about 32° and purified with iron oxide. The gas is then passed through a condenser to remove moisture and cool it to normal. A. B. MANNING.

Freeing gas liquor from tar. GUTEHOFFNUNGS-HÜTTE OBERHAUSEN A.-G. (B.P. 318,173, 23.8.29. Ger., 29.8.28).—The gas liquor is passed up through a layer of tar and then through a layer of filling bodies, e.g., flints, small coke, etc. Provision is made for drawing off any light tar oils not retained by the filling bodies from the surface of the purified liquor, which is itself withdrawn through a tube dipping below the surface. A. B. MANNING.

Recovery of tar and other by-products from coaldistillation gases. BARRETT Co., Assees. of S. P. MILLER (B.P. 303,167, 27.12.28. U.S., 29.12.27. Cf. B.P. 289,378; B., 1929, 803).—The gases from the earlier and the later portions of the coking operation in coke ovens or other coal-distillation plants are collected and cooled separately to give low-carbon and high-carbon tars, respectively. The tars, which are separated in different hydraulic mains, may be recirculated through the respective mains to effect further cooling. After the gases have been separately cooled to condense the heavier tars they may be combined and further cooled to condense a composite light tar. Suitable arrangements of the by-product recovery system are described. A. B. MANNING.

Working-up of tars containing paraffin waxes. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 329,671, 18.1.29).—Tars containing paraffin wax, e.g., brown-coal tar, are worked up by first removing the paraffin waxes without distillation, e.g., by addition of acetone and subsequent cooling, subjecting the oils to a condensation process, e.g., by heating with aluminium chloride (cf. B.P. 318,311; B., 1929, 883), and then converting the constituents which have not been changed into lubricating oils into hydrocarbons of low b.p. by cracking or destructive hydrogenation.

A. B. MANNING.

Refining benzene. Soc. DU GAZ DE PARIS (B.P. 314,052, 2.4.29. Fr., 23.6.28. Addn. to B.P. 307,935; B., 1930, 704).—The process is made continuous by means of a single apparatus, which is charged with filling substances, e.g., Raschig rings, over which the sulphuric acid flows countercurrent to the benzene vapours. The gums and resins formed are sufficiently fluid to be drawn off with the excess acid, and the apparatus can operate for long periods without cleaning. A. B. MANNING.

Destructive hydrogenation of carbonaceous materials. N.V. DE BATAAFSCHE PETROLEUM MAATS. (B.P. 309,859, 27.2.29. Holl., 16.4.28).—In the process which consists in heating the initial materials in the presence of hydrogen under pressure, preferably in the presence also of one or more catalysts, in order to form chiefly high-boiling tar-like products, and avoid extensive splitting, and thereafter subjecting these products to further heat treatment with hydrogen under pressure, preferably in the presence of one or more catalysts, in order to form lower-boiling products, the gaseous products are removed from the reaction vessel at the end of the first stage and, if desired, at the end of the second stage, while the reaction mass is still hot. Molybdenum or its compounds, and iodine or its compounds, are suitable catalysts for the first and second stages of A. B. MANNING. the process, respectively.

Destructive hydrogenation of carbonaceous materials. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 329,688, 17.1.29).—The gases issuing from the reaction chamber are freed from condensable products and treated with agents which take up hydrogen sulphide, whereby the concentration of hydrogen sulphide is reduced to less than 0.3 vol.-%. Thus the gas may be scrubbed under the reaction pressure with the middle oil (b.p. 200—300°) obtained in the process or other organic solvent for hydrogen sulphide ; the latter is subsequently removed from the oil by reducing the pressure. The purified gases may be recycled.

A. B. MANNING.

Extraction or recovery of useful products from non-fibrous materials [by means of suint liquor]. E. C. DUHAMEL, and COMP. GÉN. DES IND. TEXTILES (B.P. 330,649, 5.3.29. Fr., 5.3.28. Cf. B.P. 307,360; B., 1930, 858.—Shales, oil-bearing sands, filtering and decolorising material, fish meal, waste from treatment of tallow, beeswax, and paraffins, etc. are treated with suint liquor ($d \cdot 04$) at about 60°; the extracted oils, fats, waxes, resins, etc. are separated by centrifuging, and the purified suint liquor is used for further extractions. F. R. ENNOS.

Dehydration of oil and water emulsions. J. M. CAGE, ASST. to DEHYDRATORS, INC. (U.S.P. 1,754,009, 8.4.30. Appl., 17.9.27).—Emulsion is caused to flow upwards between successive sets of electrodes, the spacing of the electrodes being reduced as the resistance of the emulsion increases. The P.D. between the electrodes is controlled by the amount of current flowing

and in the event of a "flash over" the current is automatically cut off. T. A. SMITH.

Enhancing the flow of oils through pipe lines. A. H. ACKERMAN, ASST. to CATALYTIC CHEM. Co. (U.S.P. 1,754,296, 15.4.30. Appl., 16.2.27).—Viscous oils are made more fluid by the addition to each 30 brls. of 1 lb. of a mixture consisting of naphthalene (133 lb.), anthracene (21 lb.), caustic soda (56 lb.), sodium phosphate (10 lb.), ammonium carbonate (20 lb.), sugar (20 lb.), nitrobenzene (1 lb.), sulphuric acid ($\frac{1}{2}$ lb.), and phosphate rock (3 lb.). T. A. SMITH.

Treating oils with finely-divided solid material. N. E. LOOMIS, ASST. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,753,171, 1.4.30. Appl., 12.6.28).—Crude oil to which clay or other solid treating material has been added is passed into the central portion of a bubblecap tower through which still vapours are ascending. The oil and clay from the bottom of the tower are cooled by passing through a heat exchanger and the clay is then removed by filtration. The filtered oil is distilled in the still. T. A. SMITH.

Removal of paraffins from fluid hydrocarbons AKTIEB. SEPARATOR-NOBEL, N. O. BACKLUND, and K. G. MALM (B.P. 331,961, 26.4.29. Addn. to B.P. 296,805; B., 1928, 843).—Chilled distillate containing wax is passed through a centrifuge fitted with a mechanical device for removing the crystalline paraffin, which is separated. The cold oil which still contains amorphous paraffin is then passed through another centrifuge in which a paraffin-free portion and a fluid portion rich in amorphous paraffin are separated. The wax-free stock is used for the preparation of lubricating oils, and the fraction containing paraffin is returned to the first centrifuge for further treatment. T. A. SMITH.

Distillation of hydrocarbons. H. H. HEWETSON, Assr. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,753,149, 1.4.30. Appl., 25.6.23).—Oil flows through a series of stills each fitted with a fractionating tower containing bubble-cap plates, condensate from the bottom of each tower being passed to the middle of the tower on the succeeding still. From the towers all fractions that can be obtained at ordinary pressures are taken. The condensate from the tower on the last still is taken to the centre of a final tower maintained under vacuum so that lubricating fractions may be distilled off. Oil from the last still may also be taken to the tower.

Т. А. Ѕмітн.

Method and apparatus for cracking oil. L. DE FLOREZ (B.P. 331,940, 17.4.29).—Oil is topped in a still fitted with a fractionating column. The heavier fractions from the tower are passed through a heating coil and delivered into a cracking still into which the hot residue from the topping still is pumped. Heat for the cracking of the residual oil is supplied by means of the hot light fractions which can be heated to a high temperature without coke deposition. Direct heating of the residual oil to cracking temperature is avoided. T. A. SMITH.

Cracking hydrocarbons. E. W. Isom, Assr. to SINCLAIR REFINING Co. (U.S.P. 1,753,432, 8.4.30. Appl., 25.5.27).—The overheating of tubes and cracking apparatus is prevented by returning a portion of the cooler flue gases for admixture with the hot furnace gases before these pass over the apparatus to be heated. T. A. SMITH.

Refining used lubricating oil. J. C. PATRICK (B.P. 331,876, 10.4.29).—The oil is heated with sulphuric acid $(d \ 1.84)$ at 50° and light products are driven off under vacuum at 230°. While hot, the oil is treated with 15—18% of fuller's earth to which lime or strontium oxide has been added. T. A. SMITH.

Cracking or destructive hydrogenation of oils, or suspensions of coal in oil. T. G. HUNTER, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 330,025, 16.3.29). —The material to be treated is caused to pass upwardly through a heated vertical tube or tubes by the injector action of a gas, *e.g.*, hydrogen, and to impinge on a baffle which causes it to fall back in the form of a parabolic curtain through which the gases and vapours must pass in order to leave the apparatus. The process may be carried out in the presence of a catalyst, which may, *e.g.*, be suspended in the material, or may be in the massive metallic form coated on the tubes.

A. B. MANNING.

Manufacture of olefines. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 330,623, 11.3.29).—The yield of olefines by catalytic thermal decomposition of hydrocarbons above C_2 at 600—700° is improved by addition of 1—9 vols. of methane to the initial gases. C. HOLLINS.

Production of non-knocking motor fuels. I. G. FARBENIND. A.-G. (B.P. 330,219, 30.11.28. Addn. to B.P. 281,247; B., 1928, 739).—The process of the prior patent is modified by extracting the bitumen or its primary conversion products in stages, under conditions of successively increasing rigour. The residue is destructively hydrogenated under pressure in presence of catalysts. The first extracts are worked up into montan or paraffin wax, and the others, after destructive hydrogenation if desired, into lubricating oils, benzines, etc.

A. B. MANNING.

Fuel for internal-combustion engines. R. JOHN, Assr. to ARJON CHEM. Co. (U.S.P. 1,753,294, 8.4.30. Appl., 27.7.26).—Antimony trichloride, preferably dissolved in benzol, is added to gasoline as an anti-knocking dope in the proportion of 18 grains to the gallon.

T. A. SMITH. Purifying exhaust gases of internal-combustion engines. L. MARKELS (B.P. 329,267, 8.12.28).—The, exhaust gases are passed through a chamber containing a loosely packed charge of activated charcoal, preferably that prepared from carbonised nut shells.

A. B. MANNING.

Gas producer and combined furnace. T. R. WOLLASTON (U.S.P. 1,767,952, 24.6.30. Appl., 31.5.27. U.K., 3.8.26).—See B.P. 274,286; B., 1927, 739.

Water-gas apparatus. C. S. CHRISMAN, Assr. to U.G.I. CONTRACTING CO. (U.S.P. 1,767,579, 24.6.30. Appl., 18.4.25).—See B.P. 245,688; B., 1926, 262.

Porous mass for storage of explosive gases and its manufacture. G. DALÉN, ASST. to AMER. GAS-ACCUMULATOR CO. (U.S.P. 1,767,514, 24.6.30. Appl., 14.5.25. Swed., 27.5.24).—See B.P. 234,462; B., 1925, 622. Treatment of mineral and naphtha oils. G. PETROFF (U.S.P. 1,766,305, 24.6.30. Appl., 23.4.27. U.S.S.R., 8.11.26).—See B.P. 291,823; B., 1928, 595.

Continuous treatment of hydrocarbons with sulphur dioxide. G. CATTANEO and P. JODECK, Assrs. to ALLGEM. GES. F. CHEM. IND. M.B.H. (U.S.P. 1,766,281, 24.6.30. Appl., 10.5.27. Ger., 1.11.26).—See B.P. 279,774; B., 1928, 779.

Conversion of heavy hydrocarbon oils into light hydrocarbon oils or spirits. F. LAMPLOUGH (U.S.P. 1,765,167, 17.6.30. Appl., 27.5.26. U.K., 23.6.25).— See B.P. 258,656 ; B., 1926, 972.

Safety and stopping arrangements for watergas producers and other intermittently operating apparatus. C. MIEDBRODT (B.P. 332,097, 12.8.29).

Gas burners. H. FRISCHKORN (B.P. 332,063, 19.7.29).

Oil burners. S. J. M. AULD (B.P. 331,874, 9.4.29).

Oil-gas burners. A. A. LAMBERTI and A. E. J. HOOPER (B.P. 331,881, 11.3.29).

Device for the purification of lubricating oil in centrifugal separators. AKTIEB. SEPARATOR (B.P. 332,183, 14.1.30. Swed., 17.1.29).

[Apparatus for] de-aerating lubricants. Drys-DALE & Co., LTD., and J. W. W. DrysDALE (B.P. 331,950, 22.4.29).

Bitumen emulsions (B.P. 330,374).—See IX.

III.—ORGANIC INTERMEDIATES.

Modern methods of manufacturing absolute alcohol. E. MERCK (Z. angew. Chem., 1930, 43, 371). K. R. DIETRICH (*Ibid.*, 370—371).—Polemical. A discussion of the economics of preparing absolute alcohol by the lime-pressure process and of the difficulties attending the separation of ethyl and methyl alcohols by fractional distillation. (Cf. Dietrich, B., 1930, 261.) A. R. POWELL.

Reactions of α - and β -naphthol. L. EKKERT (Pharm. Zentr., 1930, 71, 433-434).—Some modifications of the colour reactions with chlorine, chloroamine, and sulphuric acid, and the use of ultra-violet radiation in connexion therewith, are described.

S. I. LEVY.

Naphthols and fast bases (I.G.). Rowe.—See IV. Determination of alcohol. MARTIN.—See XVIII. Urea in water. McCRADY. Coal-tar disinfectants. PHILBRICK.—See XXIII.

PATENTS.

Sulphonation of alcohols of high mol. wt. DEUTS. HYDRIERWERKE A.-G. (B.P. 307,709, 11.3.29. Ger., 9.3.28).—Non-carboxylated alcohols above C_8 , e.g., cetyl alcohol, are sulphonated with sulphuric acid in presence of acetic or other anhydride, with or without a diluent and/or a catalyst. C. HOLLINS.

Manufacture of aliphatic carboxylic acids from aqueous solutions thereof. I. G. FARBENIND. A.-G. (B.P. 306,097, 14.2.29. Ger., 15.2.28. Addn. to B.P. 300,923; B., 1930, 452).—The use of halogenated hydrocarbons for the separation of acetic acid by the method of azeotropic mixtures is extended to higher acids; e.g., propionic, butyric, and isobutyric acid are obtained anhydrous by means of di- or tri-chloroethylene or chloroform. C. HOLLINS.

Manufacture of acetic anhydride. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 330,537, 8.3.29).— Acetic acid vapour is passed over an alkali phosphate containing boron phosphate, especially a mixture of boron phosphate, lithium phosphate, and sodium metaphosphate, at 600—700°. C. HOLLINS.

Catalytic removal of hydrogen or oxygencontaining [carboxylic] groups from organic compounds. SELDEN Co., Assees. of A. O. JAEGER (B.P. 309,024, 8.3.29. U.S., 3.4.28).—Polybasic acids, esters, or amides are decarboxylated by passing the vapours with hydrogen, with or without steam, watergas, etc., over a decarboxylating catalyst which has been incorporated in or combined with a base-exchange substance. In presence of ammonia or an amine vapour an amide of the monocarboxylic acid may be produced. The conversion of phthalic anhydride into benzoic acid or benzaldehyde is described.

C. HOLLINS. Manufacture of organic acyl halides. G. B. ELLIS, From Soc. DES USINES CHIM. RHÔNE-POULENC (B.P. 330,511, 1.3.29.)— α -Halogenoethyl esters of organic acids are passed as vapour through a tube at 250— 400°; the tube may contain a contact mass, such as pumice, kieselguhr, etc., with or without acid catalysts. α -Chloroethyl acetate gives acetyl chloride and acetaldehyde; $\alpha\beta$ -dichloroethyl acetate gives acetyl chloride and chloroacetaldehyde. The esters are suitably prepared by addition of hydrogen halide or halogen to vinyl esters. C. HOLLINS.

Preparation of primary and secondary amines. COMP. DE PROD. CHIM. & ELECTROMÉTALL. ALAIS FROGES, & CAMARGUE (B.P. 317,079, 29.7.29. Fr. 10.8.28).—A primary or secondary alcohol, other than a cyclohexanol, is heated with ammonia or a primary amine in presence of nickel, e.g., in alcohol at 190°. Tertiary amines are absent from the product.

C. HOLLINS.

Manufacture of hydroxycarboxylic acids of naphthacarbazoles. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 330,643, 16.3.29).—The Kolbe reaction is applied to the carboxylation of hydroxynaphthacarbazoles. 4-Hydroxy- α -naphthacarbazole, from Laurent acid and phenylhydrazine followed by alkaline fusion, gives the 1(?)-carboxylic acid; 4-hydroxy- β -naphthacarbazole the 1(?)-carboxylic acid, m.p. 220°; 3-hydroxy- α -naphthacarbazole the 2- or 4-carboxylic acid; and 2-hydroxy- α -naphthacarbazole the 1-carboxylic acid, m.p. above 300°, which has a strong effect on the nasomucous membrane. C. HOLLINS.

Separating and purifying sulphonic acids of high mol. wt. G. PETROFF (U.S.P. 1,766,304, 24,6.30. Appl., 23.4.27. U.S.S.R., 26.11.26).—See B.P. 284,859 ; B., 1928, 361.

Condensation products of hydrogenated naphthalenes with ethylene. R. MICHEL, Assr. to I. G. FARBENIND, A.-G. (U.S.P. 1,766,344, 24.6.30. App 1, 7.4.28. Ger., 4.2.26).—See B.P. 265,601; B., 1928, 74.0

Manufacture of derivatives of 2:3-hydroxynaphthoic acid. B. HEYN, Assr. to GEN. ANILINE WORKS, INC. (U.S.P. 1,754,390, 15.4.30. Appl., 28.2.29. Ger., 27.2.28).—See B.P. 326,971; B., 1930, 604.

Manufacture of alkoxy--ketodihydrothionaphthens. E. RUNNE, K. MOLDAENKE, and E. FISCHER, Assrs. to GEN. ANILINE WORKS, INC. (U.S.P. 1,765,703, 24.6.30. Appl., 18.9.28. Ger., 8.10.27).—See B.P. 298,493; B., 1930, 95.

Production of alkyl ketones of the anthracene series. A. LÜTTRINGHAUS and F. KAČER, ASSTS. to GEN. ANILINE WORKS, INC. (U.S.P. 1,766,443, 24.6.30. Appl., 24.3.27. Ger., 15.7.26).—See B.P. 289,585; B., 1928, 516.

[Manufacture of] 1-hydroxylamino-8-sulphoanthraquinone. A. SHEPHERDSON and A. J. HAILWOOD, Assrs. to BRIT. DYESTUFFS CORP., LTD. (U.S.P. 1,767,230, 24.6.30. Appl., 28.3.27. U.K., 26.4.26).—See B.P. 274,226; B., 1297, 697.

Carbon disulphide (B.P. 331,734).—See VII. Acetic and lactic acids (B.P. 316,287).—See XVIII. Phenols (B.P. 330,333).—See XX.

IV.—DYESTUFFS.

Constitution of some Naphthols and fast bases (I.G.) used for the production of insoluble azo colours. F. M. Rowe (J. Soc. Dyers and Col., 1930, 46, 227-230).-Recent additions (cf. B., 1924, 704, 708; 1925, 797; 1926, 6, 310) to the Naphthol AS range of dyes include Naphthol AS-E, β -hydroxynaphthoic *p*-chloroanilide, m.p. 259° (commercial product) and 264° (from acetic acid); Naphthol AS-OL, β -hydroxynaphthoic o-anisidide, m.p. 162° (commercial) and 167° (from alcohol); Naphthol AS-BG, β -hydroxynaphthoic, 2:5-dimethoxyanilide, m.p. 181° (commercial) and 185° (alcohol); Fast Red RBE base, 6-benzamido-m-4-xylidine hydrochloride (free base, m.p. 176°, from alcohol); Variamine Blue B base, 4-amino-4'-ethoxydiphenylamine sulphate, m.p. 100° (base, m.p. 100°, from dilute alcohol). When diazolised in the usual manner at about 12°, Variamine Blue B base combines with 2 mols. of nitrous acid forming a nitroso-diazo-chloride which couples with naphthols to yield dull claret shades; on soaping or treating with a reducing substance such as sodium sulphide or sulphite the nitroso-group is removed and the shade changes to a permanent blue. The true diazo compound (which is very stable) may be prepared by diazotising at 45° and using only 1 mol. of nitrous acid. The following couplings are described: Fast Scarlet Salt GG with Naphthol AS-E, red, m.p. 294°; Fast Red R base with Naphthol AS-OL, red, with yellowish green lustre, m.p. 283°; Fast Scarlet Salt GG with Naphthol AS-OL, scarlet, with golden lustre, m.p. 280°; Fast Orange GC base with Naphthol AS-BG, dark orange-brown needles with green lustre, m.p. 225°; Fast Scarlet Salt GG with Naphthol AS-BG, reddishbrown, m.p. 278°; Variamine Blue B base with Naphthol AS, dark purple, m.p. 258°; Variamine Blue B base with Naphthol AS-E, purplish-black, m.p. 264°; the two last-named products obtained dissolve

with a crimson colour in sulphuric acid and are thus distinguished from Dianisidine Blue dyes. A. J. HALL.

PATENTS.

Manufacture of [green] azo dyes insoluble in water [ice and pigment colours]. W. W. GROVES. From I. G. FARBENIND. A.-G. (B.P. 330,349, 12.4.29).— A 6-amino-, 6-arylamino-, or 6-arylalkylamino-2:3hydroxynaphthoic arylamide is coupled in substance or on the fibre with any non-sulphonated, non-carboxylated diazo-, tetrazo-, or diazo-azo-compound to give shades which are usually green to olive, bronze, or brown. Acid coupling yields bluish-red shades. The 6-arylamino-compounds are especially useful. The arylamides are made from the 6-amino-2: 3-hydroxynaphthoic acids of B.P. 326,971 (B., 1930, 604).

C. HOLLINS.

Lakes of triarylmethane dyes. IMPERIAL CHEM. INDUSTRIES, LTD., F. W. LINCH, E. H. RODD, and H. K. FREW (B.P. 330,229, 31.1.29).—Complex acid lakes are made by oxidising the leuco-compounds of basic triarylmethane dyes, or of acid triarylmethane dyes containing basic groups, in presence of a complex inorganic acid or its components, preferably in presence also of a dispersing agent stable to the oxidising agent used. The lakes may be improved by a subsequent heating with water. Leuco-malachite-green, e.g., is added in hydrochloric acid solution to a solution of potassium permanganate The containing sodium phosphotungstomolybdate. leuco-compound of Acronol Brilliant Blue is oxidised with dichromate at 90-95° in presence of sodium phosphotungstomolybdate. A suitable dispersing agent is formaldehyde-naphthalenesulphonic acid.

C. HOLLINS.

Manufacture of [green] sulphur dyes. A. CARP-MAEL. From I. G. FARBENIND. A.-G. (B.P. 330,308, 6.3.29).—The indophenol (or its leuco-compound) from *p*-aminophenol and an alkyl- or aralkyl- α -naphthylamine-6(or 7)-sulphonic acid is sulphurised, with or without addition of copper or a copper salt. Ethylor benzyl-Cleve acid, *e.g.*, is oxidised together with *p*-aminophenol, and the product is boiled with sodium polysulphide and copper sulphate solution.

C. HOLLINS.

Rubber derivatives (B.P. 313,919).—See XIV.

V.-FIBRES; TEXTILES; CELLULOSE; PAPER.

