

BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

FEB. 12 and 19, 1932.*

I.—GENERAL; PLANT; MACHINERY.

Sampling relations with special reference to quantitative microscopy. J. D. WILDMAN (J. Assoc. Off. Agric. Chem., 1931, 14, 563—570).—The statistical principles of sampling errors are discussed and the relation governing the variations in successive samples of mixed good and bad units (seeds etc.) is shown by a simple equation from which the standard deviation, A , can be calc. $A = \sqrt{(PQ/N)}$, where $P = \%$ of good units, $Q = 100 - P$, $N =$ size of sample in units, from which P is calc. Where N is < 30 , $N - 1$ should be used. The results obtained were found to be very close to standard deviations calc. from actual counts of distribution. Microscopical applications are quoted with spore-starch grain mixture and rag-chemical wood fibres.

H. R. JENSEN.

Diaculator or percolator [for fluid extracts]. H. BREDDIN (Pharm. Ztg., 1931, 76, 1302—1304).—The superiority of diaculation over percolation, which latter is fundamentally faulty, for the preparation of fluid extracts is discussed.

E. H. SHARPLES.

New type of ring test-piece for the Schopper tensile machine. F. H. COTTON and G. L. BARRON (Trans. Inst. Rubber Ind., 1931, 7, 67—80).—A test-piece cut with the two circular knives placed eccentrically so as to give a ring of the same vol. as the standard, but with a max. and min. width of 5 mm. and 3 mm., respectively, gives a tensile strength (calc. on the min. cross-section) greater than that of a standard ring. The stress-strain curve is practically unaltered in shape and two rings suffice, instead of the customary six, to give a trustworthy average for the ultimate strength. It is possible so to place the eccentric ring on the machine as to ensure breaking between the pulleys and on either side as desired. With the eccentrically cut ring the tendency of some compounded stocks to rupture by tearing is reduced.

D. F. TWISS.

Plant for synthetic resins.—See XIII.

PATENTS.

Oil-fuel furnaces. J. W. JONES (B.P. 361,993, 3.9.30).—An air inlet for an oil burner is described.

B. M. VENABLES.

Conveyance of goods through furnaces and the like. A. SMALLWOOD and J. FALLON (B.P. 362,078, 8.10.30).—In a conveyor of the "walking-beam" type having alternating series of longitudinal bars which reciprocate and rise and fall, the driving gear is constructed so that, at the moment at which the load is transferred from one series of bars to the other, all bars have the same longitudinal velocity.

B. M. VENABLES.

Steam-generating system. F. W. GAY (U.S.P. 1,807,783, 2.6.31. Appl., 12.4.29).—High-pressure superheated steam is generated and superheated in the same vessel by means of sprays of highly heated metal. The superheating is effected inside an inner shell spaced from the pressure-resisting wall of the boiler, while saturated steam is caused to flow through the annular space, thus protecting the wall from the max. heat. The metal is heated in a pipe coil of considerable height, the coldest metal entering at the bottom where the static pressure is greatest, and the hot metal from the top being pumped to the boiler sprays. Provision is made for reheating steam exhausted from a high-pressure turbine.

B. M. VENABLES.

Heat-interchanging apparatus. SERCK RADIATORS, LTD., and C. O. AGNER (B.P. 362,073, 4.10.30).—Elements for the construction of radiators for cooling fluids are constructed of strips of metal, each strip having the long edge bent twice at right angles; to strengthen the channels thus formed the metal may be bent back on itself previous to bending at right angles. The web portion may be bent so as to form sinuous or prismatic passages for the cooling air.

B. M. VENABLES.

Evaporating ovens. CHEM. WERKE VORM. H. & E. ALBERT (B.P. 361,289, 15.8.30. Ger., 15.8.29. Addn. to B.P. 283,495; B., 1929, 269).—The apparatus described in the prior patent is operated also with direct contact of heated gases, preferably not gases of combustion.

B. M. VENABLES.

Evaporating apparatus. J. GOLDING, and DECO, LTD. (B.P. 360,038, 1.8.30).—Above a pair of heated rolls is placed an M-shaped vessel of sheet material within which the vapour arising from the drying rolls rises. The liquid to be evaporated is supplied to the trough formed by the upper part of the M, is there pre-heated, and falls in films down the outside of the legs where initial evaporation takes place, such evaporation being aided by a draught through a surrounding hood. The liquid is then spread on the rolls by gutters at the feet of the M and the evaporation completed on the rolls which run towards each other.

B. M. VENABLES.

Apparatus for condensing vapours and/or for exothermic chemical reactions, particularly applicable to production of nitric acid from nitrous vapours. APPAREILS & EVAPORATEURS KESTNER (B.P. 359,313, 3.1.31. Fr., 6.1.30).—The nitrous acid is sprayed on the inside surface of a tower which has no filling and is cooled by water flowing over the outside; the walls are thin and of heat-conducting material.

B. M. VENABLES.

Absorption machines for producing cold or heat. SIEMENS-SCHUCKERTWERKE A.-G. (B.P. 359,058, 22.7.30.

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

Ger., 25.7.29).—In order to prevent transfer of heat from a warm part of the apparatus to a colder part by actual movement of the inert gas, the refrigerant vapour is caused to flow by diffusion only from the evaporator to the absorber, the inert gas being preferably lighter than the refrigerant. In the case of NH_3 a mixture of He and Ne is recommended; H_2 , though excellent for diffusion, is rather too good a conductor. Baffles are provided which permit eddy currents in a useful direction, but discourage them in the direction of temp. difference. In one form of apparatus an intermediate vessel is provided also containing inert gas which permits a second stage of both boiling off and absorption to be effected and in which the warm dil. solution in an open-tray boiler in the upper part flows countercurrent to the cool conc. solution in the lower part, the vessel being elongated to give the countercurrent effect. The use of two stages enables waste steam at a comparatively low temp. to be used as heating medium. B. M. VENABLES.

Pulverising apparatus. CLARKE, CHAPMAN & CO., LTD., and W. A. WOODSON (B.P. 359,231, 1.11.30).—A pulveriser, adapted to operate on moist coal, is provided with a feeder comprising a belt conveyor attached to a hinged door forming one side of the pulverising chamber and driven through a gear shaft coincident with the hinge pin. B. M. VENABLES.

Material-treating device. H. G. LYKKEN (U.S.P. 1,807,923, 2.6.31. Appl., 19.8.27).—An air-borne pulverising system is described. B. M. VENABLES.

Grinding apparatus. T. KETIN (B.P. 362,327, 28.5.31. Addn. to B.P. 358,568; B., 1932, 3).—A form of scraper is described. B. M. VENABLES.

Grinding mills. BABCOCK & WILCOX, LTD. From BABCOCK & WILCOX Co. (B.P. 359,979, 30.7.30).—A grinding mill of the double-ball-race type is provided with a quartering device by which half the original material is supplied to each ring of balls, the oversize not carried away by the air current being returned to the lower race. B. M. VENABLES.

Vibratory ball mills. C. N. G. WILDE (B.P. 361,992, 3.9.30).—The material and grinding media are placed in a trough which is subjected to severe vibration, preferably about an axis along one edge. B. M. VENABLES.

Colloidal mill. B. M. DAWSON, Assr. to F. ZIEGLER, JUN. (U.S.P. 1,807,773, 2.6.31. Appl., 30.3.25).—The cylindrical or slightly conical co-operating surfaces are provided with axial grooves of which the width of the teeth is less than that of the channels. The action has three elements, viz., film-shearing when teeth are opposite each other, film-beating when teeth are approaching, and churning when grooves are opposite. B. M. VENABLES.

Separation of dry materials. I. L. BRAMWELL, and BIRTLEY IRON CO., LTD. (B.P. 358,986 and 362,341, [A] 11.4.30, [B] 26.5.30).—In (A) the material is stratified by upward pulsating currents of air, the net upward flow being produced by vac.-producing means and the pulsations by pistons or bellows placed close to, above, and covering about the same area as, the bed. The pistons over different parts of the bed may be operated under different conditions of stroke, height

above the bed, and speed. In (B) the lower layer is removed by the currents of air passing upwardly and forwardly through suitably inclined passages in the bed. B. M. VENABLES.

Pneumatic separator for cocoa powder and other pulverulous material. R. G. NEUMANN (B.P. 360,125, 18.9.30. Ger., 6.11.29).—The apparatus comprises a blower, and a number of cyclone sifters situated round an air filter where the finished cocoa is collected; the oversize is withdrawn from the bottoms of the sifters by cell-wheel air-locks and returned to the blower until completely freed from "fines." B. M. VENABLES.

Centrifugal machines. SIEMENS-SCHUCKERTWERKE A.-G. (B.P. 359,369, 1.5.31. Ger., 27.2.31).—In a centrifugal machine, the reduction of pumping of air by reducing the clearance between the basket and casing causes precession of the basket by compression of air opposite the narrowest space; in the direct-coupled machines described the precession is removed from the basket to the casing itself by suspending the latter in a non-rigid manner, preferably directly but resiliently to the housing of the motor. The driving hub of the basket may be made fan-shaped to draw air between the motor and the extension of the casing surrounding it. B. M. VENABLES.

Centrifugal bowls. AKTIEB. SEPARATOR (B.P. 360,189, 4.11.30. Swed., 7.11.29).—A bowl for the separation of liquids containing solid matter has the end of the inlet channel at a larger radius than the edges of the driving discs, so that accumulated solids eventually stop the admission of feed. This effect is enhanced by providing radial wings to cause the sludge to set firmly. The outlet for lighter liquid is also provided with a trap at its greatest radius, which becomes sealed by the heavy liquid so that the line of division of light and heavy liquids is held at that radius. B. M. VENABLES.

Self-draining centrifugal bowls. AKTIEB. SEPARATOR (B.P. 362,329, 29.5.31. Swed., 5.6.30).—A loose sleeve is provided to protect the drainage hole near the axis. B. M. VENABLES.

Collecting vessels for centrifugal separators. AKTIEB. SEPARATOR (B.P. 359,321, 13.1.31. Swed., 14.1.30).—Means are provided to lift up the covers, between which the collecting passages are formed, one at a time on hinges. B. M. VENABLES.

Aperiodic mounting for centrifugal extractors. T. A. BRYSON (B.P. 359,282, 9.12.30. U.S., 12.12.29).—The spindle is provided with a mounting which is more flexible in one horizontal direction than in the other; e.g., an annular rubber block may be used which is thicker in some places than in others, or rigid material may be inserted at intervals. B. M. VENABLES.

Filters or strainers. J. A. PICKARD, F. ROGERS, and W. MITCHELL (B.P. 358,927, 11.4.30).—A device for filtering a fluid flowing under pressure, e.g., lubricating oil, is described. The filter may be cleaned while in operation by reverse flow produced by a depression of a piston on the outlet side of the apparatus combined with the operation of a rotating cage-like scraper. A by-pass with spring-loaded valve is provided to permit oil to flow when the filter is completely choked. B. M. VENABLES.

Filtering apparatus and method of operation. E. J. SWEETLAND (B.P. 361,920, 22.8.30).—A suction-type filter is surrounded by a casing and operated in an atm. of compressed gas. B. M. VENABLES.

Emulsification or mixing of soluble and insoluble substances. D. M. A. G. HAWES (B.P. 360,171, 20.10.30).—The apparatus comprises a cylindrical screen within which is a propeller and guide forcing the liquid upwardly and outwardly through the screen; it may be suspended at different levels, starting at the interface of two liquids if they are not already mixed. B. M. VENABLES.

Reducing the liquid contents of materials which have many capillary spaces. A. TEN BOSCH (B.P. 359,984, 28.4.30).—The material, *e.g.*, peat or oil seeds, is placed in a basket or other vessel having a drainage surface, brought into contact with a heated liquid different from that in the pores of the material, and simultaneously subjected to pressure. The removal of the entrained liquid is due to the fall in van der Waals "tangential pressure," so that simultaneous cooling of the interior of the mass is advisable. B. M. VENABLES.

Cleansing of flue gases and the like. PNEUMATIC CONVEYANCE & EXTRACTION (1929), LTD., and W. A. SMITH (B.P. 361,968, 29.8.30).—The gases are cleaned by contact with wetted surfaces in two stages: (a) the surfaces are covered by a continuous, rapidly moving layer of water sufficient to prevent corrosion; (b) the water is applied only in small amount and corrosion of the surfaces encouraged. Treatment with alkaline or other solutions may follow if desired. B. M. VENABLES.

Flue-gas washing and purification with means for minimising effluent. CHEM. ENG. & WILTON'S PATENT FURNACE CO., LTD., T. O. and N. WILTON, H. E. J. GREEN, and H. C. MANN (B.P. 360,127, 18.9. and 3.12.30).—The gases are scrubbed with milk of lime and/or CaCO_3 ; the quantity of alkali must, at any rate in the later stages, be in excess so that the whole of the SO_2 and SO_3 are pptd. in solid form, leaving a practically pure effluent, but it may be advisable to use insufficient reagent in the early stages with formation of $\text{Ca}(\text{HSO}_4)_2$ and $\text{Ca}(\text{HSO}_3)_2$. B. M. VENABLES.

[Visual] detection of suspended matter in fluids. H. C. GRANT, JUN., ASST. to W. KIDDE & Co., INC. (U.S.P. 1,807,659, 2.6.31. Appl., 25.2.28).—In an apparatus in which a beam of light is rendered visible by suspended matter, a direct image and a reflected one are viewed superimposed by means of a mirror. B. M. VENABLES.

Recovery by cold of one constituent in a gas mixture. L'AIR LIQUIDE SOC. ANON. POUR L'ETUDE ET L'EXPLOIT. DES PROC. G. CLAUDE (B.P. 359,279, 6.12.30. Ger., 4.3.30).—The constituent is frozen (or condensed) in one, and simultaneously sublimed (or evaporated) from the other, of two reversible indirect heat exchangers, the transfer of heat being effected by a fluid circulating in a closed cycle and subjected to compression between the cold and hot exchangers and expansion between the hot and cold, reversal of flow being effected when the transfer of heat becomes poor or at incipient choking. The process is applicable to the isolation of C_2H_2 , and

by operating at a suitable pressure the formation of liquid C_2H_2 may be avoided. B. M. VENABLES.

Gastight seals. BRIT. THOMSON-HOUSTON CO., LTD., ASSEES. of J. W. CASE (B.P. 362,190, 29.12.30. U.S., 28.12.29).—A gastight seal is made between a metallic sleeve and a metallic rod by means of a vitreous compound, *e.g.*, 50% of mica and 50% of Pb borate. The sleeve and compound are heated to the softening point of the latter and the rod, rather hotter, is pressed through them. B. M. VENABLES.

Refractometers. C. ZEISS (B.P. 359,320, 12.1.31. Ger., 14.1.30).—The divisions of the main scale (which is in the image plane) are subdivided by rotating the image very slightly by means of the greater rotation by hand of a parallel plate inserted between the objective and the image plane and placed at an angle to the axis. B. M. VENABLES.

[Boiler] furnace structures. CLARKE, CHAPMAN & Co., LTD., ASSEES. of SOC. ANON. DES APPAREILS DE MANUTENTION ET FOIRS STEIN (B.P. 360,251, 19.12.30. Fr., 19.12.29).

Absorbent clay.—See VII. **Coated Fe tubes.**—See X.

II.—FUEL; GAS; TAR; MINERAL OILS.

Coal-dust explosions in underground tunnels and elimination of coal dust in mines. V. I. BELOV (Trud. Vsesoyuzn. Gorn. Nauk Tekh. Syezda, 1928, 9, 25—59).—The nature of the inflammability of the dust is independent of the content of volatile matter. The occluded dust explodes more readily than $\text{H}_2\text{--O}_2$ mixtures. The size of the particles is inversely proportional to the explosion temp. and the dryness is directly proportional to the violence of the explosion. The rate of flame propagation is a function of the diameter of the particles. The inflammability of the dust is related to the temp., duration, and vol. of the flame. H_2O is "about 2.4 times more active" than ash in lowering explosibility; this ratio is about the same as that of the sp. heats. The length of flame is related to the sp. gr. of the dust cloud. The dust explosion consists of (a) explosion of the dust itself, and (b) that of the explosive fraction of it. Coal dust which has undergone partial oxidation or in which the oxidation process has been interrupted exhibits a greater resistance to explosion.

CHEMICAL ABSTRACTS.

Carbon residue in certain explosions. A. ALBERTO (Ann. Acad. brasil. sci., 1930, 2, 187—188).—As the equilibrium $\text{C} + \text{CO}_2 \rightleftharpoons 2\text{CO}$ is disturbed, an increase in pressure causes a decrease in CO and H_2O and an increase in CO_2 and CH_4 , accompanied by deposition of C. Rise in temp. increases the concn. of CO. Free C retards the decomp. of CO. CHEMICAL ABSTRACTS.

Blending of coal for carbonisation purposes. **Suitability of constituents.** J. G. KING (Fuel, 1931, 10, 521—531).—In carbonising blends of a coking coal and a "high volatile" coal of low coking power a preliminary oxidation of the latter at 200° had no effect on the strength of the resultant coke. It is concluded that the constituent of low coking power acts merely as a diluent and that variations in its properties are without influence on the results obtained. The strength

of the coke does not vary regularly with the proportions of the two coals in the blend; the mixture giving the coke of max. strength must therefore be found by experiment. The reactivities of blend cokes vary regularly with the proportions of the constituent coals (cf. Jones, B., 1931, 999). When blends of coking coal and coke are carbonised the resultant coke is strongest if the diluent coke contains a high percentage, e.g., 15%, of volatile matter. If it contains $> 5\%$ of volatile matter the resultant coke is larger but weaker; with cokes of intermediate volatile matter content the resultant coke is smaller and weaker than either of the above. It is suggested that a high-volatile matter coke combines more readily with the coking coal during melting and forms a stronger connecting layer than does a low-volatile matter coke, whereas with the latter the absence of gas formation allows greater permeability of the plastic coal into the pores of the coke, giving a more continuous structure and larger coke. Low-temp. coke which has been reheated to remove most of its residual volatile matter gives the best compromise between strength and size in the blend coke. The nature of the coal used for the manufacture of the diluent coke has no influence on the blend. Coke made from coal-coke blends has a greater combustibility than coke made from coal and is suitable for use in the domestic open grate. For the laboratory evaluation of the suitability of the constituents of blends a modification of Audibert's method (B., 1929, 501) would seem to be the most satisfactory; preliminary experiments with a method based on the measurement of the rate of coking of the blend show some promise.

A. B. MANNING.

Carbonisation of resinous wood and of its sawdust. M. COUTANT (Bull. Assoc. Chim. Sucr., 1931, 48, 352—355).—On carbonisation in special plant, pine wood yielded somewhat less charcoal, pyroligneous acid, and wood alcohol than barked oak, but more tar and 1.8% of crude pine oil. Results are given also of carbonisation tests of the two kinds of sawdust, which was kept stirred during the heating. As the plant is readily transportable, its use in colonial forests is suggested. Utilisation of charcoal for automobile purposes in the colonies exhibits certain advantages over that of petrol.

T. H. POPE.

Graphitisation. K. ARNDT and A. POLLACK (Z. anorg. Chem., 1931, 201, 81—112).—Graphitisation of different carbonaceous materials has been studied by measurements of electrical resistance. Generally, graphitisation is complete at 2400—2450°, incomplete at 2100°, and only slight at 1650°. Among different specimens of anthracite it takes place most readily in those of greatest geological age and lowest initial resistance. Of other materials examined, viz., petrol coke, foundry coke, gas coke, wood charcoal, and retort carbon, the last-named was most easily graphitised. X-Ray examination indicated that graphitisation occurs mainly by the growth of graphite crystal nuclei (10^{-5} cm.) already present to crystals of 10^{-4} cm. The experiments did not establish a favourable influence of high ash content.

F. L. USHER.

Water hyacinth as a source of power. H. K. SEN (Trans. II World Power Conf., 1930, 6, 221—237).—

Air-dry *Eichornia crassipes* contains H_2O 13.46, C_6H_8 -sol. matter 1.15, fat and wax 7.70, cold H_2O -sol. 21.64, hot H_2O -sol. 23.64, sol. in 1% NaOH 45.51, lignin 11.31, pentosan 13.33, cellulose 21.89 (Cross and Bevan's method) or 42.23 (ClO_2 method), N 1.45—1.73, volatile matter 62.4, α -cellulose in cellulose 16.49—16.94, ash 19.75%. The ash contains Cl 25.56, CO_3 6.46, SO_4 4.72, P_2O_5 6.21, SiO_2 2.44, $Fe_2O_3 + Al_2O_3$ 13.31, CaO 9.39, K + Na 32.00%. Balance sheets are given for: saccharification by acid digestion and subsequent fermentation; gasification by air and steam with recovery of NH_3 ; and bacterial fermentation with utilisation of the evolved gas for power production.

CHEMICAL ABSTRACTS.

Viscosity of tar, pitch, etc. H. PICKARD (Chem. and Ind., 1931, 1000).—Remarks by Broome and Thomas (J.S.C.I., 1931, 50, 425) are criticised. Inability to obtain consistent results with different instruments and different tars is probably due to pseudo-viscosity effects, and not to the inaccuracies of the instruments. Tars containing solid paraffinoid compounds or uncarbonised coal dust would exhibit pseudo-viscosity, and in these cases determinations must be made at const. temp.

R. N. B. D. BRUCE.

Ring-and-ball method. F. C. EATON (J. Rheology, 1931, 2, 392—394).—Improvements in this method for determining the softening point of bituminous material are suggested. The loss of volatile constituents on heating affects the softening point, and a standard and uniform rate of rise of temp. should be adopted.

E. S. HEDGES.

Considerations affecting the use of coal tar for road-surfacing operations. H. PICKARD (Gas J., 1931, 196, 549—552).—Bleeding usually results from the use of an excessive proportion of tar. Too large-sized aggregate results in excessive wear, due to increased frictional resistance to traffic, great retentivity of moisture after rain contributing to disintegration of the surface, but the latter is non-slippery; too small aggregate gives a quick-drying but slippery surface; a reasonable compromise is an aggregate of $\frac{3}{8}$ -in. stone. Fine powder resulting from disintegration of aggregate leads to a reduced period of usefulness of road; hence aggregate should be mechanically strong. Tar has good wetting power at all normal temp. Failure of tar to adhere is generally due to overloading with sand. Tar becomes more viscous by loss of volatile matter on heating, but chemical changes on exposure play no part in the adhesive value. When the road surface is rough, spreading at too high a temp. may lead to the formation of a tar film too thin to hold stone, whilst spreading at too low a temp. may produce a film thick enough to cause bleeding.

D. K. MOORE.

Determination of olefinic, aromatic, and paraffin hydrocarbons in neutral oil from coal tar. E. B. KESTER and W. D. POHLE (Ind. Eng. Chem. [Anal.], 1931, 3, 294—297).—The oil is treated with 80% H_2SO_4 to remove olefines, the residue distilled to a point 5° above the end-point of the original oil, and the aromatic hydrocarbon content of the distillate determined by the decrease in vol. after treatment with 98% H_2SO_4 ; distillation and solubility corrections are made. The

paraffin content is found by difference. Numerous examples (synthetic mixtures and oils of the Roda and Elkhorn series) are given. H. BURTON.

Analysis of light oils from low- and intermediate-temperature carbonisation. E. B. KESTER and C. R. HOLMES (Ind. Eng. Chem. [Anal.], 1931, 3, 292—294).—The method involves fractionating the oil (freed from olefines by treatment with cold H_2SO_4), determining the aromatic hydrocarbon content of the fractions by sulphonation of a portion with 3 vols. of 98% H_2SO_4 (the unsulphonated residue is designated as paraffin hydrocarbon), and calculating the proportion of C_6H_6 and PhMe in the fractions containing mixtures of these from distillation data. The method gives good results with synthetic mixtures. Analyses of oils obtained by carbonisation of coal from the Davis and Mary Lee beds at 500—1100° are given. H. BURTON.

Catalytic decomposition of kerosene. E. W. KANNING and O. W. BROWN (J. Physical Chem., 1931, 35, 2689—2710).—With catalysts of Co, Mn, Fe, or Ni, supported on pumice, a rise in temp. (290—550°) resulted in increased decomp. of kerosene (b.p. 200—230°), with an increased vol. of gaseous product, a decreased vol. of liquid product, and an increased deposition of C. Further, when liquid products were formed the I val. also increased with temp. The C deposited is proportional to the quantity of liquid decomposed by the catalyst; the C deposited at lower temp. renders the catalyst less active, but that formed at higher temp. has little effect. The catalysts exhibit sp. properties with regard to the nature of the products, and their ability to decompose the kerosene fraction, b.p. 200—230°, is $\text{Co} > \text{Fe} > \text{Ni} > \text{Mn}$. The Co catalyst produces the greatest vol. of gas in the shortest time and effects a complete conversion of the kerosene at 500°, which is 50° lower than with Fe. With a rise in temp. and Co catalyst the % of H_2 increases and that of CH_4 decreases; with Mn and Fe the converse obtains, whilst with Ni the % of H_2 reaches a max. and that of CH_4 decreases. Only Ni gives unsaturated hydrocarbons in the gaseous product to any significant extent, but Co gives traces above 400°. Ni and Mn at 550° favour the production of large quantities of paraffins above CH_4 . The gas with the largest % of H_2 (90.5) is obtained with Fe at 400°, and with the largest % of CH_4 (46.4) with Ni at 390°.

