

BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

DECEMBER 10, 1926.

I.—GENERAL; PLANT; MACHINERY.

Determination of the filtration constants of various charcoals. H. I. WATERMAN and A. DAUVILLIER (Rec. trav. chim., 1926, 45, 628—632; cf. *ibid.*, 1924, 43, 757).—The constants m and n of the filtration formula $dV/d\theta = K_1 P^n / V^m$, where V is the volume of liquid filtering in time θ , P the pressure, and K_1 a constant depending on apparatus and temperature, have been determined for carboraffin, norit, and nobrac by measuring the speed of filtration of suspensions of the charcoals in water under different pressures. The values of m and n are only approximately constant, their order of magnitude being: carboraffin $m = 0.62$, $n = 0.56$; norit $m = 0.63$, $n = 0.72$; nobrac $m = 0.36$, $n = -0.30$. The negative value of n for the nobrac shows that the speed of filtration decreases with increase of pressure, probably owing to the greater compressibility of the nobrac. The charcoal layer obtained on the filter cloth was quite air-tight though not water-tight, and was only removed by very thorough washing.

S. J. GREGG.

Gas apparatus. G. STIEHR (Chem.-Ztg., 1926, 50, 694).—A pocket apparatus for the detection and determination of small quantities of substances, e.g., calcium carbonate in soil, which yield gases on treatment with a suitable liquid. The gas evolved is measured by counting the bubbles of air which are displaced through water and standardising the apparatus with weighed amounts of known substances.

F. R. ENNOS.

[Laboratory] filtering devices. H. B. GORDON (Ind. Eng. Chem., 1926, 18, 1075—1076).—Filtration of a large volume of liquid, without the necessity of constant attention, can be effected by a device in which the liquid is contained in a carboy with its stopper perforated by two tubes. One is a siphon leading to the filter, the other an air tube terminating within the filter funnel but near the top. When the funnel fills, the liquid seals this air tube and stops the flow until the level has fallen. If it is necessary that the liquid should be in a wide-mouthed vessel a siphon tube only is used, which, together with the funnel, is supported by a clamp and occasionally lowered as the vessel empties.

C. IRWIN.

Apparatus for examining oils. KIEMSTEDT.—See II.

Counter-current jet condenser. MÜLLER.—See II.

Apparatus for measuring turbidity and colour of water. OLSZEWSKI.—See XXIII.

PATENTS.

Performing chemical reactions. E. C. R. MARKS. From A.-G. F. CHEMIEWERTE (E.P. 231,901, 6.4.25).—

The use of a reactive agent comprising a porous carrier moistened and treated with a reacting substance under reduced pressure facilitates and intensifies chemical reactions. Thus, by impregnating kieselguhr or fuller's earth under reduced pressure with sulphuric acid, and removing the excess by pressing, the remaining water being then eliminated by heating the residue *in vacuo*, small quantities of active substances remain finely distributed in the pores. Various applications are suggested.

F. G. CROSSE.

Pulverising apparatus. J. E. BELL and W. J. A. LONDON, Assrs. to INT. COMBUSTION ENG. CORP. (U.S.P. 1,598,702, 7.9.26. Appl., 8.1.24).—A centrifugal machine is described having an impeller disc with detachable impeller blades, together with an annular receiving chamber and impact blades interposed between the disc and chamber.

F. G. CROSSE.

Generation of steam and other vapours. NIEDER-BAYERISCHE CELLULOSE-WERKE A.-G., and A. SCHNEIDER (E.P. 253,062, 11.8.25. Conv., 6.6.25).—In a field boiler tube unit, by throttling the steam outlet and providing a non-return valve in the water or down tube, the excess pressure in the up or steam tube will cause it to remain partially empty of water and the upper part will serve as a superheater, the steam being further dried on expansion through the throttling device into the boiler.

B. M. VENABLES.

Heat interchanging apparatus. L. CHAVANNE (E.P. 249,535, 19.3.25. Conv., 19.3.24).—The apparatus comprises a nest of tubes, together with the necessary diaphragms to form headers and baffles in a casing, the whole being made into a unit of box-like form. The flow of the internal fluid is in one direction through half the tubes and back through the other half. The external fluid also passes twice along the tubes. Refractory material may be placed either inside or outside the tubes to aid the heat interchanges.

B. M. VENABLES.

Condenser type heaters. GRISCOM-RUSSELL Co., Asses. of J. PRICE (E.P. 249,079, 28.12.25. Conv., 13.3.25).—A heat interchanger comprising a nest of tubes is provided with one or more supporting diaphragms for the tubes, the whole unit being easily removable from the shell. A baffle for deflecting gases to the appropriate discharge outlet may also be combined with the tube bundle.

B. M. VENABLES.

Drying, heating, or cooling machines. W. G. and F. R. SIMON (E.P. 258,978, 23.7.25).—An apparatus comprising a bundle of heating or cooling tubes rotating in a trough-like chamber, allowing vapours to be drawn off from the chamber at positions other than and in addition to the usual ones at the ends.