Reducing properties of wool. R. HALLER (Helv. Chim. Acta, 1930, 13, 620—628).—The behaviour of wool fibres towards different oxidising agents has been investigated. The two powerful oxidising agents chromic acid and potassium dichromate in aqueousalcoholic solution are partly adsorbed without undergoing reduction. Alkaline Fehling's solution is unaffected and no blue colour is developed with an alkaline solution of Indanthrene Yellow R. The reduction of a 0.01% solution of potassium nitrate to nitrite observed by Schellens is due to bacteria, not to the wool itself. Wool bleaches a solution of Methyl Green, but itself becomes slightly coloured, and this effect is not due to combined sulphur. Wool will absorb 50% of its weight of iodine from an alcoholic solution, giving a unique solid compound, fast to water and extraordinarily fast to light. Part of the iodine is reduced to hydriodic acid, which remains in the bath. Curves showing the rate of adsorption of iodine by wool from solutions of different concentration are given. F. L. USHER.

Change of some properties of sericin particles on the surface of the [silk] cocoon on drying. H. KANEKO, T. HAYASHI, S. CHINO, and M. MIYASAKA (Bull. Sericult. Silk Ind., Japan, 1930, 2, 2—3).— During the drying of the cocoon the sericin particles on the surface undergo dehydration and their physical properties change in such a way that the amount of dyestuff absorbed is decreased and the surface tension, viscosity, refractive index, and turbidity and colloidal properties of the sericin solution in water are altered.

W. O. KERMACK.

Behaviour of cellulose with bisulphite as compared with sulphurous acid solution. T. NAKA-SHIMA, S. OHORA, and J. MURAKAMI (J. Soc. Chem. Ind., Japan, 1930, 33, 199–200 B).—In both cases after heating for 24 hrs. at 100° no change in iodine value or acid value, or separation of sulphur, was observed; hydrolysis of the cellulose was slight, but dissociation occurred especially with sulphurous acid. Bisulphitecooked cellulose diminished in viscosity with time of heating, but the increase in the copper number and the proportion of β -and γ -cellulose was small. On the other hand the sulphurous acid cook diminished the viscosity enormously and caused a distinct increase in β - and γ cellulose, but the increase in copper number was not great, scarcely any sugar being formed. F. R. Ennos.

Preparation of viscose from wood pulp. B. RASSOW, T. VOERSTER, and L. WOLF (Papier-Fabr., 1930, Fest- u. Auslandsheft, 77—103).—A summary of current knowledge relating to the preparation of viscose, with particular reference to the formation of alkali-cellulose and to ripening, is given. Experiments are described in which the effect of varying conditions during mercerisation, ageing, sulphidation, dissolution, and ripening on the viscosity is investigated. The main cause of the lower viscosity of wood-pulp viscoses, compared with those prepared from cotton, is held to be different molecular complexity of the two materials. T. T. Ports.

Viscose. VII. Acid decomposition of viscose. K. TANEMURA and S. MIYOSHI (J. Soc. Chem. Ind., Japan, 1930, 33, 184—186 в; сf. В., 1930, 758).— Changes in total and xanthate-carbon disulphide during ripening and the evolution of gases during the acid decomposition of viscose have been investigated. Carbon disulphide was determined by iodometric titration of the potassium ethyl xanthate formed by absorption of this substance in alcoholic potash; carbon dioxide by conversion into barium carbonate, dissolution of the latter in excess of standard hydrochloric acid, and back-titration with sodium hydroxide solution; and hydrogen sulphide and sulphur dioxide by means of iodine and sodium thiosulphate solutions. The total carbon disulphide decreases fairly quickly at the beginning of ripening, but afterwards only slowly. Of this total 16% is converted into other sulphur compounds when the viscose coagulates. The xanthatecarbon disulphide decreases alternately slowly and quickly with ripening, giving a stepped curve, so that changes in the secondary reactions occur. Acid decomposition of spinning-viscose yielded CS_2 1.75, H_2S 0.38, SO_2 0.069, and CO_2 0.26, expressed as a percentage of the viscose. B. P. RIDGE.

Viscose. VIII. Gases evolved in spinning, reeling, washing processes, and in cabinet of viscose factory. K. TANEMURA and S. MIYOSHI (J. Soc. Chem. Ind., Japan, 1930, 33, 217—219 B).—From analyses of the yarn at various stages in its manufacture, the relative proportions and rates of evolution of carbon disulphide, hydrogen sulphide, sulphur dioxide, and carbon dioxide in the spinning and reeling rooms, skein washer, and cabinet are calculated. F. R. ENNOS.

Sulphonamide derivatives as plasticisers for acetylcellulose. T. S. CARSWELL (Ind. Eng. Chem., 1929, 21, 1176-1178).-The effect of incorporating various arylsulphonamides as plasticisers on some commercially important properties of cellulose acetate lacquers is examined. No relationship is apparent between the chemical constitution of these compounds and their "retentivity" ([wt. of plasticiser \times 100]/wt. of cellulose acetate) in cellulose acetate, but p-toluenemethylenesulphonamide has a significantly high value. Replacement of NMe by NEt tends to increase the elongation and decrease the tensile strength of the films produced. With increasing numbers of methyl groups in the nucleus the tensile strength of the films increases without notable effect on elongation. With the phenyl group attached to nitrogen there is a marked decrease in tensile strength. p-Toluenemethylenesulphonamide produced the highest tensile strength among materials examined. Toluenesulphonamide derivatives produced films of greater fastness to light than the corresponding benzene or xylene compounds. Derivatives with an NEt group are faster to light than corresponding methyl compounds, but an N-phenyl group markedly decreases fastness. The best results in this connexion were obtained with p-toluenemethylenesulphonamide. Relationships between chemical constitution of the plasticiser and resistance of films to outdoor exposure were indefinite, except that the sulphonmethyleneamide is superior to simple alkyl deriva-A. G. POLLARD. tives.

Impregnation of wood during digestion in the pulping process. A. S. KLEIN (Papier-Fabr., 1930, Fest- u. Auslandsheft, 105—111).—A review of the literature. T. T. Ports.

Effects of bleaching variables on strength of easy-bleaching spruce sulphite-pulp. P. K. BAIRD and R. H. DOUGHTY (Paper Trade J., 1930, 8, Ann. Rev. No. 175, 177, 179, 181, 183).—Increasing the rate of agitation during bleaching results in an increase in bursting and folding strengths, and no change in tensile and tearing strengths. Increasing the consistency from 2% to 7% results in a higher burst and a lower tear. The effect of raising the temperature from 21° to 41° is slightly to lower the folding and tearing strengths and to increase the tensile strength slightly. When the bleach ratio is raised from $12 \cdot 3\%$ to $17 \cdot 0\%$ a slight decrease in all

the strength properties is noted, except the burst, which is unchanged. The effects are explained on the grounds of a combination of chemical and mechanical actions during bleaching, which influence the behaviour of the fibres on beating, and hence the character of the resulting sheet. T. T. Potts.

Preparation of fibre test sheets. M. B. SHAW, G. W. BICKING, and L. W. SNYDER (Bur. Stand. J. Res., 1930, 5, 105-114).- A laboratory method for making small sheets of fibres has been developed and a suction sheet machine designed for studying the paper-making quality of pulp. The finished sheet is large enough for ordinary tests and results are closely reproducible.

C. J. SMITHELLS.

Filter cloths. WERNER.-See I. Formation of Calcium sulphate in the sulphite-pulp process. LAUBER.-See VII.

PATENTS.

Obtaining fibres from fibrous vegetable material. E. C. DUHAMEL, and COMP. GÉN. DES IND. TEXTILES (B.P. 307,360, 5.3.29. Fr., 5.3.28).—Fibrous vegetable material (flax, china grass, nettles, bark fibres) is treated at about 98° with suint liquor of a suitable concentration, or with alkaline salts derived from suint, and the liquor is afterwards centrifuged to recover the suint liquor for re-use and the substances dispersed therein ; if desired, the suint liquor may be decolorised and/or deodorised and/or sterilised, or concentrated to a paste to facilitate transport and subsequently diluted for use.

F. R. ENNOS.

Manufacture of [artificial silk] fabrics. BRIT. Celanese, Ltd. (B.P. 310,845, 27.4.29. U.S., 1.5.28) .---Fabrics having lustre pattern effects are manufactured by weaving together two types of cellulose acetate silk yarns (or yarns composed of other cellulose esters or ethers), one type being easily delustred by treatment with boiling water or soap solutions and the other being more resistant and then subjecting the fabric to a delustring process such as immersion in a boiling soap bath. A. J. HALL.

Precipitating baths for making threads or the like from viscose. I. G. FARBENIND, A.-G. (B.P. 304,244, 17.1.29. Ger., 17.1.28. Addn. to B.P. 303,514; B., 1930, 760) .- In modification of the prior process, the precipitating bath contains no mineral acid or an amount not exceeding 12% (calc. as sulphuric acid), its content of the organic substance with tanning properties being increased to maintain it at the saturation point. F. R. ENNOS.

Dry spinning of artificial threads. ACETA GES.M.B.H. (B.P. 317,368, 3.7.29. Ger., 14.8.28).-The spinning chamber consists of a gastight cylindrical pipe closed at one or both ends by a transverse pipe having a fixed or movable circular window at one or both ends, whilst the upper transverse pipe is provided with a tubulure for introduction of the spinning nozzle and for passage of the drying air. F. R. ENNOS.

Manufacture of ammoniacal copper cellulose solutions. K. Hess and C. Trogus (B.P. 307,939, 15.3.29. Ger., 16.3.28. Addn. to B.P. 301,752; B., 1930, 655) .- During dissolution of the copper

alkali cellulose obtained in the prior patent, addition is made of a sufficient quantity of a salt (copper sulphate, ammonium sulphate or chloride) or an acid (sulphuric, hydrochloric, or carbonic) to remove the excess of free alkali over the amount required to produce a spinning solution containing the equivalent of 0.6% by wt. of cautic soda. F. R. ENNOS.

Manufacture of acetylated cellulose fibres. HEBERLEIN & Co., A.-G. (B.P. 312,280, 23.5.29. Ger., 23.5.28).—Cellulose fibres are rendered immune to substantive dyes by partly acetylating with acetic anhydride, glacial acetic acid, and a catalyst (sulphuric acid or zinc chloride), in the presence of formaldehyde, a polymeride thereof, or a derivative or condensation product yielding either substance during the reaction. F. R. ENNOS.

Manufacture of organic esters of cellulose and coating compositions containing the same. BRIT. Celanese, Ltd. (B.P. 326,515, 5.11.28. U.S., 5.11.27).-Low-viscosity organic esters of cellulose which have all the desirable properties of the high-viscosity esters and are in addition compatible with natural or synthetic resins, are obtained by esterifying at not above 50-55° (depending on the proportion of sulphuric acid used) and ripening the product as described in B.P. 300,140 (B., 1930, 655) to a stage between solubility in hot chloroform and very slight plasticity therein, the ester at the same time being soluble in a mixture of hot alcohol and benzene without the addition of water. The products are suitable for lacquers and coating compositions. D. J. NORMAN.

Manufacture of cellulose esters. G. B. ELLIS. From Soc. des Usines Chim. Rhône-Poulenc (B.P. 329,704, 25.2.29).-A solution of cellulose tricrotonate prepared as described in B.P. 328,588 (B., 1930, 655) is stirred with an aqueous solvent (acetic acid, alcohol) and a catalyst (mineral acids, sulphonic acids, acid salts) at 45-50° for about 20 hrs.; the partially hydrolysed ester is precipitated with water or aqueous alcohol. F. R. ENNOS.

[Plastic] compositions containing cellulose derivatives [esters or ethers]. BRIT. CELANESE, LTD. (B.P. 313,405, 10.6.29. U.S., 9.6.28).-Halogenated aryl phosphates, e.g., tetrabrominated tolyl phosphate, are used as plasticisers for cellulose esters or ethers.

C. HOLLINS.

Recovering salts from the waste water of artificial silk factories. E. Rodolfo (B.P. 331,648, 21.5.29).-Calcium sulphate, magnesium hydroxide, and zinc hydroxide (if zinc is present) are precipitated from the waste water by addition of milk of lime. The precipitate is separated and treated in aqueous suspension with carbon dioxide, when magnesium sulphate alone passes into solution; the liquor is concentrated until sodium sulphate separates. The free sulphuric acid in the waste water may be recovered as magnesium sulphate by neutralising with dolomite or calcined dolomite S. K. TWEEDY. prior to treating with lime.

Continuous sulphate process. W. D. MOUNT, Assr. to K. A. FORREST (U.S.P. 1,754,902, 15.4.30. Appl., 11.1.29).-Sulphate-pulp is produced by alkaline digestion, and the spent liquors are evaporated, incinerated, causticised, purified, and re-used, the process being continuous. T. T. Porrs.

Paper and paper making. E. LIONNE (U.S.P. 1,752,802, 1.4.30. Appl., 12.11.28).—Celluloid is precipitated from solution by addition to the furnish of a paper-making beater, or is precipitated before adding to the paper pulp. The resulting stock is made into paper in the usual way, and the celluloid content of the sheet or board may be softened by the action of a suitable solvent under pressure. T. T. Ports.

Sizing of paper pulp. J. A. DE CEW, Assr. to PROCESS ENGINEERS, INC. (U.S.P. 1,753,775, 8.4.30. Appl., 24.5.29).—The furnish is brought to an optimum $p_{\rm H}$, e.g., by the use of an aluminium sulphate solution of $p_{\rm H}$ 5—6.8, followed by the addition of free rosin size. T. T. Ports.

[Manufacture of] mineral-coated paper. W. W. TRIGGS. From CHAMPION COATED PAPER Co. (B.P. 331,578, 5.4.29).—Paper having a top coating consisting of at least 70% of mineral filling (clay, satin white, etc.) and not more than 30% (dry basis) of adhesive (casein, glue, starch, with a small amount of soap) is finished by bringing the coated side, while the coating is in a plastic condition produced by wetting or heating, in contact with a solid non-adhering surface, e.g., a revolving metal drum or a belt of hard rubber, having a finish similar to that required on the paper ; the coating is then rendered non-plastic by drying or cooling and the paper removed from the solid surface. F. R. ENNOS.

Process of making waterproof paper. G. A. BROWN, ASST. to BENNETT, INC. (U.S.P. 1,753,690, 8.4.30. Appl., 23.10.26).—Waste wax paper is disintegrated, the wax dispersed by heating and/or the addition of sodium silicate or rosin size, followed by alum, and the furnish is then run off on a paper machine. T. T. POTTS.

[Carrier for] manufacture of films and foils etc. G. FRENKEL (B.P. 332,254, 18.2.29).

Manufacture of [composite] films, foils, etc. G. FRENKEL (B.P. 332,255-6, 18.2.29).

Manufacture of ornamented paper. J. Y. JOHN-SON. From I. G. FARBENIND. A.-G. (B.P. 331,707, 22.7.29).

Pulp beating or refining machines. T. D. NUTTALL, and BENTLEY & JACKSON, LTD. (B.P. 331,992, 21.5.29).

Products from non-fibrous materials (B.P. 330,649). See II. Recovering alkali (U.S.P. 1,753,128).—See VII. Wall-board (U.S.P. 1,754,413 and 1,754,843).—See IX. Stencil sheet (U.S.P. 1,753,204—5). Moulded articles (B.P. 331,851).—See XIII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Stoving and allied effects in [wool] hosiery. A. T. KING (J. Soc. Dyers and Col., 1930, 46, 225— 227).—From analogy of the special conditions which govern the fastness of certain azo dyes towards sulphur dioxide (King, B., 1928, 636) it was concluded that wool materials would be satisfactorily bleached by the bisulphite process provided that the bleach liquor had $SO_2/NaOH = 1.25-1.35$; this was shown to be true in large-scale trials. Bleaching with a solution of sodium bisulphite is superior to the stoving process since it is effected without the odour of sulphur dioxide and without the danger of this gas affecting adjacent coloured materials; further the resulting white is purer and more permanent. The bisulphite bleach is very sensitive to iron, and iron stains in the wool immediately become evident; in the case of stoving, such stains are masked during bleaching, but return during subsequent storage.

A. J. HALL. Naphthols and fast bases (I.G.). Rowe.—See IV. Reducing properties of wool. HALLER.—See V.

PATENTS.

Preparing wool-containing fabrics for dyeing. DEUTS. WOLLENWAREN MANUF. A.-G. (B.P. 308,605 and Addn. B.P. 331,529, 21.3.29. Ger., 23.3.28).—Waste materials containing artificial silks, or fabrics made from these and containing wool, are freed from the latter and also oily impurities by extraction with suitable organic solvents (e.g., esters of fatty acids, ketones, chlorinated hydrocarbons), adhering solvent being removed by means of cold or warm water. (Cf. B.P. 241,314 and 266,436; B., 1926, 9; 1927, 295.)

A. J. HALL.

Manufacture of evenly dyed viscose fabrics. I. G. FARBENIND. A.-G. (B.P. 306,908, 27.2.29. Ger., 27.2.28).—Level shades on viscose silk are obtained by the use of chromable azo dyes containing a single heavy metal (copper, nickel, or cobalt). [Stat. ref.]

C. HOLLINS.

Improving dyeing properties of viscose silk. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 331,612, 22.4.29).—Viscose silk threads are treated while swollen, after spinning and before the first drying, for about 1 hr. at ordinary temperature, with an ammoniacal solution of copper oxide containing 1—3 g. of copper and 20—100 g. of ammonia per litre, so that the loss of weight of cellulose by dissolution does not exceed 6%. Improved lustre, a roughened surface, and an increased and more uniform affinity for dyes are thus imparted. A. J. HALL.

Dyeing of cellulose acetate. J. S. WILSON, J. THOMAS, and SCOTTISH DYES, LTD. (B.P. [A] 330,216 and [B] 330,253, 27.11.28).—(A) Cellulose acetate silk is impregnated with a soluble leuco-ester of a vat dye (Soledon or Indigosol colours) at 50—80° for 30—60 min., preferably in presence of salt, and the colour is developed in the usual way without steaming. (B) The material is dried before development. C. HOLLINS.

Printing white or coloured matt effects on esters of cellulose or its transformation products. I. G. FARBENIND. A.-G. (B.P. 309,194, 6.4.29. Ger., 7.4.28). —The materials are printed with a solution of urea (about 20—30%) thickened with gum tragacanth etc., dried, steamed for 5—10 min., and washed; a suitable dye may be added to the printing paste. A. J. HALL.

Machines for continuously washing and treating, by a wet process, textile fibres and threads.

Briffsh Chemiont Abstracts-B.

M. H. CARPMAEL. From SNIA-VISCOSA (B.P. 332,003, 27.5.29).

Apparatus for dyeing tubular textile webs or fabrics. H. LOESER (B.P. 332,180, 2.1.30. Latvia, 5.1.29).

Apparatus for treating hair, feathers, etc. [with ozonised air]. W. W. TRIGGS. From AMER. HAIR & FELT Co. (B.P. 331,845, 4.4.29).

Titanium solutions (B.P. 309,090).—See VII.

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

Evaporation of electrolytic caustic soda. J. A. LEE (Chem. Met. Eng., 1930, 37, 404-408).-An account is given of the continuous evaporation and salt-recovery system at the South Charleston plant of the Westvaco Chlorine Products, Inc. The original solution contains about 8% NaOH and 17.5% NaCl, and the final products from the steam evaporation plant are: 53 short tons of NaOH per 24 hrs. in the form of caustic soda solution, d 1.53, containing also about 0.9% NaCl in solution and none in suspension, and sodium chloride brine for return to the electrolytic cells. The water evaporated is about 1 million lb. per day, and the steam used, at 10 lb./sq. in. gauge, about ³/₄ million lb. Evaporation is in three stages, a double effect followed by a single, then follows a continuous crystalliser and Laughlin centrifugal filter which delivers the final caustic liquor. Swenson evaporators and Dorr thickeners and rake classifiers are employed. The materials of construction used are nickel-cast iron, nickel tubes, and Monel B. M. VENABLES. metal.

Determination of ammonia in synthetic ammonia solution. E. OTT (Chem.-Ztg., 1930, 54, 412).—For weighing the ammonia solution in the method of Egeling (B., 1930, 371) a two-bulb pipette is recommended. The upper bulb has a capacity of 100 c.c. and is closed by stopcocks above and below the bulb; the lower bulb has a capacity of 25 c.c. The tube above the upper stopcock is opened out to form a small funnel which facilitates introduction of rinsing water into the bulb. A. R. POWELL.

Preparation of ammonium sulphate and nitrogen. D. VORLÄNDER and A. LAINAU (Z. angew. Chem., 1930, 43, 647—648).—Ammonium sulphite solutions are oxidised very rapidly by air in presence of soluble cobaltammine sulphite compounds, the best conditions being a temperature of $18-19^{\circ}$, $p_{\rm H} 8.4-8.6$, and a concentration of 80 g. of $(\rm NH_4)_2\rm SO_3, \rm H_2O$ (with 10 mg. Co) per litre. Addition of other substances which normally accelerate or inhibit catalytic oxidations does not affect the influence of the cobalt compounds. On crystallisation of the ammonium sulphate, the cobalt compounds remain in the mother-liquor.

S. I. LEVY.

Determination of active chlorine in hypochlorite liquors. J. D. BLAKELEY, J. M. PRESTON, and F. SCHOLEFIELD (J. Soc. Dyers and Col., 1930, 46, 230-

233).-Ordinary indicators are eliminated in the Penot and Ehrenfried methods for determining active chlorine, which use standard solutions of arsenious acid, by using an electrical method for ascertaining the endpoint in the titration, it being found that in the region of the end-point there is a sudden drop of electric potential from 691 to 250 millivolts and an increase from 512 to 820 millivolts, respectively, with regard to a platinum electrode immersed in the hypochlorite solution being titrated. The Penot and Ehrenfried methods may be combined for determining both the hypochlorite and chlorate contents of a bleaching solution, by titrating first with sodium arsenite in bicarbonate solution, then adding a known excess of arsenite, acidifying with hydrochloric acid, and titrating with potassium bromate, the difference between the two results being equivalent to the chlorate present. A simplified method is described for works' routine analysis in which the use of a platinum electrode within a suitable buffer solution avoids the necessity for a potentiometer, standard cell, accumulator, etc. A. J. HALL.

Bauxite. Float-and-sink fractionations and flotation experiments. B. W. GANDRUD and F. D. DE VANEY (U.S. Bur. Mines, Bull. 312, 1929, 101 pp.).-Gravity separation showed that the separation of silica from low-grade bauxites was almost impossible ov to the non-detachment of particles even when pulverised to 100-mesh. It is believed that bauxites in the United States consist of hydrated gibbsite (Al₂O₃,3H₂O) with which is associated kaolinite as the source of silica, and apart from the fine-grinding involved, the difference in density does not promise successful separation. Concentration of iron oxide was more promising, and it was indicated that many bauxites containing 10-20% Fe₂O₃ could be concentrated on tables to a content of less than 10% Fe₂O₃, also from 10% Fe₂O₃ to less than C. A. KING. 3% in some instances.

Determination of "sugar-soluble" silica in burnt limestone. O. SPENGLER and A. TRAEGEL (Z. Ver. deut. Zucker-Ind., 1930, 80, 413-419).-In the second saturator, where the dilute sugar syrup 18 treated with lime, relatively large quantities of silica enter the solution and subsequently cause the formation of silica incrustations in the plant. Most of this silica is derived from the lime, and a close approximation of 2 g. of lime are ground to an impalpable powder, 0.5 g. of which is slaked with water in a nickel dish. The pasty mass is washed into a flask with more water to give a volume of 100 c.c.; 5-6 drops of 1% phenolphthalein solution are added and the mixture is carefully treated with N-sulphuric acid until the colour fades, after vigorous shaking, to a pale rose, boiled for 1 min., and filtered. The filtrate is cooled to 20° and treated with 1 g. of ammonium molybdate and 5 c.c. of 3N-hydrochloric acid, and the resulting yellow colour is compared with that of a standard potassium chromate solution (cf. Spengler and Brendel; B., 1930, 260). The results are reasonably close to those obtained for the silica content of the syrups after the lime treatment.