L. S. THEOBALD.

Variation in m.p. of mineral oils accompanied by change of state. "Tempering" of oils. P. WOOG and (MLLES.) E. GANSTER and F. COULON (Compt. rend., 1931, 193, 850—852).—Certain mineral oils, congealed at —85°, show different m.p. according to the rate of cooling, the time during which the oil is kept at the congealing temp., and the temp. of the bath in which fusion takes place, the m.p. tending to a const. val. as the rate of cooling is reduced and the time of maintenance at temp. of congelation prolonged, i.e., as the oil is more completely "tempered." It is concluded that the oil solidifies in two forms: (a) vitreous, of lower, and (b) cryst., of higher, m.p., and that time is required for the conversion of (a) into (b).

C. A. SILBERRAD.

Funnel for oils.—See XII. **Anti-fouling paints.**—See XIII.

PATENTS.

Treatment of coal. C. P. ANDERSON (U.S.P. 1,807,817, 2.6.31. Appl., 29.1.30).—The screened run-of-mine coal is immersed in a solution, e.g., of CaCl_2 or ZnCl_2 , of sp. gr. sufficiently high to cause the pure coal to float and to allow the impurities to sink. The coal is conveyed continuously from the surface of the solution and is allowed to retain permanently the adsorbed salt solution, whereby its combustible properties are improved. A. B. MANNING.

Production of solid fuel and binder therefor. TRENT PROCESS CORP. (B.P. 361,619, 24.11.30. U.S., 26.11.29).—Pulverised anthracite etc. is briquetted with a binder consisting of bituminous coal particles coated with the residue from the distillation of a hydrocarbon oil. The binder is produced preferably by distilling a coal-oil amalgam formed by agitating an aq. suspension of coal with a heavy oil.

A. B. MANNING.

Regenerative coke ovens. J. E. POLLAK. From HINSELMANN KOKSOEFENBAUGES. M.B.H. (B.P. 360,956, 11.8.30).—The regenerators extend in the same direction as the heating walls, and the walls of the main regenerators are constructed of stretcher bricks and transversely spaced header bricks to form hollow walls, the spaces within which are available for utilisation as auxiliary regenerator chambers, e.g., as poor gas regenerators. The headers may also contain passages through which rich gas may be led to the heating flues. The flues are associated in pairs of adjacent flues, each pair being connected to one of the main regenerators and to one of the auxiliary regenerators. Two superimposed passages connected together by openings are provided under all the main regenerators, the lower passages serving to supply combustion air in the one direction of draught and to lead away flue gases in the other direction; the openings connecting the passages are provided with members for regulating their aperture.

A. B. MANNING.

Manufacture of carbon black. W. B. WIEGAND (U.S.P. 1,807,884 and 1,809,290, [A] 2.6.31, [B] 9.6.31. Appl., [A] 18.2.29, [B] 25.1.30).—(A) C black produced by the impingement of a hydrocarbon gas flame on a cool surface is subsequently calcined at about 650° in a non-oxidising atm.; the mechanical properties of vulcanised rubber compounds made therewith are much improved. (B) In the "channel" process for C black, provision is made for collecting separately the C deposited on the central longitudinal part of the channel faces and that deposited on the outer longitudinal parts. The former constitutes a product of low adsorptive capacity especially suitable for use in the manufacture of vulcanised rubber. A. B. MANNING.

Gasification of fuels. SOC. OXYTHERMIQUE, *Assees.* of M. FRANKL (B.P. 362,317, 4.5.31. Ger., 15.10.30. Addn. to B.P. 357,853; B., 1931, 1130).—When using a bituminous fuel in the producer described in the prior patent the duration of each run is periodically lengthened by an amount sufficient to allow the temp. of the issuing gases to rise to 400°. The tar which has accumulated during

the normal run is thereby vaporised and removed from the system. A. B. MANNING.

Destructive hydrogenation of carbonaceous materials in the liquid phase. H. HARPER, R. SCOTT, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 361,135, 2.12.30).—The materials are treated in stages at successively higher temp., the first stage, *e.g.*, at 420–440°, being carried out in a vertical cylindrical reaction vessel, preferably of height at least 10 times its diam., and the second stage, *e.g.*, at 450–480°, in an annular vessel surrounding the first vessel. A. B. MANNING.

Treatment of fuel by destructive hydrogenation etc. G. ZOTOS (B.P. 361,714, 24.1.31. Ger., 6.2.30).—The material to be cracked or hydrogenated is heated by direct contact with the gases from a burner wherein a combustible gas is brought into contact with air or O₂ preheated before it enters the burner to above the ignition temp. of the gas. Both gas and air are under pressure. The temp. in the combustion chamber is controlled by regulating the air supply automatically. A. B. MANNING.

Determining the net heating value of fuels. H. JUNKERS (B.P. 361,271, 27.5.31. Ger., 14.7.30).—The fuel is supplied continuously to a burner and the heat of combustion is transmitted to a steady flow of a cooling medium, *e.g.*, H₂O, as in a known type of calorimeter. The arrangement is modified, however, in such a manner that the H₂O of combustion condensed in the heat exchanger of the calorimeter is continuously evaporated and its heat of evaporation is deducted from the heat of combustion of the fuel. This may be effected by evaporating the H₂O in a coil heated by the flame of fuel in the calorimeter itself, or the H₂O may be evaporated by a separate source of heat and recondensed by the flow of the cooling medium, the rise in temp. of the latter being measured and deducted from the rise in temp. observed in the calorimeter itself. A. B. MANNING.

Treatment of sulphur-bearing gases. W. G. HIATT, Assr. to PHILLIPS PETROLEUM Co. (U.S.P. 1,807,528, 26.5.31. Appl., 21.11.27).—To gases containing H₂S, *e.g.*, natural gas used in the production of C black, air is added and the mixture is passed through a reaction zone above 180° wherein the H₂S is oxidised to SO₂, the gas being subsequently maintained at a temp. above the condensation point of the H₂O vapour present until it is consumed. Formation of sulphides and deposition of S in the distributing line are thereby avoided. A. B. MANNING.

Production of a methane-hydrogen mixture, free from carbon monoxide, from industrial gases containing same. H. KEMMER (B.P. 361,476, 16.9.30. Ger., 16.9.29).—A plant is described suitable for carrying out the process of B.P. 356,838 (B., 1931, 1083). It consists essentially of a heat exchanger and intermediate and end gas-reaction towers through which the initial gas is passed in succession, and so arranged that the gases issuing from the reaction towers serve to heat the initial gas. The plant includes also a supercooler for gas purification and a waste-heat boiler etc. The catalyst in the reaction towers is preferably supported on metal screens which can be heated electrically. A. B. MANNING.

Production of asphalt. STANDARD OIL Co., Assees. of C. P. McNEIL and S. A. MONTGOMERY (B.P. 361,158, 17.12.30. U.S., 18.12.29).—Hot petroleum residua are introduced into the top of a tower, preferably 30–40 ft. high, down which they flow countercurrent to a stream of air. A number of towers may be used in series to produce an asphalt of any desired characteristics. A. B. MANNING.

Preparation of asphalt. N. V. DE BATAAFSCHE PETROLEUM MAATS. (B.P. 361,173, 31.12.30. Holl., 15.1.30).—Asphalt-containing material, *e.g.*, crude petroleum, is distilled with the aid of a heat carrier, *e.g.*, a portion of the distillation residue from a previous operation, which is liquid and substantially non-volatile at the distillation temp. By this process asphalt of high m.p. (above 100°) may be obtained without undue C deposition. A. B. MANNING.

Bituminous emulsions. SALVIAM, Assees. of C. G. J. LEFEBVRE and E. E. F. BERGER (B.P. 362,299, 2.4.31. Fr., 12.12.30).—The breaking-down of aq. emulsions of bitumen containing coal as the emulsifying agent, on the addition of H₂O or fillers, is prevented by the addition of a small quantity, *e.g.*, 0.1%, of the salt of an acid, other than H₃PO₄, which forms a highly insol. Ca salt, even in the presence of CO₂, *e.g.*, the fluoride, oxalate, or fluosilicate of Na or K. A. B. MANNING.

Increasing the spreading capacity of bitumen, asphalt, etc. with the aid of additional substances. R. TRAUT (B.P. 361,564, 30.10.30. Ger., 14.2.30).—Fine coal ash from pulverised-coal burners is mixed intimately with the molten bitumen. A. B. MANNING.

Cracking of petroleum oil. G. EGLOFF, Assr. to UNIVERSAL OIL PRODUCTS Co. (U.S.P. 1,806,618, 26.5.31. Appl., 10.12.20. Renewed 9.6.26).—The uncondensed gases from the receiver, fresh HCl gas, and the reflux from the dephlegmator are passed into the pipe conveying the raw oil to the cracking furnace. Chlorohydrocarbons and light oils, *e.g.*, gasoline and kerosene, are produced. D. K. MOORE.

Apparatus for treating [cracking] hydrocarbon oil. G. EGLOFF and H. P. BENNER, Assrs. to UNIVERSAL OIL PRODUCTS Co. (U.S.P. 1,806,619, 26.5.31. Appl., 1.9.20. Renewed 2.7.28).—Oil is cracked by passing through a number of heated coils and thence to a still placed in the furnace flue. The liquid is drawn off and the vapours are passed into a chamber the reflux from which is re-circulated through the coils. The vapours are condensed with or without previous dephlegmation. D. K. MOORE.

Cracking of hydrocarbon oils. E. W. ISOM, Assr. to SINCLAIR REFINING Co. (U.S.P. 1,807,241—2, 26.5.31. Appl., [A] 27.9.27, [B] 27.12.29).—The pressure difference across the filter medium in the drum (cf. U.S.P. 1,634,666; B., 1,927,674) is maintained by taking off vapours from above and below the medium separately, the latter being at a lower pressure than the former. The vapours may be refluxed separately or together and the reflux liquids returned either with the feed to the cracking furnace or to the drum either above or below the filter bed. The pitch may be withdrawn from the drum to a vessel from which the vapours pass to one of the reflux towers. D. K. MOORE.

Manufacture of hydrocarbons of low b.p. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 361,944, 25.7.30).— CH_4 and its gaseous homologues are passed several times through tubes which may contain catalysts, e.g., Si, graphite, at $500\text{--}950^\circ$, with short reaction periods (10–60 sec.), the temp. being raised and the reaction period decreased for each successive treatment. The liquid products, chiefly C_6H_6 , are removed between each treatment. D. K. MOORE.

Production of liquid hydrocarbons [by hydrogenation]. J. MARUHN and L. TÜBBEN (U.S.P. 1,807,122, 26.5.31. Appl., 10.3.30. Ger., 16.12.25).—The apparatus for the hydrogenation of finely-divided coal or oil consists of a hydraulic press in which the plunger acts as a valve for closing the inlet passages. The reaction is started by increasing the temp. and pressure. D. K. MOORE.

Fractionation of liquids such as mineral oils and the like. A. E. EARL and T. W. REEVES (U.S.P. 1,799,414, 7.4.31. Appl., 25.2.27).—A series of inter-connected stills is maintained under pressures that vary progressively > 1 atm. to < 1 atm. Oils are introduced under sub-atm. pressure into the units of one portion of the system. Superheated steam is made to flow through the first-mentioned portion of the series of stills and allowed to expand in those units which are at a pressure below atm. The pressures of the steam in the different units are used for maintaining levels of the oil at variant altitudes relatively proportional to the pressures, while maintaining a quiescent flow of oil through a portion of the system and removing certain component fractions of the oil from the unit with the greatest vac., and recovering the fractions obtained from the last-mentioned unit. H. S. GARLICK.

Refining of oil. A. E. PEW, JUN., ASSR. to SUN OIL CO. (U.S.P. 1,799,640, 7.4.31. Appl., 14.6.27).—Finely-divided, relatively cold, liquid oil and Hg vapour are mixed and sprayed into a relatively unconfined space of substantial vertical height, the Hg vapour being hotter than the oil and by contact therewith effects, by heat exchange and condensation, the vaporisation of part of the oil. The unvaporised oil and condensed Hg are allowed to fall through the space while the rising oil vapours are fractionally condensed; the condensate is returned through the space to the unvaporised oil, the condensed Hg being separated therefrom by gravity. H. S. GARLICK.

Treatment [purification] of [petroleum] oils. W. M. STRATFORD, ASSR. to TEXAS CO. (U.S.P. 1,807,183, 26.5.31. Appl., 24.11.24).—The H_2SO_4 used in the process may be added gradually and the sludge formed separated after the addition of each portion. The settlement of the sludge is facilitated by agitating the oil with a finely-divided inert material, e.g., sand, clay. After neutralisation, but before separation of the aq. layer, steam is blown through the oil. D. K. MOORE.

Refining and purification of hydrocarbon oils. J. C. MORRELL, ASSR. to UNIVERSAL OIL PRODUCTS CO. (U.S.P. 1,799,431, 7.4.31. Appl., 25.3.26).—The oil is heated in the presence simultaneously of added metal, e.g., Zn, and an oil-sol. acid, e.g., glacial AcOH , as a step

in the refining process, in order to convert the refractory S compounds into those more readily removable.

H. S. GARLICK.

Manufacture of lubricating oil [of low pour point]. (A) H. T. BENNETT and (B) LE R. G. STORY, (B) ASSR. to J. CHATFIELD (U.S.P. 1,806,735, 26.5.31. Appl., 24.10.27).—The pour point of lubricating oil is lowered to -23° to -26° by adding to the oil, at above 149° , 0.05–0.3 wt.-% of a soap, e.g., Al or Zn stearate or palmitate, or, at $65\text{--}82^\circ$, 0.05–0.2% of a stabiliser, e.g., $\text{CH}_2\text{Ph}\cdot\text{OH}$, cyclohexanol, $\text{CH}_2\text{Ph}\cdot\text{OAc}$, or glycerin, in addition to the soap. D. K. MOORE.

Heat-treatment of hydrocarbon oils in presence of hydrogen. C. J. FRANKFORDER (B.P. 362,967, 9.9.30).—See U.S.P. 1,780,873; B., 1931, 528.

Means for supplying [burners of] furnaces with pulverised coal. TODD DRY DOCK, ENGINEERING & REPAIR CORP. (B.P. 362,954, 5.8.30. U.S., 5.4.30).

Heating of coke ovens with alternately ignited top and bottom burners. GAS CHAMBERS & COKE OVENS, LTD., ASSEES. of COLLIN & CO. KOMM.-GES. (B.P. 363,243, 7.3.31. Ger., 13.3.30).

Apparatus for burning liquid fuels. H. JUNKERS (B.P. 363,162, 9.1.31. Ger., 27.1.30).

Pulverisers. Filters. Reducing the liquid contents [of peat]. [Separation of] gas mixtures.—See I. Fatty acids from hydrocarbons. Disperse systems.—See III. Alkali-coke briquettes. Adsorbent clay.—See VII.

III.—ORGANIC INTERMEDIATES.

Complex catalysts for the synthesis of methyl alcohol. V. A. PLOTNIKOV, K. N. IVANOV, and D. A. POSPEKHOV (J. Chem. Ind., Russia, 1931, 8, 472–478).—Cu is a poor catalyst for the synthesis of MeOH from CO and H_2 ; Cr_2O_3 is more energetic, the chief reaction being $2\text{CO} + 2\text{H}_2 = \text{CH}_4 + \text{CO}_2$. Addition of ZnO or Cr_2O_3 to Cu increases its activity; addition of both is more effective. The activity of the complex catalyst is impaired by addition of Na_2CO_3 , Ag, or MgO.

CHEMICAL ABSTRACTS.

Sulphonation of benzene. A. I. ZAKHAROV (J. Chem. Ind. Moscow, 1929, 6, 1648–1656).— C_6H_6 in a pressure tank is dried by H_2SO_4 and flows into a sulphonator at the bottom of which it is heated, evaporates, is sulphonated, and escapes with the H_2O formed into a condenser, whence the mixture flows into the pressure tank and settles out. Reaction proceeds smoothly and H_2O evaporates when the concn. of H_2SO_4 is about 90%. The reaction is stopped when the amount of H_2SO_4 falls to 4–4.5%; about 0.5–1% of sulphones will then be present. The design of the apparatus is discussed. CHEMICAL ABSTRACTS.

Production of *p*-nitroaniline from *p*-chloronitrobenzene by direct amination. I. VASSERMAN (J. Chem. Ind., Russia, 1930, 7, 1523–1525).—6 mols. of (24% aq.) NH_3 were used per mol. of $\text{C}_6\text{H}_4\text{Cl}\cdot\text{NO}_2$ during 7–8 hr. at 25–36 atm.; the yield (crude) was 97–98%. The product was recrystallised from dil. NH_3 at 4–6 atm. CHEMICAL ABSTRACTS.

Preparation of Schäffer's acid. I. I. VORONTZOV (J. Chem. Ind., Russia, 1930, 7, 1287—1829).—By sulphonation of β -naphthol with 2 pts. of 95–97% H_2SO_4 during 36 hr. at a low temp. approx. equal quantities of β -naphthol-8-sulphonic acid and Schäffer's acid are obtained. By sulphonation during 2–3 hr. at 80–85° with 1.5 pts. of H_2SO_4 the yield of sulphonic acids is 60%, Schäffer's acid constituting 75–80%.

CHEMICAL ABSTRACTS.

Sulphonation of anthraquinone by sulphur trioxide. E. SCHWENK (Z. angew. Chem., 1931, 44, 912—913).— SO_3 , formed by heating 20% oleum, is led into anthraquinone at 150–170°, the product treated with H_2O , and the solution of sulphonic acid filtered from unreacted anthraquinone. Cooling and concn. of the filtrate yields Na anthraquinone-2-sulphonate of 85–90% purity. The influence of time on the reaction is indicated graphically.

F. O. HOWITT.

Acids from solar oil.—See II. C_2H_5 polymerides.—See XIV. **Determination of esters in liquors.**—See XVIII. CHCl_3 .—See XX.

PATENTS.

Recovery of fatty acids from oxidation products of hydrocarbons. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 358,278, 7.10.30).—Fatty acids are distilled (at 240–280°) from the crude oxidation acids by injecting a spray of inert liquid, preferably of b.p. below 105°, at reduced pressure (e.g., 18–28 mm.). Suitable liquids are H_2O (e.g., in wet steam), C_2HCl_3 , C_6H_6 , petrol, EtOH, etc. Hydroxy-acids and other by-products remain in the residue without decomp.

C. HOLLINS.

Manufacture of hydroxy-aliphatic amines. H. DREYFUS (B.P. 357,152, 16.6.30).—Aliphatic aldehyde, ketone, or glycol cyanohydrins are reduced, preferably in the liquid phase, with H_2 in presence of Ni, Cu, Pt, Pd, etc. β -Hydroxyethylamine is obtained from formaldehyde cyanohydrin (glycollonitrile).

C. HOLLINS.

Manufacture of disperse systems [dispersing agents]. W. W. GROVES. From I. G. FARBENIND. A.-G. (B.P. 358,202, 14.8.30).—Quaternary NH_4 salts derived from unsymmetrically acylated diamines are used in conjunction with other agents which assist dispersion. Examples are: benzyldiethyl- β -oleylaminoethylammonium chloride, lanoline, and Na oleate for paraffin oil or wax in H_2O ; methyldiethyl- β -oleylaminoethylammonium methanesulphonate and Na abietate for turpentine in H_2O ; the same methanesulphonate and NaOH for linseed oil in H_2O ; benzyldiethyl- β -oleylaminoethylammonium chloride and Na diisopropyl-naphthalenesulphonate for CS_2 in H_2O ; Me_2SO_4 compound of the product from castor oil and β -aminotriethylamine, and gelatin for NH_2Ph in H_2O .

C. HOLLINS.

Manufacture of hydroxyalkylamines [washing, wetting, and dispersing agents]. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 358,114, 5.7.30).—An aliphatic halogenated alcohol or an alkylene oxide is condensed with a primary or secondary aliphatic amine having at least 1 alkyl above C_8 . Examples are: heptadecylamine with ethylene chlorohydrin or glycerol α -chlorohydrin or ethylene oxide.

C. HOLLINS.

Manufacture of safrole derivatives such as (A) protocatechualdehyde and isoeugenol, (B) vanillin and isochavibetol. F. E. STOCKELBACH (U.S.P. 1,792,716—7, 17.2.31. Appl., [A] 12.5.27, [B] 17.5.27).—Safrole is heated with alcoholic KOH at 140–170°, whereby the alkyl group is isomerised to propenyl and the methylenedioxy-group is opened. The resulting mixture of 3(and 4)-hydroxy-4(and 3)-ethoxymethoxy-1-propenylbenzenes is selectively oxidised, e.g., with PhNO_2 , either (A) directly or (B) after methylation, to give, on hydrolysis of the ethoxymethoxy-group by dil. H_2SO_4 , isoeugenol and protocatechualdehyde, or isochavibetol and vanillin.

C. HOLLINS.

Manufacture of piperidine pentamethylenedithiocarbamate. IMPERIAL CHEM. INDUSTRIES, LTD. From E. I. DU PONT DE NEMOURS & Co. (B.P. 358,230, 12.9.30).—The reaction between piperidine and CS_2 is effected in a medium, e.g., petrol or cyclohexane, of b.p. below 250°, in which the reactants are sol. and the product is insol.

C. HOLLINS.

Manufacture of (A) dimethylaniline, (B) methyl-arylamines. E. C. BRITTON and W. H. WILLIAMS, Assrs. to DOW CHEM. CO. (U.S.P. 1,794,057 and 1,793,993, 24.2.31. Appl., [A] 9.4.27, [B] 25.10.28).—(A) NH_2Ph is completely dimethylated by heating for 12–20 hr. at 230–240°/700 lb. per sq. in. with 3–4 mols. of MeOH and < 1 mol. of MeBr. (B) Methylation of other arylamines (e.g., *p*-toluidine) is similarly facilitated by MeBr.

C. HOLLINS.

Production of [halogenated] phthalic anhydride derivatives. IMPERIAL CHEM. INDUSTRIES, LTD., C. SHAW, and J. THOMAS (B.P. 357,165, 14.3.30).—Nitro-groups in nitrated phthalic anhydrides are directly replaced by halogen; e.g., 3-nitrophthalic anhydride with Cl_2 at 240° gives the 3-chloro-compound, and nitrated 4 : 5-dichlorophthalic anhydride a trichloro-compound.

C. HOLLINS.

Isolation and purification of benzidine and its substitution products. H. J. WEILAND and I. GUBELMANN, Assrs. to NEWPORT CHEM. CORP. (U.S.P. 1,794,097, 24.2.31. Appl., 18.8.26).—Crude benzidine (etc.) is dissolved in boiling C_6H_6 , PhMe, PhCl, or petrol and the solution is filtered from inorg. matter; the pure base separates on cooling, the by-products being sol.

C. HOLLINS.

Manufacture of carbazole-2 : 7-disulphonic acid. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 358,056, 2.7.30).—2 : 7-Diaminodiphenyl-4 : 4'-disulphonic acid is heated in H_2O at 180° with addition of salts $[(\text{NH}_4)_2\text{SO}_4]$ or of about 1 mol. of alkali (NaOH), whereby ring-closure is effected without removal of SO_3H groups.

C. HOLLINS.

Manufacture of polycyclic compounds containing two CO groups. I. G. FARBENIND. A.-G. (B.P. 358,186, 7.8.30. Ger., 8.8.29. Addn. to B.P. 263,163; B., 1928, 361).—A 1 : 4- or 1 : 5-diaroylnaphthalene having halogens either *ortho* in the aryl ring or *peri* in the C_{10}H_8 ring, the corresponding positions being unsubstituted, is condensed in presence of alkali or acid-binding agents to give dibenzpyrenequinones. 1 : 5-Bis-*o*-chlorobenzoylnaphthalene with KOAc, KCN, Na_2CO_3 , or K phthalimide at 300° gives 1 : 2 : 6 : 7-dibenzpyrene-3 : 8-quinone.

1:4-Bis-*op*-dichlorobenzoylnaphthalene, m.p. 188—189°, yields 5':4''-dichloro-1:2:7:8-dibenzpyrene-quinone. C. HOLLINS.

Manufacture of condensation products of the anthraquinone series. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 358,066, 3.4. and 7.5.30).—A 2-halogeno-1-phthalimidoanthraquinone is condensed with a 1-aminoanthraquinone; the product may be hydrolysed with a mild alkali, *e.g.*, NaOPh or aq. NH₃, to give 1-amino-2:1'-dianthraquinonylamines. Examples of second components are: 1-aminoanthraquinone, 1-amino-5-benzamidoanthraquinone, 1-amino-4-methoxyanthraquinone, carbazole from 5:5'-dibenzamido-1:1'-dianthraquinonylamine, 3-chloro-1-aminoanthraquinone, 1-amino-3-benzoylanthraquinone, Et 1-aminoanthraquinone-3-carboxylate, 1-amino-4-*p*-toluidinoanthraquinone, carbazole from 4:4'-diamino-1:1'-dianthraquinonylamine. C. HOLLINS.