A. R. POWELL.

Formation of calcium sulphate in the towerliquors of the sulphite-pulp process. H. LAUBER (Papier-Fabr., 1930, Fest- u. Auslandsheft, 50—53).— Traces of calcium sulphate are formed during the preparation of calcium bisulphite from pure sulphur dioxide. It is shown that this is not due to catalytic action, control experiments using catalysts failing to increase the velocity of sulphate formation. The possibility of a molecular side-reaction is precluded by the fact that it is possible, in an atmosphere of carbon dioxide and pure sulphur dioxide, to prepare bisulphite solutions free from sulphate. It is concluded that the reaction is one of pure oxidation dependent simply on the partial pressure of oxygen. T. T. Ports.

Chlorine in coal. DAMON. Silica gel. BOSSHARD and WILDI.—See II. Determination of potassium. CALVERT.—See XVI.

PATENTS.

Manufacture of phosphoric acid and products containing phosphoric acid. AKTIEB. KEMISKA PATENTER, Assees. of KONSTGODNINGSFABR. AKTIEB. I. LANDSKRONA (B.P. 314,976, 4.4.29. Ger., 7.7.28).— Phosphate rock is treated at a minimum temperature of 80° with sulphuric acid solution containing more than 10 mol.-% of sulphuric acid. Under these conditions calcium sulphate is deposited in the anhydrous or hemihydrated form (or in a mixture of these forms).

S. K. TWEEDY.

Manufacture of dicalcium phosphate. R. D. PIKE (U.S.P. 1,753,478, 8.4.30. Appl., 14.11.27).— Gaseous hydrogen chloride is brought into contact with an aqueous suspension of pulverised phosphate rock, and, after neutralising with calcium carbonate, the precipitate is separated. H. ROYAL-DAWSON.

Treating leucitic rocks with oxides of nitrogen. F. JOURDAN (B.P. 309,957, 18.4.29. Ital., 18.4.29).— The rock is treated with nitric acid in vapour form, alone or mixed with oxides of nitrogen and water vapour and air. The quantity of nitrous gases is in excess of that necessary for forming nitrates of the potassium, aluminium, and iron contained in the rock. The aluminium and iron nitrates in the mixture formed are decomposed by heat, and the oxides of nitrogen thus evolved are again utilised. A cyclic process is described.

S. K. TWEEDY.

Recovering alkali. R. H. McKEE (U.S.P. 1,753,128, 1.4.30. Appl., 24.10.24).—The black ash residue from soda-pulp mills etc. is ground with calcium carbonate sludge, excess of water is removed, and the residue is heated and recovered as caustic soda.

H. ROYAL-DAWSON. H. ROYAL-DAWSON. Production of sulphates containing little or no water of crystallisation. O. KASELITZ, and KALI-FORSCHUNGS-ANSTALT G.M.B.H. (B.P. 331,674, 17.6.29). —The sulphate solutions, of maximum concentration, are heated in closed vessels at temperatures (e.g., 200°) at which the solubility of the salt becomes practically zero, or very slight. The mixture of salt and liquor is separated without any appreciable reduction in pressure, the heat of the liquor being recovered for further use. When the salts to be treated are normally highly hydrated they may be treated alone or with quantities

of water or mother-liquor insufficient to dissolve the

salts. When the sulphates contain soluble impurities these are frequently retained by the mother-liquor and thus a purified dehydrated salt is produced.

S. K. TWEEDY.

Treatment of sulphur-containing mineral complexes such as alunite, jarosite, copiapite, [carphosiderite], and the like. (SIR) D. MAWSON (B.P. 331,552, 4.4.29).—The crushed mineral is treated with liquid, dissolved, or gaseous ammonia (e.g., steam containing ammonia), if desired at moderate heat (100°) and/or under pressure. The mineral breaks down to aluminium, iron, and other metal hydroxides with simultaneous formation of the sulphates of alkali metals and of ammonium. Methods of separating the products are given. The process is adapted for fixing ammonia.

S. K. TWEEDY.

Preparation of anhydrous perborates. G. SCHOEN-BERG (B.P. 312,664, 17.5.29). Ger., 30.5.28).—Crystallised perborates, e.g., sodium perborate, are dehydrated completely by heating, e.g., in a rotating drum, first at 40—100°, with or without reduced pressure, and then at a pressure of 40 mm. or less. During both stages dry inert gases may be passed over the material, and the temperature during the second stage may be increased above 100°, particularly where the inert gas enters the apparatus and where there is little evolution of water vapour. The partially-dried perborate may be formed into tablets etc., and the final dehydration effected in the containers, e.g., of glass, subsequently used for storage or transport. F. G. CLARKE.

Production of potassium nitrate. O. KASELITZ, and KALI-FORSCHUNGS-ANSTALT GES.M.B.H. (B.P. 327,909, 13.6.29).-A solution of potassium nitrate, aluminium nitrate, and aluminium chloride, saturated at 0°, is evaporated, preferably in a vacuum, so that on cooling to about 20° hydrated aluminium chloride separates out. Potassium chloride and its equivalent of aluminium nitrate are added to the mother-liquor, together with sufficient water to restore the original concentration, and the solution is cooled to about 0°. Potassium nitrate separates out and the mother-liquor is returned to the process. The precipitated aluminium chloride may be converted into nitrate. The starting liquid may also be saturated with potassium chloride in addition to, or in place of, the aluminium nitrate. In a modified process potassium nitrate is precipitated from the saturated solution by addition of potassium chloride; the aluminium chloride formed in the reaction is precipitated from the mother-liquor by adding aluminium nitrate at the point at which the solution is saturated with aluminium chloride, aluminium nitrate, and potassium nitrate, and the solution is re-used by adding further potassium chloride. In these processes the aluminium nitrate may be produced in situ from the oxide and nitric acid or nitrous gases.

S. K. TWEEDY.

Production of potassium monophosphate. KALI-FORSCHUNGS-ANSTALT GES.M.B.H. (B.P. 327,885, 6.5.29. Ger., 19.11.28).—Potassium chloride is heated (e.g., at 130° and under reduced pressure) with an excess of phosphoric acid of over 30% concentration (together with available mother-liquors) until the chlorine is expelled ; the whole is then cooled and the acid salt thus obtained,

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 $\mathrm{KH}_{2}\mathrm{PO}_{4},\mathrm{H}_{3}\mathrm{PO}_{4}$, is decomposed with a quantity of potassium monophosphate solution, or water, such that a saturated solution of this acid salt and monophosphate is produced with the precipitation of monophosphate. Alternatively, the hot solution of the acid salt may be treated directly without cooling.

S. K. TWEEDY.

Treating mixtures of alkali stannates, arsenates, and antimonates. A. E. HALL, Assr. to AMER. SMELTING & REFINING Co. (U.S.P. 1,747,709, 18.2.30. Appl., 5.3.27).-The alkaline slag obtained in the Harris process of lead refining is fused and poured in a thin stream into a saturated solution of sodium chloride containing sufficient sodium hydroxide to give $d \ 1.4$. The mixture is agitated at 90° and the hot, alkaline arsenate solution is separated by decantation from the insoluble residue of sodium stannate and antimonate. On cooling the solution trisodium arsenate separates and the mother-liquor may be used again for leaching or evaporated to obtain a mixture of sodium hydroxide and chloride for use as a flux in refining further quantities of lead. The insoluble sodium salts are digested with hot water, which dissolves sodium stannate, and the insoluble sodium antimonate is washed, dried, and smelted to antimony. The stannate solution is agitated with powdered tin or treated with stannous salts to remove lead, copper, and arsenic, and the purified solution is electrolysed to obtain tin. A. R. POWELL.

Production of quicklime and sulphur dioxide. A. FLECK, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 328,128, 9.5.29).—Gypsum or anhydrite is heated in a rotary kiln by means of a reducing flame of coal gas and producer gas mixed with insufficient air for complete combustion, the temperature being maintained at 1050—1300°. No dead-burnt lime or calcium sulphide is formed. W. J. WRIGHT.

Production of nitrate of lime. APPARELLS ET EVAPORATEURS KESTNER (B.P. 329,145, 3.5.29. Fr., 3.4.29. Addn. to B.P. 279,037; B., 1928, 230).—In the modified process the coarse limestone is added to a mixture of nitric acid with some of the previously prepared calcium nitrate solution, or a suspension of calcium carbonate sludge in calcium nitrate solution is treated with nitric acid. L. A. COLES.

Continuous calcination of gypsum. A. W. TYLER (U.S.P. 1,746,294, 11.2.30. Appl., 2.6.26).—The gypsum is fed automatically to a pressure kettle in which it is heated to expel the greater part of its water content and the steam evolved is superheated under pressure to 190° and returned to the kettle to drive the gypsum into the calcining furnace in which the final dehydration is effected by means of superheated steam.

A. R. POWELL.

Manufacture of purified zinc sulphate solutions. Soc. MINIÈRE & MÉTALLURG. DE PENNARROYA (B.P. 331,886, 11.4.29. Fr., 30.1.29).—Zinc sulphate solutions containing cobalt are treated with dimethylglyoxime or other organic oximes or phenols, which take up the metal, forming a compound which is fixed by means of adsorbent material, *e.g.*, active carbon, talc, etc.

H. ROYAL-DAWSON,

Manufacture of concentrated titanyl and titanic sulphate solutions. I. G. FARBENIND. A.-G. (B.P. 309,090, 4.4.29. Ger., 4.4.28).—A moderately hot solution (e.g., not exceeding 60°) of metatitanic acid in sulphuric acid is saturated with metatitanic acid, and then orthotitanic acid is added and the mixture concentrated *in vacuo* (e.g., at 70—90°). The titanic acids may be added in solid form or in aqueous solution. The solutions obtained are substantially free from iron and are adapted for use as tanning agents and mordants. S. K. TWEEDY.

Artificial snow. R. W. SIMPSON (U.S.P. 1,746,717, 11.2.30. Appl., 24.8.27).—A material to represent snow for decorating purposes consists of light, glistening crystals of gypsum prepared by dissolving commercial calcium sulphate in hot 10% sulphuric acid, filtering the solution, and allowing it to cool slowly. A. R. POWELL:

Production of carbon disulphide. IMPERIAL CHEM. INDUSTRIES, LTD., W. B. FLETCHER, T. S. WHEELER, and J. MCAULAY (B.P. 331,734, 21.8.29).—Hydrocarbons (coal gas, coke-oven gas, etc.), preferably preheated at 600—800°, are heated with sulphur vapour at temperatures above 1100°, preferably above 1300°. The mixed gas is preferably passed through a heated tube at a rate such that 100—300 vols. of gas (measured at the reaction temperature) pass through one vol. of the reaction space per min. The yield of carbon disulphide corresponds to about 50% of the sulphur used; no carbon oxysulphide is formed and any unreacted sulphur may be recovered as such, or as hydrogen sulphide.

S. K. TWEEDY.

Catalytic oxidation of ammonia. A. O. JAEGER, Assr. to Selden Co. (U.S.P. 1,765,352, 17.6.30. Appl., 14.4.28).—See B.P. 309,583; B., 1930, 764.

Production of amphoteric hydrated oxides of metals by hydrolysis. R. H. Monk and J. IRWIN (U.S.P. 1,755,512, 22.4.30. Appl., 18.2.29).—See B.P. 329,041; B., 1930, 661.

Production of hypochlorite compositions. (A, B) R. B. McMullin and (A) M. C. TAYLOR, Assrs. to MATHIE-SON ALKALI WORKS, INC. (U.S.P. 1,754,474—5, 15.4.30. Appl., [A] 29.12.28, [B] 27.9.28).—See B.P. 329,896 and 319,727; B., 1930, 711.

Catalytic transformation of gases (B.P. 309,169). —See I. Recovering salts (B.P. 331,648).—See V.

VIII.—GLASS; CERAMICS.

Rate of expansion of glass threads on heating. G. TAMMANN and E. JENCKEL (Z. anorg. Chem., 1930. 191, 122—127).—From experiments on the rate of elongation of threads of various glasses under tensile strain, it has been found that the temperature at which the relative stationary elongation (cf. English, B., 1923, 550A) for the tensile strain of 1 kg./mm.² has the value of 0.0002/min. is approximately the same as that temperature within the softening interval at which the physical property-temperature curves have a point of inflexion (cf. A., 1929, 1138). Values of the temperature coefficient of the fluidity have also been deduced from the results. R. CUTHILL.

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[Continuous-type tunnel ceramic] kilns. H. M. ROBERTSON (B.P. 331,224—5, 23.1.29. U.S., 9.5.28. Cf. B.P. 311,316; B., 1930, 664).—In a kiln having preheating, firing, salt - glazing, and cooling zones in succession with exhaust means at the junction of the last two: in (A), refuges or expansion chambers are formed in the walls of the kiln between the salt-volatilising fire and the exhaust ports in which the gases are retarded by circulation and from which they are thoroughly distributed among the goods. In (B), air is heated in pipes on the interior walls of the cooling zone and despatched by a fan through passages in the roof of the firing zone to ports distributed over the walls of the preheating zone, whence they mix with the goods and effect water-smoking and preheating.

B. M. VENABLES.

Feeding and forming glass. F. ECKERT (B.P. 310,422, 24.4.29. U.S., 25.4.28).

Manufacture of safety or unsplinterable glass. T. W. HOLT (B.P. 332,385, 4.7.29).

IX.—BUILDING MATERIALS.

Crushing and preliminary grinding in Portland cement manufacture. A. C. DAVIS (Cement, 1930, 3, 813-822).—A description of various types of crushing and grinding machinery suitable for the preparation of the raw materials of Portland cement is given and their limitations are stated. In contradistinction to ore dressing, the production of fines by the crushers is an advantage. The power used for reduction of materials is about 80-85% of the total power used in a cement works, and for the raw materials before burning alone may be 8-10 kw.-hrs. per ton for chalk and clay or 35-40 kw.-hrs. per ton for harder materials. B. M. VENABLES.

Diminution of the water content of sludge in the manufacture of Portland cement by the wet process. Influence of diluting substances on the fineness of grinding materials for the manufacture of cement by the wet process. P. P. BUDNIKOV, G. V. KUKOLEV, and V. M. LESHOEV (Ukraine Chem. J., 1930, 5, [Tech.], 27-39, 41-42).-The fluidity of Portland cement sludge containing 48% of distilled water is equal to that of a sludge made by adding 42% of a 0.01N-sodium silicate solution. This entails an economy of $8 \cdot 3\%$ of fuel required for the preparation of dry cement, and permits a greater throughput for a given plant, by diminishing the bulk of the products. The fluidity of cement sludges is adversely affected by the presence of alkaline-earth ions in the water; hence the addition of any reagents precipitating these ions, such as carbonates, silicates, and sucrose, will augment the fluidity. The proportion of grains of small diameter obtained by grinding cement in the presence of 0.04N-sodium carbonate solution is greater than when spring-water is used. R. TRUSZKOWSKI.

Constitution of cements. N. P. COSTA (Anal. Soc. Cient. Argentina, 1930, 109, 73—96).—The variations of crystallographic structure of different types of cement with variations of the method of curing have been studied. In general, the cement is not merely a mixture

Transmission changes in ultra-violet glasses during high-temperature exposure to light. C. C. NITCHIE and F. C. SCHMUTZ (Science, 1930, 71, 590).— When kept in contact with the hot tube of the mercury arc lamp (about 450°), certain glasses showed a marked increase in short-wave transmission. L. S. THEOBALD.

Effect of oil on devitrified glass surfaces, and the detection of this defect in glass. P. Wood (Bull. Soc. chim., 1930, [iv], 47, 450-453).—Very slight devitrification of the surface of glass is rendered evident by treating the surface with an oil, especially if this contains traces of water. The particles of silica resulting from the devitrification become detached and form a suspension in the oil. A. B. MANNING.

Volumetric determination of silica in glass. N. A. TANANAEV and A. K. BABKO (Ukraine Chem. J., 1930, 5, 71-85).-0.25 G. of powdered glass is treated in a platinum basin with 4 g. of potassium fluoride, 10 c.c. of water, and 5 c.c. of hydrochloric acid. After 15 min. 10 c.c. of alcohol are added, and after 2 hrs. the precipitate of potassium fluosilicate is collected, washed with 50% alcohol, mixed with 20 c.c. of 4Ncalcium chloride solution, and diluted to 250 c.c. The solution is titrated at 100° with 0.5N-sodium hydroxide solution until the supernatant solution becomes clear. The number of c.c. of sodium hydroxide solution used in a blank determination is subtracted from the result obtained. The above method gives results about 0.3% higher than the theoretical. R. TRUSZKOWSKI.

Method of treating clays to overcome drying defects. J. G. PHILLIPS (Trans. Canad. Inst. Min. Met., 1929, **32**, 270—282).—Clays found in Alberta, Manitoba, and Saskatchewan, otherwise suitable for brick-making, crack readily in drying. This tendency may be minimised by preheating at 450—550°, or by adding finely-ground grog together with ferric chloride or a mixture of ferric chloride and sodium chloride. C. W. GIBBY.

Saskatchewan clays of Dominion importance. W. G. WORCESTER (Trans. Canad. Inst. Min. Met., 1929, 32, 255—269).—A classification of clays and their uses is given, and the age of the Saskatchewan deposits is discussed. Analyses and fusion data, linear drying and burning shrinkages, porosity, and modulus of rupture are tabulated. C. W. GIBBY.

Method of measuring strains between glazes and ceramic bodies. H. G. SCHURECHT and G. R. POLE (Bur. Stand. J. Res., 1930, 5, 97—104).—A 2-in. diam. hollow cylindrical ring of the material to be glazed is glazed on the outside only. Two reference marks are made about $\frac{1}{4}$ in. apart on the edge of the ring and their distance is accurately measured. The ring is then slit between the marks and the distance remeasured. The contraction or expansion gives an approximate indication of the extent to which the glaze was in tension or compression. By means of this test glazes can be fitted to ceramic bodies so as to be in sufficient compression to avoid crazing without causing shivering.

C. J. SMITHELLS.

Manufacture of refractory products in the U.S.A. G. V. EVERS (J. Soc. Glass Tech., 1930, 14, 205-218 T). Particle size. KASAI.—See I. of the component aluminates and silicates, but contains solid solutions and isomorphous mixtures of calcium and iron silicates and calcium aluminate. "Ciment fondu" contains silicates and aluminosilicates, and aluminates crystallised upon the residue formed from iron silicates during the fusion ; there is a preponderance of a metastable form of 5CaO,3Al₂O₃ in cements of this class. "Ciment fondu" differs from Portland cement in that the chemical composition as well as the crystal arrangement varies with the mode of curing, and the double refraction diminishes with more intensive curing. Portland cement cured in water has the same structure as that obtained by dry-curing, except that the crystals of hallite and zeolite are more uniform and somewhat larger, and the zeolite crystals are oriented radially around crystals of hallite and are united by iron silicates; double refraction is also more marked in this case. Portland cement of a high initial strength, prepared by wet-curing, contains a high proportion of zeolite and relatively large and wellformed crystals of hallite and zeolite. The strength of such a cement is governed mainly by the orientation of the individual crystals, especially those of hallite.

H. F. GILLBE.

Testing of road-making materials, using small quantities. R. GRENGG (Mikrochem., 1930, 8, 281—292). —The technique of methods for the mineralogical and grain-size analysis of road-making materials, using only small quantities of substance, is outlined and small-scale apparatus for the preparation and mechanical testing of agglomerates is briefly described. A. R. POWELL.

Improving the swelling and shrinking of wood in conditioning processes. FALCK (Chem.-Ztg., 1930, 54, 569—571).—The degree to which partly or artificially seasoned timber swells and shrinks may be reduced to one half by (1) keeping in boiling water for several hours in open vessels; (2) heating to a definite seasoning temperature, which must be determined for each wood (for the beech used in the tests, this temperature was found to be 123°); or by (3) steaming at intervals over several days. Chemical treatments were either ineffective or unsuitable. S. I. LEVY.

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Manufacture of a material for building etc. from, e.g., Sorel cement or gypsum and bituminous substances. L. C. SCHILLING (B.P. 303,889, 2.1.29. Holland, 13.1.28).—An aqueous dispersion of bitumen is incorporated with a cement mixture composed of calcined magnesite, magnesium chloride solution, and filling materials. The water content of the dispersion is controlled so that the final water content of the mixture gives the optimum setting conditions of the oxychloride cement. C. A. KING.

Manufacture of laminated [building] materials. R. ARNOT (B.P. 331,561, 4.2. and 3.5.29).—Composite boards of vegetable fibrous materials, e.g., sugar-cane fibre, or laminated sheets of Balsa wood, are coated with fire- or water-proof compositions, e.g., asbestos cement etc. C. A. KING.

Manufacture of cement. BRIT. PORTLAND CEMENT MANUFRS., LTD., S. G. S. PANISSET, and W. S. HANNAH (B.P. 331,584, 6.4.29).—Cement clinker is treated with a reducing agent before cooling and is then cooled rapidly to prevent re-oxidation. Powdered coal may be blown upon the hot clinker or the clinker may be delivered on to a surface coated with a volatile mineral oil, and then cooled in water to such a point that the residual heat drives off adherent water. C. A. KING.

Cementitious composition. A. METHERELL, Assee. of G. E. BARNHART and H. E. PFAFF (B.P. 310,875, 17.4.29. U.S., 2.5.28).—A solution for gauging cement mixtures for waterproof and glazed artificial stone consists of aluminium sulphate 1 pt., magnesium sulphate 1 pt., potassium (sodium) sulphate 2 pts., and water 120 pts. (all by vol.). Substitutions in the preferred composition by iron or zinc sulphates or sodium silicate provide modified formulæ.

C. A. KING.

Fibrous wall-board. H. E. BROOKBY, Assr. to U.S. GYPSUM Co. (U.S.P. 1,754,413, 15.4.30. Appl., 5.2.27).— A mixture of comminuted maize stalks and peat fibres is treated with caustic soda and pulped to sufficient degree of fineness with water; it is then formed into sheets, dried, and pressed. H. ROYAL-DAWSON.

Fireproof wall-board. F. S. VIVAS, ASST. to INTER-NAT. FIREPROOF PROD. CORP. (U.S.P. 1,754,843, 15.4.30. Appl., 8.10.27).—Cellulose pulp is saturated with calcium chloride solution, a resinated soap solution is added, and the material is treated with a solution of alum or aluminium sulphate, and compressed into sheets.

H. ROYAL-DAWSON.

Emulsions of bitumens. N. BENDIXEN and J. D. MORGAN (B.P. 330,374, 7.5.29).—Tar or other bituminous substance is emulsified with water and a small proportion of fossil diatomaceæ, *e.g.*, kieselguhr, and sufficient alkali is added to dissolve a part of the silica.

A. B. MANNING. Wood preservation. H. W. WALKER (U.S.P. 1,753,000, 1.4.30. Appl., 26.10.25).—The wood is impregnated with an ammoniacal solution of arsenic trioxide and heated, the ammonia driven off being recovered. H. ROYAL-DAWSON.

Device for testing constructional material by means of oscillations of flexure of test pieces. O. FÖPPL (B.P. 332,299, 24.4.29.)

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

Oxides in pig iron: their origin and action in the steel-making process. ANON. (U.S. Bur. Mines, Bull. 308, 1929, 56 pp.).—The oxide content of iron from blast furnaces varied from nil to more than 0.13%, the higher quantities corresponding with irregular furnace working. Elimination of these oxides depends on their presence as silica or silicates, the quantities of FeO and MnO in the metal, temperature, viscosity of slag, and time effects. Additions of ore, cinder, or pig iron cause an increase in silicate content unless the viscosity of the slag is sufficiently high to support the added material until dissolved. The silica introduced in pig iron is in a form most difficult to eliminate, often remaining to the end of the heat and causing defects in forging due to the non-plasticity of the particles.