Production of esters of anthrahydroquinones. D. A. W. FAIRWEATHER, J. THOMAS, and SCOTTISH DYES, LTD. (B.P. 358,032, 25.3.30).—The sulphuric ester obtained from 1-chloroanthraquinone-2-carboxylic acid by the action of pyridine-sulphuric anhydride and a metal is treated with aq. NH₃, preferably in presence of a cupric salt, to replace the Cl by NH₂. The product may be used for dyeing in the usual way or may be diazotised and coupled with phenols. C. HOLLINS.

Manufacture of dichloro-2-methylantraquinones. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 357,985, 30.6.30).—2-Methyl- or 1-chloro-2-methylantraquinone is treated in H₂SO₄ at 70—100° with Cl₂ until a Cl₂-compound, m.p. 130—140°, is produced. C. HOLLINS.

Manufacture of a stable, water-soluble, yellow sulphuric acid ester [2:4-diphenyl-1:3:5-triazine-6-carboxylic leuco-anthraquinonylamide]. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 357,986, 30.6.30).—The leuco-amide is treated with SO₃ (*etc.*) in pyridine, NPhMe₂, or other *tert.* base, and the product is converted into the K or NH₄ salt, which on development on cotton gives stronger yellow dyeings than are obtained by vatting. C. HOLLINS.

Low-b. p. hydrocarbons.—See II. Anthraquinone derivatives. Anthraquinonenaphthacridone derivatives.—See IV.

IV.—DYESTUFFS.

Analysis of condensate formed during steaming of aniline-black. A. V. PAMFILOV and E. P. IVANCHEVA (Izvest. Tekstil. Prom., 1930, 9, No. 12, 78—80).—Owing to the presence of HCN and NH₂Ph, the HCl is preferably determined as Cl'. CHEMICAL ABSTRACTS.

Determination of amaranth and tartrazine in a food-colour mixture. O. L. EVENSON and R. H. NAGEL (Ind. Eng. Chem. [Anal.], 1931, 3, 260—262).—A 1% aq. solution of the mixture is treated with (NH₄)₂S [whereby the amaranth (I) is reduced], and after the original red colour changes to yellow, reaction is stopped by addition of Na H tartrate. The resultant solution is boiled and then titrated with TiCl₃, thereby giving the amount of tartrazine (II). Titration of the original solution with TiCl₃ in presence of Na citrate gives (I) + (II). The

amount of (I) can also be determined spectrophotometrically. H. BURTON.

Determination of sulphur dyes in vat dyes. M. P. SELIVANOV (Niti, 1930, 1, No. 6—9, 1—3).—The solution (25 c.c.) is treated with 2*N*-K₂Cr₂O₇ (10 c.c.) and H₂SO₄ (*d* 1.84, 50 c.c.), kept on the water-bath for 10 min., and then treated with cold H₂O (250 c.c.), the excess of K₂Cr₂O₇ being determined with I or KMnO₄. To determine the quantity of K₂Cr₂O₇ consumed by the dye itself the dye solution is treated with Mg(NO₃)₂ or MgSO₄; the ppt. is rapidly collected on a filter in absence of air, and the filtrate is oxidised with KMnO₄ solution. The difference between the two titrations indicates the K₂Cr₂O₇ required for oxidation of the dye. The K₂Cr₂O₇ is standardised against a pure S dye. CHEMICAL ABSTRACTS.

Oxidation of a sulphur black dye. R. S. OSIPOV (Niti, 1930, 1, No. 6—9, 3—5).—Perrette's conclusions are confirmed. When a S dye is dried it undergoes partial destruction as well as oxidation; hence any method of determining S which requires drying of the dye is untrustworthy. CHEMICAL ABSTRACTS.

PATENTS.

Improving the solubility of dyes. A. R. MURPHY and J. B. OESCH, Assrs. to NEWPORT CHEM. CORP. (U.S.P. 1,796,115, 10.3.31. Appl., 6.2.28).—Addition of Na pyrophosphate enables clear solutions to be obtained even with dyes, such as Congo-corinth, Direct Fast Yellow 5G, or Benzopurpurin 4B, which tend to form insol. lakes with hard waters. C. HOLLINS.

Production of dyes and intermediates [of the anthraquinone series]. IMPERIAL CHEM. INDUSTRIES, LTD., C. SHAW, and J. THOMAS (B.P. 357,164, 14.3.30).—Nitration is effected with HNO₃ in molten phthalic anhydride, preferably above about 140°. Examples of starting materials are dibenzanthrone at 220—250°, 3:3'-dibenzanthronyl at 150°, and Caledon Red BN at 140°. C. HOLLINS.

Manufacture of vat dyes [of the anthraquinone series]. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 357,195, 17.4.30).—Anthraquinone-acridone- or trioxanthone-carboxylic acids are converted into their arylamides, especially anthraquinonylamides. Examples are: anthraquinone-1:2-acridone-10-carboxylic α -anthraquinonylamide (red-brown), 4-methoxy- (red-brown) and 5-benzamido-1-anthraquinonylamide (brown); anthraquinone-2:1-thioxanthone-10-carboxylic anilide (violet), α -anthraquinonylamide (red-yellow), benzidide (orange), and 5-benzamido-1-anthraquinonylamide (red-yellow); anthraquinone-1:2-acridone-3-carboxylic 5-benzamido-1-anthraquinonylamide (orange); anthraquinone-1:2($\beta\beta$)-naphthacridone-11-carboxylic α -anthraquinonylamide (olive-green), and 5-benzamido-1-anthraquinonylamide (yellow-olive); anthraquinone-1:2($\beta\alpha$)-naphthacridone-2-carboxylic 4-methoxy-1-anthraquinonylamide (red-brown); anthraquinone-1:2-thioxanthone-3-carboxylic α -anthraquinonylamide (golden-yellow); anthraquinone-1:2-thioxanthone-1-carboxylic 5-benzamido-1-anthraquinonylamide (golden-yellow), and 4-benzamido-1-anthraquinonylamide (orange-red); anthraquinone-2:3-thio-

xanthone-1-carboxylic α -anthraquinonylamide (green-yellow), and 5-benzamido-1-anthraquinonylamide (golden-yellow); anthraquinone-2 : 1-thioxanthone-4-carboxylic 5-benzamido-1-anthraquinonylamide (green-yellow); anthraquinone-1 : 2-thioxanthone-10-carboxylic 3-methyl-6-pyrimidoneanthronylamide (orange).

C. HOLLINS.

Manufacture of new [acid] dyes of the anthraquinone series. CHEM. FABR. FORM. SANDOZ (B.P. 357,380, 3.10.30. Ger., 4.10.29).—A 4-halogeno-1-aminoanthraquinone, having halogen or SO_3H groups in positions 2 and either 5, 6, 7, or 8, is condensed with arylenediamines, and if necessary the product is sulphonated. Examples are: 5-chloro-2 : 4-dibromo-1-aminoanthraquinone with *p*-phenylenediamine (1 mol.), sulphonated (green-grey) or with 2 mols. of diamine, sulphonated (pure grey); 2 : 4-dibromo-1-aminoanthraquinone-5- or -8-sulphonic acid with *p*-phenylenediamine (green-grey; chromed, blue-grey).

C. HOLLINS.

Manufacture of [anthraquinonenaphthacridone] dyes and intermediates. IMPERIAL CHEM. INDUSTRIES, LTD., P. F. BANGHAM, and R. F. THOMSON (B.P. 357,285, 1.7.30).—Caledon Red BN is nitrated with HNO_3 alone or in an org. medium (PhNO_2 , $o\text{-C}_6\text{H}_4\text{Cl}_2$). The dinitro compound on reduction and benzoylation gives a grey vat dye.

C. HOLLINS.

Manufacture of azo dyes containing chromium. COMP. NAT. DE MAT. COL. & MANUF. DE PROD. CHIM. DU NORD RÉUNIES ETABL. KUHLMANN (B.P. 358,146, 10.7.30. Fr., 13.11.29).—Part of the Cr is eliminated from Cr complexes of dyes of the type: *o*-aminonaphthols \rightarrow pyrazolones by heating with dil. H_2SO_4 , preferably under pressure. The Cr compound of 1 : 2 : 4-aminonaphtholsulphonic acid \rightarrow 1-phenyl-3-methyl-5-pyrazolone gives after treatment bright pink shades on wool instead of dull bluish-reds.

C. HOLLINS.

Esters of anthrahydroquinones. Yellow sulphuric acid ester.—See III. Printing colours.—See VI. Colour lakes.—See XIII.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Emulsification process of cottonising. M. M. TSCHILKIN and R. I. KREINES (Niti, 1931, 1, No. 10—11, 13).—Flax waste is cottonised by treatment with NaOH (10%), "Kontakt" (5%), Na silicate (5%), and NaHSO_3 (5%) for 1 hr. Treatment for 1 hr. at 40–90° with NaOH (10%) containing Na silicate (5%) and keeping or 1 hr. at 90° is cheaper.

CHEMICAL ABSTRACTS.

Utilising stem of *Asclepias syriaca*. N. N. ORLOV (J. Chem. Ind., Russia, 1930, 7, 463–467).—The use of the material in the manufacture of paper and artificial silk is described.

CHEMICAL ABSTRACTS.

Characterisation of cellulose preparations by means of differences in solubility. I. SAKURADA (J. Soc. Chem. Ind., Japan, 1931, 34, 426–427 B).—The solubility of natural cellulose fibres in cuprammonium depends on the structure of the fibre and on the intermixed membrane elements that are removed by purification. Determination of the concn. of Cu in the cuprammonium solution necessary for dissolution of a certain amount of cellulose enables characteristic solu-

bility curves for the different kinds of cellulose to be obtained, thus affording a means of distinguishing between them.

B. P. RIDGE.

Hygroscopic moisture of cellulose. IV. S. OGURI and S. TERUI (J. Soc. Chem. Ind., Japan, 1931, 34, 422–426 B; cf. B., 1931, 1005).—The hygroscopic moisture content of cellulose nitrate decreases with increasing N content. The experimental curves expressing the relation between % H_2O in the material and the R.H. of the atm. with which it is in equilibrium coincide fairly well with those obtained by calculation from the equation $y = x/(a + bx + cx^2)$, where y is the moisture content at equilibrium, x the % R.H., and a , b , and c are consts. The shape of the curve showing the velocity of desorption is similar to that for the standard cotton cellulose.

B. P. RIDGE.

Dissolution of cellulose xanthate in water. I. SAKURADA (J. Soc. Chem. Ind., Japan, 1931, 34, 427 B; cf. preceding abstract).—The solubility of cellulose xanthate depends to a great extent on the purity of the cellulose fibres. The results obtained by Kita and Tomihisa (B., 1927, 675), which show that cellulose fibres that are xanthated to the same degree may have different solubilities, are held to support the fact that the solubility depends on the structure of the fibre, and especially on the internal membrane elements in the raw fibre.

B. P. RIDGE.

Swelling of cellulose in alkali. I, II. G. SAITÔ (J. Soc. Chem. Ind., Japan, 1931, 34, 437–444 B).—Cross-sections of viscose filaments prepared by the paraffin method are about 80% larger than when the cork method is used. Swelling of the sections in aq. NaOH increases rapidly with increasing concn. of NaOH until a max. is reached at 97 g. NaOH per litre, after which a decrease occurs which is rapid at first and then slow. The change in length with increasing concn. of NaOH is small, but there are generally two min. points and one max.; the latter also occurs at the concn. of 97 g. per litre. For filaments of higher strength and lower extensibility the first min. is displaced towards the side of more conc. NaOH. Near the first min. the % roundness of the cross-sections is a min., whilst at the max. point it is also a max. These phenomena are thought to be due to the arrangement of the cellulose micelles in the viscose, and the occurrence of the max. at a certain concn. of NaOH is considered to depend on some property, such as the osmotic pressure, of the solution. Ramie fibre shows only one min. in its length-change curve.

B. P. RIDGE.

Regeneration of used viscose precipitation baths. H. SCHMIDT (Chem. Fabr., 1931, 453–454, 464–465).—The reasons for the unsuitability of the usual types of vac. evaporators for the concn. of waste viscose liquors are outlined, and a detailed description and account of the method of operation of certain commercial vac. concn. plants designed for this purpose are given.

H. F. GILLBE.

Fractionation of nitrocellulose by means of aqueous acetone. J. CRAIK and F. D. MILES (Trans. Faraday Soc., 1931, 27, 756–767).—Eight technical nitrocelluloses have been fractionated by dissolution in aq. COMe_2 ; the larger portion of any nitrocellulose

tends to dissolve within a narrow crit. range of COMe_2 concn., but from samples which have received special treatment to reduce viscosity, less can be dissolved within a given range. Progressive extraction at const. temp. tends to remove material of continuously increasing viscosity and N content, and a nitrocellulose can be separated into a series of fractions each of which requires for dissolution aq. COMe_2 of definite crit. concn., the $\text{COMe}_2/\text{H}_2\text{O}$ ratio being, for any fraction, slightly lower than for the next fraction to be dissolved. The dissolving power of a solvent increases with temp. Owing to solvation, the results vary with concn. of nitrocellulose in a manner which, however, can be calc., and this factor also limits the wt. of material which can be dissolved.

J. G. A. GRIFFITHS.

Action of caustic solutions on soda pulp. F. BOGOIAVLENSKI and S. NOVIKOV (Bumazhnaya Prom., 1930, 9, No. 7, 23—28).—Bleached poplar pulp was treated for about 2 hr. at room temp. with caustic liquors. The β -cellulose contained 81.4% of pentosans. Max. solubility of the β -cellulose occurs at 2—3N-NaOH or -KOH. With NaOH, after the max. has been reached, the solubility curve falls rapidly with increasing concn., and with 10N-NaOH is practically zero. The curve of solubility in KOH falls slowly from 2 to 7N, and then rapidly from 7 to 10N.

CHEMICAL ABSTRACTS.

Sorption of water vapour by paper-making materials. I. Effect of beating. C. O. SEBORG and A. J. STAMM (Ind. Eng. Chem., 1931, 23, 1271—1275).—The relation between moisture content and R.H. in pulp is continuous, indicating that its hydration is physical rather than chemical. The desorption hysteresis is similar in air and in a vac. Beating does not affect the hydration, and consequently it is concluded that it is the increase in available bonding surfaces of the fibres for each other which affects the nature of the resulting paper. Beating has also no effect on the electrical conductivity-moisture content relations, showing that conduction depends only on the H_2O content and is independent of fibre-fibre bonding.

J. W. SMITH.

Combined bleaching of pulp. I. CHINCHIN and N. ROSENBERGER (Bumazhnaya Prom., 1930, 9, No. 10, 17—25).—The combined and two-stage processes are preferred; the saving in bleach is, respectively, 35% and 20%. Chlorinated lignin compounds are removed by use of NaOH (0.8—1.2% of dry wt. of fibre).

CHEMICAL ABSTRACTS.

Sampling relations.—See I. Cottonising.—See VI.

PATENTS.

Manufacture of water-resistant fibrous articles. D. F. SMITH, E. J. PIEPER, and C. C. VOGT, Assrs. to ARMSTRONG CORK CO. (U.S.P. 1,809,316, 9.6.31. Appl., 9.1.29).—Refuse wood chips from rosin-extraction plants, or other woods containing residual rosin, are ground with H_2O to form a pulp into which a drying or semi-drying oil dissolved in a solvent is beaten. The excess H_2O is removed, the fibres are felted into boards or other articles, and dried at 80—200° under pressure, whereby the rosin and drying oil react to form a H_2O -resistant film over the fibres.

B. P. RIDGE.

Manufacture of fibrous blocks. R. B. FULLER, Assr. to SOUNDEX CORP. (U.S.P. 1,805,981, 19.5.31. Appl., 1.3.27).—Fibrous material (shredded wood fibre or straw) is treated with a liquid binder [aq. MgO and MgCl_2 , or Ca(OH)_2], the excess of which is removed, and the mixture is agitated by an air current, forced into a mould without rendering it compact, and allowed to set.

F. R. ENNOS.

Manufacture of cellulose compounds. L. LILIENFELD (B.P. 357,080 and 357,167, 15.3.30. [B] Addn. to B.P. 335,994; B., 1931, 153).—(A) Cellulose is converted into its alkyl thiourethanes by treatment with alkali and an alkylthiocarbimide; the product is then dissolved in alkali, formed into threads etc., and coagulated or coagulated and plasticised, e.g., with 50—80% H_2SO_4 , in presence of cellulose xanthate or a softening agent. (B) Cellulose alkyl or aralkyl ethers or cellulose carboxyl-alkyl ethers, e.g., Me or Et ethers, or the product from alkali-cellulose and chloroacetic acid, are xanthated.

C. HOLLINS.

Manufacture of artificial threads and other materials from cellulose compounds. L. LILIENFELD (B.P. 357,121, 357,154, and 357,192, 15.3.30. [A] Addn. to B.P. 335,906; B., 1931, 153).—(A) Cellulose xanthate is treated with an inorg. ester or halogenated ether of a monohydric alcohol (Et_2SO_4 , Me_2SO_4 , CH_3PhCl , $\alpha\beta$ -dichlorodiethyl ether) or an ester (except halides) or cyclic ether of a di- or poly-hydric alcohol (glycerophosphoric or -sulphuric acid, mono- or di-acetin, ethylene oxide, glycide, α -dichlorohydrin, tricarbin), and the products are spun into threads. (B) In the process of B.P. 335,906 the cellulose xanthate is treated with di- or poly-halogenoparaffins in which at least 2 halogens are attached to one C atom, e.g., CHMeCl_2 , CHEtCl_2 , CMe_2Cl_2 , C_2HCl_6 , preferably with prolonged stirring. (C) In known non-plasticising processes producing threads having a dry tenacity above 2 g. per denier, the cellulose xanthate is replaced by any of the various derivatives thereof.

C. HOLLINS.

Cellulose [ester] film. S. E. SHEPPARD and J. G. McNALLY, Assrs. to EASTMAN KODAK CO. (U.S.P. 1,808,998, 9.6.31. Appl., 30.1.30).—Non-curling films are produced by compressing together at least two laminated films so that the grain of one is at an angle to that of the other, one of the films being of cellulose acetate and the other of the nitrate.

B. P. RIDGE.

Production of filaments, films, foils, etc. from aqueous cellulose solutions. WOLFF & CO. KOMM.-GES. AUF AKT., and R. WEINGAND (B.P. 360,688, 21.11.30. Ger., 29.11.29).—The pptg. bath consists of an inorg. acid (H_2SO_4) and MeOH together with sufficient H_2O to form one or more of the mono-, di-, tri- or pentahydrate of MeOH, the H_2O introduced by the filaments being removed, e.g., by cooling and crystallisation of hydrated Na_2SO_4 , so that the degree of hydration of the MeOH does not exceed that of the pentahydrate.

F. R. ENNOS.

Treatment of cakes of artificial silk and other textile materials in package form with liquids and gases by centrifugal means. B. P. DOBSON (B.P. 360,581, 24.9.30).—The cakes are placed in a number of separate rotatable containers arranged round the outside

of a rotating conical table. The treating fluids are fed under pressure to the interior of the cakes, which rotate at a speed sufficient to cause the fluid to permeate and to be discharged by centrifugal action on to the rotating table, whence they flow to a collecting tank.

F. R. ENNOS.

Heating device for the dry-spinning method of producing artificial threads. A. FRIEDERICH, Assr. to ACETA GES.M.B.H. (U.S.P. 1,804,530, 12.5.31. Appl., 7.6.29. Ger., 9.6.28).—The upper and lower parts of a number of spinning cells are each provided with a water-jacket, the upper water-jackets being connected to one another and also the lower ones to one another, whilst the heating medium circulates through each lower jacket in the opposite direction to that through the corresponding upper jacket.

F. R. ENNOS.

Manufacture and treatment of artificial silk or like fibrous material. COURTAULDS, LTD., and E. A. MORTON (B.P. 362,114, 1.11.30).—The coil or cake of artificial silk etc. is wound on a perforated, resilient holder which is slightly concave so that the pressure against the upper and lower ends of the coil or cake is greater than that against the centre. F. R. ENNOS.

Production of artificial threads and the like. COURTAULDS, LTD., and C. DIAMOND (B.P. 360,626, 18.10.30).—Melted wax, e.g., paraffin or spermaceti, is homogenised with a cellulose carboxylic ester solution, and the product is dry-spun, its temp. being maintained above the m.p. of the wax until it has passed the spinning jet.

F. R. ENNOS.

Manufacture of (A) sheet material from fibres produced from animal hides and skins, (B) fibrous sheet material. SOCIETA INVENZIONI BREVETTI ANONIMA-TORINO, Assees. of A. MACKAY (B.P. 360,371—2, 29.7.30. U.S., [A] 20.9.29, [B] 11.1.30).—(A) Scraps and cuttings of leather and hides are disintegrated in H_2O to form an aq. suspension of fibres, which is neutralised with Na_2CO_3 and treated first with a tanning agent and grease (sulphonated cod oil, colloidal neatsfoot oil) and then with a binder (rubber latex), which is pptd. on the fibres by means of acid, alum, etc.; the water is finally separated to form the sheet. (B) Suitable sheet-forming apparatus is described. F. R. ENNOS.

Digestion of wood. J. E. BOND (U.S.P. 1,808,830, 9.6.31. Appl., 27.5.29).—Continuous circulation of the contents of the digester is secured by fitting a large central pipe through which the wood chips and acid are forced upward until they overflow into the body of the digester and are then withdrawn again from the conical bottom. The propellers used also serve to disintegrate the chips, and rapid initial heating to the required temp. is obtained by passing the cooking acid through an external heater.

B. P. RIDGE.

Production of wood pulp of high α -cellulose content. G. A. RICHTER and M. O. SCHUR, Assrs. to BROWN Co. (U.S.P. 1,809,312, 9.6.31. Appl., 19.4.27).—The long-fibre portion of raw pulp is separated off and treated with Cl_2 -water or $CaOCl_2$ solution to just beyond the point at which further consumption of Cl_2 is accompanied by a marked decrease in α -cellulose content and

an increase in Cu no. It is then cooked with an alkaline liquor (e.g., $NaOH$ or Na_2S), further bleached, and separated into long- and short-fibre portions. The former is used for making high-grade writing papers or cellulose esters and the latter for cheap papers.

B. P. RIDGE.

Production of [wood] pulp of high whiteness and strength. G. A. RICHTER, Assr. to BROWN Co. (U.S.P. 1,809,286, 9.6.31. Appl., 1.7.25).—Kraft pulp is digested for 2–6 hr. at 80–100° in an acid sulphite liquor containing at least 0.5% of combined SO_2 and 0.25 of free SO_2 . The stock is washed, bleached for 5–10 hr. with 15–35% of $CaOCl_2$, and further washed. Under-cooked or refractory pulp is pretreated with 3–35% of $CaOCl_2$ to render sol. the ligneous and coloured impurities before digestion. B. P. RIDGE.

White wood pulp for high-grade paper manufacture. G. A. RICHTER, Assr. to BROWN Co. (U.S.P. 1,809,287, 9.6.31. Appl., 18.11.30).—Raw kraft pulp is treated with Cl_2 -water or $HOCl$ bleach liquor for 2–6 hr. at 10–40°, but without visible whitening of the material. It is then digested with a $NaOH$ - Na_2S liquor at 50–70° for 1–4 hr. and finally bleached in 3 stages. In the first two 3% and 2%, respectively, of $CaOCl_2$ with 0.5% of added $NaOH$ is used at 21° for 3–6 hr., whilst in the third 0.3% of $KMnO_4$ is employed at 21° for 4 hr. and the adhering oxides of Mn are removed with H_2SO_3 . The product is pure white, has a high strength and α -cellulose content, and is low in resin and pentosans.

B. P. RIDGE.

Treatment of [cellulose] pulp. G. A. RICHTER and M. O. SCHUR, Assrs. to BROWN Co. (U.S.P. 1,806,309, 19.5.31. Appl., 5.8.27).—Wood pulp is digested in an alkaline liquor containing soap, bleached in a bleach liquor containing soap, and the bleached and deresinified product is separated into portions of different fibre-length.

F. R. ENNOS.

Production of cellulose from lignified material. R. B. WOLF, R. P. HILL, and R. S. HATCH, Assrs. to LIGNO-CELLULOSE CORP. (U.S.P. 1,804,967, 12.5.31. Appl., 13.6.30).—Cellulosic material is digested with indirect heating below 100° and above 6 atm. with a 12% aq. solution of SO_2 free from inorg. bases; the relief gases are absorbed partly in H_2O above 40 lb. per sq. in. and partly at atm. pressure, the cooked material being finally subjected to sub-atm. pressure to remove any remaining free SO_2 .

F. R. ENNOS.

Decomposition of lignified fibres. W. SEIDEL and R. FINGADO, Assrs. to I. G. FARBERIND. A.-G. (U.S.P. 1,804,893, 12.5.31. Appl., 21.1.30. Ger., 25.1.29).—To accelerate the decomp. of wood by the sulphite process, 2–10% of its wt. of O_2 is added in small portions during the reaction.

F. R. ENNOS.

Manufacture of sulphite pulp from Douglas fir and other resinous conifers. H. K. BENSON (U.S.P. 1,805,799, 19.5.31. Appl., 27.7.29).—Before treating with sulphite solutions, the resins, colouring matter, etc. are removed by circulating aq. NH_3 over the uncrushed chips in a closed system at 70–150°; the solutions are cooled to about 70° before releasing the pressure, and the chips are drained and washed at 70°.

F. R. ENNOS.

Manufacture of paper [pulp] [with recovery of reagents]. J. H. SPOHN, JUN., ASSR. to CHEM. DEVELOPMENT Co., LTD. (U.S.P. 1,809,427, 9.6.31. Appl., 3.11.28).—The black liquor is injected into a furnace, whereby it is conc. and its org. impurities are burned out, the products of combustion and the vaporised reagents from the furnace are scrubbed in order to remove obnoxious gases and recover the reagents, and the insol. S sludge is returned to the furnace. B. P. RIDGE.

[Waterproof] paper-pulp container. M. GENTILE, ASSR. to S. W. WEIS (U.S.P. 1,804,555, 12.5.31. Appl., 20.10.28).—The container is coated first with a relatively thick layer of glue, starch, or dextrin, and then with a thin layer of a cellulose ester (acetate or nitrate) containing a modifier (tritoyl phosphate, castor oil) to render the two layers adherent to each other.

F. R. ENNOS.

Heat- and fire-proofing of paper, kraft board, and the like. O. HERTING, ASSR. to SANI PAPER PRODUCTS Co., INC. (U.S.P. 1,804,417, 12.5.31. Appl., 15.6.26).—The material is treated at 60–80° with an aq. solution containing sulphates of Al, Mg, Fe, or Mn with those of Ti or Zr, partly dried, further treated at the same temp. with aq. Na sulphate, borate, and silicate, and dried without removing combined H₂O.

F. R. ENNOS.

Apparatus for washing and after-treating artificial silk spun in the form of spun cakes. ALGEM. KUNSTZIJDE UNIE N.V. (B.P. 363,257, 7.4.31. Ger., 11.2.31).

Stretching of filaments of artificial silk. VEREIN. GLANZSTOFF-FABR. A.-G. (B.P. 363,238, 28.2.31. Ger., 29.3.30).

Coloured paper.—See VI. Synthetic lumber.—See IX.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Rapid bleaching process. N. V. FILIPOV and B. S. VORONKOV (Izvest. Tekstil. Prom., 1930, 9, No. 8—9, 84—90).—Directions for boiling and chlorination are given.

CHEMICAL ABSTRACTS.

Steaming of alizarin-pink (without pressure). N. K. MOKOSHEV and V. G. VOROBIEV (Izvest. Tekstil. Prom., 1930, 9, No. 10—11, 90—96).—The colour effect of steaming (without pressure) light and medium shades of alizarin-pink is a function of time, temp., and relative humidity. The best shade and fastness to soap are obtained with saturated steam. Superheated steam or the presence of air produces poor shades.

CHEMICAL ABSTRACTS.

Optimum conditions of adsorption of leuco-indigotin by cotton yarn. V. I. MINAEV and P. V. MORUGANOV (Izvest. Tekstil. Prom., 1930, 9, No. 8—9, 93, 97).—The degree of dispersion diminishes, in that order, when S₂O₄²⁻, Zn, or FeSO₄ is used in preparing the bath. The quantity of indigotin derivatives increases with the degree of dispersion. The degree of adsorption of the leuco-derivative is increased by increasing the number of immersions and the degree of dispersion. The degree of dispersion is decreased by

increasing alkalinity. Adsorption of the leuco-derivative decreases as the stability of the vat increases.

CHEMICAL ABSTRACTS.

Controlling cold dyeing with azo dyes. N. I. KOZHIN (Izvest. Tekstil. Prom., 1930, 9, No. 10—11, 77—86).—The loss of Na naphthoxide from a fabric was 2.25% after 3 hr., 9.16 (8 hr.), 14.8 (24 hr.), 92% (1 week), the brown coloration of the fibre increasing concurrently with loss of naphthoxide. The diazo-*p*-nitroaniline content of the bath is preferably determined colorimetrically by means of Na salicylate; the neutralisation of the mineral acid is greater when HCO₂Na is used than when NaOAc is used, but Na lactate gives the best results.

CHEMICAL ABSTRACTS.

The cellulose-dyestuff complex. I. Structure of cellulose fibres. J. M. PRESTON (J. Soc. Dyers and Col., 1931, 47, 312—319).—Cellulose fibres and film dyed with direct dyes behave dichroically, and the ratio of the optical densities of the dyed material at any wavelength when the plane of vibration of the light lies first parallel and then perpendicular to the long axis of the cellulose is a const. which is the same for all wavelengths; this const. is termed the “dichroic constant” and is characteristic of the cellulose material and the dyes used. With the same cellulose material (viscose cellophane sheet) this const. (approx. 1.5) was the same for all the 10 direct dyes tested; the measurements were made with a Hilger-Nutting spectrophotometer, but this must be combined with a microscope when measuring fibres. A theoretical consideration of the dichroic const. together with the experimental results obtained indicates that this const. is a function of the degree of orientation of the cellulose micelles within the cellulose material; the more perfect the orientation the greater is the dichroic const. Tension applied along the long axis of a cellulose fibre during dyeing and drying increases the const. considerably for slightly oriented fibres. A. J. HALL.

Tendering of [rubber-]proofed fabrics. J. KIRKWOOD (Trans. Inst. Rubber Ind., 1931, 7, 228—235).—Tendering of cold-vulcanised rubbered fabrics is caused by the action of moisture on the S₂Cl₂ with formation of HCl; it is not due so much to the penetration of the rubber film by the S₂Cl₂ as to transference of excess S₂Cl₂ from the face of the rubber to the back of the fabric when rolled. The method of weaving of sateen is such that the weft is more exposed than the warp to such tendering action. The previous bleaching or dyeing operation may also be a cause of tendering. On account of the anchoring of the threads by the rubber the tearing strength of a fabric is reduced by proofing, but the tensile strength, particularly in the direction of the warp, is increased. D. F. TWISS.

Sizes [for textiles] prepared from maize starch. M. A. HERMANN (Izvest. Tekstil. Prom., 1930, 9, No. 8—9, 101—103).—(1) Maize starch (72 g.) is heated at 30° with H₂O (1 litre) and boiled for 8 min. after addition of H₂C₂O₄ (0.2 g.); the mixture is boiled for 15—20 min. and neutralised with Na₂CO₃. This contains dextrin, and liquid rapidly separates. (2) H₂O (1 litre) is treated with 96% H₂SO₄ (0.4 g.) and (gradually) maize starch

(76 g.); the mixture is boiled for 10 min. and neutralised with NaOH. This remains homogeneous and contains chiefly sol. starch. CHEMICAL ABSTRACTS.

Developments in the application of washing and finishing agents [to textiles]. J. NÜSSEIN (J. Soc. Dyers and Col., 1931, 47, 309—312).—A description is given of the application of various products marketed under the name "Igepon." A. J. HALL.

Boiling of fabrics without pressure. N. M. ROMANOV and P. M. BOGATUIREV (Izvest. Tekstil. Prom., 1930, 9, No. 8—9, 91—93).

Coloured fertilisers.—See XVI.

PATENTS.

Coloration of [cellulose ester and ether] textile materials. BRIT. CELANESE, LTD. (B.P. 360,449, 2.7.30. U.S., 2.7.29).—Cellulose acetate etc. materials are dyed with vat dyes from a bath prepared in the usual manner, except that Na_2CO_3 (0.5—2.0 g./litre) is used instead of NaOH and the temp. of dyeing is about 75°; no hydrolysis of the material occurs. A. J. HALL.

Manufacture of fast-coloured crêpe paper. G. H. SAYLER, ASSR. to DENNISON MANUFACT. CO. (U.S.P. 1,805,013, 12.5.31. Appl., 16.5.29).—Paper sheets are treated simultaneously with a dye solution and a solution of a fixing agent (Katanol-o, tannin, tartar emetic, etc.) containing an adhesive (glue or dextrin) and are afterwards crêped. F. R. ENNOS.

Process and/or preparation for washing silk and other garments. A. JOHNSON (B.P. 360,039, 1.8.30).—Silk garments, dress gloves, etc. are washed with an aq. solution of a prep. consisting of aq. NH_3 (d 0.880) 3 oz., gum arabic 1 oz., spike (or lavender) oil $\frac{1}{2}$ oz., and H_2O 14 oz.; this process is unsuitable for grey silk goods. A. J. HALL.

Sizing and finishing of fibres and goods manufactured therefrom and preparing printing colours. HOLZHYDROLYSE A.-G., and E. FÄRBER (B.P. 360,015, 28.7.30. Ger., 27.7.29).—Viscous products obtained by the restricted hydrolysis of wood with mineral acids (e.g., HCl) are used instead of starch and glucose in the prep. of sizes for yarns and of vat printing pastes; the sizes confer softness on textile yarns. Such hydrolysis products are not directly fermentable and have about $\frac{1}{2}$ th the reducing power of glucose. A. J. HALL.

Production of silk-like lustre on vegetable fibrous material by coating. L. LILLENFELD (B.P. 357,120 and 357,190, 14.3.30).—(A) Cotton sateen (etc.) is coated with a solution of cellulose ethers, xanthates, or *N*-substituted thiourethanes, e.g., in aq. pyridine, and then shrunk; softeners or plasticisers may be added. (B) A mercaptan or sulphide derived from a di- or poly-hydric alcohol, e.g., β -hydroxy- α -propylene sulphide, $\beta\beta$ -dithiolisopropyl alcohol, ethylene dithioglycol, is added to the aq. pyridine solution. A gas may be introduced into the solution. C. HOLLINS.

[Suction apparatus for] drying of textile fabrics. (SIR) J. F. NORTON & CO., LTD. and D. G. NORTON (B.P. 360,156, 11.10.30).

Hydroxyalkylamines.—See III.

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

Estimation of [output of] sulphuric acid. Y. I. ZILBERMAN (J. Chem. Ind., Russia, 1930, 7, 1412—1413).—Correction is made for the fact that the vol. of acid is measured at 50—70°, whilst the factors of Lunge and Isler's tables are given at 15°. CHEMICAL ABSTRACTS.

[Preparation of] hydrochloric acid and magnesium oxide from magnesium chloride. G. I. TSCHUFAROV and A. P. LOKHVITZKAYA (J. Chem. Ind., Russia, 1930, 7, 962—964).—Optimal conditions are indicated. CHEMICAL ABSTRACTS.

Purification of brine from sulphate with barium carbonate. N. N. VORONIN, A. M. KOLESNIKOV, and E. E. ROSENBERG (J. Chem. Ind., Russia, 1930, 7, 1522—1523).—Treatment for 6 hr. at room temp. with 100% excess of BaCO_3 reduced the SO_4 content to 0.008 g. per litre, or by 25% excess of freshly pptd. BaCO_3 to 0.2 g. Finely-divided, freshly pptd. BaCO_3 in 2—3% excess with vigorous agitation, or passing CO_2 with agitation for 3—4 hr. in presence of a 10—15% excess of BaCO_3 , removed SO_4 completely. CHEMICAL ABSTRACTS.

[Preparation of] sodium hyposulphite from metallic sodium and sulphur dioxide. R. F. JUFEREV and P. V. MALUGIN (J. Chem. Ind., Russia, 1930, 7, 553—555).—With 0.4-mm. Na wire the reaction in abs. EtOH and in EtOH containing H_2O at 20° affords, respectively, yields of 55.1 and 65.3% $\text{Na}_2\text{S}_2\text{O}_4$, the conversion occupying 1 hr. Further treatment with SO_2 decreases the yield. At 0° the yield is 23—26%; in Et_2O or kerosene the yield is poor. Increase in thickness of the Na wire decreases the yield. With Na-Hg yields in EtOH + H_2O reach 99.68%. CHEMICAL ABSTRACTS.

Potash recovery from the dust of blast-furnace gas at Kamaishi Iron & Steel Works. H. KÔDA and Y. YAMAMOTO (J. Soc. Chem. Ind., Japan, 1931, 34, 444 B).—The dust collected by the Cottrell precipitator contains 14—28% of K_2O , mostly as KCl and K_2CO_3 , and these salts are extracted by hot H_2O and separated from Na salts by fractional crystallisation. N. H. HARTSHORNE.

[Preparation of] potassium chloride and carbon dioxide by the Engel-Precht method. G. A. YAKOVKIN (J. Appl. Chem., Russia, 1931, 4, 1—8).—By treating with CO_2 a 3—5% suspension of $\text{Mg}(\text{OH})_2$ in dil. KCl solution below 40° (G.P. 143,595, 144,742) a 50% yield of $\text{MgCO}_3 \cdot 3\text{H}_2\text{O}$ (stored under NaHCO_3 solution) is obtained. The reaction $3(\text{MgCO}_3 \cdot 3\text{H}_2\text{O}) + 2\text{KCl} + \text{CO}_2 \rightarrow 2[\text{KHMg}(\text{CO}_3)_2 \cdot 4\text{H}_2\text{O}] + \text{MgCl}_2$ (G.P. 55,182, 125,987) proceeds smoothly; excess of CO_2 is advisable, and mechanical agitation can be avoided. The reaction $2[\text{KHMg}(\text{CO}_3)_2 \cdot 4\text{H}_2\text{O}] + \text{Mg}(\text{OH})_2 \rightarrow 3(\text{MgCO}_3 \cdot 3\text{H}_2\text{O}) + \text{K}_2\text{CO}_3 + \text{H}_2\text{O}$ (G.P. 135,329, 157,354, 143,409, 155,007, 172,313, 188,504) needs careful control. CHEMICAL ABSTRACTS.

Production of potassium sulphate from gypsum and dolomite. M. FURY and (MME.) M. FURY (Chim. et Ind., 1931, 26, 1289—1291).— $\text{Mg}(\text{OH})_2$, obtained from dolomite, is treated with gypsum and CO_2 . The MgSO_4 formed is treated with KCl. The conditions are

shown by means of an equilibrium diagram for the system $K-Mg-SO_4$. Directions are given for working up the mother-liquors. E. S. HEDGES.

Manufacture of technical red cuprous oxide. I. VOUK (J. Appl. Chem., Russia, 1931, 4, 55—59).—High temp. of reduction favour fineness of division. Solutions of Cu salts should be treated after addition of the reducing agent. The concn. is of no importance if reduction takes place at high temp.

CHEMICAL ABSTRACTS.

Removal of traces of iron from aqueous solutions of sulphates. T. W. RICHMOND and F. K. CAMERON (Ind. Eng. Chem., 1931, 23, 1288—1290).—Clays, kaolin, and powdered talc are inefficient in adsorbing Fe from aq. solutions of sulphates. Animal charcoal is more effective than vegetable charcoal, but with alum solutions Al is also adsorbed. A permutit of the glauconite type is fairly effective, but removal is never complete, and the Fe is removed again from the permutit if its concn. in the solution is very low. J. W. SMITH.

Fixation of vanadium by preparation of complex vanadio-zeolite catalysts, and their properties. I. E. ADADUROV, G. K. VORESPOV, and Z. M. LISIANSKAIA (J. Chem. Ind., Russia, 1931, 8, 606—612).—V zeolites are good catalysts for SO_2 oxidation, but the V is sol. in H_2O . A catalyst containing insol. V is prepared from $(NH_4)_3VO_3$, K_2SnO_3 , and Na silicate solutions (V_2O_5 5, SnO_2 15, SiO_2 30%) heated at 70° and neutralised with 81—90% of the theoretical quantity of HCl. The ppt. is washed with ≥ 500 c.c. H_2O per 50 g. and dried at room temp. for 24 hr. The colour should be light yellow; the activity slowly decreases. At 400° with 150 c.c. per min. of gas containing 6.5—10% SO_2 , 99.5% conversion into SO_3 occurs.

CHEMICAL ABSTRACTS.

Analysis of traces of Morogoro pitchblende. F. HECHT (Mikrochem., 1931, 10, 45—52).—A micro-method has been developed for analysis of the constituents of the mineral. The residue insol. in HCl (titanates, niobates, SiO_2 , etc.) is separated and the Pb in the sol. portion determined electrolytically as PbO_2 . The rare-earth metals are pptd. as oxalates; after conversion of the ppt. into oxide and dissolution in acid, the Th is isolated as Th subphosphate and weighed as ThP_2O_7 , the remaining rare earths being determined by difference. From the filtrate, after suitable treatment, Fe and Al are pptd. with NH_4OH , HCl, and the U, which remains in solution, is determined with 8-hydroxyquinoline. A complete micro-determination, including that of H_2O , may be carried out in $1\frac{1}{2}$ —2 days, compared with the 9—10 days required for a macro-determination.

H. F. GILLBE.

Apparatus for determining the purity of limestone in the field. P. EMERSON (Science, 1931, 74, 418).

Barium industry. W. TRANTOM (Chem. & Ind., 1932, 5—8).

[NH_3 from] water hyacinths.—See II.

PATENTS.

Manufacture of nitric acid by oxidation of ammonia. F. A. F. PALLEMAERTS, and UNION CHIM.

BELGE SOC. ANON. (B.P. 360,778, 27.2.31).—Gases escaping from the columns for absorption of HNO_3 are heated, directly or indirectly, to such a temp. that, after expansion of the gases inside suitable machines, they shall still be at a temp. above their condensation point. Expansion machines are used in which the gases do not come into contact at any point with surfaces covered with lubricating oil, e.g., centrifugal machines with outside bearings. F. YEATES.

Manufacture of highly active alkali-coke briquettes for production of alkali cyanides with simultaneous recovery of low-temperature carbonisation products. A. MENTZEL (B.P. 361,814, 14.5.31. Ger., 14.5.30).—The alkali starting material, preferably $NaHCO_3$, is mixed in a fine state of subdivision with ground coal, a binder, e.g., NaCl, is added if desired, and the mixture is briquetted and carbonised at 400 — 550° . A. B. MANNING.

Production of ammonium sulphate nitrate. GEWERKSCHAFT VICTOR (B.P. 360,165, 17.10.30. Ger., 17.10.29).—The NH_3 that escapes with the hot vapours when producing NH_4 sulphate nitrate by introducing H_2SO_4 , HNO_3 , and NH_3 into a solution of $(NH_4)_2SO_4$ and NH_4NO_3 , while working under strongly ammoniacal conditions, is separated off in known manner into conc. ammoniacal liquor and liquor almost free from NH_3 by directly attaching the hot-vapour conduit to a rectifying column, no fresh quantities of heat being supplied. (Cf. B.P. 357,396; B., 1932, 1138.)

F. YEATES.

Production of barium monoxide in tunnel ovens. C. H. THOMPSON, H. E. ALCOCK, and G. T. SHINE (B.P. 360,503, 13.8.30).—A mixture of $BaCO_3$ and C is charged into open-ended retorts or bottom-perforated crucibles which traverse a tunnel furnace on a truck having a perforated refractory bed covering its upper surface and perforations in the truck corresponding to those of the bed, with suitable closures. The retorts or crucibles seat in and project from the perforations in the bed and above those in the truck. The BaO produced is dumped through the perforations in the truck.

F. YEATES.

Production of calcium carbide and phosphorus [from tricalcium phosphate]. N. CARO and A. R. FRANK (B.P. 360,765, 5.2.31. Ger., 7.2.30).— $Ca_3(PO_4)_2$ is reduced with C to CaC_2 in two stages. In the first, reduction to CaO and P takes places without the formation of carbide by working at a temp. between 1200° and 1600° , or above 1600° (up to about 1750°) and employing CO pressures above the equilibrium pressure of the carbide-formation system. The CaO-C mixture obtained is then fused (with the addition of C if necessary) in an adjacent furnace at the usual temp. to yield CaC_2 . The two stages of the process may be effected in one furnace, the CaO-C mixture being produced in the upper part and converted into CaC_2 in the lower. The $Ca_3(PO_4)_2$ passing through the upper part is completely reduced therein to CaO. F. YEATES.

Separation of adhering particles [carbon from calcium carbonate]. G. H. BUCHANAN, Assr. to AMER. CYANAMID Co. (U.S.P. 1,806,888, 26.5.31. Appl., 8.2.29).—The mixture of C and $CaCO_3$, obtained as a

by-product in the manufacture of NH_3 from CaCN_2 , is treated with H_2SO_4 to give a slightly acid reaction, and the C is removed by flotation.

D. K. MOORE.

Production of beryllium oxide or beryllium hydroxide. SIEMENS & HALSKE A.-G. (B.P. 360,758, 30.1.31. Ger., 4.6.30).—A double fluoride of an alkali and Be (e.g., resulting from the decomp. of beryl by means of alkali silicofluoride) is treated with conc. alkali lye (about 30%) containing the same alkali metal as is present in the double fluoride (e.g., Na Be or K Be fluoride with Na or K lye). The solution, after separation of the alkali fluoride ppt., is strongly diluted and heated to about 70–80° to obtain $\text{Be}(\text{OH})_2$, from which BeO may be derived by further heating. F. YEATES.

Apparatus for production of zinc oxide. ZINK-HÜTTE NEU-ERLAA G.M.B.H. (B.P. 360,746, 16.1.31. Austr., 21.1.30).—Evaporation of metallic Zn, combustion of the vapour to ZnO, and deposition of the oxide take place in individual devices so connected as to form an independent unit. The deposition device is divided into two or more parts and provided with means for putting any of these parts out of operation or for effecting any combination of operating parts; O_2 may be introduced into the combustion chamber together with the hot waste gases from the furnace. The divided bag deposition plant is directly connected to the combustion chamber, only coolers being inserted between them.

F. YEATES.

Manufacture of lead oxides. C. J. WRIGHT, ASSR. to COMBUSTION UTILITIES CORP. (U.S.P. 1,800,239, 14.4.31. Appl., 17.9.25).—Molten Pb is allowed to fall into a downwardly inclined, rotating, cylindrical furnace up which is passed a stream of air preheated to 430°. The interior of the furnace is provided with a series of cells covering the entire lining, so as to lift up and drop the Pb and PbO during the passage of the charge through the furnace and thus accelerate the oxidation. The charge is separated into PbO and Pb in a settler and the latter is returned to the melting pot. Pb_3O_4 is made in a similar manner, using a second rotary furnace fed with PbO from the first furnace.

A. R. POWELL.

Manufacture of [finely-divided] lead oxides. S. NEGISHI (B.P. 360,070, 7.8.30).—A fine powder of Pb_2O is sprayed into an atm. of heated air or O_2 in a combustion chamber, becoming first oxidised to litharge and then (in the same or another chamber) to red lead, and the product is passed through a cooler and collected.

F. YEATES.

Treatment of phosphate rock and alunite. H. H. MEYERS, ASSR. to ARMOUR FERTILIZER WORKS (U.S.P. 1,791,103, 3.2.31. Appl., 8.12.28).—A finely-divided mixture of 2 pts. of alunite (containing 36% Al_2O_3) and 1 pt. of phosphate rock (47% CaO) is calcined at 1300–1400° and the product extracted with NH_3 , H_2O , and CO_2 to extract all the P_2O_5 , leaving a $\text{CaO-Al}_2\text{O}_3$ residue which, after burning, forms a high- Al_2O_3 cement of the quick-setting type.

A. R. POWELL.

Manufacture of absorbent clay. T. L. HENDERSON and W. KELLEY, ASSRS. to FILTROL CO. OF CALIFORNIA (U.S.P. 1,800,687, 14.4.31. Appl., 29.5.28).—Bentonitic clay (1300 lb.) is heated at 100–101° for 3 hr. with an

equal wt. of H_2O and 250 lb. of conc. H_2SO_4 , a further 150 lb. of acid and 600 lb. of a clay with a low content of Al_2O_3 and carbonates are added; heating is continued for another hr., and finally sufficient of a basic clay containing MgCO_3 is added to neutralise the acid. Sol. salts are removed by centrifuging and the clay is dried with the addition of sufficient dry clay to prevent balling. The product should contain 0.1–0.5 (0.25)% of free H_2SO_4 when it is required for decolorising mineral oils, but should be absolutely neutral when required for the treatment of vegetable oils.

A. R. POWELL.

Separation of air into oxygen and nitrogen by liquefaction. A. MESSER (U.S.P. 1,800,353, 14.4.31. Appl., 27.10.27. Ger., 15.11.26).—A two-column air-liquefying and separating apparatus is provided with an additional column in the form of a heat interchanger of the countercurrent type through which N_2 from the top of the low-pressure column of the liquefying apparatus is conducted in the opposite direction to the condensate from the upper end of the high-pressure column, which is passed through the heat interchanger to the upper end of the low-pressure column.

A. R. POWELL.

Production of sulphur dioxide and ammonium sulphate. VER. F. CHEM. U. METALLURG. PROD. (B.P. 360,326 and Addn. B.P. 360,327, 20.3.31. Czechoslov., [A] 26.3.30, [B] 28.3.30).—(A) Gases containing SO_2 (particularly those from H_2SO_4 contact plants) and NH_3 are combined in a conc. (preferably saturated) solution of $(\text{NH}_4)_2\text{SO}_4$ to form NH_4 sulphites, with pptn. of $(\text{NH}_4)_2\text{SO}_4$, but not to the extent of saturating the liquor with sulphites. The NH_4 sulphite solution is then decomposed with H_2SO_4 to form SO_2 and a fresh $(\text{NH}_4)_2\text{SO}_4$ liquor, which is adjusted to the original condition and conc. Solid $(\text{NH}_4)_2\text{SO}_4$ is thus obtained without resorting to evaporation, and a pure SO_2 gas is produced. (B) The gases are combined in $(\text{NH}_4)_2\text{SO}_4$ solution in the mol. proportions of approx. 1.3 : 1.