C. A. KING.

Effect of manganese on distribution of carbon in steel. B. M. LARSEN (U.S. Bur. Mines, Tech. Paper 466, 1929, 31 pp.).-Manganese increases the temperature range of γ -iron or austenite, forming a carbide more stable than cementite. Little diffusion of manganese through the iron space lattice occurs below 1100°, which is much above the heat-treatment temperature at which carbon diffuses freely. The dendritic patterns in cast steel containing more than 1% Mn are therefore not affected by the usual thermal treatment, but diffuse uniformly on heating the steel at 1300° for 1 hr. When a casting (1-3% Mn) is cooled at a rate slower than about 3° per min. carbon tends to segregate in the high-manganese fillings between the dendrites of lower manganese concentration. A marked banded structure occurs when the carbon content falls below 0.3%, aided also by the presence of phosphorus and arsenic. With increasing manganese a "manganese-cementite" tends to form, and with more than 2% Mn a fine-grained structure of this character may be distributed and linked together through the manganese atoms scattered through the iron space lattice. C. A. KING.

Apparatus for demonstrating the "arrest points" of 0.9% carbon steel. R. C. GALE (J. Sci. Instr., 1930, 7, 165—166).—The extension of an electrically heated length of steel wire is magnified by a pointer moving over a graduated circle. C. W. GIBBY.

Effect of rate of cooling on the structure and constitution of steel. J. M. ROBERTSON (Safety in Mines Res. Brd. Paper No. 59, 1930, 57 pp.) .- The effect of variation in the rate of cooling steel cannot be accounted for by the supposition that an increased cooling rate produces in turn sorbite, troostite, and martensite, as between these states many other different forms of structure are evident. It is suggested that the constitution of steel should always be considered in terms of the quantity of α -solid solution, γ -solid solution, and cementite present, and their relation with one another. Four series of structures may be obtained by different methods of cooling. The first includes all structures consisting of ferrite and pearlite or the latter alone. Again, continuous rapid cooling which suppresses the Arl and lowers the Ar2 point produces the series of quenched steels the structure of which may be varied considerably. When cooled so that the Arl point is suppressed and the rate then retarded so that the Ar2 change takes place at constant temperature, a third series results, and a fourth is similar except that the steel is withdrawn before the change is complete, the final change being effected by atmospheric cooling. The general arrangement of all ferrite-pearlite structures is determined by the manner in which ferrite develops from austenite, but the structure of the grains of pearlite is determined by simultaneously formed ferrite and cementite. The only structures which temper in a different manner are those which contain considerable quantity of a-solid solution, since, during reheating, decomposition of this α -phase occurs by the gradual separation of carbon as the temperature is raised and not by a sudden precipitation of fine carbon with subsequent coalescence to form larger globules. C. A. KING.

Effect of low temperatures on the impact-resistance of steel castings. R. W. MOFFATT (Canad. J. Res., 1930, 2, 327-340).-The impact-resistance of cast iron, cast carbon steel, and alloy steels decreased considerably for temperatures below f.p., e.g., for normally cast steels the values obtained at -35° were only $\frac{1}{3}$ $-\frac{1}{2}$ those for atmospheric temperature. Heat treatment improved the resistance values both at ordinary and low temperatures. Vanadium steels have a much higher resistance than plain carbon steels, and at low temperatures compare favourably with heat-treated carbon steels tested at ordinary temperature. Nickel steel (2-3% Ni) showed similar values to 0.18-0.22%vanadium steels, and the highest impact-resistance was given by a steel (1.56% Ni, 0.1% V) which showed also only a slight decrease at the low temperatures. C. A. KING.

Flow characteristics of special iron-nickelchromium alloys and some steels at elevated temperatures. H. J. FRENCH, W. KAHLBAUM, and A. A. PETERSON (Bur. Stand. J. Res., 1930, 5, 125-183).—The results of creep tests at different temperatures are given for three groups of alloys. The first group included commercial iron-nickel-chromium alloys with or without tungsten, and low-chromium steels. The second comprised low-carbon steels and nickel steels, and was tested only at 370°. The alloys of the third group were castings of nickel-chromiumiron melted in the induction furnace, and were tested at temperatures above 540°. The addition of nickel to mild steel produced little change in the stress required to produce 1% elongation in 1000 hrs. Chromium additions were advantageous only when over 50%. With 14% Cr, corresponding to stainless steel, the creep stress was the same as for mild steel. The addition of small quantities of chromium to steels containing 40% Ni produced marked improvement. The highest creep stress was found in castings of about 50% Ni, 50% Cr. Wrought alloys containing 11-20% Cr and 8-40% Ni showed intercrystalline weakness at about 630°. No marked difference between coarseand fine-grained samples of an 18% Cr, 8% Ni alloy was found below 538°. The best commercial alloy contained 20% Cr, 8% Ni, 4.5% W, 0.3% C, and 1% Si. C. J. SMITHELLS.

Steel [gas] mains and corrosion. E. E. JEAVONS and H. T. PINNOCK (Gas J., 1930, 191, 203-204, 255-256).—Extensive experiments on a large high-pressure gas-distribution system have shown how steel mains can be advantageously used and preserved. Although originally coated carefully with bituminous material, the mains showed corrosion after 5 years, and this grew rapidly in intensity. Electric currents were detected, particularly near tramways and similar installations, and corrosion always began at an anodic spot unless the covering were perfect. Also rapid changes in the direction and intensity of curr nt were noted as the jointing material gave bad contact between individual pipe sections. The corroded spot was almost invariably anodic and generally accompanied by a neighbouring intensely cathodic area. Preventive measures, adopted 10 years ago, have now been fully

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justified by almost complete cessation of troubles, and recommendations for dealing with similar cases are made. Earth bars should be fitted at frequent intervals to the main, and the sections should be linked into one circuit by bonding with copper; alteratively, in laying fresh mains with welded joints the same result would be achieved. R. H. GRIFFITH.

Rate of grain-boundary displacement in the primary and secondary recrystallisation of aluminium. G. TAMMANN and K. L. DREYER (Z. anorg. Chem., 1930, 191, 69-73).-In the primary recrystallisation of aluminium the isothermal growth of the grains follows the same law as with other metals (cf. A., 1930, 530). In the secondary recrystallisation, however, Karnop and Sachs' observation of a stationary rate of grain-boundary displacement (ibid., 530) has been confirmed. It seems probable that the gradual decrease in the rate of primary recrystallisation is due to the separation from the crystallites of impurities which form resistant films and ultimately bring the grain-boundary displacement to a standstill. In the secondary recrystallisation, however, no further separation of impurities can occur, and therefore grain growth may be expected to proceed more readily, until, in the R. CUTHILL. ideal case, a single crystal results.

Intercrystalline substance in lead and its effect on grain size. G. TAMMANN and K. L. DREYER (Z. anorg. Chem., 1930, 191, 65—68).—An investigation of the impurities present in various samples of lead has shown that the presence of even very small amounts of copper causes a considerable reduction in grain size. The relatively fine-grained character of the Pattinson lead examined by Brenthel (B., 1930, 286) is due to the presence of copper. R. CUTHILL.

Bradford sulphur dioxide process [for lead-zinc slimes]. A. LOWRY (Proc. Austral. Inst. Min. Met., 1929, 207-232).—The application of the Bradford sulphur dioxide process for the selective flotation of lead and zinc concentrates depends chiefly on the regular addition of sulphur dioxide to slime pulp of definite density, the time factor for the absorption of the gas, and the control of sulphur dioxide subsequent to absorption. Under the conditions operating at the Broken Hill North mine the pulp contains approx. 0.0032% SO2 as it enters the flotation machine; the limiting range for efficient work is 0.0021-0.0064% SO₂. Excess of sulphur dioxide causes a partial loss of lead concentrate and difficulty in flotation of zinc blende, though the effects of an excess may be counteracted by adding potassium xanthate. The flotation agent is a mixture of equal parts of unrefined coal tar and eucalyptus oil.

C. A. KING.

Corrosion of rabbles in zinc concentrate roasting furnaces. J. N. GREENWOOD and A. J. ROENNFELDT (Proc. Austral. Inst. Min. Met., 1929, 99—120).—In the Barrier type of furnace working at 950—1000°, in which the rabble teeth are embedded in zinc concentrates containing about 6% of lead sulphide, considerable corrosion of the steel occurs particularly at the "wash" line, due to the attack of lead sulphide which is volatilised and condenses on the metal in the form of either bright columnar crystals or a light grey porous scale which latter appears to exert a very corrosive action. The most resistant alloy contained 1.5-3% C, 26-27% Cr, and 0.5-1% Si, a low content of carbor being preferred. It is considered that in the primary attack of lead sulphide the iron chromium carbide is replaced by sulphides, and possibly by metallic lead, and the solid solution of iron, chromium, and carbon is unattacked. From a practical point of view any improvement in ore dressing which lowers the lead content will be reflected in a longer life of the rabbles. C. A. KING.

Roasting of zinc ores. Y. OGAWA (Tech. Rep. Tôhoku, 1930, 9, 175—191).—The progress of roasting a clean zinc blende was examined by means of the Honda thermo-balance, the specimens heated consisting in some instances of one single crystal. At 550° the smaller size of grains began to lose weight, but those greater than 40-mesh only began to oxidise above 600°, the velocity rapidly increasing at 700—800°. From the roasting of a single crystal cut and ground to a true sphere it was deduced that the linear velocity of roasting is inversely proportional to the radius of the specimen, and that the time requisite for complete oxidation is proportional to the square of the radius. Since the oxide shell once formed has no fissures it seems to offer a uniform resistance to diffusion and to be amenable to Fick's law.

C. A. KING.

Zinc chloride flux used in the manufacture of tinplates. J. C. Jones (Trans. Faraday Soc., 1930, 26, 249-254).-The extents to which iron and tin are attacked by hydrochloric acid produced by the hydrolysis of zinc chloride solutions after 2 hrs. at 300° were measured from the amounts of metal in the flux. The amounts dissolved increase with the water content of the flux, and in the case of iron there is also evidence of oxidation to the tetroxide by water. Ferric chloride in the flux is reduced by metallic tin to ferrous chloride and/or iron, whilst ferrous sulphate is reduced to sulphide which is immediately converted into chloride. The cleaning of the steel surface in tinning with zinc chloride fluxes is due to the acid, whilst the accumulation of iron salts is prevented by the formation of a tin-iron alloy ("dross" or "hard tin") of high m.p. Spent flux contains stannic oxide and stannous chloride formed by J. GRANT. replacement of iron from its compounds.

Properties of strontium-tin alloys. K. W. RAY (Ind. Eng. Chem., 1930, 22, 519-522).-A series of alloys was prepared by the electrolysis of a mixture of fused sodium and strontium chlorides over molten tin in a chromium-plated iron crucible. Alloys containing more than 30% Sr could not be prepared by this method as the m.p. was high, the fused salts volatilised, and the crucible oxidised seriously. Alloys containing 20-30% Sr were of the eutectic type, one component of which was Sn₃Sr, the other probably being SnSr. Intermetallic compounds represented by Sn₅Sr and Sn₃Sr were also found, the former being unstable above 338° and also very slow in formation, so that only a small quantity of Sn₅Sr was present in chilled castings. Cast alloys low in strontium are composed of long needle-shaped crystals of Sn₃Sr in a matrix of tin, which spheroidise more or less completely when annealed at above 338°. The hardness of the alloys increases with increasing content of strontium, and cast alloys containing more than 18% Sr were brittle. C. A. KING.

Analysis of white metals and solder. H. L. MATTHIJSEN (Chem. Weekblad, 1930, 27, 284—287).— Slight modifications in standard methods, and particularly in simultaneous electrolytic determination of lead and copper, are described. S. I. LEVY.

Treatment of Lake View and Star low-grade sulphide ore. W. G. CLARKE and B. H. MOORE (Chem. Eng. Min. Rev., 1930, 22, 324-326).-The ore contains 7.6 dwt. Au per ton and 4.9% of pyrites. By grinding through 150-mesh in a tube mill and passing the material over amalgamating plates, strakes, or Wilfley tables, 34, 64, and 58% of the gold was recovered respectively. Flotation of the tailings with 0.25 lb. of "Euco" and 0.25 lb. of xanthate per ton yielded a further 61.4, 30, and 36.7% of the gold, respectively, using a pulp ratio of 1:3 and either fresh or salt water. Thus the total recovery in all cases was about 95%. After roasting the flotation concentrates 90-95% of their gold content was readily extracted by cyaniding. Washing the roasted material with water prior to the cyanide treatment did not improve the recovery, but materially reduced the lime and cyanide consumption. A. R. POWELL.

Ore concentration at the North Mount Farrell Mine, West Tasmania. J. E. COLDHAM (Chem. Eng. Min. Rev., 1930, 22, 320-322).-The ore contains 10-12% Pb as galena, 8-10% Zn as blende, 14 oz. Ag per ton, and 10% of iron pyrite in gangue consisting of slate, quartz, and carbonates. The ore is crushed through a 3-in. screen and then separated on 1-, 3-, and 1-in. screens. The oversize on each screen is concentrated separately in a series of Luhrig jigs to give a galena concentrate containing 60% Pb and 62 oz. Ag per ton, and the undersize and jig tailings are crushed to 60% through 200-mesh and passed to the flotation plant. Lead is floated with 0.2 lb. of "Aerofloat," 0.25 lb. of cyanide, and 4.5 lb. of sodium carbonate per ton and the tailings then pass to the zinc cells, where they are floated with 0.2 lb. of xanthate and 1 lb. of copper sulphate per ton. The lead concentrate assays 60% Pb, 5% Zn, and 80 oz. Ag, per ton and the zinc concentrate 54% Zn, 6% Pb, and 13 oz. Ag per ton. A. R. POWELL.

Flotation with xanthates. I. K. KELLERMANN and E. BENDER (Kolloid-Z., 1930, 52, 240-243).— The flotation effect of xanthates is not a property of the xanthate radical, but is due to the simultaneous effect of two products of hydrolysis. When carbon disulphide and alcohol were led simultaneously by means of a stream of air bubbles into a suspension of finely divided galena in water normal flotation occurred; a separation from zinc blende was also effected. For every alcohol a maximum flotation effect occurs at a certain dilution and the position of this maximum lies at a greater dilution with increasing number of carbon atoms in the alcohol. The best conditions were realised with butyl alcohol. Alcohols containing two or more hydroxyl groups are much less effective.

E. S. HEDGES.

Determination of the porosity of electro-deposits. D. J. MACNAUGHTAN (Trans. Faraday Soc., 1930, 26, 465-481).-The influence on the corrosion at a discontinuity in a metal coating of such factors as the relative potentials of the two metals, the amount and composition of the electrolyte that covers them, the character of the cathodic and anodic products, and the ease of access of oxygen is discussed. A review of the methods suggested for testing porosity indicates that the ferricyanide test is the most suitable. This test is best made by means of paper dipped in a solution containing sodium chloride, potassium ferrocyanide, and ferricyanide : a rapid and permanent record of porosity tests may be obtained. The method has been found applicable to coatings of nickel, tin, chromium, copper, lead, silver, and gold on iron, steel, copper, and copperbase alloys. The test is unsuitable for coatings on a nickel base. The porosity of cathodic coatings on zinc, aluminium, and alloys of these metals is best determined by immersion of the specimen in a hot solution of sodium hydroxide, when attack of the basis metal occurs at the site of pores or discontinuities with the evolution of gas bubbles at these points. F. G. TRYHORN.

Soldering tungsten. R. D'E. ATKINSON (Nature, 1930, 126, 97).—Gold, palladium, and zinc (as brass) can be used for soldering tungsten, using borax as a flux. L. S. THEOBALD.

Use of micro-analysis in the streak test [for precious metal alloys]. R. STREBINGER and H. HOLZER (Mikrochem., 1930, 8, 264-270).-The streak test is made on a roughened depression in a microscope slide. When the alloy is chiefly silver the streak is dissolved in nitric acid on the slide, the silver precipitated as chloride and removed by centrifuging. The filtrate is evaporated to dryness, the residue dissolved in water, and 1 drop of potassium mercurithiocyanate solution added; green crystals indicate the presence of copper and brown crystals the presence of cadmium. For the examination of a gold streak it is dissolved in aqua regia, the metals are precipitated as sulphides by passing hydrogen sulphide through the solution from a capillary tube, the precipitate is collected in a micro-centrifuge, washed, digested with ammonium sulphide to remove the gold, and dissolved in nitric acid. Minute drops of the solution are tested for lead by addition of potassium acetate and nitrite (triple potassium lead copper nitrite), for bismuth with potassium sulphate (double sulphate), for palladium with dimethylglyoxime in acetic acid, nickel with the same reagent and ammonia, cobalt, zinc, and iron with ammonium mercurithiocyanate, and aluminium with alizarinsulphonic acid. Platinum streaks may be similarly tested for the presence of copper, palladium, and silver; gold is detected by the purple of Cassius A. R. POWELL. test.

Process of failure of metals under stress. K. YUASA (J. Fac. Eng., Tokyo, 1930, 18, 271-345).— In a tensile-testing apparatus the load applied to the test piece is measured by means of a specially designed mirror extensometer having twice the sensitivity of the Martens instrument. At certain temperatures many irregular jumps occur in the curves after the so-called yield point is passed, and after the sudden decrease the resistance increases uniformly until another discontinuity is reached. These breaks in resistance, reaching a maximum at about 200° and ending at about 340°, are termed "sudden yieldings" and are considered to indicate the instantaneous occurrence of slip, crack, rotation, or breaking of crystal grain in the test-piece or a combination of these effects, which may be regarded as a dangerous condition of failure not recorded by the usual tensile tests. No "sudden yieldings" occur in eutectoid steel, but the number increases with increase of carbon, and the observation of the number of sudden yieldings is suggested for the determination of the percentage of carbon and also for the effect of heattreatment of metals. The relation between sudden yieldings and Fry's strain figures is also discussed.

C. A. KING.

Relationships between Rockwell and Brinell numbers. S. N. PETRENKO (Bur. Stand. J. Res., 1930, 5, 19-50).—The tensile strengths and the Brinell and Rockwell indentation numbers have been obtained for various ferrous and non-ferrous metals. Empirical formulæ relating Rockwell and Brinell numbers were found which give values differing by not more than 10% from the experimental results. The tensile strength of steels can be calculated from their Rockwell numbers, using empirical formulæ, with an error not exceeding 15%. No relation was found between the tensile strengths and indentation numbers of non-ferrous metals. C. J. SMITHELLS.

Centrifugal concentration. DOERNER.-See I.

PATENTS.

Annealing dishes. W. SHAW, and W. SHAW & Co., LTD. (B.P. 328,506, 8.7.29).—Two plates are connected together by a series of ribs, thus forming longitudinal channels through which the heating medium is conducted. The external faces may be grooved in line with the ribs, and the dish is reversible if buckling occurs during use. C. A. KING.

Annealing [of car wheels]. G. S. Evans, Assr. to GRIFFIN WHEEL Co. (U.S.P. 1,745,362, 4.2.30. Appl., 6.2.22).—The annealing furnace is in the form of a tunnel kiln divided longitudinally into three parts. The central passageway is heated along a portion of its length and the carriers are pushed through the heating zone, then through a slow-cooling zone, and finally travel through one of the side tunnels which serves as a more rapid cooling zone. C. A. KING.

Pickling of iron and steel. I. H. DERBY, ASST. to P. C. REILLY (U.S.P. 1,729,097, 24.9.29. Appl., 30.8.28). —An inhibitor for use in pickling baths comprises the reaction product of phosphorus pentasulphide with ammonia or its organic substitution derivatives, or with an aliphatic or aromatic alcohol, or with a hydrocarbon of the naphthalene or anthracene series.

A. R. POWELL. Metal-coating [galvanising] metal [iron or steel] sheets. E. R. WEHR and C. C. MAHLIE, Assrs. to AMER. ROLLING MILL Co. (U.S.P. 1,741,388, 31.12.29. Appl., 13.9.26).—Iron or steel sheets are coated with an alloy of zinc with 3—20% Al by passing them through a zinc bath floating at one end of a bath of molten lead, thence through the lead bath upwards into a bath of molten zinc-aluminium alloy, and finally through hot rolls. A. R. POWELL.

Protection of iron, copper, and their alloys. G. NOBILLEAU and J. GUIPET (B.P. 308,778, 1.2.29. Fr., 28.3.28).—The articles are packed tightly in a box filled with a mixture of 40% of powdered zinc, 52% of powdered silica, 3% of potassium ferrocyanide, and 5% of barium carbonate. The box is heated at 400° for $1\frac{1}{2}$ hrs., allowed to cool, and emptied. The articles are then similarly packed in a mixture of 50% of powdered zinc, 45% of powdered silica, and 5% of barium carbonate, and heated at 550° for 2 hrs. After cooling, the zinc-coated articles are cleaned and polished with a mixture of fine sand and petrol. A. R. POWELL.

[Beryllium-nickel-iron] alloy. SIEMENS & HALSKE A.-G., and W. KROLL (B.P. 306,035, 9.2.29. Ger., 14.2.28). —Alloys of iron with 0.1—12% Be, up to 0.2% C, and nickel in excess of the beryllium are claimed. Up to 25% of the iron may be replaced by one or more of the elements copper, chromium, tungsten, molybdenum, vanadium, manganese, silicon, or phosphorus. The alloys are quenched from 800—1200° and aged at 300—700°. An alloy of 71.3% Fe, 7.1% Ni, 20.1% Cr, 1.2% Be, and 0.3% Mn after quenching has a Brinell hardness of 279, which increases to 524 after ageing at 500° for 1 hr. [Stat. ref.] A. R. POWELL.

Manufacture of [cutting steel] alloys. DEUTS. EDELSTAHLWERKE A.-G. (B.P. 311,267, 8.2.29. Ger., 8.5.28).—The alloy comprises iron with 1-1.5% C, up to 2% Cr, 2—18% Co, and 10—30% W. Molybdenum or vanadium may replace part or all of the chromium, and with 25—30% W the alloy may contain up to 2.5% C. [Stat. ref.] A. R. POWELL.

Production of dark oxide coatings on magnesium and its alloys. B. JIROTKA, ASST. to DR. O. SPRENGER PATENTVERWERTUNG JIROTKA M.B.H. (U.S.P. 1,747,776, 18.2.30. Appl., 27.5.29. Ger., 19.4.29).—The metal articles are immersed in a hot bath containing 100 g. of manganese sulphate and 100 g. of sodium dichromate per litre, whereby they become coated with a dark brown to black adherent coating of manganese dioxide. A. R. POWELL.

Manufacture of bodies for tools and the like from materials such as carbides, the alloys thereof, and the like. K. SCHRÖTER and H. WOLFF, Assrs. to F. KRUPP A.-G. (U.S.P. 1,757,846, 6.5.30. Appl., 10.6.29. Ger., 15.6.28).—See B.P. 313,619; B., 1930, 616.

Material [flux] for low-temperature soldering of metals. J. A. ROGNON (U.S.P. 1,759,279, 20.5.30. Appl., 20.7.29. Fr., 24.7.28).—See B.P. 316,196; B., 1930, 773.

Electric furnaces (B.P. 332,015-6). Coating organic articles (B.P. 331,863).—See XI.

XI.—ELECTROTECHNICS.

Conversion of methane etc. into acetylene. PETERS and PRANSCHKE.—See II. Steel mains and corrosion. JEAVONS and PINNOCK. Porosity of electro-deposits. MACNAUGHTAN.—See X.

PATENTS.

Electric furnace. R. M. CHERRY, Assr. to GEN. ELECTRIC Co. (U.S.P. 1,775,051, 15.4.30. Appl., 1.3.28). —A heating resistor secured to hook members is pivotally fastened to refractory members secured together.

J. S. G. THOMAS.

[Tubular heat-treatment] electric furnaces. R. M. CATTERSON-SMITH (B.P. 332,015-6, 7.3.30).—(A) A heating tube rests in a trough-like recess formed in the bottom refractory lining of a box-like casing having a hinged or removable lid lined with refractory material. An inwardly-projecting flange is formed on or attached to one side wall of the bottom of the casing for the terminals of the heating tube, and connexions from the tube to these terminals are arranged in recesses in the lining, so that on opening the lid the tube can be lifted out after removing the connexions. (B) Billets are fed to a heating tube by a push rod reciprocated by a chain preferably moved forward against the action of a weight or spring by a solenoid or electromagnet.

J. S. G. THOMAS.

Electric annealing furnace. HIRSCH, KUPFER-U. MESSINGWERKE A.-G. (B.P. 331,793, 19.11.29. Ger., 15.12.28).—In electric annealing furnaces having a cantilever-arm charging-machine, heating resistances, arranged at right angles to the direction of the spaces for the introduction of the arms, are placed in recesses in the furnace hearth below the lowest working position of the arms of the machine. J. S. G. THOMAS.

Manufacture of electrically insulating material. INTERNAT. GEN. ELECTRIC Co., INC., Assees. of ALLGEM. ELEKTRICITÄTS-GES. (B.P. 309,505, 11.4.29. Ger., 11.4.28).—A film of lacquer removed from the support, upon which it has been dried at ordinary temperatures, is dried at above 150°, *e.g.*, 200—270°, and further thin films of lacquer are applied thereto and similarly treated. J. S. G. THOMAS.

Plastic [insulating] composition. A. R. KEMP, Assr. to WESTERN ELECTRIC Co., INC. (U.S.P. 1,753,746, 8.4.30. Appl., 3.12.23).—Finely-divided fused silica is heated at 900—1000° for not less than 1 hr., whereby adsorbed and occluded gases are removed and a thin film of crystalline silica (tridymite) is formed on the surface of the individual particles, thus preventing readsorption of gases. This material when used as filler for rubber insulating materials etc. confers high water-resistance and stable electrical characteristics.

S. S. WOOLF.

Electrolysis of molten substances. I. G. FARB-ENIND. A.-G. (B.P. 309,605, 12.4.29. Ger., 14.4.28).— Electrolysis is carried out between electrodes of heaped carbonaceous material which are maintained separate and can be continuously renewed. Thus one (or more) electrodes is guided and maintained in place by a shaft or shafts widened towards the bottom and extending almost to the surface of the molten bath.

J. S. G. THOMAS.

Preparation of organic articles for electrolytically covering them with a metallic layer. I. AINSTEIN (W. I. EINSTEIN) (B.P. 331,863, 9.4.29. Addn. to B.P. 300,060; B., 1929, 25).—A thin preliminary metallisation with easily fusible alloy is applied from a "gun," followed, if necessary, by pulverisation with copper or its alloys, and finally by electroplating in a bath at 10—30°, before the main plating operation. J. S. G. THOMAS.

Manufacture of electrodes for secondary cells, in particular those with alkaline electrolytes. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 331,540, 4.1. and 17.6.29).—The active mass, e.g., nickel, is introduced into the pores of a coherent, porous material composed of iron, nickel, or cobalt, produced from the corresponding metal carbonyl, and/or ferrosoferric oxide similarly produced. Alternatively, metallic hydroxides or oxides may be precipitated within the pores, and salts washed out by boiling. The hydroxides or oxides are then heated in a reducing atmosphere.

J. S. G. THOMAS.

Fixing the depolarising mass to salt-containing carbon elements for electric batteries. A. KUNZE (B.P. 332,155, 24.10.29).—A small percentage of resin, *e.g.*, less than 5% of coumarone resin, is added to the depolarising mass, which is heated for a short time above the m.p. of the resin. J. S. G. THOMAS.

Reclaiming battery-plate material. W. C. SMITH, Assr. to PRIMOS LEAD CO. (U.S.P. 1,752,356, 1.4.30. Appl., 14.1.27).—Lead compounds are separated from the material by crushing and screening, and dissolved in a solution of caustic soda. Impurities are precipitated by treatment with sponge lead, and the solution is electrolysed to precipitate spongy lead.

J. S. G. THOMAS.

Manufacture of [cathodes for] photoelectric cells. GEN. ELECTRIC CO., LTD., and N. R. CAMPBELL (B.P. 332,002, 27.5.29).—A cathode consisting of a thin film of cæsium or rubidium deposited upon an oxidised metal, *e.g.*, silver, is sensitised by an electric glowdischarge through a rare gas, *e.g.*, helium, at a pressure of 1 mm. J. S. G. THOMAS.

Prevention of electrical leakage [in electrical discharge devices containing an alkali metal]. E. A. LEDERER, Assr. to WESTINGHOUSE LAMP Co. (U.S.P. 1,752,748, 1.4.30. Appl., 14.9.26).—Glass near the leading-in wires is coated with a non-conducting, non-hygroscopic compound which, under the conditions existing in the discharge device, converts any deposited alkali metal into a stable, non-conducting compound which does not adversely affect the operation or life of the device. Thus a mixture of potassium and sodium nitrates may be placed near the wall of a discharge tube containing cæsium vapour. J. S. G. THOMAS.

Electrical precipitation plants. LODGE-COTTRELL, LTD. From H. V. WELSH (B.P. 331,699, 11.7.29).— In electrical precipitation plants comprising a numbe of units in series, flues controlled by valves are provided so that on closing down any units gases to be treated can be by-passed from the inoperative units either to the next operative unit or to the delivery outlet from the series. J. S. G. THOMAS.

Electrical purification of gases. F. BARTLING (B.P. 309,149, 5.4.29).—Gas is passed in a thin layer between smooth, substantially parallel, stationary or

moving electrodes, preferably not more than 4 in. apart, the surfaces upon which deposition occurs being constantly cleaned by the stream. J. S. G. THOMAS.

Electrical precipitator [for cleaning gases]. G. E. McCLOSKEY, Assr. to BARRETT Co. (U.S.P. 1,752,920, 1.4.30. Appl., 10.2.27).—Means are provided whereby any liquid condensed in the chambers surrounding the insulators supporting the electrodes drains away immediately into the body of the precipitator, whereby short-circuiting is prevented.

J. S. G. THOMAS.

Forming copper-copper oxide rectifier plates. W. T. Anderson, JUN., and L. F. BIRD, Assrs. to HANOVIA CHEM. & MANUFG. Co. (U.S.P. 1,757,284, 6.5.30. Appl., 30.8.28).—See B.P. 328,701; B., 1930, 672.

Electric [baking] ovens. MOORWOODS, LTD., and H. WHEALE (B.P. 331,593, 9.10.29).

Manufacture of dollies for dry batteries. H. A. BUMKE G.M.B.H. (B.P. 332,103, 17.8.29. Ger., 26.7.29).

Production of carbon dollies for galvanic cells. H. A. BUMKE G.M.B.H., and AUTOM SPEZIAL-MASCHINEN G.M.B.H. (B.P. 332,101, 14.8.29. Ger., 26.7.29).

[Cut-out for] electric incandescence lamps. GEN. ELECTRIC CO., LTD., Assees. of PATENT-TREUHAND-GES. F. ELEKTR. GLÜHLAMPEN M.B.H. (B.P. 332,164, 11.11.29. Ger., 13.11.28).

Electron-discharge tubes, and insulating means therefor. BRIT. THOMSON-HOUSTON CO., LTD., Assees. of J. B. WANTZ (B.P. 314,341, 21.6.29. U.S., 25.6.28).

Anodes for electric-discharge devices. BRIT. THOMSON-HOUSTON CO., LTD., Assees. of J. S. THELEN (B.P. 316,561, 30,7.29. U.S., 30,7.28).

Removing soot etc. from smoke (B.P. 307,805).— See I. Carbon granules (B.P. 329,652). Dehydration of emulsions (U.S.P. 1,754,009).—See II. Lacquer composition (U.S.P. 1,754,243).—See XIII. Rubber compositions (U.S.P. 1,752,531).—See XIV.

XII.-FATS; OILS; WAXES.

Examination of oils by the extended capillary diagram and the analytical quartz lamp. C. A. ROTHENHEIM and L. LETTENMAYER (Pharm. Ztg., 1930, 75, 862; cf. Rapp, B., 1929, 110).—A number of fatty oils in the presence of various solvents have been examined by these means, the methods of colour comparison having been improved. Cod-liver oils alone gave a characteristic yellow fluorescence. A solution of irradiated ergosterol in sesamé oil ("Vigantolôl") shows no typical colour. E. LEWKOWITSCH.

Decomposition of oils and fatty acids by heating with active nickel on a carrier. H. I. WATERMAN and M. J. VAN TUSSENBROEK (Chem. Weekblad, 1930, 27, 146-147; cf. B., 1929, 861; 1930, 66).--The hexabromide value of soya-bean oil, which is unaltered after the usual treatment for deodorising, is reduced by heating in a vacuum to 225°; the effect is greater in presence of kieselguhr, and in presence of nickel mounted on kieselguhr the treatment reduces the value to zero. The acid value is increased in the same order. Oleic and elaidic acids are stable to this treatment, whilst linoleic acid and its glyceride are attacked. S. I. LEVY.

Twitchell reagent. Effect of addition of (II) acids, and (III) salts and variation of conditions, on the fat-splitting power of the reagents and on the darkening of fatty acid. K. NISHIZAWA and Y. MATUKI (J. Soc. Chem. Ind., Japan, 1930, 33, 179-182 B, 182-184 B; cf. B., 1929, 946).-II. The addition of the weak formic or acetic acids, although they did not much influence the emulsifying power (cf. loc. cit.), very markedly reduced the degree of hydrolysis obtained with Idrapid, Pfeilring, or Kontakt reagents. The fatsplitting power of all these reagents was greatly increased by the addition of strong acids (oxalic, sulphuric, and hydrochloric). Increased concentration of the added mineral acid increased the hydrolysis in the case of the Idrapid solution, but Kontakt and Pfeilring, which were salted out, gave extraordinarily irregular curves. The intensity of colour of the acids produced was calculated by a formula (involving the acid value) from the observed colorimeter readings: the depth of colour was nearly in direct proportion to the amount of oil saponified, and was practically the same whether sulphuric or hydrochloric acid was added; oxalic acid produced about half the intensity of colour. Under the conditions employed Idrapid was the most satisfactory reagent for fat-splitting power, colour of the fatty acids, and separation of the glycerol water.

III. The addition of normal salts such as sodium chloride or sulphate, or the sodium salts of the reagents themselves, greatly reduced the hydrolysing action, which could only be restored by the addition of large amounts of strong acids. The addition of glycerol or of free fatty acids similarly reduced hydrolysis. The increased hydrolysis effected by strong acids is explained by (1) the saponifying action of the acid itself, (2) the increased emulsifying power (cf. loc. cit.), and (3) the prevention of the formation of salts of the reagents. The influence of temperature and agitation on hydrolysis was considerable: hydrolysis at 100 r.p.m. by Idrapid, Kontakt, and Pfeilring was only 29.8, 43.7, and 8.7%, respectively, of that at 500 r.p.m., although variations were only slight if the stirring was kept at the latter rate. E. LEWKOWITSCH.

Japanese fish oils. II. M. HIROSE (J. Soc. Chem. Ind., Japan, 1930, 33, 172—173B).—The principal physical and chemical characteristics of the following oils: sardine, herring (iodine values 96—110), plaice, salmon, sand-eel, cod-liver, Alaska pollack-liver, and common ray-liver, from various districts are given. Sardine oil from Japan proper had higher iodine value, sp. gr., and n_D than those from Chosen (cf. B., 1930, 247). Alaska pollack-liver oil closely resembles cod-liver oil, but the iodine value, sp. gr., and n_D of the former are usually lower than the corresponding values for the latter. E. LEWKOWITSCH.

Higher unsaturated alcohols from certain drying oils. S. KAWAI (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1930, 13, 254–259).—Reduction of tung oil with sodium and amyl alcohol in presence of toluene gave cetyl alcohol, m.p. $49 \cdot 5$ —50°, together with an unsaturated alcohol, C₁₈H₃₄O, b.p. 200–205°/9·5 mm., containing two ethylenic linkings. Sardine oil similarly yielded cetyl alcohol, and a fraction, b.p. $220-230^{\circ}/7$ mm., which on catalytic hydrogenation yielded "dihydrolaganol," C₂₀H₄₁OH, m.p. 66-67.5°, oxidised by sodium dichromate in acetic acid solution to dihydrolaganic acid, m.p. $68.5-70^{\circ}$ (Kotake, A., 1927, 1215), whilst linseed oil gave cetyl alcohol, and an unsaturated alcohol, b.p. 196-201°/6 mm., converted by hydrogen and platinum-black into stearyl alcohol, m.p. 59°.

A. I. VOGEL.

Testing for rancidity of fats. J. DAVIDSOHN (Chem. Umschau, 1930, 37, 193—196).—The Kreis rancidity test and its various modifications are discussed : the author's original experiments confirm the conclusions of the German Fat Analysis Commission and of the A.O.C.A. Kreis Test Committee, that none of these reactions can be considered entirely reliable.

E. LEWKOWITSCH.

Neutralisation and refining of Spanish olive oils. M. MASRIERA and A. PAR (Anal. Fis. Quim., 1930, 28, 771-783).—The methods available for the removal of free fatty acids from olive oil in order to fit it for food are reviewed and discussed. The usual method of treatment with alkali is commercially impracticable when the amount of acids exceeds 25% and impossible when the amount exceeds 50%. Processes of distillation, particularly with superheated steam or other vapours, are likely to be applicable to low-grade olive oils. The possibility of esterifying the fatty acids with glycerol is discussed, and preliminary experiments are described in which the amount of free acid in low-grade oil (from rind) is reduced from 70% to 10% by esterification at 120° in presence of sulphonated fatty acids (" divulson ") as catalyst. The formation of emulsions, however, causes trouble in the subsequent separation.

R. K. CALLOW.

Volumetric determination of fatty acids in soaps etc. J. E. HEESTERMAN (Chem. Weekblad, 1930, 27, 434—436).—The soap or soap powder is dissolved and decomposed by means of hydrochloric acid in the butyrometer, a few drops of saponin are added, the whole is centrifuged, and the volume of separated fatty acids read. For accurate results it is necessary to determine the density of the acid layer.

S. I. LEVY.

Milk-in-fat emulsions. EICHSTÄDT; MOHR and EICHSTÄDT. Butter fat. LANA. Olive oil in sardines. WEWERS.—See XIX.

PATENTS.

Preventing development of rancidity in vegetable oils. IMPERIAL CHEMICAL INDUSTRIES, LTD., and H. J. TATTERSALL (B.P. 331,814, 7.3.29).—The castor oil etc. used in leather-cloth manufacture is treated with sufficient peracetic acid to convert the more unsaturated constituents (e.g., trilinolein) into polyhydroxy-polyacetoxy-derivatives. E. LEWKOWITSCH.

Preparing oil, fat, lard, tallow, etc. for storage or transit. M. M. BURMAN (B.P. 309,502, 11.4.29).— A homogeneous mixture prepared by melting the oil etc. with a proportion (e.g., 10-15%) of the same fat which has been hydrogenated is suddenly cooled to below the m.p., yielding a solid compact product which does not melt in hot weather. E. LEWKOWITSCH.

Production of fats. T. P. HILDITCH (B.P. 331,880, 11.3.29).—Edible synthetic fats resembling lard or tallow are prepared by esterifying mixtures of saturated (40-60%) and unsaturated acids, such as are obtained by the saponification of vegetable oils or fats, or their mixtures, with a deficiency of glycerin; the excess (10-20%) of fatty acids is removed by the usual methods. E. LEWKOWITSCH.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Plasticisers for acetylcellulose. CARSWELL.— See V.

PATENTS.

Production of painting oils of improved drying capacity. J. SCHEIBER (B.P. 306,453, 9.2.29. Ger., 20.2.28).—Fatty acids of good drying oils, e.g., tung or perilla oil, or isomeric linoleic acids with conjugated double linkings produced from ricinoleic acid (cf. B.P. 306,452; B., 1930, 726) are mixed with fatty acids from semi- or non-drying oils and the mixture is esterified with glycerin by heating at about 200° for 5—6 hrs., or a mixture of oils and fatty acids (in excess) may be transesterified by heat, and the excess acids esterified subsequently by glycerin : excess of glycerin is removed by distillation or by esterification with resin etc. E. LEWKOWITSCH.

Non-tarnishing metallic ink. W. F. SMITH, Assrto KINGSPORT PRESS, INC. (U.S.P. 1,752,462, 1.4.30-Appl., 16.11.27).—Powdered metal (2 pts.) is stirred slowly into a solution of nitrocellulose (pyroxylin 1 pt.) until the metallic particles are completely coated, and the solvent is then driven off in such a way as to leave the coated metal in powdered form, *e.g.*, by spraying. The powder is then mixed with rosin and terpineol, or equivalent vehicle. E. W. LEWIS.

Stencil sheet. S. HORII (U.S.P. 1,753,204-5, 8.4.30. Appl., [A] 4.8.27, [B] 31.12.27).-(A) To prevent absorption of the coating composition, the paper is made from material having maximum felting and greaseproofing qualities. This is achieved, e.g., (1) by hammering mulberry (Kozo) bast tissue for about 5 hrs. until the degree of hydration, as shown by the Schopper-Riegler beating tester, reaches 40-45 units, or (2) by beating "Mitsumata" or "Gampi" bast tissue for 20 min. in a beating engine, followed by wet beating for about 5 hrs. until the hydration reaches 50-60 units. The beaten stuffs may be blended, and the colloidal mucilage "Neri" is added to them. The paper is coated with an ink-resisting composition including waxes or a gelatinous organic colloid, or cellulose esters, combined with a suitable tempering agent. (B) The fibrous base, such as Japanese "yoshino" paper, is coated or impregnated with a solution of esters of polysaccharides (other than cellulose and starch acetates), such as starch stearate, mannan acetate, cellulose stearate or nitrate, in a suitable solvent (e.g., acetone, alcohols), mixed with a suspension of an insoluble colloid such as aluminium tannate or hydroxide, titanium white, or kaolin in a tempering or softening

agent (hydrocarbon or fatty oils, fats, fatty acids, esters, etc.). Dyeing the insoluble colloids with a colloidal colouring matter exerts a protective action.

E. W. LEWIS.

Production of plastic materials for use in manufacture of lacquers, covering materials, binding agents, etc. FRANKFURTER GASGES., and H. W. HOELZER (B.P. 331,846, 4.4.29).—Coal tar, lignite tar, coumarone resin, etc. are heated under pressure in the presence of a catalyst, *e.g.*, iron chlorides, manganese sulphate, caustic soda, sulphuric acid, paraformaldehyde, with a sulphurous extract formed by extracting spent gas-purification materials with, *e.g.*, the tar oil or taroil vapour from the tar employed in the process, or carbon disulphide. Such mixtures as 15—25% of bitumen and asphalt and 85—75% of tar may also be vulcanised as above. S. S. WOOLF.

Coating materials and their preparation. IMPERIAL CHEM. INDUSTRIES, LTD., and B. W. FOSTER (B.P. 331,837, 3.1.29).—A water-wet cellulose ester or ether is kneaded with a medium which includes gelatinisers, e.g., "cellosolve," ethyl lactate, butyl acetate, chloroform, softeners, e.g., raw or blown castor, linseed, or tung oil, and diluents, e.g., industrial spirit, toluol, kerosene, and the water set free is removed, practically without evaporation. Pigments (dry or water-wet), resins, etc. may also be incorporated. Improved gloss of final product is claimed. S. S. WOOLF.

Coating compositions containing *m*-styrene combined with softeners. E. I. DU PONT DE NEMOURS & Co. (B.P. 311,700, 3.4.29. U.S., 14.5.28).—Mixtures of *m*-styrene, softeners, *e.g.*, butyl phthalate, solvents, etc. are claimed. S. S. WOOLF.

Coating compositions. E. I. DU PONT DE NEMOURS & Co. (B.P. 312,049, 3.4.29. U.S., 18.5.28).—Compositions containing polymerised vinyl compounds, *e.g.*, a vinyl chloride or acetate polymeride, and tetrahydrofurfuryl alcohol are claimed. Pigments etc. may be incorporated. S. S. WOOLF.

[Urushiol] lacquer composition. T. SATOW (U.S.P. 1,754,243, 15.4.30. Appl., 23.1.26).—The milky liquid product from the "lacquer plant" (*Rhus vernicifera*) containing urushiol is heated with sulphur at 120—160° for 1—3 hrs., a thick mass semi-liquid at 100° being formed. This is heated with aldehydes and fillers are incorporated for use as impregnating insulating material. For coating purposes, solvents, *e.g.*, benzine, benzol, acetone are added.

S. S. WOOLF.

Lacquer and varnish thinners. CARBIDE & CARBON CHEM. CORP. (B.P. 304,759, 21.12.28. U.S., 27.1.28).— In liquid coating compositions containing natural and/or synthetic resins, and, if desired, a cellulose ester and a solvent therefor other than amyl or butyl esters, e.g., "cellosolve," the use of ethylbenzene or its higher homologues is claimed. [Stat. ref.] S. S. WOOLF.

Manufacture of pressed or moulded articles [from cellulosic materials]. H. P. BAYON. From MAGNASCO ROGGERO & Co. (B.P. 331,851, 8.4.29).— "Formed" cellulosic materials, *e.g.*, wood shavings, tree barks, woven fabrics, are treated with a dilute caustic alkali at elevated temperature and pressure, washed and dried, treated with an aqueous oxidising acid solution, *e.g.*, a mixture of sulphuric and nitric acids, impregnated with a solution containing a synthetic resin, *e.g.*, phenol-formaldehyde, treated with *p*-dichlorobenzene with or without a hardening agent, *e.g.*, hexamethylenetetramine, and then pressed or moulded and heated sufficiently to "cure" the resinous material. The final product shows the original texture of the cellulosic material employed. S. S. WOOLF.

Production of moulding compound. H. S. SNELL, Assr. to WESTERN ELECTRIC Co., INC. (U.S.P. 1,752,580, 1.4.30. Appl., 8.11.24).—A water-insoluble proteinate, e.g., aluminium caseinate, and an insoluble salt capable of waterproofing the compound, e.g., aluminium oleate, are precipitated simultaneously and jointly by a common precipitant, e.g., aluminium acetate, the precipitate is washed and dried, and furfuraldehyde is added.

S. S. WOOLF.

Improving aldehyde resins. W. W. GROVES. From CONSORT. F. ELEKTROCHEM. IND. G.M.B.H. (B.P. 314,399, 26.6.29).—Aldehyde resins are combined with polymerised vinyl compounds and mixed with filling materials in the manufacture of articles, *e.g.*, gramophone records, by pressure or fusion. Improvement in toughness, freedom from bubbles in the molten state, and higher capacity for taking up fillers are claimed.

S. S. WOOLF.

Plates of artificial resin [with intermediate veneer]. F. OEHRING (B.P. 331,870, 5.4.29).

Processes and apparatus for surfacing sheet material with pigments, varnishes, lacquers, etc. G. M. BROWN (B.P. 332,190, 15.2. and 21.5.29).