F. YEATES.

[Apparatus for] solidification of carbon dioxide [in blocks]. W. C. PRIESTLEY (B.P. 360,166, 18.10.30).

HNO_3 .—See I. Reagents from paper-pulp manufacture.—See V. Cl_2 for colds etc.—See XX.

VIII.—GLASS; CERAMICS.

Importance of the softening process in safety glass manufacture. T. PESCH (Chem.-Ztg., 1931, 55, 935).—For softening the sheet of celluloid or other material a solvent diluted with an inert liquid is used. The point of maturity is determined by touch of the hand and the success of the process depends on the skill with which this is done. The effect of temp. and concn. of solvent is discussed.

W. J. BOYD.

Scratching of plate-glass. G. TAMMANN and H. E. VON GRONOW (Z. anorg. Chem., 1931, 201, 37–40).—The influence of various liquids on the production of lateral fissures in glass when scratched with a diamond has been studied microscopically. The fissures are largest in the absence of liquid, and least in the presence of paraffin oil, olive oil, or turpentine. A number of aq. and org. liquids occupy an intermediate position. The cause of the fissures and of the protective effect of liquids is discussed.

F. L. USHER.

Physical and mechanical properties of clay. H. BERRIDGE (Engineering, 1931, 132, 126—129, 192—193).—Clay is considered as within the category of "disperse systems," the mineral being aluminosilicate and the liquid water. Chatley's and other formulæ are given for calculating the various ratios of wt. and vol. of H_2O to mineral content. The mechanical properties are discussed mainly from the engineering point of view. F. SALT.

Pyrochemical series of oxides. H. SALMANG (Z. angew. Chem., 1931, 44, 908—912).—The corrosion of refractory materials by silicate melts of varying composition indicates that the influence of oxides in the melt leads to a definite pyrochemical series when they are arranged according to their reaction at the temp. of the melt. The types R_2O and RO function as bases, those richer in O as acids. K_2O and Na_2O are exceptional, being little dissociated in the melt. CaO acts as a very strong base, MnO as a weak base, whilst Al_2O_3 is acidic and not ampholytic in character. ZnO is ampholytic, whilst Ni_2O_3 is stable in the melts investigated. In solidifying glass melts the same series is recognisable, but the alkalis behave more normally, whereas MgO has an acidic function. F. O. HOWITT.

Determination of silica and alumina in refractory materials. C. PERTUSI and E. DI NOLA (Annali Chim. Appl., 1931, 21, 482—490).—20—25 c.c. of HF are added to 1 g. of finely-powdered material in a tared Pt crucible and evaporated to dryness on the water-bath. After repeating twice, the residue is treated with 15—20 c.c. of conc. $H_2C_2O_4$ solution, evaporated to dryness, and ignited. The total oxides are thus obtained and the difference gives the SiO_2 . The total oxides are fused for a few min. in a Ni crucible containing 5 g. NaOH. After cooling, the melt is exhausted with boiling H_2O and the liquid collected, boiled, and filtered. In the filtrate $Al(OH)_3$ is pptd. with NH_4Cl and aq. NH_3 and Al_2O_3 is determined in the usual way. When Ti is present in small amounts it is left in the residue together with $Fe(OH)_3$. Alternatively, the total oxides are fused with $KHSO_4$, the melt is dissolved in dil. H_2SO_4 and made up to 300 c.c., and in an aliquot part of the solution Fe is determined with $KMnO_4$ and Ti colorimetrically by Weller's method. Al_2O_3 is determined by difference. O. F. LUBATTI.

PATENTS.

Lithographer's glass. E. A. ZEH, Assr. to ZEH, Inc. (U.S.P. 1,803,519, 5.5.31. Appl., 5.1.29).—A thick sheet of glass of any desired size is coated with three layers (applied in different directions) of an enamel comprising a mixture of 40% of ZnO , 50% of SnO , and 10% of a glass flux, and the sheet is then fired at a temp. 22° below the m.p. of the enamel until the enamel has just fused into the glass surface. After cooling, the enamel surface is ground to the requisite degree of roughness to be used in place of the ordinary lithographer's stone. A. R. POWELL.

Flashing of clay products. F. K. PENCE (U.S.P. 1,802,776, 28.4.31. Appl., 27.12.27).—A grey tint due to reduction of Fe oxides on the surface is produced on ceramic products, e.g., tiles, by firing them in a kiln in

saggers in which they are packed in sand with layers of coal slack between the rows of tiles to produce a reducing atm. A. R. POWELL.

Absorbent clay.—See VII.

IX.—BUILDING MATERIALS.

Relation between the tenacity and strength of various cements. F. KLOKNER (New Internat. Assoc. Test. Mat., Sept., 1931, 14 pp.).—Six different cements were tested for tenacity (impact strength) and static strength after 7 and 28 days' hardening. The impact strength was tested by the falling-hammer method. The results indicate that, when hardening took place under water, the tenacity of 1:3 mortar is approx. proportional to the square root of the product of the crushing and tensile strengths. A similar relationship for test pieces hardened under combined storage could not be established. F. SALT.

Resistance and elasticity of concrete made with Italian cements. L. SANTARELLA (New Internat. Assoc. Test. Mat., Sept., 1931, 19 pp.).—The results are reported of tests on two-year-old specimens of mortars and of concrete prepared with four qualities of Italian cements with different H_2O /cement ratios and with a given granulometric composition of the sand-gravel mixture. From the data, diagrams and formulæ are obtained defining the resistance and modulus of elasticity under compression as a function of the resistance of normal mortar and of the H_2O /cement ratio. F. SALT.

Hydration of Portland cement. IX, X. Hydration of the calcium aluminate. K. KOYANAGI (J. Soc. Chem. Ind., Japan, 1931, 34, 452—459 B; cf. B., 1931, 1012).—Addition of saturated $CaSO_4 \cdot 2H_2O$ solution to an aq. extract of Portland cement clinker ppts. uniaxial needles, α_D 1.465 \pm 0.002, ϵ_D 1.461 \pm 0.002, of composition $3CaO \cdot Al_2O_3 \cdot 3CaSO_4 \cdot 32 \cdot 6H_2O$. The yield is greater the better the clinker is burnt and the greater its % of Al_2O_3 . No other Ca sulphoaluminate is formed. On keeping in contact with the solution it decomposes into $CaSO_4 \cdot 2H_2O$ and Ca aluminate.

N. H. HARTSHORNE.

Essential qualities of Portland cement and their consequences. L. LILI (New Internat. Assoc. Test. Mat., Sept., 1931, 6 pp.).—To obtain good Portland cements, the production of chemical compounds having a low, or average, hydraulicity index and the correct SiO_2 content should be aimed at. To determine the true quality of a cement for a given purpose, the results of strength tests on normal mortars must be interpreted in a manner not hitherto adopted, and an attempt should be made to establish a quality-index figure and a resistance-index figure. Chemically inert, or partly inert, material must not be added to Portland cement. F. SALT.

Cements and puzzuolanic substances. F. FERRARI (New Internat. Assoc. Test. Mat., Sept., 1931, 8 pp.).—The weakening of Portland cement under the action of H_2O , S-containing H_2O , etc. is due mainly to the CaO which is liberated during hydration of the cement. The problem of fixing this CaO progressively to form compounds of lower basicity is discussed. F. SALT.

Rational puzzuolana cements of Segni (Rome). C. VITTORI (New Internat. Assoc. Test. Mat., Sept., 1931, 9 pp.).—Puzzuolanic cements should satisfy Lafuma's chemical resistance index: $(\text{SiO}_2 + \text{Al}_2\text{O}_3)/\text{CaO} = 1$. By the use of a very old puzzuolana, free from alkali, which is first subjected to thermal treatment to increase its hydraulic activity and then suitably quenched, cements have been produced which combine short-date mechanical strength with prolonged hydraulic activity. These cements give new and characteristic tensile and crushing strength curves; they have an acid surface crust, giving impermeability, and they develop very little heat during hydration. F. SALT.

[Action of] Santorin earth [on cement]. B. L. KATZIGHERAS (New Internat. Assoc. Test. Mat., Sept., 1931, 6 pp.).—Varying proportions (up to 50%) of Santorin earth (a volcanic product containing 64–68.5% SiO_2) were added to cement. The crushing strength was increased by additions not exceeding 8%; the tensile strength continued to increase with much greater additions. The initial and final set were retarded. The sp. shrinkage was reduced in the earlier period, but after a certain age it was greater than that of pure Portland cement. The compactness of the concrete was increased. F. SALT.

Influence of the water-cement ratio on the mechanical strength of cement mortars. A. PERFETTI (New Internat. Assoc. Test. Mat., Sept., 1931, 3 pp.).—Four types of cement were gauged as 1:3 mortars with different amounts of H_2O , and the effect of the H_2O -cement ratio on the crushing and tensile strengths is reported. In every case the quantity of H_2O giving max. crushing strength did not give max. tensile strength; for the former it was 8%, and for the latter 9–9.5%. F. SALT.

Cement containing added hydraulic materials. R. GRÜN (New Internat. Assoc. Test. Mat., Sept., 1931, 68 pp.).—The hydraulic, physical, and chemical properties of hydraulic additions ("hydraulites") to cement were investigated, and a classification is derived from the data. The effect of the various "hydraulites," natural and artificial, on the strength and resistance to sulphates of cements was studied, and the results of extensive research on the hardening effect of blast-furnace slags on cement, the effect of additions of diatomaceous earths to cements, and on lime-trass and cement-trass mortars and concretes are reported. F. SALT.

Ferric oxide in the constitution of cements and the ferrous cements. Q. SESTINI and L. SANTARELLI (New Internat. Assoc. Test. Mat., Sept., 1931, 8 pp.).—Microscopical analyses showed that ferrous cements are always rich in alite, that Fe is present in the form of celite, and that belite rarely occurs. The best ferrous cements have a very high $\text{CaO}:\text{SiO}_2$ ratio, which approaches the theoretical max. of 2.8, free CaO being absent. The synthetic products appear as constituents of alite and celite, indicating that alite is a Ca_3 silicate free from Al_2O_3 . Fe_2O_3 appears to be a more efficient stabiliser of Ca_3 silicate than Al_2O_3 . F. SALT.

Determination of the cement ratio for mortar and concrete made from cement or hydraulic lime. H. MAITRE-DEVALLOIN (New Internat. Assoc. Test. Mat.,

Sept., 1931, 6 pp.).—A method is described for the direct determination of the "combined" or "hydraulic" SiO_2 , which simplifies the problem of proportioning a mortar or concrete with the right quantity of cement or hydraulic CaO . F. SALT.

High-alumina cements. E. RENGADE (New Internat. Assoc. Test. Mat., Sept., 1931, 14 pp.).—A general account is given of the methods of manufacture, chemical composition, physico-chemical, hydration, and setting properties, mechanical strength as compared with that of Portland cements, etc. The ratio compressive strength/tensile strength is much higher for high-alumina than for Portland cements. The uses of high-alumina cement are indicated in relation to its special qualities. F. SALT.

Means of preserving natural stone. J. F. CELLERIER (New Internat. Assoc. Test. Mat., Sept., 1931, 4 pp.).—The nature and causes of the weathering of natural stone are briefly reviewed, and chemical analyses of efflorescence taken from old, damp cellars are given. In spite of the presence of org. matter, nitrates were almost absent, the efflorescence being composed mainly of products of disintegration of sulphates. The principal physical and chemical methods of preservation are noted. F. SALT.

Characteristics of home-grown timbers. C. J. CHAPLIN, J. LATHAM, and F. H. ARMSTRONG (Dept. Sci. Ind. Res., Forest Products Res., Bull. 12, 1931, 11 pp.).—Mechanical properties are given.

Tar for roads.—See II.

PATENTS.

Surface coloration of bodies [asbestos-cement tiles]. C. BATCHELLER, ASST. to BEMIS INDUSTRIES, INC. (U.S.P. 1,798,996—9, 31.3.31. Appl., [A, B] 23.2.26, [C] 21.6.26, [D] 24.12.27).—(A) Shingles or tiles made of a mixture of cement and asbestos are coloured with a solution of a sol. salt of Fe or Cu which reacts with the CaO in the cement to form an insol. coloured compound on the surface. (B) Multicoloured or mottled effects are produced by using a solution containing two or more different metals or by applying first a solution of one metal, and then, when reaction has ceased, a solution of another metal. (C) A 3:1 mixture of cement and coarse asbestos fibre is moulded wet to shape, allowed to set, wire-brushed to roughen the surface, and immersed in a 20% solution of CuCl_2 , whereby the surface becomes covered with $\text{Cu}(\text{OH})_2$, which is fixed by immersing the article in Na_2CO_3 to produce a green surface layer of malachite. (D) A brown colour is produced by immersing the shingles in a 3–5% CoSO_4 solution, then in a 0.25–1% solution of KMnO_4 . Addition of FeSO_4 or NiSO_4 produces tones varying from red-brown to black. A. R. POWELL.

Compound for preservation of wood. B. R. V. MALENKOVIĆ (U.S.P. 1,795,658, 10.3.31. Appl., 15.11.27. Holl., 3.12.26. Cf. U.S.P. 1,656,863; B., 1928, 266).—The addition compound formed by fusing or triturating together 2:4-dinitrochlorobenzene with α -naphthylamine is claimed. A. R. POWELL.

Production of synthetic lumber from cornstalks. O. R. SWEENEY, ASST. to IOWA STATE COLL. AGRIC. &

MECHANICAL ARTS (U.S.P. 1,803,737, 5.5.31, Appl. 27.6.29).—Unshredded cornstalks are cooked under a pressure of 30 lb. per sq. in. in H_2O of p_H 7 for 3 hr., allowed to remain in the H_2O for a further 4–24 hr., macerated in a rod mill to produce fibres several in. in length, and washed on a sieve until the pentosans and lignins are removed. The pulp is then formed into boards by pressure in the usual way.

A. R. POWELL.

Bituminous emulsions. Spreading of bitumen etc.—See II. **Fibrous articles.**—See V. **[Cement from] phosphate rock etc.**—See VII. **Treating Fe ore.**—See X.

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

Course of the reactions in the boshes and hearth [of an iron blast furnace] and its importance in the smelting process. A. MUND, J. STOECKER, and W. EILENDER (Stahl u. Eisen, 1931, 51, 1449–1461).—Samples of the charge in the Fe blast furnace have been taken at various levels in the boshes and from the hearth during the smelting of hematite and other Fe ores to produce pig iron. The samples were separated into metal and slag and each was analysed separately, allowances being made for incomplete separation. The results obtained show that a part of the metal formed in the upper zones of the furnace is burned in front of the tuyères by the blast, and is again reduced to metal below the main tuyère level; this reduction is not effected chiefly by the impurities in the Fe which passes the tuyères unchanged, although these impurities may take some part in the reaction, depending on the rate at which the metal falls through this zone. In the hearth of the furnace the reduction of the remainder of the charge is completed, the Fe previously burnt is reduced again and the metal desulphurised, whilst the coke ash is absorbed by the slag.

A. R. POWELL.

Corrosion of water mains. H. R. REDINGTON, J. L. W. BIRKINBINE, and F. N. SPELLER (J. Amer. Water Works' Assoc., 1931, 23, 1649–1693).—A general survey is made of the development of materials for use in pipe-lines and of the methods to prevent corrosion. Probably the furthest advance is due to the introduction of interior linings, as the smooth surface not only protects the pipe from corrosion, but reduces friction and the attachment of adhesive growths. More progress in adopting this type has been made in Europe than in America, the Talbot process of centrifugally lining a pipe with a bituminous composition showing high efficiency on pumping costs.

C. A. KING.

Corrosion-fatigue tests of mild steel and chromium-nickel austenitic steel in River Tees water. N. P. INGLIS and G. F. LAKE (Trans. Faraday Soc., 1931, 27, 803–808).—The fatigue limit of mild steel diminishes from ± 17.0 tons/sq. in. in air to ± 0 in River Tees water. Fully softened steel (Cr 18%, Ni 8%, W 1%) has the corrosion-fatigue limit ± 11.1 in Tees water; heating the steel to 650° depresses this limit to ± 6.5 . Photomicrographs show that the fractures are essentially transcryst. The corroding fluid

may form minute intercryst. fissures, thus leading to greater stresses and finally to failure through fatigue.

J. G. A. GRIFFITHS.

Attempts to obtain ferro-titanium. S. S. STEINBERG and P. S. KUSAKIN (Trans. Inst. Econ. Min. Met., Moscow, 1929, No. 43, 5–44).—With a concn. of Ti in the charge necessary to obtain 5% Ti-Fe, complete reduction of Ti is obtained at 1480° , 10–12% at 1680° ; further increase of Ti in the melt raises the m.p. Ti carbide has m.p. 3170° . An alloy containing 14–18% Ti and 5–7.5% C is obtained only at temp. above 1680 – 1750° . In preparing alloys with 19–21% Ti, 80% reduction is obtained at 1700° and 92% at 1940° . It is easier to obtain ferro-carbo-titanium than low-C ferro-titanium; the latter can be obtained by reduction with Al. Recommendations for obtaining ferro-titanium are made.

CHEMICAL ABSTRACTS.

Electrometric determination of chromium and vanadium in ferrous alloys and rustless steels, based on the principle of an opposed end-point potential. Determination of chromium in ferrochrome and of vanadium in ferrovanadium. Disturbing factors in the simultaneous titration of chromium and vanadium. Simultaneous potentiometric determination of chromium and vanadium with opposed end-point potential. W. WERZ (Z. anal. Chem., 1931, 86, 335–344).—Cr and V in ferrous alloys are converted into CrO_4^{2-} and VO_3^+ , respectively, and titrated potentiometrically with $FeSO_4$, the end-points being observed with a galvanometer through which the appropriate e.m.f. corresponding with the end-point is applied to the electrodes. Cr and V may be thus determined with rapidity and accuracy either singly or in presence of one another. Details of working conditions are given.

F. L. USHER.

Gravimetric determination of tin in brass and bronze. W. F. POND (Chemist-Analyst, 1931, 20, No. 5, 5–6).—The alloy (up to 6% Sn; 5 g.) is treated with H_2O (25 c.c.) and conc. HNO_3 (25 c.c.); after 5 min. the mixture is boiled for exactly 5 min. Boiling H_2O (25 c.c.) is added and the mixture is boiled for 25 min. After 30 min. at a temp. just below the b.p. the solution is filtered through a double filter.

CHEMICAL ABSTRACTS.

[Determination of] tin in tin drosses. W. M. MULDOWNY (Chemist-Analyst, 1931, 20, No. 5, 14–15).—The sample (20 g.) is decomposed with conc. HNO_3 (60 c.c.) and H_2O (200 c.c.); the mixture is diluted to 400 c.c., boiled, left overnight, and filtered. The residue is ignited and weighed. A weighed portion is fused with Na_2O_2 in an Fe crucible, the Sn in the HCl solution being determined by the $KMnO_4$ method.

CHEMICAL ABSTRACTS.

Thermal expansion of copper-nickel-tin alloy. P. HIDNERT and W. T. SWEENEY (Physical Rev., 1930, [ii], 35, 667).—The average coeffs. of expansion per degree $\times 10^6$ of an alloy containing 69.57% Cu, 28.70% Ni, and 0.91% Sn are 20– 100° , 15.2; 100– 200° , 15.5; 200– 300° , 18.0; 20– 200° , 15.4; and 20– 300° , 16.3.

L. S. THEOBALD.

Thermal expansion of M-M-M alloy. P. HIDNERT and W. T. SWEENEY (Physical Rev., 1930, [ii], 36,

787—788).—Data for the coeff. of linear expansion between 20° and 500° are given for an alloy containing approx. 61% Ni, 25% Cu, 9% Sn, 3.5% Fe, 0.75% Mn, and 0.75% Si. L. S. THEOBALD.

Effect of cold-working on properties of aluminium: electrical resistance [and breaking stress]. G. GREENWOOD (Z. Krist., 1931, 80, 481—495).—The electrical resistance of Al wire (99.49% pure) is increased by cold-working, but the increase is removed by annealing at not above 250°; above 250° the resistance is increased. Breaking stress is increased by cold-working, and decreased by annealing, but only slightly so if at above 250°. Credner's hypothesis of recrystallisation and production of cracks above 250° (cf. A., 1913, ii, 280) explains this, and is confirmed by X-ray examination, which also shows cold-drawn wire to possess a fibrous structure due to crystallisation with the [111] direction parallel to the fibres. Cold-working of recryst. Al wire causes the [100] direction to become parallel, the more so the higher is the temp. of annealing. Cold-working causes a decrease, annealing an increase, in Young's modulus (cf. B., 1928, 713).

C. A. SILBERRAD.

Application of micro-analysis to the investigation of precious-metal alloys. R. STREIBINGER (Mikrochem., 1931, 10, 306—312).—A lecture.

H. F. GILLBE.

Electrolytic refining of copper using the complex salt of cuprous chloride. VIII, IX. Behaviour of silver present in the crude copper of the anode. N. KAMEYAMA and S. MAKISHIMA (J. Soc. Chem. Ind., Japan, 1931, 34, 462—465 B; cf. B., 1931, 1100).—On theoretical grounds Ag in the crude anode is likely to pass into solution under the ordinary conditions of electrolysis owing to the electrolyte becoming impoverished of AgCl, and to the reaction $\text{Cu}^{2+} + \text{Ag} = \text{Cu} + \text{Ag}^+$, for the presence of Cu^{2+} ions cannot be entirely avoided. In agreement with this the cathodic deposit always contains Ag. Attempts to "fix" the Ag in the anode by adding, e.g., S to it, and to prevent the formation of Cu^{2+} ions by adding various reducing agents to the solution were unsuccessful, but circulating the electrolyte through a layer of CuI, which removes the Ag, gave a cathodic deposit containing only about 1% of the Ag in the anode. N. H. HARTSHORNE.

Chromium-plating practice and theory. W. PFANHAUSER and G. ELSSNER (Z. Elektrochem., 1931, 37, 874—886).—In the electrolytic separation of metallic Cr from a bath containing CrO_3 the e.m.f. at which the Cr_2O_3 diaphragm (cf. A., 1926, 913) is formed depends on the nature of the cathode. The lower the over-voltage of H at the electrode the more negative is the e.m.f. of formation of the diaphragm, and also the smaller are the abrupt potential change with increasing c.d. and the val. of the c.d. above which the separation of metallic Cr may take place. A rise of bath temp. produces a rise in the c.d. at which the break in the c.d.—e.m.f. curve occurs. E.m.f. measurements are difficult in the case of brass, owing to the high solution tension of the latter. The rise in c.d. necessary for Cr separation above the c.d. at the break in the curve increases greatly with temp. in the case of Ni. This

passivity is probably due to an oxide layer. The behaviour of the Ni cathode also depends on its previous history. The passivity of a Ni cathode formed by electrodeposition increases with age. A rapid increase of c.d. has a more favourable influence on Cr separation than a slow one. The e.m.f. of different metals in contact with Cr has been investigated with reference to the difficulty of plating already partly plated cathodes. The influence of the composition of the bath and the shape of the cathode on deposition have also been determined. M. S. BURR.

Electrodeposition of chromium from tervalent chromium salt solutions. I. Chromium chloride and chromium sulphate baths. H. T. S. BRITTON and O. B. WESTCOTT (Trans. Faraday Soc., 1931, 27, 809—826).—The p_H at which pptn. by means of NaOH commences from 0.5M- $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ solutions is raised progressively by previously boiling the solution (a) alone, (b) with 0.5 equiv. NaOH, and (c) with 1.0 equiv. NaOH. Similar pptn. curves were obtained with $\text{Cr}_2(\text{SO}_4)_3$ solutions. Extensive data of the effects of concn., c.d., temp., addition of salts, and use of a diaphragm between the electrodes, on the mechanical properties and purity of Cr deposited from normal and basic Cr chloride and sulphate are given. Whilst under the best of the conditions employed the purity exceeded 90%, the mechanical properties of the Cr were poor. In general, increase of concn., c.d., and p_H improved the process, although high p_H vals. favour deposition of basic material. The duration of electrolysis is important owing to changes of p_H near the cathode.

J. G. A. GRIFFITHS.

Diffusion of cadmium deposited electrolytically. E. BEUTEL and A. KUTZELNIGG (Z. Elektrochem., 1931, 37, 886).—An electrolytic deposit of Cd on brass from solution in aq. KCN gradually diffuses into the interior of the brass, the silver-white of the Cd being replaced by the yellow of the brass in the course of a few weeks. No diffusion appears to take place when the Cd separates from aq. H_2SiF_6 , probably owing to the coarser structure of the deposit in the latter case. M. S. BURR.

Potash from blast-furnace gas.—VII. Anti-fouling paints.—See XIII. Conc. rubber latex.—See XIV.

PATENTS.