Grinding mills (B.P. 330,923).—See I. Coating compositions (B.P. 326,515).—See V.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Spanish rubbers. J. G. VIANA and M. TOMEO (Anal. Fís. Quím., 1930, 28, 709—717).—Analytical and physical data are given of samples of rubber (i) from the Canary Islands, and (ii) from Guinea. Sample (i), probably derived from *Euphorbia balsamifera*, Hors. Kew, contained 27% of caoutchouc and 56% of resins; it could not be vulcanised and resembled chicle gum in properties. Sample (ii), from *Landolphia* sp., contained 12% of caoutchouc and 58% of resins; it is used under the name "Almedina" as an addition to certain rubber mixings. Neither product is commercially important. R. K. CALLOW.

Isoprene and caoutchouc. XXI. Molecular size of caoutchouc and the nature of its colloidal solutions. H. STAUDINGER (Kautschuk, 1930, 6, 153– 158).—Dilute solutions of rubber or balata, like polystyrene solutions, contain macro-molecules and not micelles. The macro-molecules of rubber contain about 1000 isoprene nuclei in a long chain, the molecular length being responsible for the characteristic physical features. The high viscosity and other properties of the "gel solutions" of rubber are the result of insufficiency of space for free movement of the long molecules. D. F. Twiss. Caoutchouc molecule or caoutchouc micelle? H. KROEPELIN (Kautschuk, 1930, 6, 158—159).—The smallness of the influence of temperature on the viscosity of rubber renders unlikely the presence of any considerable proportion of micelles or molecular aggregates in equilibrium with simple molecules in the solutions. There are undoubtedly micelles present, although possibly not strictly of the Nägeli type. Only in stretched rubber do they become crystalline, and their number increases with increasing extension. The molecules in a micelle remain together on relaxation of the tension and also when rubber is dissolved in a solvent.

PATENTS.

D. F. Twiss.

Treatment of guayule etc. Extraction of rubber from guayule etc. D. SPENCE, Assr. to INTER-CONTINENTAL RUBBER Co. (U.S.P. 1,753,184-5, 1.4.30. Appl., (A) 8.5.26, (B) 12.5.26).—(A) Deterioration of the rubber contained in plants such as guayule is prevented by treating the plants after harvesting and before extraction of the rubber, and either before or after crushing, with the vapour or dilute solution of an organic nitrogenous stabilising agent, e.g., dimethyl-p-phenylenediamine, p-phenylenediamine, piperidine, or condensation products of amines with aldehydes etc. The product may be stored without deterioration. (B) Deterioration of the rubber from guayule etc. during extraction, whether mechanically or by means of solvents, is prevented by carrying out the process in presence of an organic stabiliser (see above). The rubber "worms" produced are devoid of tackiness, and can be baled without sheeting. The product is readily deresinised by acetone, alcohol, or E. W. LEWIS. caustic alkali.

Manufacture of rubber derivatives. I. G. FARBENIND. A.-G. (B.P. 313,919, 13.6.29. Ger., 19.6.28). -Rubber derivatives (intended to find application in the manufacture of dyestuffs and pharmaceutical products) are obtained by the interaction of an alkyl- or aryl-sulphur halide, or a substitution product thereof, with natural or artificial rubber, preferably in presence of an indifferent solvent. For example, a solution of p-nitrophenylsulphur chloride (3 pts.) in carbon tetrachloride (50 pts.) gives, when mixed with a solution of rubber (1 pt.) in carbon tetrachloride (400 pts.), a quantitative yield of an additive product which, when dry, forms a bright yellow amorphous powder sintering at about 135°. E. W. LEWIS.

Manufacture of artificial rubber. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 330,272, 29.12.28).— A diolefine is polymerised in water emulsion by the action of an emulsifying inorganic salt of a high-molecular non-amphoteric organic base. Examples of such bases are: oleic β -diethylaminoethylamide, oleic p- β diethylaminoethoxyanilide, 2-n-pentadecylglyoxalidine (from ethylenediamine and the imino-ether of palmitic acid), and menthyl β -diethylaminoethyliminodicarboxylate, NEt₂·CH₂·N(CO₂·C₁₀H₁₉)₂. These are used as hydrochlorides, and produce a synthetic rubber latex. C. HOLLINS.

Manufacture of rubber-like masses. I. G. FARB-ENIND. A.-G. (B.P. 307,308, 4.3.29. Ger., 3.3.28).— A butadiene, e.g., $\alpha\gamma$ -butadiene, isoprene, $\beta\gamma$ -dimethylbutadiene, etc., is polymerised in two stages, a further quantity of the hydrocarbon preferably being added after the first stage, and polymerisation being completed by means of a different agent. Thus isoprene is partly polymerised with sodium at 35°, then dissolved in more isoprene, emulsified in sodium oleate solution, and polymerised at 60° to a rubber latex, which may be coagulated in the usual manner. C. HOLLINS.

Manufacture of factice and the like. J. BAER (B.P. 313,917, 5.6.29. Switz., 19.6.28).—Sulphuretted oils, especially factice soluble in hydrocarbons, are prepared by vulcanising the oils with the caoutchouclike mass obtained by the action of alkali or alkalineearth polysulphides on saturated halogenated hydrocarbons (*e.g.*, methylene dichloride) (cf. B.P. 279,406, 302,399, and 298,889; B., 1929, 220, 652).

[Rubber] composition [for submarine insulation]. F. S. MALM, Assr. to WESTERN ELECTRIC Co., INC. (U.S.P. 1,752,531, 1.4.30. Appl., 20.12.28).—Raw rubber or latex is heated with a 1% solution of sodium chloride for some hours at above 100° (about 150°), washed, and dried. This treatment is said to hydrolyse and render soluble some of the protein and to coagulate and render less water-absorbent other portions. The product is preferably used in admixture with, e.g., commercial deresinated balata and montan wax (35:35:30). The heat-treated rubber has a dielectric constant of 2.61 as compared with 3.0 for good commercial gutta-percha, and is stated to be electrically stable when immersed in water. E. W. LEWIS.

Manufacture of rubber articles. B. W. ROWLAND, Assr. to GOODYEAR TIRE & RUBBER CO. (U.S.P. 1,757,928, 6.5.30. Appl., 10.11.28).—See B.P. 329,897; B., 1930, 729.

XV.—LEATHER; GLUE.

Mode of action [on pelt] of pickles of different compositions. A. KÜNTZEL (Collegium, 1930, 218-233).-Pickling solutions exercise two functions, viz., the completion of the deliming and neutralisation of the pelt which is still slightly alkaline from the bating liquor, and the characteristic pickling effect whereby the pelts absorb a definite amount of acid. When collagen is placed in hydrochloric acid-salt pickles, some of the acid is combined with the collagen and some taken up by capillary absorption; the maximum amount of combined hydrochloric acid was 0.7 mol. per kg. of dry collagen. The amount of combined acid was only slightly affected by the salt content of the pickle. The acid swelling was greatly reduced by the salt content of the pickle, and in highly concentrated salt solutions the swelling due to the salt was reduced by even small amounts of acid. Acid swelling was diminished by small amounts of salt, but only completely repressed by large amounts of salt. The collagen was swollen as much in pickles of high salt concentration as in water. It is shown that the repression of the acid swelling depended not on the ratio of acid to salt, but on the actual salt concentration. No acid swelling was observed if the salt concentration was greater than 5 mols. of sodium chloride per kg. of dry collagen, independent

E. LEWKOWITSCH.

of the presence of much or little acid. The swelling in collagen, which was either acid- or alkali-swollen before pickling, was only partly repressed by treatment with highly concentrated pickles. D. WOODROFFE.

Preparation and properties of raw collagen. A. KÜNTZEL and K. BUCHHEIMER (Collegium, 1930, 205-217).-The flesh and hair sides of a fresh cowhide were removed by splitting and the remaining pelt was split into an upper layer 0.35 mm. thick and two other layers each 0.95 mm. thick, all of which were allowed to dry in a ventilated warm room, when they became hard, horny, yellowish, and transparent. All epidermal structures, hair muscles, flesh muscles, and most of the blood vessels were removed with the flesh and hair side splits. Certain non-collagenous components, e.g., interfibrillary tissue cells, blood vessels, fat, and ash, are present in the above three layers. The amount of water absorbed by dry collagen is less than that present in the original collagen, and the thicker dry collagen absorbed less water on soaking than the thin. The loss in weight at 105° was thick split 20.75%, thin split 19.62%, dry collagen ground to powder 14.08%. Analysis showed C 50.24, H 6.58, N 17.75, fat 0.33, ash 0.41%. Washing the dry collagen for 88 hours removed 0.13% of mineral matter (ash). By treating the collagen first with 10% salt solution and then with saturated lime water for different periods of time and extrapolating the results it was shown that the dry splits contained 1% of non-collagenous proteins. 1 G. of the air-dry collagen combined with 7×10^{-4} mol. of hydrochloric acid, which gives an equivalent of 1142, the same as for gelatin. D. WOODROFFE.

Determination of chromium, iron, and aluminium in chrome[-tanned] calf leathers. H. B. MERRILL and R. C. HENRICH (J. Amer. Leather Chem. Assoc., 1930, 25, 270—275).—Low chromium figures and high iron and alumina results were obtained by precipitating the latter with ammonia from the product obtained by fusion of the leather ash with borax, potassium carbonate, and sodium carbonate. The errors are reduced to 0.03% on a 3-g. leather sample by redissolving the iron and aluminium precipitate in acid and reprecipitating with ammonia. The iron and aluminium may be separated by the sodium peroxide method; an accuracy of 0.02% is obtained by the procedure detailed. The cupferron method was much less accurate. D. WOODROFFE.

Influence of splitting on the strength and stretch of commercial leathers. R. C. BOWKER and E. S. OLSON (J. Amer. Leather Chem. Assoc., 1930, 25, 275— 290).—The breaking strength of grain splits was considerably less than was anticipated from the thickness, whilst that of the flesh splits was in the same proportion to that of the unsplit leather as were their relative thicknesses. The tensile strength of the grain splits in $1b./in.^2$ was only about 25% of that of the unsplit leathers, whereas that of the flesh splits was 80-106%. The stretch (%) of the grain splits at a definite stress was much greater than that of either the flesh splits or the unsplit leather. The stretch (%) of both flesh and grain splits at breaking point was less than that of the unsplit leathers. The stitch-tear resistance of the grain splits was 10-20% and of the flesh splits was 40-80% of that of the unsplit portions.

D. WOODROFFE.

Birch bark [Betula alba and B. pubescens] as a tanning material. P. JAKIMOV and P. TOLSKI (Collegium, 1930, 233-239).-The following reactions are given by birch-bark tannin : bromine water, yellow precipitate; ferric chloride, black precipitate; gelatin, copious precipitate; sulphuric acid, red ring changing to reddish-brown on dilution with water; lead salts, rose-coloured precipitate; formaldehyde, rose-coloured precipitate and colourless filtrate. The outer and inner barks contained tans 2.4, 8.52% and non-tans 3.3, 8.8%, respectively. The percentage of tannin in the inner bark increased with the age of the tree from 5.4% (20 years) to 10.6% (80 years). The proportion of tans to non-tans diminished with increase in height from which the bark was derived. The optimum temperature of extraction was found to be 90°. The material was improved for subsequent leaching by preliminary leachings at 10° or 20°. A liquid extract of $p_{\rm H}$ 4.57 was prepared and used to tan hides into leather, which had the properties of an upper leather with elastic grain, no spring, and a light brown, rosetinted colour. About 450,000 tons of birch bark containing 30,000-35,000 tons of tannin are available annually in European Russia. D. WOODROFFE.

PATENTS.

Unhairing hides and skins. H. M. ULLMANN and E. R. THEIS (U.S.P. 1,753,539, 8.4.30. Appl., 26.12.28).—Hides or skins are soaked for about 20 hrs. or less in water containing pancreatin (0.02 to 0.1%), at 60—80°, and are then limed until the hair is loosened (about 20 hrs.). The hair is removed in the usual way. E. W. LEWIS.

Leather and its production. A. EHRENREICH and R. TANDLER (B.P. 331,241, 26.3.29).—Soaked skins of marine and terrestrial animals, e.g., shark, are treated to fix the scales or shagreen, e.g., with 2% soda and 2% formaldehyde solution, then treated with solutions of ammonium chloride or hydrochloric acid to dissolve the mineral constituents in the scales or shagreen, after which they may be given a quick preliminary tanning with astringent materials, and finally subjected to an intensive tannage of long duration.

D. WOODROFFE.

Leather product. C. G. SHAW (B.P. 331,263, 19.2.29).—Leather is impregnated with rubber cement, an ultra-accelerator (e.g., piperidine pentamethylenedithiocarbamate, zinc ethylxanthate), and sulphur, the solvent removed by evaporation under vacuum at a temperature sufficiently low to retard vulcanisation, and the impregnated leather subsequently vulcanised under heat and pressure. D. WOODROFFE.

Titanium solutions (B.P. 309,090).-See VII.

XVI.—AGRICULTURE.

Comparison of elutriators for the separation of sands, silts, and slime in easily worked soils. E. BRIQUET (Arch. Sci. phys. nat., 1930, 12, 161–178).— The advantages and disadvantages of the Kopecky and

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Crook elutriators are discussed. A modification, having some advantages over the latter form, is described. C. W. GIBBY.

Fluctuations of bacterial numbers and nitrate content of field soils. H. G. THORNTON and P. H. H. GRAY (Proc. Roy. Soc., 1930, **B**, 106, 399–417).— Bacterial counts have been made and the nitrate contents determined in samples taken every 2 hrs. from a field soil. Significant diurnal variations were found and there was some evidence that different groups of bacteria show different fluctuations. The fluctuations appear sometimes to be correlated with rainfall, but not with the moisture content of the soil nor with the nitrate content, although the latter also appears to fluctuate during the day. W. O. KERMACK.

Actinomycetes in Danish soils. H. L. JENSEN (Soil Sci., 1930, 30, 59–77).—A systematic survey of the types and chemical activities of actinomycetes is recorded. The highest numbers of the organisms occurred in soils of $p_{\rm H}$ value 6.8—8.0. A. G. POLLARD.

"Single value" soil properties. Significance of certain soil constants. III. Technique of the Keen-Raczkowski box experiment. J. R. H. COUTTS. IV. Technique of the "box" experiment. B. A. KEEN (J. Agric. Sci., 1930, 20, 407-413: 414-416, cf. B., 1929, 486).—III. A simplified technique for the box experiment is described. By its use values for pore space are about the same as those obtained by the older method; the old and new values for water retention and swelling are not the same, but are related by a simple linear expression.

IV. A note on the effect of compression on "single value" soil properties as determined by the "box" method. Such inert material as precipitated silica swells when saturated with moisture. E. HOLMES.

Occurrence of elementary carbon in soils. G. W. ROBINSON and W. MCLEAN (J. Agric. Sci., 1930, 20, 345—347).—The presence of free carbon from coal or coke in soils introduces an appreciable error in the determination of organic matter by organic carbon analyses. A mechanical sedimentation method of removing at least 75% of the elementary carbon is proposed. E. HOLMES.

Carbon-nitrogen ratio of soil organic matter. W. McLEAN (J. Agric. Sci., 1930, 20, 348-354).—The C: N ratio of 50 British soils varied from 6.5 to 13.5:1(average about 10:1), and of 16 foreign samples 2.0 to 23.0:1. The ratios for arable soils do not differ appreciably from those of grassland soils, both elements being in higher amount in the grassland soils. Although fertile soils usually contain relatively high amounts of carbon and nitrogen, there is no marked correlation between C: N ratios and fertility. It is suggested that in the same areas total organic carbon or total nitrogen might be used as an index of fertility. The C: N ratio decreases in descending a soil profile.

E. HOLMES.

Significance of the carbon : nitrogen ratio, and other chemical properties of organic materials in the action [in soils]. O. LEMMERMANN, W. JESSEN, and H. ENGEL [with H. BORTELS, VON SCHMELLING, and

W. LESCH] (Z. Pflanz. Düng., 1930, 17A, 321-355).-The course of the decomposition and humification of organic materials (straw, long straw manure, etc.) is accompanied by definite variations in chemical properties, notably the C/N ratio, nitrogen and pentosan contents, and the "humus" content as determined by means of hydrogen peroxide or ammonia. The decreasing rate of carbon dioxide production as decomposition proceeds is not sufficiently characteristic for assessing the extent of humification of these materials. During decomposition the ash and nitrogen contents of the material increase and the C/N ratio decreases. The attainment of a C/N ratio of 20:1 during decomposition corresponds with a 50% loss of dry matter, and a nitrogen content in the product of 2% or more. The degree of humification of such material (soluble in 2% ammonia solution) is more than 30%, and its pentosan content is less than 12%. When this stage of decomposition is reached the material no longer causes plant injury when incorporated with soil, as a result of the temporary withdrawal of available nitrogen by micro-organisms. A. G. POLLARD.

Carbon and nitrogen cycles in the soil. I. H. J. PAGE. II. Extraction of organic matter of soil with alkali. C. W. B. ARNOLD and H. J. PAGE. III. Formation of natural humic matter. M. M.S. DU TOIT and H. J. PAGE (J. Agric. Sci., 1930, 20, 455-459, 460-477, 478-488).-I. The term "humic matter" is defined as the dark-coloured, high-molecular, colloidal organic matter which is a characteristic constituent of the soil, and "non-humic matter" includes colourless, chiefly soluble organic substances and undecomposed plant residues.

II. Although the total organic carbon in the soils of various plots of the classical permanent experiments at Rothamsted receiving, respectively, organic, artificial, and no manures, varied between 0.81 and 2.91%, and in the subsoils between 0.54and 1.04% of the oven-dry samples, there was a marked similarity between the properties of their organic matter, especially in its behaviour on extraction with cold and hot dilute caustic soda. Colorimetric examinations of the extracts indicate that the organic carbon of the surface soils is more deeply coloured than that of the corresponding subsoils, that the organic carbon is most deeply coloured in extracts from surface soils receiving annual dressings of dung, and that that from subsoils of plots receiving no manure is least coloured.

III. Decomposition experiments in which soil extracts and nutrient salts were added to plant materials such as wheat straw, clover hay, maize cobs, and pine sawdust, and to purified preparations of plant constituents, including lignin, cellulose, xylan, xylose, potato starch, dextrose, and protein in the form of commercial blood fibrin, indicate that the formation of humic matter is more closely related to the change in lignin content of the original material than to the change in content of any other groups of plant constituents estimated. E. HOLMES.

Phosphorus-fixing compound in the soil. A. H. MEYER (Science, 1930, 71, 461).—An iron compound existing as concretions in southern soils and responsible for the fixation of phosphorus has been discovered. The phosphorus is present as a basic ferrous phosphate of very low solubility. L. S. THEOBALD.

Separation of two products of solubilisation of sulphur in a soil rich in organic matter. G. GUITTONNEAU and J. KEILLING (Compt. rend., 1930, 191, 277—279).—The formation of thiosulphuric and pentathionic acids during the oxidation of sulphur in a soil rich in organic matter (peptone) (cf. B., 1927, 150, 587) is proved by their isolation as the corresponding bismuth potassium and potassium salts from an aqueous extract. H. BURTON.

Determination of exchangeable sodium in soils. R. WILLIAMS (J. Agric. Sci., 1930, 20, 355-358).— The amounts of exchangeable sodium extracted from soils by 0.5N-acetic acid and by N-ammonium chloride, and determined by the zinc uranyl acetate method (Barber and Kolthoff, A, 1928, 859), show good agreement. The experimental procedure for determining the sodium in acetic acid extracts is detailed.

E. HOLMES.

Determination of potassium in soil samples by the application of an X-ray method. J. T. CALVERT (Trans. Faraday Soc., 1930, 26, 509-514).— Potassium in soil samples and in minerals may be determined by mixing with the sample a known quantity of manganese oxide and comparing the intensities of the potassium $K\alpha$ - and the manganese $K\beta$ -lines excited by X-rays of shorter wave-length. An accuracy within 5% may be obtained by short exposures; increased accuracy follows more prolonged exposure. For minerals it is advisable to replace manganese oxide by cadmium oxide and to compare the potassium $K\alpha$ - and cadmium $L\beta$ -lines. F. G. TRYHORN.

Measurement of carbon dioxide evolution from soil. H. HUMFELD (Soil Sci., 1930, 30, 1—11).—The Lundegårdh "respiration bell" for determining respired carbon dioxide is modified by replacing the glass bell with a rectangular metal box having inlet and outlet tubes at opposite sides. The carbon dioxide produced by the soil is constantly removed by a measured current of air and trapped in standard caustic soda solution.

A. G. POLLARD.

Determination of available phosphoric acid in soils. S. DAS (Soil Sci., 1930, 30, 33-48).—The author's potassium carbonate method of extracting available phosphate from soils (B., 1926, 456) is successfully applied to a wide range of soil types, including alkali and calcareous soils with which Dyer's citric acid method fails. Cropping and fertiliser trials confirm the validity of the results obtained. A. G. POLLARD.

Variations in soil acidity, especially in Heinrichauer soils. E. PAASCH (Z. Pflanz. Düng., 1930, 9B, 309-326).—The effects of lime and various fertilisers on soil reaction are examined. Green manures, but not farmyard manure, increased soil acidity, and this effect was additive when physiologically acid fertilisers were used conjointly. A. G. POLLARD.

Carbon dioxide-bicarbonate and water extracts as bases for the determination of the phosphate requirement of soils. B. DIRKS and F. SCHEFFER (Landw. Jahrb., 1930, 71, 74—99).—Solvents commonly used for extracting the "available" phosphate from soils have much lower $p_{\rm H}$ values than has the root sap of plants. For this purpose the authors utilise a calcium bicarbonate solution saturated with carbon dioxide for neutral and alkaline soils, and carbon dioxide-free water for acid soils. The phosphate content of a single extract serves as a measure only of the temporary condition. The total assimilable phosphate is determined by means of 4 or 5 successive extracts. The amount of phosphate removed by a single extract shows a definite relationship to Neubauer values. A. G. POLLARD.

Effect of a "soil mulch" on the quantity of water lost from a given soil by evaporation. E. S. WEST (J. Council Sci. Ind. Res., Australia, 1930, 3, 97—105).—The mulching of soil produced by digging to a depth of 10 cm. increased the quantity of water retained by the undisturbed soil layers.

A. G. POLLARD.

Relations between potash fertilisation and the effect of light. O. LEMMERMANN and H. LIESEGANG (Z. Pflanz. Düng., 1930, 9B, 256—268).—Comparison is made of the growth of plants variously fertilised and shaded to different extents. Potash, more than other nutrients, increases the ability of plants to utilise the diminished light under shaded conditions. Although the effect of potash fertilisers in increasing crop yields reaches a maximum in full daylight, it cannot be proved that the crop increases are the outcome of an increased utilisation of light by the fertilised plants.

A. G. POLLARD.

Crop variation. VII. Influence of rainfall on yield of barley at Rothamsted. J. WISHART and (MISS) W. A. MACKENZIE (TYRRELL). VIII. Application of the resistance formula to potato data. R. J. KALAMKAR (J. Agric. Sci., 1930, 20, 417-439, 440-454). --VII. A statistical examination of the effects of each inch of rainfall over the average at various parts of the year on the yields of barley on plots under different manurial treatments from 1852 to 1921.

VIII. A further examination of the validity of the resistance formula as applied to crop yield statistics (cf. B., 1928, 906). E. HOLMES.

Effect of different fertilisers on the composition of the crop and the structure of the leaves of barley and wheat. K. BOEKHOLT (Z. Pflanz. Düng., 1930, 9B, 289—300).—The leaf area of wheat and also the density of the crop are largely controlled by the potash supply. Potash tends to reduce leaf size and nitrogen to increase it, whilst phosphate has but slight effect. The effects of the principal nutrients on the anatomical structure of the plants are systematic. Increased leaf area corresponds with larger stomata and larger vascular bundles, but smaller numbers of stomata per unit leaf area. A. G. POLLARD.

Nitrogen fixation in field soil under different conditions of cropping and soil treatment. L. A. BRADLEY and J. E. FULLER (Soil Sci., 1930, 30, 49-57).— The distribution and activity of a species of *Azotobacler* in soil treated with various fertilisers and carrying various crops is examined. The nitrogen fixation and distribution of the organism were practically uninfluenced by the nature of the crop or changes in soil reaction. The organism tolerated lower $p_{\rm H}$ ranges than those usually accepted as limiting values for *Azotobacter* growth. A. G. POLLARD.

Influence of sodium nitrate and ammonium sulphate on the intake of potash and phosphate [by plants] from the soil. M. GRAČANIN (Z. Pflanz. Düng., 1930, 9B, 300-309).-The variable effects of ammonium sulphate on the resorption of phosphate and potash by plants in Neubauer tests is largely attributable to differences in soil reaction. In soils with $p_{\rm H} < 6.0$ ammonium sulphate decreases the intake of phosphate, and to a small extent that of potassium. With $p_{\rm H} > 6$ the phosphate intake increases. In soils having no reserve of calcium carbonate ammonium sulphate reduces the extent of root development. In all cases sodium nitrate reduces root size, the decrease being the greater in soils which, initially, had the higher reserves of available nitrogen. These results do not detract from the value of Neubauer tests provided the soil reaction is examined and due consideration given to its effect on the resorption of nutrients. There is no positive correlation between the available nitrogen content of soil and the nitrogen intake by plants.

A. G. POLLARD.

Sodium salts used in conjunction with potassium salts as plant nutrient. VI. Summer and winter rape, kohl-rabi, and horse beans. H. JACOB (Z. Pflanz. Düng., 1930, 17A, 355—392).—An extension of earlier investigations (Heinrich, B., 1928, 343) on the effect of sodium sulphate in increasing the potash absorption of various crops. The translocation of potash from straw to grain in cereals and from haulm to tuber in potatoes caused by sodium sulphate occurs in the later stages of plant growth and closely resembles the transference of nutrients from the dying parts of plants. The substitution of sodium for potassium in active plant organs cannot definitely be proved.

A. G. POLLARD.

Phosphate studies in culture solutions. J. W. TIDMORE (Soil Sci., 1930, 30, 13-31).--Water cultures of maize, sorghum, and tomatoes with varying concentrations of phosphate in the nutrient are described. The rate of absorption of phosphate by the plants was not directly proportional to the phosphate concentration of the nutrient. The rate of growth increased with the phosphate concentration throughout the growing period. Concentrations of 0.5 p.p.m. PO_4 produced maximum growth with all plants examined. With 0.2 p.p.m. PO4 maize and sorghum produced 71% and tomatoes 42% of maximum growth. Plants grew better in displaced soil solutions with 0.02-0.03 p.p.m. inorganic PO₄ than in culture solutions with 0.1 p.p.m. PO₄. The phosphate content of plants and plant sap increased with that of the nutrient. The tomato plants had a higher percentage of phosphorus than maize or sorghum, but a low PO4 content in the leaf sap. Phosphates play a minor rôle as buffer agents in the plant sap. Maize and wheat plants absorbed phosphate more rapidly from acid nutrient solutions than from alkaline ones, but there was little difference in the rate of absorp-10n over the $p_{\rm H}$ range 4—6. A. G. POLLARD.

Causes of the beneficial effect of brown coal on the growth of crops. A. KISSEL (Brennstoff-Chem., 1930, 11, 257—260).—The effect of brown coal in promoting the growth of corn etc. is due, not to its inorganic constituents, but to (a) its mechanical action on the soil, (b) the carbon dioxide evolved by its slow decomposition, (c) the production of organic acids which render available the otherwise insoluble salts containing phosphorus, and (d) the decreased thermal conductivity of the soil due to which the optimum growing temperature is maintained therein for longer periods. The amount required to produce these favourable results, however, makes it uneconomical to use the raw material for this purpose.

A. B. MANNING.

Method of increasing the manurial value of bone phosphate. N. D. VYAS (Bull. Imp. Inst. Agric. Res., Pusa, No. 204, 1930, 21 pp.).-Composts were prepared with bone dust 4 pts., sulphur 1 pt., and sand 8 pts., together with added moisture and either with or without cultures of sulphur-oxidising organisms or soil containing the same. It was found that in 23 weeks the citrate-soluble phosphate, originally 5% of the whole, had risen to from 75% with uninoculated compost to 92% with compost inoculated with the culture. In absence of sulphur little change occurred. Losses of nitrogen in the same period in presence of sulphur did not exceed 10%, and ammoniacal nitrogen nitrified more rapidly than when sulphur was absent. Charcoal was added to the composts to remove the offensive odour produced, but was found also to increase the rate of solubilisation of phosphate. A series of trials on wheat, potatoes, and marua are described in which the value of this compost was found in some cases to be equal to superphosphate, in others better, and in most cases very considerably better than untreated bone meal. Bone meal could be used in preparing the compost in the same way as bone dust.

C. IRWIN.

Decomposition of keratin by soil microorganisms. H. L. JENSEN (J. Agric. Sci., 1930, 20, 390—398).—Keratin from horn meal, when added to moist field and garden soils, slowly decomposed, 35—40% of its nitrogen being transformed into nitrate after 120 days. The addition of keratin produced little or no increase in the numbers of bacteria, but markedly increased the numbers of actinomycetes, especially in garden soil. Two strains of actinomycetes were isolated and found capable of thriving on keratin in pure culture to give ammonia. E. HOLMES.

Modification of the citrate method [for the determination of soluble phosphate in superphosphate]. A. SUCHER (Z. angew. Chem., 1930, 43, 672-673).—The arrangement of an apparatus for collecting and automatically washing with the correct amount of wash water the phosphate precipitate obtained by the method previously described (B., 1929, 992) is illustrated and briefly described.

A. R. POWELL.

Fungicidal properties of spray fluids. VII. W. GOODWIN, H. MARTIN, and E. S. SALMON (J. Agric. Sci., 1930, 20, 489-497).—Continuing earlier investigations (cf. B., 1930, 632) on the fungicidal properties of sodium, potassium, calcium, and barium polysulphides against the conidial stage of hop powdery mildew, it is shown that the nature of the spreader may influence the concentration at which polysulphide sulphur attains fungicidal strength. Samples of potassium and sodium polysulphides had the same fungicidal power when applied at the same concentration of spreader and polysulphide sulphur. Solutions of calcium polysulphides which differed widely in the relative amounts of total and thiosulphate sulphur behaved as fungicides in accordance with the polysulphide sulphur content only, and, in general, it is concluded that the efficiency of polysulphide sulphur is independent of the base with which it is combined. E. HOLMES.

Standardisation of Schweinfurth green for plant treatment. G. HILGENDORFF (Z. angew. Chem., 1930, 43, 648—650).—Differences in ease of suspension of various samples are completely masked when the preparation is mixed with preparations of chalk and copper sulphate, as is usual in making up suspensions for spraying. The fineness of the sample is therefore of much less importance than the hydrolysis value as measured by the amount of arsenic taken into solution under standard conditions. The German official specification is given. S. I. LEVY.

"Dry pickling" or "dusting" seed wheat to prevent bunt. G. H. PETHYBRIDGE and W. C. MOORE (J. Min. Agric., 1930, 37, 429–439).—Co-operative trials by advisory mycologists in England and Wales on seed wheat contaminated with bunt spores indicate that $2\cdot5\%$ copper sulphate solution has a slightly higher fungicidal efficiency than formalin or copper carbonate, but the yields of grain favoured the copper carbonate treatment. E. HOLMES.

Stibaropus tabulatus, Schiö (Hem., Pent.), a new pest of tobacco in S. India. P. N. K. AYYAR (Bull. Entom. Res., 1930, 21, 29–31).—Crude oil emulsions (1:6) effectively controlled S. tabulatus without injury to the plants. A. G. POLLARD.

The onion maggot (*Hylemyia antiqua*) in Ohio, 1929. M. P. JONES (J. Econ. Entom., 1930, 23, 394— 398).—Onion crops were increased by 45% after spraying with Bordeaux-oil emulsion and with proprietary oil emulsions against the onion maggot. A. G. POLLARD.

Plant juice clarification for nitrate nitrogen determinations. H. H. HILL (Science, 1930, 71, 540).—Details are given for the clarification of maize juice by means of silver sulphate and carbon black. L. S. THEOBALD.

Method of estimating the yield of a missing plot in field experimental work. F. E. Allan and J. WISHART (J. Agric. Sci., 1930, 20, 399-406).

PATENT.

Drying processes [for grass], apparatus therefor, and products thereof. H. A. N. DELLOW, C. M. WRIGHT, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 327,409, 29.9.28).—In drying and compressing grass crops into cakes that will not swell on keeping, the grass is dried within 6—12 hrs. after cutting, and should not be more than 6 in. long, the maximum air temperature is 200°, and the air when hottest is brought in contact with the grass when wettest. The velocity of the air through the grass should not exceed about 15 ft./sec., and the moisture should not exceed 15%, preferably 12—14%, to prevent swelling after compression. A pressure of 5—10 tons per in.² should be maintained for 15—20 sec., or longer time lower pressure. The cake thus produced usually has sp. gr. about 0.8. Suitable apparatus is described. B. M. VENABLES.

XVII.—SUGARS; STARCHES; GUMS.

Sugar losses in beet-sugar factories. II. Recovery of sugar from factory waste products. H. CLAASSEN (Z. Ver. deut. Zucker-Ind., 1930, 80, 239-263; cf. B., 1930, 478).-The usual loss of 0.25% of sugar and 0.25% of non-sugar (calc. on beets) in the waste liquors from the diffusion battery and the pulp presses can be entirely avoided by returning the liquors to the diffusion battery after they have been freed from pulp. Only a few German factories follow this practice, but in the Dormagen factory the author has successfully applied it, in one form or another, for 25 years. The essentials are efficient de-pulping of the water, its rapid return to the battery, preferably within 15 min., and avoidance of occasions for frothing. At Dormagen the water from the pulp presses is passed through a pulp-remover and then mixed with the waste waters from the battery, the mixture being raised by a pump and passed through a second pulpremover, after which the necessary amount of fresh water is added and the whole pumped back into use. A closed settling vessel of 5 cub. m. capacity is installed on the pressure side of the pump. The whole of the diffusion waste waters must be returned, for they become richer in sugar than ordinary waste waters, and much of the economy of the process would be lost by running part of the water to waste. The greater part of the non-sugar recovered by this process is retained by the pulp. The recovered soluble matter which passes into the juice has, after carbonatation, a purity quotient corresponding to that of a normal afterproduct massecuite, viz., 70-80%. The necessary plant is not costly, its operation is not difficult, and with normal care the water should not be subject to injurious decomposition. A method of recovering most of the sugar usually lost in carbonatation cakes is also described (cf. B., 1929, 490). This loss is seldom less than 0.12% of the beets, and can be reduced to 0.04-0.05% without extra dilution of the juice. The process has been worked for 2 years in the Dormagen factory, where the scum cakes retain an abnormal amount of sugar. Cakes from the first and second carbonatation filters are mixed with hot water in worm conveyors below the filters and carried to mixers where a mash having $d \ 1.08 - 1.10$ is produced. This is pumped to settling tanks 1 m. high in which it is kept for 13-2 hrs. at 85°. The upper liquor is then drawn off and used for sweetening-off subsequent filter-press charges. The sludge is run into second clarifiers in which it is again mashed with hot water and allowed to subside. The sugar recovered has a purity of 84-85%, and therefore lowers the purity of the thin juice less than the usual sweetening-off waters. The first cost and running costs are small. If the final scums are required as pressed cakes, filter presses can be used in place of settling tanks. J. H. LANE.

Fall in purity and polarisation of beet-sugar juices during evaporation. G. CAPELLE (Bull. Assoc. Chim. Sucr., 1930, 47, 155—184).—The purity quotient of beet juices diminishes by 0.4—1.2% in the course of evaporation, whether this is carried out under pressure or in evaporators of the older type with temperatures below 108° in the first body. Of this fall in purity, not more than 0.31 can be ascribed to increase of density due to evolution of ammonia and carbon dioxide, and not more than 0.2 to the effect of heat on the optical rotation of the non-sugars. Assuming a total fall of 1%, at least 0.49 of this must accordingly be due to decomposition of sucrose, representing a loss of 0.08%of sugar, calculated on beets. J. H. LANE.

Diffusion losses [in beet-sugar manufacture], and the Naudet "plus sugar." J. BOTHY (Bull. Assoc. Chim. Sucr., 1930, 47, 110-119).-Extraction of 200-g. lots of fresh cossettes with successive portions of hot water at 85-95° in a closed metal container immersed in a water-bath indicated, on polarisation of the extracts and the exhausted slices, total sugar contents 0.1-0.8% (on beets) in excess of those found by analysis of the pulped beets by the Pellet and Sachs-Le Docte methods. The excess amounts were larger with freshly harvested roots than with those which had been stored. It is suggested that they may represent sugar actually formed from reserve substances during extraction, by living cells in the cossettes, under the influence of heat and pressure, as claimed by Naudet for his modified diffusion process with high initial temperatures. Pulped beets similarly extracted gave no higher results than by the usual methods of analysis. J. H. LANE.

Determination of the adhesive power of starch pastes. SPROCKHOFF (Chem.-Ztg., 1930, 54, 411—412).— Ekhard's method (B., 1929, 298) is adversely criticised owing to the time taken in making the test and the great effect of temperature variations on the results. Much more accurate figures are obtained by viscosity measurements. A. R. POWELL.

Sugar-soluble silica. Spengler and TRAEGEL.— See VII.

PATENTS.

Defecation of sugar juice. A. W. BULL, Assr. to DORR Co. (U.S.P. 1,752,781, 1.4.30. Appl., 26.4.27).— Sugar juice is treated with defecating agents and the sedimentation process controlled by regulating the rate of agitation so that complete flocculation and the maximum size of the individual flocks are obtained.

C. RANKEN.

Stabilisation and preservation of inulin in vegetable material. SCHERING-KAHLBAUM A.-G. (B.P. 309,195, 6.4.29. Ger., 7.4.28).—The vegetable material which contains the inulin is made into a paste with an anti-fermentation agent such as carbon monoxide, hydrogen cyanide, potassium cyanide, or a fluorine compound. C. RANKEN.

XVIII.—FERMENTATION INDUSTRIES.

Influence of shaking and temperature on acid production and nitrogen assimilation during fermentation. W. WINDISCH, P. KOLBACH, and E. Schild (Woch. Brau., 1930, 47, 327-331, 337-340).-Laboratory fermentations each of 500 c.c. of wort, with exclusion of air, were compared under various conditions and against brewery fermentations. The best, though not perfect, agreement with the latter was obtained by fermenting at 9°, with a thorough shaking every 24 hrs. The shaking hastens all the changes studied. At temperatures above 9° the products of yeast autolysis obscure the course of nitrogen assimilation after a very few days. Ammoniacal nitrogen is less readily used than formol nitrogen, but is assimilated more rapidly from worts poor in formol nitrogen than from more nitrogenous worts. There is a marked relationship between the assimilation of ammonia and acid formation, and the production of ammonia in the later stages of fermentation at higher temperatures is accompanied by decrease of titratable acidity and rise of $p_{\mathbf{H}}$. Volatile acidity increases most rapidly during the first few days; its production is favoured by low temperatures, and its amount is not decreased, as is that of fixed acidity, by the ammonia resulting from yeast autolysis. The production of fixed acidity is most marked at relatively high temperatures. F. E. DAY.

Brewing value of barley and malt. F. KUTTER (Woch. Brau., 1930, 47, 309-314, 321-324).-Determinations are made of the extract, moisture, and protein in the barley, and values are allotted to these factors according to their closeness to certain fixed standards. The sum of these values is designated as the "chemical brewing value." Similarly, the "mechanical brewing value" is calculated from the values awarded for the 1000-corn weight, the size of the corns, and the amount of refuse. Marks given for the germinative energy are included in the physiological brewing value, whilst the valuations of colour, quality of husk, etc. are classified under the heading of "general brewing value." The total sum of these values is given as the brewing value of the barley. In the evaluation of malts, the determinations of the 1000-corn weight and the germination are replaced by those of the length of acrospire and the modification. The standards of valuation can be modified as desired, and any of the separate factors can be given a weighted value. C. RANKEN.

Presence and determination of acetaldehyde in wines. E. CHARLES (Ann. Falsif., 1930, 23, 153—154). —Determinations in various samples of wine by the hydroxylamine hydrochloride and the Schiff's reagent methods gave concordant results, the amount of aldehyde varying from 0.11 g. to 0.75 g. per litre. Wines containing more than 0.5 g. per litre were judged unfit for consumption, and it is suggested that this substance should be tested for in all doubtful wines. The aldehyde is formed by oxidation of the alcohol of the wine.

A. SHORE.

Determination of alcohol [in wines etc.]. E. MARTIN (Ann. Falsif., 1930, 23, 154—156).—A reply to Semichon and Flanzy (B., 1929, 449) as to priority. The simplest method of carrying out this oxidation is

to collect the distillate directly in the warm chromic acid solution, when the alcohol is oxidised completely to acetic acid. The method is applicable to 1 c.c. of wine. A. SHORE.

Desiccation of potatoes and manufacture of alcohol therefrom. E. LÜHDER, B. LAMPE, and W. KILP (Z. Spiritusind., 1930, 53, 191-193, 199-200). -The washed potatoes are macerated and pressed so that 2 pts. of potatoes yield 1 pt. of potato juice and 1 pt. of potato pulp containing 60% of moisture. To prevent the potato starch forming a paste during drying, the temperature of the drying plant is not allowed to exceed 50° during the first 3 hrs., and thereafter is gradually raised to 100°. Desiccation is completed in 6 hrs., and yields potato flakes containing 14% of moisture. Both time and heat are saved by the prior separation of the juice, which contains in solution salts, protein, and a small amount of starch. The juice is used afterwards as the mashing liquor, and any surplus is run into the distillery slop. The replacement of the mashing water by juice permits a low mashing temperature, and as the mash does not require to be boiled, the slop has a relatively higher nutritive value. In addition, the yield of alcohol is greater. Approximately one fourth of the green malt is mixed with the potato juice at 55° and the dried potato pulp gradually added in the proportion of 50 g. of pulp to 120 c.c. of juice. The acidity of the mash is adjusted to $0.05-0.1^{\circ}$ by the addition of sulphuric acid and the temperature raised to 75-80° for 15 min. After cooling to 55°, the remainder of the malt is added and the whole allowed to saccharify for 30-45 min. After finally heating the mash to $60-61^{\circ}$, it is cooled and fermented with yeast. C. RANKEN.

Fermentation-physiological properties of Saccharomyces Saké. Y. NISHIWAKI (Zentr. Bakt., 1929, II, 79, 194—204; Chem. Zentr., 1930, i, 1866).—The optimal temperature for yield of alcohol, carbon dioxide, and yeast is $23 \cdot 5 - 24^{\circ}$; the maximum for daily production of carbon dioxide and fermented extract is $33-34^{\circ}$. The acidity is scarcely influenced by the temperature. Experiments on the optimal conditions for the fermentation of koji extract are described; multiplication and fermentation are not so rapid or complete as with maize. A. A. ELDRIDGE.

PATENTS.

Manufacture of a pure, constant yeast. E. I. LEVIN (B.P. 311,315, 21.1.29. Swed., 9.5.28).—A pure culture of yeast suitable for bread-making is mixed with sucrose and phosphates and incubated at $20-40^{\circ}$ for 1—5 hrs. The yeast is then separated and dried.

C. RANKEN.

Manufacture of acetic acid and lactic acid by fermentation. Soc. ANON. DES DISTILLERIES DES DEUX-SÈVRES (B.P. 316,287, 5.4.29. Belg., 27.7.28).— Worts containing a high percentage of sugars are fermented without evolution of gas for 2 or 3 days by a new species of bacteria termed *Lactobacillus acidophilus*, B, which is obtained from milk. Its optimum temperature is 38°, and it differs essentially from *B. bulgaricus* in that it strongly attacks sucrose. C. RANKEN.

Manipulation of liquids (B.P. 309,541).-See I.

XIX.—FOODS.

I. Conditions for formation of Emulsions. various types of emulsion from fat and skim milk and the effect of emulsifying media on milk-in-fat emulsions. A. EICHSTÄDT. II. Stability of emulsions in relation to viscosity of fat, surface tension, and the formation of adsorption films. W. MOHR and A. EICHSTÄDT (Milchwirt. Forsch., 1930, 9, 388-395, 396-408; Chem. Zentr., 1930, i, 1869) .-- I. The process "first fat, then milk " gives an emulsion of milk in fat; the converse process usually gives a creamy emulsion. Rapid addition of fat, or simultaneous mechanical admixture, gives a double emulsion. The first type is that required for margarine emulsions, the stability of which is the greater when coconut or hardened arachis oil is used, and when small quantities of emulsifiers are added.

II. The reasons for the greater stability of certain milkin-fat emulsions are discussed. The formation of an absorption film at the interface fat-skim milk is concerned. A. A. ELDRIDGE.

Nutritive value of condensed milk and milk powder. W. F. DONATH (Med. Dienst Volksgesondb. Ned.-Indie, 1929, 1—57; Chem. Zentr., 1930, i, 1638). —With one exception, considerable amounts of vitamin-*A* were present. With sterilised, evaporated, and condensed milk the loss of vitamin-*B* was 50% of that present in fresh milk. Only small quantities of vitamin-*C* were present. A. A. ELDRIDGE.

Relation between constants of butter fat. O. LAXA (Ann. Falsif., 1930, 23, 159—160).—The relation (RM+WP+i)/n stated (B., 1928, 374) to be a constant is now shown to rise from 1.4 to 1.59 during the months June to September owing to the fact that during this period the iodine value rises more than the refraction. It is also shown that the relation (RM+WP+i)/s(where s = solidif. pt.) rises from 2.8 to 3.6 during the period February to September. It is suggested that this number is below 3 for butters produced while the cows are on dry food, and above 3 for butters produced while the cows are having green food. A. SHORE.

Testing of casein for technical purposes. H. ULEX (Chem.-Ztg., 1930, 54, 421-422).-The following method is recommended for the determination of the acidity, calculated as lactic acid, of commercial preparations of casein: 1 g. of the powder is dissolved in 25 c.c. of 0.1N-sodium hydroxide at 20° and 175 c.c. of a 3% solution of calcium chloride previously neutralised to phenolphthalein are added, followed by 25 c.c. of 0.1N-hydrochloric acid and 8 c.c. of potassium mercuriiodide solution (1.35 g. of mercuric chloride and 5 g. of potassium iodide in 100 c.c. of water); the mixture is diluted to 250 c.c. with freshly boiled water and 100 c.c. are filtered through a dry paper and titrated with 0.1N-sodium hydroxide using phenolphthalein as indicator. The total acidity of a good casein should not exceed the equivalent of 1.75% of lactic acid.

A. R. POWELL.

Determination of acids in silage by Wiegner's method. K. GREIST (Tierernähr., 1929, 1, 65-69; Chem. Zentr., 1930, i, 1873).—A diagram permitting direct reading of the amounts of acetic and butyric acids has been constructed. A. A. ELDRIDGE.