Treatment of iron ore. L. BRADLEY (U.S.P. 1,800,856, 14.4.31. Appl., 7.4.26).—Fe oxide ore is preheated in a multiple-hearth furnace, then passed to a reduction furnace in which it is treated with hot CO from a gas producer, and finally is cooled in a third furnace by means of the waste gases from the preheating furnace, which itself is partly heated by the hot gases from the reducing furnace. The gases from the cooling furnace are wholly or partly returned to the gas producer to regenerate CO for use again. The reduced Fe is separated from the gangue by means of a magnetic separator and the gangue is mixed with limestone and passed to a cement kiln which is fired with the excess CO produced in the reduction process.

A. R. POWELL.

Graphitising castings of white cast iron. A. HAYES, Assr. to INDUSTRIAL FURNACE CORP. (U.S.P.

1,801,742, 21.4.31. Appl., 29.7.27. Renewed 11.9.30).—The castings are annealed at 927° for t hr., where $t = -22.3 \times (\% \text{ Si}) - 12.4 \times (\% \text{ P}) + 2.21 \times (\% \text{ Mn} - \% \text{ S}) + 33.7$, then cooled slowly to 705° , at which temp. it is annealed for t' hr., where $t' = -23.6 \times (\% \text{ C}) - 32.7 \times (\% \text{ Si}) + 40.9 \times (\% \text{ Mn} - 2[\% \text{ S}]) + 38 \times (\% \text{ P}) + 102.7$. A. R. POWELL.

Bimetallic [chromium-nickel] protective coating for iron tubes. I. T. BENNETT, Assr. to METROPOLITAN ENGINEERING Co. (U.S.P. 1,802,695, 28.4.31. Appl., 21.1.25).—Tubes for boilers provided with a steel fin to be exposed to the fire and plated externally with Cr and then with Ni by the process disclosed in U.S.P. 1,578,254 (B., 1926, 495) are claimed. A. R. POWELL.

Heat-treatment of crankshafts. J. E. POLLAK. From DEUTS. EDELSTAHLWERKE A.-G. (B.P. 359,521, 16.7.30).—The surface layers of the shaft pins and journals are hardened by heating them with a broad O_2 - C_2H_2 flame to the hardening temp. and then quenching by means of a blast of cold air or by spraying with jets of H_2O . A. R. POWELL.

[Steel for] permanent magnets. DEUTS. EDELSTAHLWERKE A.-G. (B.P. 356,169, 3.3.30. Ger., 8.3.29. Cf. U.S.P. 1,773,793; B., 1931, 301).—The steel contains 0.75–1.15% C, 2.02–4.9% Cr, and 0.5–1.5% Mo and/or 0.5–2% W, (Mo + W) being 0.6–2%. A. R. POWELL.

Sulphide ore treatment. R. E. PHELAN, S. P. LOWE, A. B. GLAMPITT, H. T. KOENIG, and O. A. FISCHER, Assrs. to R. H. CHANNING, JUN. (U.S.P. 1,801,105, 14.4.31. Appl., 3.11.26).—Complex Cu-Fe-Zn sulphide ores containing Au and Ag are subjected to differential flotation to recover a Cu concentrate and a Zn concentrate, and the Au and Ag are recovered from the tailings by cyanidation. The flotation concentrates are roasted separately and leached to recover Cu and Zn, the leaching residues are extracted with brine to remove Pb, and the final tailings are passed to the cyanide vats. A. R. POWELL.

Flotation concentration of [sulphide] ores. F. G. MOSES, R. W. HESS, and R. L. PERKINS, Assrs. to BARRETT Co. (U.S.P. 1,801,317–1,801,320, 21.4.31. Appl., 20.5.27).—The following reagents are claimed for use in the flotation of Cu sulphide ores: (A) a mercaptothiodiazole, e.g., the 3-Ph derivative, (B) a mercapto-benzoxazole, (C) a pentacyclic thiourea, e.g., pinacolylthiourea, (D) a tetrahydrothiodiazinethione, especially the N-Ph compound. A. R. POWELL.

Selectively floating one or more minerals contained in ore pulp. M. KRAUT (U.S.P. 1,802,919, 28.4.31. Appl., 20.2.28).—Selective flotation of Pb-Zn sulphide ores is effected by subjecting the ore pulp with the necessary reagents to a partial controllable vac. while admitting regulated quantities of air to the pulp. A. R. POWELL.

Flotation of metals [free gold, silver, and copper from their ores]. G. G. THOMAS, Assr. to AMER. CYANAMID Co. (U.S.P. 1,802,989, 28.4.31. Appl., 26.1.29).—Oxidised ores containing sol. salts of Zn or Cu together with free Cu, Ag, and Au are ground wet and treated with CaO until the pulp has $p_{\text{H}} < 9$, preferably 7.5–8. The deleterious sol. salts are thus decomposed

and the depressing effect of Ca salts is avoided in the subsequent flotation process. A. R. POWELL.

Production of blister copper from copper-bearing materials. G. C. CARSON, Assr. to CARSON INVESTMENT Co. (U.S.P. 1,803,663, 5.5.31. Appl., 6.4.26).—Cu sulphide ore is smelted to a matte in a reverberatory furnace the walls of which are banked up with silicious material through which tuyères penetrate for blowing the matte to blister Cu, in which operation the FeO formed is slagged off by the SiO_2 in the sloping embankments. The hearth of the furnace slopes downwards from the front end to the back where the blister Cu is tapped, while the slag is skimmed at the front, thereby avoiding the formation of Fe_3O_4 accretions in the smelting end of the furnace. A. R. POWELL.

Recovering metals [zinc]. W. F. BLEECKER (U.S.P. 1,800,500, 14.4.31. Appl., 18.6.28).—A charge of roasted Zn ore and C is distilled in a vertical retort, a stream of air is passed through the hot residue, and this hot air is used to preheat a second charge of ore and coke in a second retort. Distillation of the preheated charge is effected by passing a current through the retort. A. R. POWELL.

Cyclic process for producing magnesium. E. BARSTOW and S. B. HEATH, Assrs. to DOW CHEM. Co. (U.S.P. 1,800,589, 14.4.31. Appl., 19.12.29).— MgCl_2 is electrolysed to produce Mg and Cl_2 , the latter is converted into HCl which is absorbed in H_2O or dil. acid to form conc. HCl, and the conc. acid is distilled to produce acid of const. b.p. and HCl gas for use in dehydrating further quantities of MgCl_2 for regenerating the electrolytic bath. The gases from the dehydrators are cooled to condense conc. HCl which is returned to the still and dry gas which is returned to the dehydrators. A. R. POWELL.

[Electro-]deposition of chromium. A. RIEDEL, F. BACHMANN, and L. (FHR.) VON EBERSTEIN (RIEDEL & Co., SPEZIAL-FABRIK F. GALVANOTECHNIK) (B.P. 360,298, 11.2.31. Ger., 11.2.30).—The articles to be plated are mounted on a circular cathode support which is moved continuously round an annular trough containing the electrolyte and two different anode arc-segment pairs each of which is connected to an independent current supply. A. R. POWELL.

Extracting or recovering metals from the slimes or residues of electrolytic lead-refining operations. J. J. FINGLAND, A. D. TURNBULL, and P. F. MCINTYRE, Assrs. to CONSOLIDATED MINING & SMELTING Co. OF CANADA, LTD. (U.S.P. 1,801,339, 21.4.31. Appl., 5.6.29).—The slimes are melted under oxidising conditions to remove As and Sb and the resulting metal is cooled slowly to obtain a crust containing the major portion of the Cu and a Pb-Bi-Ag alloy relatively low in Cu. This alloy is fractionally crystallised to recover Pb-Ag crusts and a substantially pure Pb-Bi alloy of low m.p. The crusts are cupelled to recover Ag and the PbO is reduced to metal and returned to the crystallising process. A. R. POWELL.

Alloy steels. HEPPENSTALL Co., Assees. of J. A. SUCCOP (B.P. 362,900, 9.8.30. U.S., 12.6.30).—See U.S.P. 1,775,615; B., 1931, 353.

Two-step sulphatising roasting process [for zinc-copper-iron sulphide ores]. F. A. BRINKER (B.P. 353,861, 18.2.30).—See U.S.P. 1,749,125; B., 1930, 720.

Manufacture of [silver] metal alloy. H. M. FREDRIKSEN (B.P. 361,041, 15.9.30).—See U.S.P. 1,732,839; B., 1930, 150.

Hard soldering and welding of metals by means of electrically generated heat. W. SCHABELITZ (B.P. 363,239, 28.2.31. Switz., 28.2.30).

Bronze colours.—See XIII.

XI.—ELECTROTECHNICS.

Cr and V in alloys. Resistance of Al. Cu. Cr-plate. Cd-plate.—See X. **Synthetic resin mouldings.**—See XIII. **Conc. rubber latex.** **K-Gutta.** **Electrodeposited rubber.**—See XIV.

PATENTS.

Electrodes for electric-discharge luminescence tubes and lamps. A. DUPUIS (B.P. 358,882, 16.6.30).—An alkali or alkaline-earth metal (m.p. below 800°) is fused into a layer in the bottom of the tube above a layer of powdered glass and is connected to the source of current by means of a stout wire of a refractory metal.

A. R. POWELL.

[Anode shields for] mercury-arc rectifiers. INTERNAT. GEN. ELECTRIC CO., INC., ASSEES. OF ALLGEM. ELEKTRICITÄTS GES. (B.P. 363,258, 9.4.31. Ger., 9.4.30).

Luminous electric-discharge tubes. GEN. ELECTRIC CO., LTD., ASSEES. OF PATENT TREUHAND-GES. F. ELEKTR. GLÜHLAMPEN M.B.H. (B.P. 363,092, 17.11.30. Ger., 11.1.30).

Photo-electric apparatus [for transmission of pictures]. BRIT. THOMSON-HOUSTON CO., LTD., ASSEES. OF W. J. HITCHCOCK (B.P. 363,103, 25.11.30. U.S., 26.11.29).

Gastight seals.—See I. **Steel for magnets.** **Zn.** **Mg.** **Cr-plate.** **Pb-refining slimes.**—See X.

XII.—FATS; OILS; WAXES.

Evaluation of crude fats for soap manufacture. E. I. BETTER (Allgem. Oel- u. Fett-Ztg., 1931, 28, 379—380).—The term "saponifiability" ("Verseifbarkeit") is open to misconstructions. Discriminatory analyses should return neutral fat, Ca soaps, etc. in detail. (Cf. WIZÖFF Standard Methods, edn. I.) E. LEWKOWITSCH.

Determination of water in fatty acids. G. KNIGGE (Allgem. Oel- u. Fett-Ztg., 1931, 28, 381; cf. B., 1932, 70).—A corrected calculation. E. LEWKOWITSCH.

Tung oil (Chinese wood oil) from Australian-grown trees of *Aleurites Fordii*, Hemsley. A. R. PENFOLD and F. R. MORRISON (Tech. Museum, Sydney, 1931, Bull. No. 12 [revised], 21 pp.; cf. B., 1927, 451).—The culture and breeding of the tree are discussed; satisfactory oil is not obtainable before the 4th year, the yield from the 5th to 9th years being 400—800 lb./acre. Oils from trees up to about 10 years old are described: they are pale, have d_{4}^{25} 0.938—0.941 (aver.) and n_D^{25} 1.5135—1.5202, and give good results in the Browne heat test (8½—12 min.). Seeds with an excessive H₂O

content cannot be satisfactorily expressed. Extraction with light petroleum tends to yield a semi-solid fat on account of isomerism. A non-gelling abnormal oil (n_D^{25} 1.5061) extracted by Et₂O from a seed with high H₂O content (5-year oil plantation) yielded, on cooling, an acidic cryst. substance, m.p. 52°, sol. in EtOH, mol. wt. 308 (calc. as monobasic acid), which polymerised rapidly. E. LEWKOWITSCH.

Determination of oil and fat-soluble vitamins in cod-liver oil emulsions. H. VALENTIN (Pharm. Ztg., 1931, 76, 1423—1426).—The emulsion is heated with 25% HCl, EtOH and H₂O are added, and the solution is extracted with Et₂O-petrol (1:1). The greater part of the aq. layer is removed, the remaining part treated with tragacanth until solid, and the org. solvents are removed to yield on distillation a residue which is weighed. This method is superior to that of drying on sand followed by Soxhlet extraction. The application of some colour reactions for fat-sol. vitamins (A., 1922, ii, 665; 1926, 870) to pharmaceutical preps. of the oil and its emulsion is described. F. O. HOWITT.

Buchner funnel [for oils]. L. R. RAYMOND (Chemist-Analyst, 1931, 20, No. 5, 17).—A steel cylinder to which a flange is welded is recessed to accommodate a disc of coarse wire gauze which supports a cloth or filter paper.

CHEMICAL ABSTRACTS.

Ageing of butter.—See XIX. **Oils from Brazilian plants.**—See XX.

PATENTS.

Preparation of emulsions. W. SELTZER (B.P. 361,262, 8.5.31. U.S., 20.6.30).—Oils, fats, and waxes are emulsified in an aq. (5%) solution of free metarabic acid. E. LEWKOWITSCH.

Extraction of oil from vegetable materials. A. A. THORNTON. From L. M. BROWN (B.P. 361,029, 8.9.30).—Seeds (e.g., soya beans), press cakes, etc. are treated below 100° with a dil. aq. solution of a volatile alkali (NH₃), which extracts the bitter principles, mucilage, etc., then drained (and crushed), and extracted with a volatile fat-solvent. E. LEWKOWITSCH.

Manufacture of soap preparations. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 359,893, 21.7.30).—Soap powders, flakes, etc. comprise a mixture of sol. soap with at least 5% (e.g., 100—1000%) of its wt. of the true sulphonic acids (or sol. salts) of higher fatty acid (>C₈) esters, the SO₃H group being attached to the alcoholic radical; e.g., 80 pts. of the Na salt of the condensation product of oleic chloride and isethionic acid is mixed with 15 pts. of Na palmitate and 5 pts. of NaBO₂.

E. LEWKOWITSCH.

Reducing the liquid contents [of oil seeds].—See I. **Fatty acids from hydrocarbons.** **Disperse systems.**—See III. **Adsorbent clay.**—See VII.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Effect of small amounts of organic acids on the gloss, yellowing, and settling properties of paint products. H. A. GARDNER and G. G. SWARD (Amer. Paint & Varnish Manufs.' Assoc., Nov., 1931, Circ. No. 401, 388—391).—The properties of a gloss white bodied oil-type enamel, a white 4-hr. varnish enamel, and a white exterior linseed oil house paint to which

traces of BzOH, crotonic and salicylic acids were added are tabulated, details of skinning on storage, brightness, yellowing, and retention of gloss of film being given. Whilst salicylic acid favours non-yellowing, and BzOH assists gloss and flow, the results are not conclusive.

S. S. WOOLF.

Anti-oxidants and anti-skinning agents. H. A. GARDNER and G. G. SWARD (Amer. Paint & Varnish Manufs.' Assoc., Nov., 1931, Circ. No. 400, 381—387).—The use of small amounts of org. anti-oxidants of phenolic or amine character in paint and rubber is discussed. The behaviour of two standard varnishes in which a range of proprietary and other anti-oxidants were incorporated is tabulated. Two materials, "X-156" and "H.N.," gave outstandingly good results. The use of special terpene solvents, *e.g.*, dipentene, "Hercosol" (a terpene-ketone mixture), is shown to inhibit surface skinning of modern quick-drying varnishes.

S. S. WOOLF.

Summer exposures on anti-fouling paints. H. A. GARDNER and L. P. HART (Amer. Paint & Varnish Manufs.' Assoc., Nov., 1931, Circ. No. 397, 369—372).—Details and results of exposure tests are reported on paints based on the standard U.S. Navy Dept. formula for anti-fouling paint, but using wood- for gum-rosin and various Cu compounds [Cu_2O , CuO , CuCO_3 , $\text{Cu}_2\text{Fe}(\text{CN})_6$, CuCrO_4 , $\text{Cu}(\text{CO}_3)_2$] as the toxic ingredient. The oxides were shown to be the most efficient of the Cu compounds from the anti-fouling view-point. The coal tar-rosin formulæ now used by the U.S. Navy Dept. are also quoted.

S. S. WOOLF.

Drier adsorptive properties of pigments. H. A. GARDNER (Amer. Paint & Varnish Manufs.' Assoc., Nov., 1931, Circ. No. 403, 396—398).—A range of pigments were ground in known quantities of varnish containing Pb linoleate as drier. After 8-months' storage the enamels were stirred and centrifuged and the clear vehicles analysed for drier content. The drying times of the restirred enamels were also observed. The tabulated results show that although drier is adsorbed to varying extent by pigments, the drying properties of the enamels are not adversely affected to a parallel extent. The protection of Prussian blue, a highly adsorptive pigment, by an adherent org. film before incorporating in varnish is shown to be advantageous.

S. S. WOOLF.

Microchemical examination of pictures. H. HETTERICH (Mikrochem., 1931, 10, 27—44).—A review of available methods and in particular those which involve the identification of pigments and media by determination of the elements present, with a full account of the investigation of the coatings of pigment on an old statue.

H. F. GILLBE.

Lacquer studies. A. W. VAN HEUCKEROTH (Amer. Paint & Varnish Manufs.' Assoc., Nov., 1931, Circ. No. 399, 377—380).—Of various plasticisers used in a series of lacquers submitted to exposure, Ph phthalate and "Paplex G-20" were shown to be the most efficient. The behaviour of a range of cellulose lacquers on red cedar, the oily nature of which is considered to be deleterious to finishes, is tabulated, a lacquer containing Rezyl No. 19 and Rezyl Balsam 33 giving the best

results. In a further series of exposures of lacquers on metal over various primers, "alkyd"-type primers tend to be superior to the oleo-resinous variety.

S. S. WOOLF.

Nitrocellulose lacquers. A. V. BLUM and A. RUFF (Farben-Ztg., 1931, 37, 197—199, 233—235).—A dissertation is given on the need for research on nitrocellulose lacquers, with particular reference to such aspects as viscosity, rate of evaporation and effect thereon of individual lacquer components, type of pigment, etc., and the correlation of these factors with film properties. The use of triangular co-ordinates in such problems is recommended, and is illustrated by its application to the investigation of the variation of hardness and elasticity with varying contents of nitrocellulose, resin, and plasticiser.

S. S. WOOLF.

Neutralising varnishes, properties of orientation of their surface molecules, molecular polishing. P. WOOG, J. GIVAUDON, and (Mlle.) E. GANSTER (Compt. rend., 1931, 193, 1001—1003).—Addition of a substance active in preventing the spreading of oil on a surface, *e.g.*, cetyl alcohol or a higher fatty acid (cf. B., 1930, 124), to a varnish does not ordinarily produce a surface on which oils do not spread, the mols. the orientation of which produces such a surface layer being, as it were, embedded irregularly in the varnish. If, however, the coating produced by a varnish consisting of dammar 3 g., C_2HCl_3 50 c.c., PhMe 50 c.c., and stearic acid 0.5 g. be rubbed gently, a surface on which oil does not spread results, a "molecular polishing" analogous to that produced in metals (cf. B., 1914, 318) occurring. A similar effect is obtained by suitably heating a coating provided it softens at a moderate temp., *e.g.*, 100°.

C. A. SILBERAD.

Effect of variable drying conditions on some physical properties of patent leather varnish films. W. C. HENRY (J. Amer. Leather Chem. Assoc., 1931, 26, 595—606).—Stress-strain curves were obtained for the films after different periods of drying. The tensile strength of the film was increased and the extensibility diminished by increasing the time of drying. The curves were slightly sigmoid in shape. The rate of oxidation was increased by raising the temp. of the drying oven, and diminished by increasing the R.H. The rate of recovery of films which had been strained was greater in those of low oxidation than that of highly oxidised films. Films recovered their original length after an extension for 1 hr. only, but the rate and degree of recovery both became less as the time of extension was increased, until at the end of 2 weeks' fixed extension the recovery was less than one third of the original (10%) extension.

D. WOODROFFE.

Uniformity of run kauri. G. G. SWARD and S. A. LEVY (Amer. Paint & Varnish Manufs.' Assoc., Nov., 1931, Circ. No. 396, 365—366).—"Kauri reduction tests" carried out on the same varnish, using freshly-run kauri, run kauri 2 and 9 years old, and a sample of run kauri the reliability of which was in question, showed satisfactory concordance. The suggested use of commercial abietic acid, which was tested alongside the kauri samples (giving reduction of 85% against 120% for kauri) was not proceeded with. It is proposed

to alter the standard test by shortening the baking time of the "reduced" varnish from 5 hr. to 2–3 hr. in view of the advent of 4-hr. varnishes. An indication of the degree of reduction necessary may be obtained from the fact that a panel bent at 0° fails at approx. 25% lower reduction than when tested at 24°.

S. S. WOOLF.

Russian rosin. A. N. HARTMAN (J. Chem. Ind., Russia, 1931, 8, 14–24).—Analytical data are tabulated. The more transparent samples have m.p. 61–80°; H_2O 0.3–0.5, ash 0.3–0.05, unsaponifiable matter 4.4–9.8%, acid val. 155–168, $[\alpha]_D^{+1}$ 11° to 4.78°. Impurities, 0.03–0.05%, are insol. in EtOH and affect the transparency.

CHEMICAL ABSTRACTS.

Specific gravity of the wood, and content of crude resin in the essence, of *Pinus nigra*, Arn., and *P. silvestris*, L. A. UGRENOVIC and B. SOLAJA (Bull. Inst. Pin, 1931, 239–240).—The wood is anisotropic, and the sp. gr. varies considerably (transversally, 11–63% in *P. nigra*, 28–98% in *P. silvestris*; longitudinally 81–107% and 95–134%, respectively). The sp. gr. is irregular transversally, and diminishes longitudinally from the base of the trunk upwards to a height of 23.3 m. in *P. nigra* or 13.3 m. in *P. silvestris*. The resin content shows 2 maxima, and is greatest and most variable in the duramen. The H_2O content varies in *P. nigra* from 50 to 62% in the aubier to 23–27% in the duramen, and in *P. silvestris* 60–68% and 20–25%, respectively. The sp. gr. of pinewood is definitely a function of the diam. of the autumn wood and, in part, of the crude resin, and the resin content varies sensibly with the thickness of the annual growth. C. HOLLINS.

Plant used in manufacture of synthetic resins. A. FRASER (Trans. Inst. Rubber Ind., 1931, 6, 516–525).—An illustrated description is given of the machinery, e.g., autoclaves, mixers, pumps, grinders, used in the manufacture of synthetic plastic products.

D. F. TWISS.

Some factors influencing the electrical properties of synthetic resin moulding materials. E. A. BEVAN, N. STRAFFORD, and E. E. WALKER (Trans. Inst. Rubber Ind., 1931, 6, 384–409).—Apparatus is described for measuring the dielectric strength and the vol. resistivity (at 75°) of mouldings of $PhOH-CH_2O$. The influence of variation in the conditions of the tests is indicated. Increased time of cure has little effect on the dielectric strength of a moulding, but the vol. resistivity decreases rapidly. The subsequent baking of mouldings is of no advantage to the dielectric strength; the vol. resistivity is increased, but on exposure to moist air it gradually diminishes again. Free moisture is the greatest adverse factor in a moulding powder, and the greatest possible care to prevent absorption of moisture by moulding powders is essential.

D. F. TWISS.

PATENTS.

Manufacture of colour lakes. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 357,155, 12.4.30).—Phosphotungstic (etc.) lakes of basic dyes (which may carry acid groups) are reduced, e.g., with hyposulphite, bisulphite, or nascent H. Examples are: phosphotungstic Al_2O_3 lake of Methyl-violet B reduced with

hyposulphite (violet); phosphotungstomolybdic lake of Diamond Green GX reduced with Zn and acid.

C. HOLLINS.

Manufacture of bronze colours. HARTSTOFF-METALL A.-G. (HAMETAG) (B.P. 360,142, 30.9.30. Ger., 30.9.29).—Thin bronze sheet or wire is pulverised in a mill containing steel balls and a small quantity of oil or fat, and a strong current of inert gas is passed through the mill to separate the fine powder and a relatively smaller proportion of coarser powder, which is then removed by sifting or differential settling and returned to the mill after re-lubrication.

A. R. POWELL.

[Manufacture of] derivatives of polyhydric alcohol-polybasic acid condensation products. IMPERIAL CHEM. INDUSTRIES, LTD., and W. BAIRD (B.P. 357,125, 6.5.30).—A "Glyptal" resin of acid val. above 30 is converted into its metal salts (other than alkali metal), by double decomp. or by treatment with the metal oxide, hydroxide, or weak-acid salt.

C. HOLLINS.

Manufacture of moulds [for thermoplastic materials]. CELLULOID CORP. (B.P. 360,743, 12.1.31. U.S., 11.1.30).—A suitable permanent form made from a cellulose derivative, polymerised vinyl compound, casein, etc. is roughened and coated with metal by spraying; when the final coating is to consist of a metal of relatively high m.p. (Cu), the form is first sprayed with a metal of relatively low m.p. (Zn, Sn).

F. R. ENNOS.

Plant for producing printing varnish. W. SCHMIDTING (W. SCHMIDTING) and A. SCHAEFER (B.P. 363,190, 26.1.31. Ger., 21.3.30).

Cutting of artificial resin. HEROLD A.-G. (B.P. 363,166, 12.1.31. Ger., 11.1.30).

Disperse systems.—See III. **Fibrous articles.**—See V. **Pb oxides.**—See VII.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

[Rubber] latex processes. D. F. TWISS (Trans. Inst. Rubber Ind., 1931, 6, 419–430).—Processes for the application of latex are grouped into 3 classes according to whether they depend primarily on the use of latex as a fluid dispersion, a dispersion of electrically-charged particles, or a dispersion of a colloid material. The composition of typical concentrate and "skim" obtained by centrifugal separation of latex is given. The increase in viscosity of latex with increase in the proportion of rubber above 60% renders it advantageous to add dispersions of compounding ingredients to latex and then to evaporate to a concn. at which sedimentation is slow. The isoelectric point of latex is influenced by its condition and by the nature of the added protective colloid.

D. F. TWISS.

Electrodeposition of rubber from latex. J. G. MACKAY (Trans. Inst. Rubber Ind., 1931, 7, 254–272).—For the Williams process (B.P. 293,095; B., 1928, 649) it is essential that the anodes should be of practically pure Zn. Results are given showing the effect of c.d. and time, and of concn. and total conductivity of the bath, on the rate of deposition; the effect of such factors on the nature of the wet deposit is also demonstrated.

D. F. TWISS.

K-Gutta : an insulation for modern submarine cables. J. N. DEAN (India-Rubber J., 1931, 82, 853—856).—K-Gutta is a mixture of gutta hydrocarbon (60–70 pts.), obtained from balata or gutta-percha by successive deresination and dissolution, with petroleum jelly (30–40 pts.) and an antioxidant (cf. B.P. 346,382; B., 1931, 640). For wire insulation it is applied preferably at 95–100° and is then submitted to a heat treatment by slow rise to, and maintenance for 4 hr. at, 56°. After this treatment, migration of the petroleum jelly to the surface does not occur unless the temp. is raised to 65°. K-Gutta has attractive electrical qualities, its ageing is as good as, and its resistance to water superior to, that of gutta-percha. D. F. TWISS.

Absorption of water by rubber and its relation to the protein content. S. J. SKINNER and T. J. DRAKELEY (Trans. Inst. Rubber Ind., 1931, 7, 196–208).—Comparable results were obtained in a reasonable time only by shredding the raw rubber before exposing it to the moist atm. and by maintaining a const. temp. to prevent deposition of dew on the rubber. The humidity was adjusted by contacting the atm. with H₂SO₄ of the necessary concn., for experimental observations a humidity of approx. 95% being convenient. After the first day of exposure absorption was slow; equilibrium was attained in approx. 1 week. The rate of absorption was generally higher with rubber containing a large proportion of protein, and the total quantity absorbed increased with the protein content. Moisture in rubber appears to be present in two forms, viz., that removable in 3 days at room temp. over H₂SO₄, and that evolved only on heating for 1 hr. or so at 100°.

D. F. TWISS.

Mastication [of rubber]. F. H. COTTON (Trans. Inst. Rubber Ind., 1931, 6, 487–515).—Rubber does not soften appreciably when masticated in N₂, and the increase in plasticity during ordinary milling is dependent on atm. O₂. Softening by mastication is not more rapid in ozonised air than in ordinary air, so that the traces of O₃ arising from static electric charges produced during mastication may not be of importance in the process. The volatile products of the action of O₃ on vulcanised rubber have a slight retarding action on vulcanisation. Dry rubber gains in wt. during mastication in air; the rate of absorption decreases slightly until the increase in wt. is 0.22%; the rubber then becomes tacky and the rate of absorption increases. Volatile products with an acrid odour resembling that of the aldehydic reaction products of O₃ and vulcanised rubber are evolved during ordinary mastication.

D. F. TWISS.

Evaluation of raw rubber. G. MARTIN (Trans. Inst. Rubber Ind., 1930, 6, 298–316).—Laboratory tests for the evaluation of raw rubber should bear a relation to its manipulation in the factory. Elasticity and mastication tests are necessary; air-dried sheet is generally harder than smoked sheet. Vulcanisation tests with a simple rubber-S mixture are inadequate and should be supplemented by an ageing test and vulcanisation of an accelerated mixing. The present undue stress laid on appearance does not encourage the production of rubber with the best intrinsic properties.

D. F. TWISS.

Surface tension of rubber solutions. C. W. SHACKLOCK (Trans. Inst. Rubber Ind., 1930, 6, 259–270).—Using a modified Sugden apparatus, the surface tension is found to be unaffected by removal of resins or by fractional pptn. of the rubber. Heating the rubber in a vac. or in air also fails to alter the surface tension of the solutions. By simultaneous mechanical stressing and absorption of O₂ such as occur during the ordinary milling of rubber, a slight elevation of surface tension is induced, and probably results from the formation of a compound of disaggregated rubber and O₂. It is suggested that formation of O₃ is involved in this effect of mastication.

D. F. TWISS.

Degradation of rubber solutions of varying concentration. B. BARY and E. FLEURENT (Compt. rend., 1931, 193, 852–854).—The viscosities of five xylene solutions of rubber (smoked plantation crêpe) of concns. 0.99, 1.98, 2.88, 3.94, and 5.12%, maintained in N₂ at 95° for varying periods, show that the hyperbolic relation (cf. A., 1931, 683) is invalid in solutions of concn. > 1.98%. For such there is first a period, increasing with concn., during which the rubber is disintegrated, e.g., 320 hr. for a 5.12% solution, after which the hyperbolic law holds. At some temp. between 95° and 140° pyrolysis of the rubber begins.

C. A. SILBERRAD.

Reinforcement [of rubber]. F. H. COTTON (Trans. Inst. Rubber Ind., 1930, 6, 248–258).—Crit. consideration is given to present knowledge of the mechanism of reinforcement by fine powders. It is suggested that the additional work required to break a reinforced rubber is needed to overcome the forces of adhesion between the rubber and that portion of the filler which is in contact with the rubber, the interfacial tension between the filler and the rubber which resists any tendency towards increase in total surface area exposed by each, the friction between flocculated particles of filler, and the friction between rubber particles undergoing reversible plastic flow around the filler particles. Probably no reinforcing filler can enhance the val. of vulcanised rubber as an accumulator of energy; it is likely that a definite relation exists between the reinforcing qualities and the hysteresis loss introduced.

D. F. TWISS.

Hysteresis and reinforcement [of rubber]. H. BARRON and F. H. COTTON (Trans. Inst. Rubber Ind., 1931, 7, 209–227).—The hysteresis loss in vulcanised rubber during a cycle of extension and retraction at uniform temp. increases with amplitude to an extent comparable with the increase in work of extension. Reinforcement does not appreciably increase the ability of the rubber to store energy. With rubber vulcanised to optimum tensile properties hysteresis loss and work of retraction are proportional to the work required for extension to that elongation; it is possible, therefore, given the hysteresis loss in a given cycle, to calculate the work of retraction from the breaking point. The work of retraction from the ultimate breaking point increases slightly with reinforcement and is greatest when reinforcement is at a max. Fillers, e.g., C black, ZnO, and clay, were found not to lessen this work of retraction until the rubber was highly compounded. Probably the increased work necessary to rupture

reinforced rubber is mainly dissipated in overcoming consequent internal friction. D. F. TWISS.

Influence of white factice on vulcanisation of accelerated rubber stocks. H. C. BAKER, W. H. BODGER, and F. H. COTTON (Trans. Inst. Rubber Ind., 1931, 7, 144—157).—White factice containing approx. 9% Cl diminished the activity of typical org. accelerators of various groups, the effect being so marked with diphenylguanidine that this could not be used satisfactorily in mixings containing above 25% of the factice; the result was improved somewhat by the additional presence of 10% of MgO. The influence of the factice appeared to commence during the mixing operation and the accelerator was best introduced last. The more stable accelerators generally gave the best results, but in all cases a high proportion of vulcanising agent was necessary, e.g., 2% of accelerator and 7½% of S; the most satisfactory accelerators were *p*-nitrosodimethyl-aniline, mercaptobenzthiazole, and tetramethylthiuram disulphide. D. F. TWISS.

Determination of free sulphur in soft vulcanised rubber by a volumetric method. W. D. GUPPY (Trans. Inst. Rubber Ind., 1931, 7, 81—84).—The rubber (2 g.) in small pieces is boiled with conc. HCl for 1—3 hr. to decompose mineral sulphides. After decanting the acid and washing with H₂O the rubber is refluxed for 1½ hr. with 50 g. of granulated Sn and 100 c.c. of a 1:1 mixture of HCl and glacial AcOH in a current of purified CO₂, and the issuing gases, after being washed with H₂O, are passed into 2 flasks in series containing aq. Cd(OAc)₂ acidified with AcOH. The resulting CdS is determined by addition of 0.1N-I and HCl followed by titration with thiosulphate. The results generally are comparable with those of the standard methods. D. F. TWISS.

Ebonite. H. RIDING (Trans. Inst. Rubber Ind., 1930, 6, 230—247).—Ebonite has advantages in power loss and dielectric strength relative to synthetic resins. Methods are described for testing tensile and transverse strength, plastic yield, and toughness. The chemical nature of ebonite is reviewed. The exothermic reaction in the vulcanisation of rubber to the hard condition commences always when the coeff. of vulcanisation is approx. 8. During the vulcanisation process the presence of ebonite dust acts merely as a diluent; the consequent reduction in the heat development, however, may necessitate a longer period of vulcanisation, particularly for thin sheet. D. F. TWISS.

Curing [vulcanisation] of hard rubber [ebonite] in boiling water and in calcium chloride solutions.

R. T. VANDERBILT CO. (India-Rubber J., 1931, 82, 859—861).—A mixture of rubber 100, stearic acid 2, ZnO 5, special C black 40, S 5, Zimate accelerator 5, and mercaptobenzthiazole 5 became vulcanised to the hard condition in boiling H₂O in 48 hr. This period could be reduced by using a solution of NaCl or, still better, of CaCl₂. In solutions of the latter, b.p. 110°, 120°, and 130°, the necessary periods were 8, 3 and 1½ hr. respectively. D. F. TWISS.

Acetylene polymerides and their derivatives. II. New synthetic rubber: chloroprene and its polymerides. W. H. CAROTHERS, I. WILLIAMS, A. M. COLLINS, and J. E. KIRBY (J. Amer. Chem. Soc., 1931,

53, 4203—4225; cf. A., 1932, 40).—Vinylacetylene and conc. HCl in presence of Cu₂Cl₂ and NH₄Cl give about 65% of β -chloro- $\Delta^{\alpha\gamma}$ -butadiene (chloroprene) (I), b.p. 6.4°/100 mm., 59.4°/760 mm., which with maleic anhydride affords 4-chloro-1:2:3:6-tetrahydrophthalic acid, m.p. 173—175°, oxidised to butane- $\alpha\beta\gamma\delta$ -tetracarboxylic acid. (I) and α -naphthaquinone give, after atm. oxidation in presence of alkali, 2-chloroanthraquinone. When kept in a closed vessel containing a little air, (I) changes after 10 days into μ -polychloroprene (II), which resembles a completely vulcanised soft rubber which is not plastic; when stretched, its X-ray diffraction pattern shows a point diagram. (II) is unsaturated to Br and is oxidised by HNO₃ to succinic acid. Polymerisation of (I) at 60°, especially in absence of air, gives β -polychloroprene, which when distilled affords two fractions, b.p. 92—97°/27 mm. and 114—118°/27 mm.; these fractions probably consist of cyclic dimerides, which show no tendency to polymerise. Interruption of the μ -polymerisation before completion results in the isolation of α -polychloroprene, a soft plastic product resembling unvulcanised rubber, which changes into (II) at 30°. An ω -polymeride, hard rubbery granules or globules, is also obtained; its formation is favoured by the presence of metallic Na and is initiated (or accelerated) by light of 3130 Å, wave-length. A balata-like polymeride is formed when (I) polymerises in presence of inhibitors such as I or tetra-alkylthiuram disulphides. O₂ is a powerful catalyst for the transformation of (I) into (II); in presence of air, the change is about 4 times faster at 62° than at 25°. Light has a considerable accelerating action and polymerisation occurs 10 times as rapidly at 6000 atm. as at room temp. The following types of compounds function as inhibitors: phenols, quinones, amines, mercaptans, thiophenols, aromatic NO₂-compounds, and halogens; C₆H₃(NO₂)₃ is a powerful inhibitor. Polymerisation of (I) can be effected in presence of solvents (but at a diminished rate), inert fillers, and various foreign substances. (I) is readily emulsified in aq. Na oleate and such emulsions polymerise rapidly and completely, forming an artificial latex; evaporation gives a thin film of material resembling (II). The latex can be stabilised by NH₃ (5 g. per 1 litre of emulsion), and can be mixed with dyes, fillers, and protective agents. α -Polychloroprene is vulcanised by ZnO, ZnCl₂, Zn butyrate, and FeCl₃; org. agents are NH₂Ph, benzidine, and naphthylamines, whilst diphenylguanidine is a mild accelerator, and aromatic *sec*-amines are powerful inhibitors (at room temp.). The behaviour of α -polychloroprene in compounding and the properties of the cured rubber formed are discussed; tests are given for compounded stocks vulcanised at 110—140°. (I) can also be polymerised in porous materials. The new synthetic rubber is denser, more resistant to H₂O, O₂, O₃, HCl, and HF, and less permeable to many gases, than natural rubber. C. J. WEST. (b)

Schopper tensile machine.—See I. **Rubber-proofed fabrics.**—See VI. **Anti-oxidants etc.**—See XIII.

PATENTS.

[Rubber] surfaces to which printing and other impressions are applied. H. BECKMANN (B.P. 360,607, 10.10.30. Ger., 12.10.29).—Finely-porous

rubber of which the pores are invisible to the unaided eye is very suitable for receiving impressions in printing presses and for multi-colour printing. The material may be of the hard or soft vulcanised type and may be reinforced, before or after vulcanisation, by textiles or metal gauze. Subsequent absorption of moisture can be prevented by suitable impregnation or spraying after printing. D. F. TWISS.

Manufacture of compositions of or containing rubber. DUNLOP RUBBER CO., LTD., D. F. TWISS, and F. A. JONES (B.P. 360,599, 7.10.30).—By treating rubber compositions with reactive org. derivatives of metals, *e.g.*, $\text{Ni}(\text{CO})_4$, and effecting decomp. of these within the rubber, the physical properties of the mixture undergo an alteration comparable with that produced by ordinary reinforcement or vulcanisation. D. F. TWISS.

Automatic vulcaniser and heating composition for vulcanising [rubber]. OFFICE GÉNÉRAL DES SPÉCIALITÉS AUTOMOBILES (B.P. 360,586, 27.9.30. Fr., 30.9.29).—For the repair of rubber goods a pellet of rubber containing vulcanising agents is pressed on the desired spot by the underside of a metallic basin, held by a suitable clamp, and the basin is heated by the combustion therein of a tablet of trioxymethylene mixed with an EtOH solution of colophony or an aq. solution of gum arabic or fish glue. This mixture is fired by the addition of a pellet made by mixing charcoal, KClO_3 , and an EtOH solution of colophony to which sparks are then applied from a mechanical lighter. D. F. TWISS.

Vulcanisation of natural rubber and rubber-like masses. A. CARPMAEL. FROM I. G. FARBERIND. A.-G. (B.P. 360,490—1, [A, B] 9.8.30, [A] 8.5.31).—Vulcanisation is accelerated (A) by the reaction product of an *N*-disubstituted dithiocarbamic acid or a salt thereof, *e.g.*, $\text{Na cyclopentamethylenedithiocarbamate}$, and CHCl_2Ac ; or (B) by the reaction product of a μ -mercaptoarylenethiazole, or a salt thereof, with a halogen compound, *e.g.*, CH_2ClAc or $\text{CHCl}_2\cdot\text{CO}_2\text{Et}$, containing a CH_2Cl or Ac group combined with a doubly- or trebly-linked C atom which is not in an aromatic nucleus. D. F. TWISS.

C black.—See II. Piperidine pentamethylene-dithiocarbamate.—See III.

XV.—LEATHER; GLUE.

Importance of the mass-action law in leather manufacturing operations. W. SCHINDLER (Collegium, 1931, 626—633).—The amount of colloid dispersed in any medium at const. vol. and const. concn. is dependent on the amount of non-dispersed material in the dispersing medium, *e.g.*, olive oil in COMe_2 and H_2O , oils in dil. alkaline solution, casein in dil. alkalis, dispersions of $\text{Fe}(\text{OH})_3$ and animal charcoal in soap solutions. The amount of dispersed material attains a max. with a moderate amount of insol. matter, and is dependent on the concn. of the peptiser, frequently attaining a max. with a moderate concn. thereof. The characteristics of a colloid dispersion are determined by the ratio of the gel to the peptiser and by the total amount of colloid present. The effect of electrolytes in swelling is analogous to that of peptisers in dispersing colloids. The intensity of the swelling varies directly with the concn. of the electrolyte in the solution. The amount of the

max. swelling of hide powder depends on the vol. of the solution used for swelling. Many of the dispersions used in leather manufacture are prepared, not by peptisation, but by means of molecularly dispersed solutions or by very highly dispersed colloids. The application of the dispersion laws to leather manufacture is illustrated by references to chrome tanning, fat-liquoring, the effect of bating on elastin, and salt denaturants.

D. WOODROFFE.

Non-tans in barks. J. ZELLNER (Collegium, 1931, 605—609).—From the non-tans in a no. of barks, sol. matter, *e.g.*, carbohydrates including pectins, invert sugar, glucosides, purine derivatives, and small amounts of sol. N compounds and alkaloids have been isolated. Phlobaphens and starches have been isolated from the slightly sol. matter, and fats, sterols, waxes, and resins from the insol. matter. The N content of the barks varied from 0.15 to 2.29% and 1.73—11.27% of mineral matter was present. Ceryl alcohol was isolated from the insol. matter of most barks.

D. WOODROFFE.

Tannin analysis and the "Parker effect." T. G. GREAVES (J. Amer. Leather Chem. Assoc., 1931, 26, 606—620; cf. B., 1929, 1024).—The val. for total solids in tanning extracts as determined by the official method was greater than the result obtained by direct heating of ordinary solid quebracho extract and less for chestnut extract. These differences are termed the "Parker effect." The results obtained by both methods diminished as the R.H. diminished, and variations in the Parker effect are attributed to the different R.H. at which the determinations have been made. Gain in wt. was not shown by continued drying of residues. The Parker effect was increased by doubling the exposure of surface of dried residues in the desiccators and in weighing during the official method. No Parker effect was given by quebracho extract when the dishes were covered with weighed watch glasses from the drying oven and left covered in the desiccators and during weighing, and the negative Parker effect with chestnut extract was increased by this method of procedure. This procedure is not recommended, but the size of desiccator should be specified and the shape modified to improve the efficiency of the drying agent. The negative effect with chestnut extract is caused by the loss of material other than H_2O during drying.

D. WOODROFFE.

Sources of error in the preparation of test glue solutions. G. GUNTHER (Farben-Ztg., 1931, 37, 251, 287).—When preparing glue solutions for measurements of the viscosity, gelling power, tendency to separate, etc. it is essential that the "swelling" in the dissolution process be complete, which is not the case when slabs of glue of irregular thicknesses are used. Division into small pieces (*e.g.*, 0.25 sq. cm.) is suggested. Any under-heating leads to hysteresis effects, whilst regular stirring is necessary to avoid agglomeration and attachment to the sides of the vessel. Distilled H_2O and clean apparatus should be employed. S. S. WOOLF.

Patent leather varnish films.—See XIII.

PATENT.

Sheet material from hides etc.—See V.

XVI.—AGRICULTURE.

Colour in fertilisers. J. O. HARDESTY and J. T. SCANLAN (*Ind. Eng. Chem.*, 1931, 23, 1431–1433).—Three methods of colouring synthetic fertilisers were tried. CHPh_3 dyes as a class proved the most satisfactory. $(\text{NH}_4)\text{H}_2\text{PO}_4$ proved the most difficult to colour. W. G. EGGLETON.

Effect of nitrogenous fertilisers on soil acidity. W. H. PIERRE (*Ind. Eng. Chem.*, 1931, 23, 1440–1443).—The acidifying effect of $(\text{NH}_4)_2\text{SO}_4$ and other nitrogenous fertilisers in relation to buffer capacity and exchangeable base content of various types of soil is discussed with special reference to liming practice. W. G. EGGLETON.

Effect of soil reaction on growth of tomatoes and lettuce, and on the nitrogen, phosphorus, and manganese content of the soil and plant. E. M. EMMERT (*Kentucky Agric. Exp. Sta. Tech. Bull.*, 1931, No. 314, 83 pp.).—Soil reaction affects the growth of plants indirectly by its influence on nutrient relationships and on the toxicity of soil constituents. In soils artificially adjusted to p_{H} 4.3–5.3 the early yield of tomatoes was improved, but the total yield declined. The nitrate supply became the limiting factor in this case. Addition of Na_2CO_3 to produce p_{H} 8.3–8.5 in soil produced greater crop increases than when the reaction was similarly adjusted with CaO . For the lettuce crop, Na_2CO_3 treatment to produce p_{H} 7.2–8.6 markedly increased yields. Applications of CaO without org. matter caused poor growth and yellowing foliage in both crops, together with a reduced P content in the plants. Treatment of soil with CaO or Na_2CO_3 in the presence of org. matter increased yields by encouraging nitrification and N fixation. The sol. Mn content of a manganiferous soil was rapidly increased by acidification to $p_{\text{H}} < 6$ to within toxic proportions. Analysis of the nutrient elements in the conducting tissues of plants gives a better indication of soil fertility than an examination of the soil itself. A. G. POLLARD.

Formation of crude protein, crude fat, and husk in oat grain. A. MIX (*Landw. Jahrb.*, 1931, 73, 795–840).—Late sowing of oats resulted in decreased grain yields, fat, and husk contents and an increased protein content and wt. per 1000 grain. In general, the protein content was increased by the use of N and P fertilisers, but was not affected by K. The fat was slightly increased by K and complete fertilisers. Liming reduced the total yield, but increased the protein content and, to a less extent, the proportion of fat and husk. Use of potash with CaO decreased the protein without affecting the fat content. Potash and N increased the proportion of protein and husk and decreased the fat. No relation was observed between the contents of protein and fat in the grain. The protein content of oats is in part an inherited factor, but modified by soil and climatic conditions and by manuring. There is an increase with rising temp. up to the tillering period and a decrease with greater rainfall subsequently. The fat content is affected by weather conditions, but no definite varietal differences are apparent. A. G. POLLARD.

Does excessive potash manuring contribute to yield increases and stiffer straw in cereals? UMBERG (*Ernähr. Pflanze*, 1931, 27, 354–355).—On soils showing a K deficiency by the Neubauer test, high K manuring gave an economic return by both increasing yields and reducing losses by “lodging.” A. G. POLLARD.

Reaction of greenhouse soils and the growth of plants. W. W. WIGGIN and J. H. GOURLEY (*Ohio Agric. Exp. Sta. Bull.*, 1931, No. 484, 30 pp.).—Optimum growth of greenhouse flowering plants was obtained in soils having reactions slightly on either side of the neutral point. At or near neutrality growth was depressed. Extremes of acidity or alkalinity were seriously detrimental. The majority of species showed a preference for slightly acid conditions. Excessive alkalinity was counteracted by treating soil with $\text{Al}_2(\text{SO}_4)_3$. Org. manures, notably sheep manure, rendered soils more alkaline. Peat moss, although showing p_{H} 4.0 approx., did not appreciably reduce the p_{H} of alkaline soil composted with it. A. G. POLLARD.

Influence of water content and the addition of various amounts of sugar on the quality of silage. M. SCHIEBLICH (*Bied. Zentr.*, 1931, 3 B, 437–449).—Good silage for milk production was produced, without sugar additions, by pre-drying lucerne to a H_2O content of 65% (fresh material had 75% H_2O). With lucerne containing 65–85% H_2O the addition of $\frac{1}{2}$ –1 lb. of sugar was necessary. A. G. POLLARD.

Determination of total acids in silage. W. WÖHLBIER (*Bied. Zentr.*, 1931, 3 B, 400–407).—These cannot be determined accurately by titration, using phenolphthalein or litmus (externally). The end-point registered varies between p_{H} 7.2 and 8.2. Moreover, results from the two indicators are not comparable. Potentiometric methods are essential for exact measurements. A. G. POLLARD.

Green manuring. BERKNER, SCHLIMM, and KINDERMANN (*Landw. Jahrb.*, 1931, 73, 781–793).—In a comparison of blue and yellow lupin, serradella, and vetch as green-manuring catch-crops, the greatest N accumulation in the plant occurred in yellow lupin and of Ca in blue lupin. The manurial value of the plants for a subsequent oat crop varied with the N content of the material. Removal of the green matter before ploughing-in reduced the oat crop very considerably. The N content of the soil following the oat crop was practically the same for all the green crops except blue lupin. The higher proportion of residual N in this case is ascribed to the slower decomp. of the more woody stems. A. G. POLLARD.