Baking value of flour, and possibility of determining it in the laboratory. A. TASMAN (Chem. Weekblad, 1930, 27, 138—143).—An account is given of the attempts to correlate chemical and physical constants, particularly viscosity and swelling power, with baking properties. Valuable information may be obtained by determinations of viscosity in presence of regularly increasing quantities of acid, the differences in viscosity being plotted to form a curve. From the form of the curve for a given flour, rough estimates may be made of the ash content, gluten content, and swelling power. S. I. LEVY.

"Adulterated "olive oil in sardines. H. WEWERS (Z. angew. Chem. 1930, 43, 656).—High iodine values of the oil used in preparing sardines, thought to be due to adulteration of the olive oil, were found to be associated with the extraction from the sardines of a fat of very high iodine value by the pure oil.

S. I. LEVY.

Gelation of fruit juices. W. ZIEGELMAYER (Kolloid-Z., 1930, 52, 243-248) .- Viscosity measurements of boiled fruit juices have been made and the values compared with the loss of water. In general, high viscosity goes with high pectin content and of acid, so that unripe fruit juices gelate better. The tendency to gelate in the juices examined is in the following order : black currant \rightarrow gooseberry (unripe) \rightarrow tomato \rightarrow apple (unripe) \rightarrow gooseberry (ripe) \rightarrow rhubard. Rhubard juice contains little pectin and does not gelate readily in spite of its high content of acid. The tendency to gelate can be influenced considerably by the presence of other substances, especially sugar, the addition of which causes an enormous increase in viscosity. Medium concentrations of acid (about 0.1N) have the most favourable effect on the gelation of mixtures of fruit juices and sugar. On keeping, the viscosity of fruit juices and their tendency to gelate diminish. Moulds were observed to grow only on preparations poor in sugar or in pectin, and even then not when exposed to free circulation of dry air.

E. S. HEDGES.

Chemical and bacteriological examination of lemonade. C. DUPONT (Ann. Falsif., 1930, 23, 141—145). —The results of examinations of seven samples are recorded and the necessity for adopting hygienic methods of manufacturing and bottling is stressed.

A. SHORE.

Desiccation of potatoes. LÜHDER and others.— See XVIII.

PATENTS.

Process of sterilisation. J. W. YATES, ASST. to GENERAL LABORATORIES, INC. (U.S.P. 1,754,251, 15.4.30. Appl., 9.5.28).—The sterilisation of plant used in connexion with milk, e.g., in creameries, condenseries, and bottling plants, is effected by atomising a solution containing 100—500 p.p.m. of available chlorine in close proximity thereto. The effective agent is hypochlorous acid, formed by the reaction of the chlorine with atmospheric carbon dioxide. It is claimed that the solution of hypochlorous acid so produced has also a highly solvent action on the film of casein adhering to the surfaces in such plants. C. JEPSON.

Apparatus for the treatment [sterilising and drying] of fish materials. W. H. HASLAM (B.P. 332,241, 16.4.29).

Drying of grass (B.P. 327,409).—See XVI. Pure, constant yeast (B.P. 311,315).—See XVIII. Preserving organic etc. matter (B.P. 331,546).—See XXIII.

XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Toxicity of different samples of mercurochrome 220. J. H. BURN and G. K. ELPHICK (Quart. J. Pharm., 1930, 3, 178—186).—Determinations of the toxicity of eight commercial samples of mercurochrome by intravenous injection into mice showed a variation of the lethal dose (causing 50% mortality) from 37 mg. to 140 mg. per kg. There was no parallelism between high toxicity and high mercury content except in extreme cases. A limiting toxicity of 105 mg. per kg. is suggested for commercial products. A simple method of determining toxicity is described. R. K. CALLOW.

Evaluation of tincture of iodine. E. RUPP and G. HAMANN (Apoth.-Ztg., 1930, 45, 67—68; Chem. Zentr., 1930, i, 1982).—Potassium iodide is determined in the solid residue after evaporation; the residue is also tested for chloride and bromide. After the determination of free iodine an additional quantity of sodium thiosulphate is added; the appearance of turbidity within 10 min. indicates the presence of acid decomposition products. A. A. ELDRIDGE.

Evaluation of tincture of iodine. G. FRERICHS (Apoth.-Ztg., 1930, 45, 161; Chem. Zentr., 1930, i, 1982; cf. preceding abstract).—For the determination of total iodine the tincture is treated with ferric chloride solution; after 1 hr. it is diluted, treated with phosphoric acid and then with potassium iodide, and titrated. An acidimetric determination of hydrogen iodide is desirable. A. A. ELDRIDGE.

Constituents of aperient drugs. L. ROSENTHALER (Pharm. Acta Helv., 1929, 4, 128—132; Chem. Zentr., 1930, i, 1948).—Légers formula for barbaloin (A., 1917, i, 276) is criticised. An osazone could not be prepared, and the anticipated acid was not produced by heating with dilute nitric acid. The reduction of alkaline copper sulphate solution is attributed to reduction products analogous to anthranols. No methoxyl group could be detected, and the existence of a penta-acetyl derivative is not considered to be established. *as*-Phenylmethylhydrazine affords a derivative which does not exhibit the characteristics of an osazone.

A. A. ELDRIDGE.

Pharmacology of ergot with special reference to biological assay and standardisation. VII. Changes occurring in crude ergot and fluid extract of ergot, U.S.P. X, during storage. VIII. Bioassay standards for ergot and its preparations. M. R. THOMPSON (J. Amer. Pharm. Assoc., 1930, 19, 436-449).—If the drug is kept dry the loss of alkaloidal activity in whole ergot during storage (1-2 years) is not serious. Airtight containers are not necessary, and

are to be avoided unless the drug is kept dry by a suitable dehydrating agent. Storage of powdered ergot results in an appreciable loss in activity unless the fixed oil is first removed. The acid value of the fixed oil increases during storage, but this bears no relationship either to the specific alkaloidal activity or the nonspecific amine content. Storage of the dry material causes no significant change in the histamine or other proteinogenous amine contents, but damp samples rapidly develop these amines. The deterioration of fluid extract of ergot in specific alkaloidal activity is hastened by exposure to air and is decreased by storage in a refrigerator; its rate is more rapid during the first three months, after which it becomes slower and more constant, but even if the preparation is kept in partially evacuated ampoules, a slight but definite loss in activity cannot be avoided. From a consideration of the proposed standards for ergot, the author recommends that the fluid extract should have an alkaloid content of 0.05%. Ergotamine tartrate is a better standard

than is either the phosphate or ethanesulphonate; it is more definitely crystalline and gives a better solution. E. H. SHARPLES.

Approximate determination of alkaloid in fluid extract of ergot. H. ESCHENBRENNER (Apoth.-Ztg., 1929, 44, 1534 ; Chem. Zentr., 1930, i, 1665).—The extract (10 c.c.) is treated with alcohol (10 c.c.) and dilute hydrochloric acid (5 drops), and evaporated to 5 c.c. Water (10 c.c.) is added, and 10 c.c. of the filtrate are treated with 2 c.c. of Mayer's reagent and 4 g. of sodium chloride. The mixture is placed in a burette. The volume of the precipitate should reach at least 2 c.c. in 2 hrs. A. A. ELDRIDGE.

Stability of tincture of digitalis, B.P., as estimated by the frog method. F. Wokes (Quart. J. Pharm., 1930, 3, 205-217).—Periodical assay by the frog method of tinctures of digitalis showed that the activity decreased initially by about 3% per month, reaching two thirds of the initial value after 16-17 months, whereas the author (*ibid.*, 1929, 2, 48) found no deterioration by the cat method. Variation in $p_{\rm H}$ from 5.47 to 5.93 did not appear to affect deterioration, contrary to the statement of Joachimoglu and Bose (B., 1924, 766), but the rate of deterioration was increased at $p_{\rm H}$ 8. The diminution of potency is not due to delayed absorption in the frog.

R. K. CALLOW.

Determination of pilocarpine. P. BOURGET (Schweiz. Apoth.-Ztg., 1930, 68, 381–382).—The ground and sifted jaborandi leaves (25 g.) are moistened with 200 c.c. of 10% sodium carbonate solution and extracted in a Soxhlet apparatus for 3 hrs. with benzene; the cold extract is immediately extracted with 1% sulphuric acid in portions of 30, 20, 20, and 10 c.c., and the combined acid extract is filtered, neutralised to Congo-red with ammonia, and treated with 1% potassium permanganate solution until one drop produces a rose tint which persists for a moment. After the addition of excess of ammonia the solution is extracted about 10 times with chloroform and the united chloroform extract (50–60 c.c. total), after filtration over dry and powdered sodium carbonate, is neutralised with 2% nitric acid and then evaporated to dryness on a water-bath. The residue is treated with a small quantity of acetone, which removes the impurities without affecting the pilocarpine nitrate, and filtered through a Gooch filter, which is then dried below 100° and weighed. The white crystalline powder should have m.p. about 174-175°; if the assay is for the manufacture of pilocarpine, it should not be below 165°. If the benzene extract be kept for very long before extraction with sulphuric acid, the alkaloid content decreases rapidly. If before adding sodium carbonate the leaves are extracted with a hot solvent, the alkaloid content of the subsequent benzene extract is not affected on keeping. Apparently the substance which provokes the decomposition exists in the leaf and is removed by extraction. E. H. SHARPLES.

Polish rhubarb. M. RUSZKOWSKI (Spraw. Prac. Państ. Inst. farm., 1925, 15 pp.; Chem. Zentr., 1930, i, 1339—1340).—The percentage of extract, the content of anthraquinone derivatives, and the ash content of Polish varieties of rhubarb are recorded.

A. A. ELDRIDGE.

Use of the bismuth-iodine reagent in the evaluation of galenical hemlock preparations. M. M. JANOT and C. FAVRE (Bull. Sci. pharmacol., 1929, 36, 529-541; Chem. Zentr., 1930, i, 1191).-The extract (2 g.) is dissolved in water (5 c.c.), treated with 10 c.c. of sodium hydroxide solution, and extracted twice with 25 c.c. of ether, the united extracts being acidified with sulphuric acid, treated dropwise with the reagent (prepared from bismuth carbonate 2 g., officinal hydrochloric acid 5 c.c., potassium iodide 12.5 g., and water 25 c.c.), and filtered after 5 min. The precipitate is collected, washed with water acidified with sulphuric acid, heated with 35 c.c. of sodium hydroxide solution at the b.p. for 10 min., distilled into 0.1N-sulphuric acid, titrated, and calculated as coniine. Tests with guinea-pigs show that the fatal dose is 0.01-0.02 g. per kg. A. A. ELDRIDGE.

Composition of cinchona febrifuge. J. A. Goodson and T. A. HENRY (Quart. J. Pharm., 1930, 3, 238-248).—In applying the Howard and Chick process for the separation of cinchona alkaloids to "cinchona febrifuge," the composition of the fractions obtained has been checked by determinations of methoxyl content and optical rotation. The quinine does not as a rule crystallise as the sulphate, but is precipitated at the second stage with cinchonidine tartrate. The amount of quinine in the bases from the tartrate is calculated from the methoxyl content. For the determination of quinidine Chick's modification of the method ("Allen's Organic Analysis," 5th Ed., 1929, Vol. 6, p. 426) is satisfactory, the precipitate consisting of practically pure quinidine hydriodide, but the quality of the cinchonine " isolated is variable, and may be roughly gauged by ascertaining the yield of "crystallisable cinchonine" obtainable from it. R. K. CALLOW.

Camphor substitutes. H. GOLDSTEIN (Bull. Soc. chim. Belg., 1930, 39, 197-205).-A lecture.

A. I. VOGEL.

Sensitive colour reaction for rivanol, and its application. M. J. SCHULTE (Pharm. Weekblad, 1930,

67, 601—604).—The diazo reaction gives a deep red dyestuff, fast to wool and silk, but not to cotton. The reaction may be applied for colorimetric determination in pharmaceutical preparations. S. I. LEVY.

Homœopathic aconite and gelsemium preparations. H. NEUGEBAUER (Apoth.-Ztg., 1930, 45, 80–82; Chem. Zentr., 1930, i, 1983).—The tincture is evaporated with hydrochloric acid, made ammoniacal, and extracted with ether; the ethereal residue is titrated. The factor 0.03322 is recommended for gelsemine instead of 0.03222. A. A. ELDRIDGE.

Identification of homeopathic preparations by luminescence analysis. H. NEUGEBAUER (Pharm. Ztg., 1930, 75, 885-889).—Preparations which give identical results under normal conditions of capillary analysis (cf. B., 1930, 82) can, in many cases, be differentiated by treatment of the "capillary picture" with certain reagents before the examination under ultraviolet light. Many examples are given and also the results of the examination of various drugs at different dilutions. E. H. SHARPLES.

Determination of essential oils [in drugs]. H. GFELLER (Pharm. Acta Helv., 1929, 4, 200—201; Chem. Zentr., 1930, i, 1665).—The method of D.A.B. VI. gave consistent results. Preparations of juniper fruit containing at least 1% of essential oil could not be obtained; German and Swiss camomile gives a blue, Hungarian a green, and camomile smalls a brown oil of unpleasant odour. A. A. ELDRIDGE.

Physiological aspects of the essential oils. G. M. Dyson (Perf. Essent. Oil Rec., 1930, 21, 287-314). —A review.

Oleum deelinæ [dee oil]. KESSLER.-See II.

PATENTS.

Production of monohydric phenols. Boot's PURE DRUG Co., and J. MARSHALL (B.P. 330,333, 26.3.29). *n*-Amylcresols, having a phenol coefficient of 250—300, are prepared from tolyl *n*-valerates by treatment with aluminium chloride and reduction of the resulting ketone by Clemmensen's method. The preparation of 3-valerylo-cresol, m.p. 18°, b.p. 140—150°/15 mm., 5-valeryl-ocresol, m.p. 103—104°, b.p. 200—205°/15 mm., 3-*n*-amylo-cresol, m.p. 32°, 5-*n*-amyl-o-cresol, m.p. 29°, 4valeryl-*m*-cresol, m.p. 6°, b.p. 152—154°/15 mm., 4-*n*-amyl-*m*-cresol, m.p. 24—25°, b.p. 137—139°/15 mm., 3-valeryl-*p*-cresol, m.p. 32—33°, and 3-*n*-amyl-*p*-cresol, m.p. 10°, is described. C. HOLLINS.

Rubber derivatives (B.P. 313,919).--See XIV.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Comparison of resolving power and sensitivity of photographic plates with varying development. B. H. CARROLL and D. HUBBARD (Bur. Stand. J. Res., 1930, 5, 1—11).—Five special developers recommended for reducing the graininess of photographic images were compared with pyrogallol and metol-quinol. Little useful improvement over the standard developers was obtained as increased resolution was accompanied by decreased sensitivity. The results do not apply to pictorial photography. C. J. SMITHELLS.

Photography on copper. C. J. SMITHELLS (Nature, 1930, 126, 133).—Immersion of a copper or brass surface for 10 sec. in a 10% solution of copper chloride or of copper ammonium chloride renders the surface sensitive to light. Details for obtaining photographic images on such surfaces are given. L. S. THEOBALD.

Desensitisers. III. Desensitising properties of chrysoidine and some of its derivatives. (MISS) F. M. HAMER (Phot. J., 1930, 70, 232-233; cf. B., 1929, 1032) .- The desensitising power of chrysoidine and of the hydrochlorides of six of its derivatives have been investigated and compared with that of safranine. The sample of chrysoidine used was as powerful as safranine (most samples are inferior), but it retarded development much more strongly. The methyl derivative was less powerful, whilst the bromo-derivative and benzene-3-azo-5-chloro-2: 4-tolylenediamine hydrochloride were as efficient as safranine. The time of appearance of the image with these three compounds was approximately the same as with safranine ; chlorochrysoidine and its methyl derivative were more powerful than safranine, and whereas the former retards development to the same extent as chrysoidine, the latter shows even stronger retardation. The desensitising power of these compounds is shown to be a property of the hydrochlorides, since the corresponding bases and p-toluene-3-azo-5-chloro-2: 4-tolylenediamine are very feeble desensitisers. Such compounds are therefore not satisfactory as practical desensitisers, since the desensitisation conferred in a preliminary bath is destroyed by the alkali of the developer.

J. W. GLASSETT.

Anti-fogging and anti-sensitising effects. S. E. SHEPPARD (Z. wiss. Phot., 1930, 28, 85–90).—See B 1929, 151.

PATENT.

Manufacture of light-sensitive silver halide emulsions. O. MATTHIES and B. WENDT, Assrs. to AGFA ANSCO CORP. (U.S.P. 1,758,576-7, 13.5.30. Appl., 28.1.29. Ger., 31.1.28).—See B.P. 305,143; B., 1930, 793.

XXII.-EXPLOSIVES; MATCHES.

Nitrocellulose service powders. M. VUKADINOVIĆ (Arhiv Hemiju, 1930, 4, 139—142).—The maximum pressure of the gaseous products of combustion of a powder is the greater the smaller is the solubility of the nitrocellulose. The disruptive power is the greater the higher is the nitrogen content, on which the quickness of the powder also depends. The degree of gelatinisation of a powder influences its density. C. W. GIBBY.

XXIII.—SANITATION; WATER PURIFICATION.

Sterilisation of water by ultra-violet light as emitted by the carbon arc. R. G. PERKINS and H. WELCH (J. Amer. Water Works' Assoc., 1930, 22, 959-967).—Small-scale experiments, using a carbon arc in place of the usual mercury lamp, show that an adequate sterilising effect can be obtained through a distance of 12 in. with an exposure of 4 sec. during which the column of water is constantly advancing towards the source of light. Since the range of effective radiation is at least 12 in., it follows that a volume of water passing a single arc may have a radius of 12 in. provided the exposure towards and away from the source of light amounts to 4 sec. C. JEPSON.

Zeolite [water-]softening plant experiences. D. E. DAVIS and J. T. CAMPBELL (J. Amer. Water Works' Assoc., 1930, 22, 952-958).-Comparison of operating results of a 2,000,000 gal./day pressure-type plant and a 4,000,000 gal./day open-type filter indicates that whereas the former was operated at twice the rate of the latter, rather less hardness was removed per cub. ft. of sand and more difficulty was experienced in preventing loss of the zeolite when washing. Average operating results of the open-type plant are as follows : hardness of raw water 194 p.p.m.; hardness of final water 63 p.p.m.; length of total softener run 559 min.; hardness removal 4004 grains/cub. ft.; salt required for regeneration 0.334 lb. per 1000 grains of hardness C. JEPSON. removed.

Determination of hardness of water. E. F. TEBENIKHIN (J. Chem. Ind., Russia, 1929, 6, 222–236).— Clark's method, using soap solution standardised with barium chloride, gives low results for calcium and high results for magnesium salts. Hard waters should first be diluted to a hardness of 3—5°. Wartha and Pfeifer's method gives low results for waters below 3° hardness, whilst Blacker's method gives high results for soft corrected and boiler waters. The palmitic acid is preferably obtained from Japan wax, and is neutralised with potassium hydroxide in glycerol solution.

CHEMICAL ABSTRACTS. Determination of sodium [in water]. E. R. CALEY and C. W. FOULK (J. Amer. Water Works' Assoc., 1930, 22, 968—976).—A rapid gravimetric and colorimetric method of determining sodium in water consists in precipitating sodium as magnesium uranyl sodium acetate with a solution of magnesium uranyl acetate in acetic acid, and either weighing the precipitate or redissolving it and comparing colorimetrically with a standard sodium solution treated in a similar way. The accuracy of the method is stated to be equal to, if not higher than, that of the standard method of the A.P.H.A. C. JEPSON.

Determination of urea in water. M. H. McCRADY (J. Amer. Water Works' Assoc., 1930, 22, 926-937).— The general assumption that urea in aqueous solution is rapidly converted into ammonium carbonate is shown not to be the case for dilute solutions unless acidified, and, moreover, free ammonia may be removed by boiling the sample without destroying any urea present. If the urea nitrogen be then converted into ammoniacal nitrogen by means of urease a measure of the urea originally present is obtained. Detailed instructions for making the determination are given, and, as it is capable of a sensitivity of the order of 0.004 mg. of urea nitrogen, it may prove a useful indicator of the presence of excretal pollution in sanitary water analysis. C. JEPSON.

Variation of phenol coefficients of coal-tar disinfectants with different test organisms. B. G. PHILBRICK (Ind. Eng. Chem., 1930, 22, 618-619).-From a study of the phenol coefficients of coal-tar disinfectants of various concentrations with different organisms it is possible, if the *B. typhosus* phenol coefficient is known, to ascertain the approximate efficiency of a disinfectant against *Staph. aureus*, *B. diphtheriæ*, *Strep. hemolyticus*, and *Pneumococcus* in presence or absence of organic matter. This may be expressed as the phenol coefficient or as maximum dilution which will kill the given organisms in 5 min. in presence of organic matter. Determinations were made of the maximum dilutions of disinfectants which would kill *B. tuberculosis* in sputum in 1 hr., using intraperitoneal inoculations into guinea-pigs, so establishing the relationship between phenol coefficient for *B. typhosus* and power of sterilising tubercular sputum. W. J. BOYD.

Theory of gas masks. II. W. MECKLENBURG (Kolloid-Z., 1930, 52, 88—103).—The theory of adsorption so far as it is applicable to gas masks is worked out and the conclusions reached explain the experimental results of Schilov, Lepin, and Wosnessensky (A., 1930, 27). E. S. HEDGES.

Test for industrial lead poisoning; presence of basophilic red cells in lead poisoning and lead absorption. C. P. McCord (U.S. Bur. Labour Statistics, Bull., 1928, No. 460, 33 pp.).

PATENTS.

Purification of boiler feed water. P. JÓHANNSSON (B.P. 331,778, 7.10.29).—A method and apparatus are claimed in which waste heat and waste steam are utilised to produce distilled water for use in the boiler. The waste steam is superheated by passing through a pipe coil placed in the furnace flue or funnel smoke box and its heat utilised to boil water in an evaporator. The steam produced is separated from the boiling liquor and passed to the feed water supply. C. JEPSON.

Water purification. J. T. TRAVERS and O. M. URBAIN, ASSTS. to OHIO SANITARY ENGINEERING CORP. (U.S.P. 1,754,129, 8.4.30. Appl., 13.7.28).—Sewage or water is mixed with a non-putrescible colloidal marl or plastic clay and the $p_{\rm H}$ value raised, e.g., by calcium hydroxide, so that the colloids carry a negative charge. An electrolyte, characterised by its capacity to dissociate, is also added with the result that the positive ions so released are adsorbed by the colloids and the negative ions are able to release enough nascent oxygen from the water to satisfy the biochemical oxygen demand of the sewage or completely to sterilise the drinking water as the case may be. C. JEPSON.

Water purification [from phenols etc.]. J. T. TRAVERS, C. H. LEWIS, and O. M. URBAIN, ASSIS. to OHIO SANITARY ENGINEERING CORP. (U.S.P. 1,754,068, 8.4.30. Appl., 27.8.28).—Phenolic substances may be completely removed from water by treatment with a mixture of the hydroxides of iron and calcium and marl clay (minimal amounts, $4 \cdot 4$, $14 \cdot 8$, and 30 grains per gal., respectively), or waste cement dust in which all free lime and calcium carbonate has been neutralised with sulphuric acid. To secure complete removal a reaction period of at least 10 min. and $p_{\rm H}$ above 10.8 are necessary. C. JEPSON.

Air-purifying apparatus (B.P. 307,428).—See I. Sterilisation (U.S.P. 1,754,251).—See XIX.