Determination of readily available phosphorus in soils. C. L. C. BOURNE (*Agric. J. Brit. Guiana*, 1931, 4, 91–94).—British Guiana soils are well supplied with available P_2O_5 ; data are tabulated. Soils showing 70 p.p.m. P_2O_5 by the citric acid method or 18 p.p.m. by the Truog method do not respond to phosphate fertilisers. CHEMICAL ABSTRACTS.

Insecticides and vermicides. Pyrethrum and its applications. E. PERROT (*Bull. Soc. d'Encour.*, 1931, 130, 709–722).

Consistency of butter. Maize and tankage for pigs.—See XIX.

XVII.—SUGARS; STARCHES; GUMS.

Continuous diffusion [of beet slices]. A. VASSEUX (Bull. Assoc. Chim. Sucr., 1931, 48, 358–361).—The advantages of hot continuous diffusion are discussed and apparatus therefor is described. T. H. POPE.

Determination of starch. V. Rask's gravimetric method. A. R. LING and F. E. SALT (J. Inst. Brew., 1931, 37, 595–597; cf. B., 1931, 561).—The starch contents in barley and malt as determined by Rask's method (B., 1927, 311) are lower than those obtained in the same samples by the diastase method of Ling and Price. The lower vals. in the Rask method are ascribed to the partial hydrolysis of the starch by HCl. The use of an acetate buffer in the diastase method raises the % of starch and causes a greater divergence from the vals. obtained by the Rask method.

C. RANKEN.

Sampling relations.—See I. Water hyacinths.—See II. Size from starch.—See VI. Sugar in fodder.—See XIX. [Sugar in] Brazilian plants.—See XX.

XVIII.—FERMENTATION INDUSTRIES.

Comparison of distillery slop prepared by different methods. B. LAMPE and W. KILP (Z. Spiritusind., 1931, 54, 295–296, 304, 308–309).—In distillery practice the yield of EtOH can be restricted and the feeding val. of the slop increased either by raising the mashing temp. and using less green malt, or by fermenting at a lower temp. with less yeast. The slop obtained by the first method contains no fermentable carbohydrate, whilst that from the second method contains 0.025–0.12% of maltose. The latter method has also the disadvantage of the difficulty of retaining with regularity a temp. sufficiently low during fermentation to restrict the yield of EtOH. In the laboratory the slop produced by both methods acidifies at the same rate on keeping.

C. RANKEN.

Determination of esters in distilled [alcoholic] liquors. F. H. CAMPBELL (J. Assoc. Off. Agric. Chem., 1931, 14, 576–577).—The A.O.A.C. official method was found to give widely variable results with different analysts for a sample of Scotch whisky (28.6–68.8 pts. by wt. of EtOAc per 100,000). Such errors are sufficient to prevent brand identification. By means of a control solution of EtOAc the alkali of the glass flask is shown to produce errors, more particularly with Pyrex and Schola glass. Jena, Chance Bros., Wood Bros., and Bohemian glass are the most suitable, and it is necessary to do the blank titrations in flasks of the same glass; for the latter purpose H₂O, and not EtOH, should be the medium employed.

H. R. JENSEN.

Water hyacinths.—See II. Water analysis.—See XXIII.

XIX.—FOODS.

Swelling of flour. T. RUEMELE (Mühlenlab., 1931, 41–45, 49–50).—The viscosities of suspensions of flours of different baking qualities in AcOH, H₂C₂O₄, and lactic acid of varying dilutions have been studied

with reference to the author's method of determining flour quality (B., 1931, 943). The swelling of flour is greatest in lactic acid, less in AcOH, and least in H₂C₂O₄, especially in greater dilutions of these acids.

W. J. BOYD.

Separation of casein and albumin in small quantities of milk. A. WASITZKY (Mikrochem., 1931, 10, 114–116).—The method described is a modification of that of Schlossmann: the casein is pptd. with alum at 40° and removed by centrifuging, and the albumin is pptd. with tannic acid in the filtrate. A device for removing the greater part of the solution before centrifuging, without loss of the ppt., is described.

H. F. GILLBE.

Physico-chemical constitution of milk powder. L. H. LAMPITT and J. H. BUSHILL (Analyst, 1931, 56, 778–794; cf. B., 1931, 563).—Milk powder prepared by the roller process absorbs moisture in a regular manner, whereas spray-dried powder absorbs a max. amount of H₂O, part of which is subsequently lost. Spray-dried lactose itself absorbs up to 10% H₂O, which is then liberated to the atm., and this constituent is probably responsible for the peculiar behaviour of spray-dried milk. Lactose dried by the spray process is different from that prepared in any other manner and is amorphous and optically inactive. Spray-dried powders absorb H₂O unevenly; the H₂O content of different samples of milk powder may vary by 0.4% below, and 1.0% above, the crit. moisture content. When the H₂O content is < 6% the solubility of a powder remains almost unaffected, but near the crit. moisture content a rapid decrease in solubility occurs on storage, this phenomenon being accentuated by a rise in temp. Above the crit. moisture content the solubility of a powder drops rapidly to about 70% and is not affected further by time or temp. Calc. on the solids-not-fat, H₂O causes the same decrease in solubility in full-cream and separated-milk powders, though the insol. residue of the former may contain up to 40% of fat. The insol. portion of a powder, other than fat, consists mainly of casein; the albumin and globulin remain sol. and cause the frothing of solutions of milk powders of low solubility.

T. MCLACHLAN.

Influence of feeding-stuffs on the consistency of butter. N. HANSSON and N. E. OLOFSSON (Bied. Zentr., 1931, 3 B, 352–391).—Summer feeding with green fodder, especially young red clover, tends to produce a soft butter of high I val. (up to 40). Drying or ensiling the plants reduces this effect. Winter roughages, e.g., hay, straw, roots, and root tops, have the reverse effect. The influence of farm-grown concentrates depends on their fat contents. Barley produces a rather harder butter than oats, and leguminous seeds a very hard butter. Among purchased concentrates the effect on butter varies with the total fat content and the nature of the acids of the fats. Acids of high I val. cause softness, and *vice versa*. For good consistency of winter butter, oil cakes should have 5–6% of fat and I val. > 100–110. The effect of feeding-stuffs on butter quality is apparent within 8 days of the commencement of feeding. Variations in the butter fat of individual cows on the same ration amounts to 6–7 units of

I val. Dairy technique affects butter consistency to a considerable extent. A. G. POLLARD.

Variations in the analytical constants of butter on ageing. S. ANSELM (Annali Chim. Appl., 1931, 21, 454—464).—The Reichert-Meissl, Polenske, and *n* vals. were determined on samples of butter kept from 3 to 42 months and on samples of butter fat kept from 5 to 27 months. In rancid butter there is a diminution in the Reichert-Meissl val.; when rancidity is accompanied by moulds there are irregular variations in all the vals. determined. In the samples of butter fat obtained by fusion and filtering the variations are small.

O. F. LUBATTI.

Rapid determination of acid-soluble phosphoric acid in eggs. J. FITELSON and I. A. GAINES, JUN. (J. Assoc. Off. Agric. Chem., 1931, 14, 558—562).—A modification of Pine's method (B., 1924, 884) was applied, with which it is shown to compare well. A very complete destruction of org. matter is effected by boiling the filtrate obtained after a picric acid-HCl digestion (shaken for 30 min. and centrifuged) with H_2SO_4 - HNO_3 . This also ensures conversion into inorg. P. P_2O_5 is then determined volumetrically with molybdate after pptg. at 25—30° (instead of 40—50°). Small amounts of SO_3 do not interfere. The following mean vals. were found (mg. P_2O_5 per 100 g. of dry material): dried egg yolks 133.1, dried whole egg 112.9, liquid whole egg 91.6, liquid egg yolk 114.

H. R. JENSEN.

"Depoisoned" coffee infusions. H. JESSER and A. SCHREMPF (Chem.-Ztg., 1931, 55, 875).—A filtered 4% infusion of coffee to which adsorbent C had been added contained 57.5% of the caffeine present in the original coffee (1.27%), whilst an ordinary 4% infusion contained 71.7%. This method of caffeine removal is more efficient than filtration of the hot extract through adsorbent C (cf. B., 1931, 1071), but neither method distinguishes between physiologically active and inactive (e.g., chemically-combined) caffeine. An untreated coffee yielding 79.1% of its caffeine content in an aq. infusion gave only 77.9% when infused, according to Turkish custom, in a sugar solution (cf. B., 1927, 153).

J. GRANT.

Improving maize and tankage for pigs not on pasture. W. L. ROBINSON (Ohio Agric. Exp. Sta. Bull., 1931, No. 488, 41 pp.).—Improved growth of pigs was obtained by supplementing a maize-tankage ration with a mineral mixture of limestone, Na_2SO_4 , and small amounts of copperas or of Fe oxides. Fermentation of the food with yeast had little or no effect on the rate of growth or in the live-wt. increase per unit feed. Cod-liver oil increased the efficiency of the rations, aerated oil being less efficient than untreated samples. Cacao-bean oil meal proved toxic. Effects of admixture of various conc. feeding-stuffs with tankage are recorded.

A. G. POLLARD.

Use of sugar in fodder. K. ULRICH (Z. Ver. deut. Zucker-Ind., 1931, 81, 619—632).—By-product sugar mixed with filling material such as fish meal, bone charcoal, rice meal, potato pulp, etc. can be advantageously used as fodder for horses and cattle. No deterioration in the val. of the fodder takes place when the sugar is inverted owing to a high moisture content in the filler.

C. RANKEN.

Food-colour mixture.—See IV. **Vitamins in cod-liver oil.**—See XII. **Silage.**—See XVI. **Starch.**—See XVII.

PATENTS.

Making a stable powder from whole milk. C. BÖHM VON BÖRNEGG (U.S.P. 1,808,730, 2.6.31. Appl., 13.8.27. Ger., 6.5.26).—The mixing of spray-dried cream and of separated milk produces a whole-milk powder with improved keeping properties. The two ingredients may be sprayed simultaneously into the same drying plant.

E. B. HUGHES.

Treatment of hay. O. ERF (U.S.P. 1,804,602, 12.5.31. Appl., 18.7.27).—Flue gases are passed up a tower down which hay slowly travels. This tower is fitted with a cutting device, thus producing finely-cut dried hay.

E. B. HUGHES.

Manufacture of animal food. W. G. HANSEN (B.P. 361,912, 20.8.30).—The prep. of a canned feed consisting of red horse meat, horse fat, barley, and broken rice, or whole wheat, flavoured with garlic, is described.

E. B. HUGHES.

Dairy plant for pasteurising milk in bottles. A. G. ENOCK, and R. MORTON & Co., LTD. (B.P. 363,033, 14.10.30).

Preparation of effervescent milk [aerated with carbon dioxide]. C. KOSANKE, G. R. E. KLEINWORT, and H. A. H. GEHRCKENS (B.P. 363,031, 13.10.30).

Separator for cocoa powder.—See I.

XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Detecting decomposition products in anæsthetic chloroform. N. L. ALLPORT (Analyst, 1931, 56, 706—710).—Owing to the action of EtOH , COCl_2 present in CHCl_3 of the B.P. gives rise to HCl , traces of which may be detected by the addition of 0.15% each of resorcinol and vanillin. If the mixture is placed in a stoppered bottle in the dark for 1 hr. and treated with $\frac{1}{2}$ vol. of 1% aq. NH_3 , a pink or red colour is developed, which reaches its max. in 30 sec. and is proportional to the amount of HCl present. The limit of sensitiveness is about 1 pt. of COCl_2 in 2 p.p.m. of CHCl_3 . The benzidine test of the D.A.B. VI does not detect the presence of COCl_2 , but is effective for HCl , and the pptn. of benzidine hydrochloride is inhibited by addition of EtOH .

T. McLACHLAN.

Determination of camphor in camphor liniment. II. U.S.P. X method for liniments made with oils other than cottonseed. C. F. POE and G. LIPSEY (J. Amer. Pharm. Assoc., 1931, 20, 1175—1177; cf. B., 1929, 659).—The U.S.P. X method for determining camphor, when applied to liniments made with any of the common fixed oils, gives low results due to oxidation of the oil. The error is not as great as that obtained when cottonseed oil is used.

E. H. SHARPLES.

Contamination in morphine deposited in the British Pharmacopœia process for the analysis of opium. J. N. RAKSHIT (Analyst, 1931, 56, 711—713).—Owing to incomplete extraction by Et_2O , B.P. morphine contains about 5.65% of extraneous matter, including 3.6% of codeine and some porphyroxine.

If the $\text{Ca}(\text{OH})_2$ solution, prepared according to the B.P. process, be extracted with C_6H_6 before adding NH_4Cl , and the EtOH and Et_2O be omitted, the yield of morphine is about 10% higher and the alkaloid purer. The standard correction of 0.51 g. should still be added to the results.

T. McLACHLAN.

Determination of morphine in opium. N. RUSTING (Arch. Pharm., 1931, 269, 609—615).—Opium (emulsified in H_2O) is treated with $\text{Ca}(\text{OH})_2$ in presence of MnCl_2 and the aq. extract treated with NH_4Cl in presence of Et_2O (to dissolve secondary alkaloids). The pptd. morphine is washed with a saturated aq. solution of morphine, dissolved in 0.1N-acid, and the excess of acid titrated with 0.1N- NaOH first to methyl-red and then (in presence of Et_2O) to phenolphthalein. The method gives more consistent results than that described in Pharm. Neerl. V, which are considerably higher than those determined by using the EtOH -tartaric acid method.

H. BURTON.

Determination of cineole in essential oils. II. Camphor oil. III. Other cineole-containing oils. 8TH REPT. ESSENTIAL OIL SUB-COMM. TO THE STANDING COMM. ON UNIFORMITY OF ANALYTICAL METHODS (Analyst, 1931, 56, 738—739; cf. B., 1927, 506).—II. The *o*-cresol method recommended in the previous report (*loc. cit.*) has been found reasonably accurate for camphor oils, using the modification for oils containing <50% of cineole. With oils distilling below 200° the test is carried out directly on the oil. Oils containing high-boiling constituents must be fractionated and the test carried out on the portion of the oil distilling below 200° , the cineole content being calc. on the original oil. Results show an error of $\pm 2\%$.

III. The presence of alcohols, esters, aldehydes, and ketones interferes with the f.p., but the test is useful and the term "apparent cineole content by *o*-cresol" should be used.

T. McLACHLAN.

Evaluation of the menthone content of peppermint oil. J. REILLY, N. NOONAN, and P. J. DRUMM (Analyst, 1931, 56, 702—706).—Treatment of menthone with semicarbazide hydrochloride and NaOAc in warm aq. EtOH (cf. B., 1928, 426) yields the carbazone. 95% of the menthone may be recovered by steam-distillation on addition of the calc. amount of 0.5N- H_2SO_4 . The prep. of the semicarbazone may be employed for the determination of menthone in peppermint oil.

T. McLACHLAN.

Esters as adulterants of cassia oil, and their detection. J. CALLAWAY, JUN., and T. N. BENNETT (J. Assoc. Off. Agric. Chem., 1931, 14, 571—573).—In view of the use of Cl-free cinnamaldehyde as adulterant it is preferable to detect additions by tests for added esters (other than cinnamyl acetate). For this purpose boiling the oil with alcoholic KOH is useful, as the K salts of the acids of foreign esters (phthalic, benzoic, etc.) often solidify on cooling. Positive reactions were given with specimens of commercial "redistilled" oils. The non-aldehydic matter may also be separated and fractionally distilled. For aldehyde determinations it was found preferable to use a saturated rather than a 5% solution of NaHSO_3 .

H. R. JENSEN.

Some unknown essential oils from Brazilian plants, used as anthelmintics. F. W. FREISE (Perf. & Essent. Oil Rec., 1931, 22, 370—371).—Oils from the following plants are described. *Jatrohiza palmata*, Miers (Calumba root): 0.07—1.15% yield, d^{25}_4 0.9558, n^{25}_D 1.4755, b.p. 165—168°; *Cissampelus ovalifolia*, DC. (Tiger's ear): 0.08—0.135% of oil (fresh roots) having d^{25}_4 1.0555, n^{25}_D 1.4528, and thymol content 20%. It has a very energetic anthelmintic effect, which is not followed by disastrous consequences. *Gomidesia tomentosa*, Mart.: fresh leaf oil (0.25—0.48%) has d^{25}_4 0.9115, n^{25}_D 1.425, and contains principally cineole and geraniol; fresh pulp oil (0.85%) has d^{25}_4 1.0555—1.0626 and b.p. 168°. Fatty oil and 10—12% of fermentable sugar are also obtained from the pulp. *Trianosperma tayuya*, Mart. (Indian's root): 0.8—0.95% yield, d^{25}_4 1.0585, b.p. 172—174°. The oil has a very rapid and lasting anthelmintic effect. *Fevillea trilobata*, L. (Jabota): 0.25% of oil from fresh seeds, having d^{25}_4 0.9875, n^{25}_D 1.5255, and b.p. 155°. *Lonchocarpus Peckoltii*, Wawra, contains in its fresh roots 0.158% of an oil (musk odour) having d^{25}_4 1.0234, b.p. 172°, and containing eugenol. The anthelmintic properties of all the above plants are due to their essential oil.

E. H. SHARPLES.

[Prep. of] fluid extracts.—See I. Vitamins in cod-liver oil.—See XII.

PATENTS.

Administering chlorine gas for treatment of colds and the like. R. H. McKEE (U.S.P. 1,802,662, 28.4.31. Appl., 2.4.28).—The Cl_2 is dissolved in a chloro-derivative of CH_4 , preferably CCl_4 , and sufficient of the solution is sealed into an ampoule to provide, when the vessel is broken in the treatment room, enough Cl_2 per 1000 cu. ft. at the rate of 0.001 g. of Cl_2 per cu. ft.

A. R. POWELL.

Manufacture of complex [metal] salts of aromatic [o-dihydroxy]-compounds. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 358,113, 5.7.30).—Neutral Mg, Ca, or Sr salts of complex metal compounds of aromatic *o*-dihydroxy-compounds containing CO_2H or SO_3H groups are prepared, the metal being Sb, Bi, Cu, Sn, Fe, Zn, Co, Pb, Bi, or other metal of at. no. >21 except alkali or alkaline-earth metals. Amongst the 18 examples are: Ca or Na pyrocatechodisulphonate boiled with Sb_2O_3 and neutralised with $\text{Ca}(\text{OH})_2$, or with $\text{Bi}(\text{OH})_3$ and neutralised with NaOH or NH_4Et_2 ; Na pyrogallodisulphonate boiled with Sb_2O_5 and neutralised with $\text{Ca}(\text{OH})_2$, or with SnCl_2 and neutralised with MgO . The products may be pptd. with EtOH and MeOH , and are suitable for injection.

C. HOLLINS.

Manufacture of gold compounds of degradation products of keratin. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 357,189, 18.6.30).—A Au salt is added to an albumose-like keratin product containing an SH group (e.g., a product of B.P. 345,630; B., 1931, 668) until the coloration just fails to be permanent; or a smaller quantity of Au salt is added. C. HOLLINS.

[Gauze compress] wound dressings. P. BEIERS DORF & Co. A.-G. (B.P. 363,255, 7.4.31. Ger., 12.6.30).

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Photographic plates for use in spectroscopy and astronomy. C. E. K. MEES (J. Opt. Soc. Amer., 1931, 21, 753–775).—A description of plates made by the Eastman Kodak Company which are suitable for scientific work. N. H. HARTSHORNE.

Panchromatic plates. N. PERRAKIS (J. Phys. Radium, 1931, [vii], 2, 341–352).—A study of Guilleminot and Ilford panchromatic plates. N. H. HARTSHORNE.

Increase in sensitivity of infra-red sensitised plates by warming during exposure. O. BARTELT (Z. wiss. Phot., 1931, 30, 261–271).—The optimum sensitisation of Schleussner Moment Yellow Label or Eisenberger Extrarapid plates by neo-, allo-, or rubrocyanine is obtained by bathing for 5 min. in a bath of 50% EtOH containing 0.3% of dye and 2.5 c.c. of 25% aq. NH_3 per 100 c.c. at 21°, quickly drying in a warm air current, and using immediately. The max. sensitivity is then obtained by warming the plate to 87–90° during exposure. Eastman Kodak Infra-red plates show a max. at 60°. Agfa Infra-red plates show no change on warming during exposure. J. LEWKOWITSCH.

Sensitising with desensitisers. II, III. LÜPPO-CRAMER (Z. wiss. Phot., 1931, 30, 241–248, 249–254).—II. Special unripened emulsions, which may be sensitised by Capri-blue and other dyes (cf. B., 1931, 743), rapidly increase in sensitivity on storage. Sensitisation by the dyes is greater when these emulsions are prepared with a 50% excess of bromide. Sensitisation is confined to the blue region, but is not inhibited by the presence of Br ions.

III. Short ripening of the emulsion changes the action of Capri-blue from sensitiser to the normal desensitiser. Dil. solutions (e.g., 1 : 10^6) of methylene-blue behave like Capri-blue; with more conc. solutions (e.g., 1 : 10^4) considerable fog is produced, especially with a quinol developer. J. LEWKOWITSCH.

Production of fine-grained negatives by development. A. LUMIÈRE and A. SEYEWETZ (Compt. rend., 1931, 193, 906–909).—The defects in negatives ordinarily resulting from development with *p*-phenylenediamine in presence of a slightly alkaline substance, e.g., Na_2SO_3 or $\text{Na}_2\text{B}_4\text{O}_7$, are removed, while retaining its power of reducing the grain size of rapid emulsions, by the use of Na_3PO_4 and slow development, e.g., 1 hr. A satisfactory developer consists of *p*-phenylenediamine 10 g., Na_2SO_3 60 g., Na_3PO_4 2 g., KBr 1 g., H_2O 1 litre. With no over-exposure an excellent and fine-grained negative results, the dichroism of which is removable by using a suitable intensifier, e.g., the chlorochromic, with no enlargement of grain. The size of grain in the negative is independent of that in the emulsion; there is no reduction of size in a slow plate, but may be the reverse. C. A. SILBERRAD.

Modern developments in colour photography. D. A. SPENCER (Phot. J., 1932, 72, 10–18).

PATENTS.

[Obtaining multicolour records in] colour photography. COLOUR PHOTOGRAPHS (BRIT. & FOREIGN), LTD., W. T. L. BECKER, L. W. OLIVER, H. D. MURRAY, and D. A. SPENCER (B.P. 363,000, 17.9.30).

Apparatus for use in making X-ray photographs. C. H. F. MÜLLER A.-G. (B.P. 363,194, 28.1.31. Ger., 24.4.30. Addn. to B.P. 339,215).

Cellulose ester film.—See V.

XXII.—EXPLOSIVES; MATCHES.

Method for investigating decomposition of guncotton at room temperature. M. LAMBREY (Compt. rend., 1931, 193, 857–858).—The method depends on the increase in intensity of the γ -absorption band of NO on addition of an inert gas (cf. A., 1930, 1496). A small quantity of guncotton is placed in a tube 160×4 mm., closed by quartz plates, the tube is exhausted to 2 μ , and after a suitable interval at the desired temp. H_2 is admitted to atm. pressure and the absorption spectrum examined. Evolution of NO at 30° by carefully purified guncotton or by pentaerythritol tetranitrate can be detected. C. A. SILBERRAD.

Fractionation of nitrocellulose.—See V.

XXIII.—SANITATION; WATER PURIFICATION.

Concentration and distribution of sewage solids during digestion. W. RUDOLFS and I. O. LACY (Sewage Works' J., 1931, 3, 64–75).—Fresh solids settle more rapidly than does ripe sludge during the first 24 hr. After 72 hr. the % compacting is the same; after 120 hr. the sludge expands owing to gas bubbles. Improper seeding of fresh solids produces foam which is broken up on liming. Compacting of sludge proceeded rapidly when gasification ceased.

CHEMICAL ABSTRACTS.

Influence of [sewage] diluting waters on the biochemical oxygen demand. E. F. ELDRIDGE and W. L. MALLMANN (Mich. Eng. Exp. Sta. Bull., 1931, No. 39, 3–11).—Synthetic H_2O containing the salts common to natural waters is superior to distilled, hydrogen carbonate, carbonate, and phosphate H_2O . The p_{H} and the mineral salt content are limiting factors.

CHEMICAL ABSTRACTS.

Effect of dilution water on the determination of biochemical oxygen demand. H. HEUKELEKIAN and N. S. CHAMBERLIN (Sewage Works' J., 1931, 3, 187–198).—Various stream waters gave different vals., the water with the lowest salt concn. giving the lowest results. Distilled H_2O gave low results.

CHEMICAL ABSTRACTS.

Water analysis. G. G. GEMMELL and R. G. THIN (J. Inst. Brew., 1931, 37, 597–602).—The method of calculating the salts present in water from the proportions of bases and acids found by analysis is not incorrect, but is incomplete and does not always give an adequate presentation of the properties of the water. Several waters with differing properties can be made to match any given analysis. The p_{H} val. yields a more accurate indication of the properties of the water supply. C. RANKEN.

Corrosion of water mains.—See X. Hazards in paint application.—See XIII.

PATENT.

Apparatus for automatically treating liquids [e.g., the water in flushing cisterns] with liquids [e.g., disinfectants]. J. WINFIELD (B.P. 360,143, 1.10.30).