B. M. VENABLES.

Centrifugal separators for liquids. F. GRIMBLE, M. N. CAIRD, and E. COOMBS (E.P. 258,097, 12.10.25).—A centrifugal separator provided with separate outlets for both liquids, is provided with a device for closing the outlet for heavier liquid when the separator is used for clarification purposes, *i.e.*, when the quantity of heavier constituent is so small that the light constituent might overflow at the wrong place. The heavier liquid normally flows over a weir formed on the rim of the bowl; this outlet may be closed by a conical ring.

B. M. VENABLES.

Centrifugal separators. B. C. CARTER (E.P. 258,204, 14.3.25).—Centrifugal separators for removing impurities from fluids, *e.g.*, from the oil and air used in internal-combustion engines, are constructed so that the fluid passes directly through the apparatus in an axial direction in passages at a short distance from the axis between an inner perforated rotating wall and the shaft. The impurities are subjected to greater centrifugal force (*i.e.*, at a larger radius) after passing through the inner wall, and may be caught on an outer peripheral rotating wall, which in the case of lubricating oil being cleaned would not be perforated, but perforations are necessary in the case of air to allow the dust to be continually discharged. For liquids such as oil an air outlet practically coincident with the axis is provided. The passage of the fluid through the apparatus is sufficient to drive turbine blades which cause the apparatus to rotate.

B. M. VENABLES.

Centrifugal separators. G. FRANCIS (E.P. 258,629, 23.3.25).—In a separator yielding two liquid products the liquid under treatment is caused to flow in a sinuous course while in the separating bowl; to this end discs (or cones) are provided with openings near the circumference and near the axis in alternate discs, and either the inner or outer edges of the discs are sealed by either a solid or a liquid seal. The liquid, if used, is of different specific gravity from the liquid under treatment.

B. M. VENABLES.

Evaporators for refrigerating apparatus. S. OTO, Assee. of J. C. JANKUS (E.P. 245,124, 19.12.25. Conv., 19.12.24).—In a reversing absorption refrigerator any liquid absorbent (water) which may collect in the evaporator or refrigerator proper passes to a sump below through a restricted orifice. From the sump communication is provided to a receiver for liquefied refrigerant above, so that the liquid will be drawn up when the pressure drops.

B. M. VENABLES.

Evaporator plant. J. MUGLER (U.S.P. 1,598,301, 31.8.26. Appl., 8.2.26).—The ill-effects of varying steam pressure in an evaporator plant are prevented by providing the regular evaporators with an additional unit which operates either as an evaporator or as a discharge vessel for the liquid under treatment. Overflow pipes for the vapours connecting the units are equipped with automatic regulators so that steam of higher pressure may be supplied from one unit to the next. In this way the efficiency of the plant may be kept constant irrespective of any variations in the steam consumption.

R. B. CLARKE.

Separation of the lowest boiling constituents of a mixture of liquids by vacuum distillation.

A. SCHMALENBACH (E.P. 244,736, 23.11.25. Conv., 22.12.24).—In vacuum distillation the vapour of the condensate is liable to reduce the vacuum attainable. The gases and vapours going to the vacuum pump are, therefore, scrubbed with another liquid which removes them, and the vapour is recovered in a rectifying column which operates under a lower vacuum. The same vacuum pump may be used for both stages by inserting in the second stage a vacuum reducer comprising a deep liquid seal.

B. M. VENABLES.

Apparatus for evaporating, distilling, or concentrating liquid. SOC. DES CONDENSEURS DELAS (E.P. 258,165, 27.2.26. Conv., 18.1.26).—In a vapour compression evaporator where the compression is effected by a live steam ejector the diffuser or outlet nozzle is cooled by the incoming feed liquid; by this means the efficiency of the ejector considered as a pump is increased, and the heat abstracted is not lost. Additional preheaters may be provided for the feed liquid after it has passed through the diffuser jacket.

B. M. VENABLES.

Liquefaction and separation of gaseous mixtures. R. C. E. MEWES (E.P. 258,773, 25.5.25).—The constituents of a gas mixture (*e.g.*, air) are separated by partial condensation at moderate pressure followed by rectification. The condenser is cooled by a separate portion of air compressed to 150–200 atm. and expanded to 50 atm., the liquefied portion being expanded to 3–6 atm. before entering the condenser for the main portion of air. The gas not liquefied at 50 atm. is returned to the compressor and raised to 150–200 atm. again. The condensate (rich in oxygen) is rectified, and liquid low-boiling gas (rich in nitrogen) is used as the heating agent. By this means the products may be removed under reduced pressure, and the condensate from the rectifier sent to the liquefier.

B. M. VENABLES.

Tintometer. BRIT. LAUNDERERS' RESEARCH ASSOC. and R. G. PARKER (E.P. 258,366, 25.6.25).—A number of discs of plaster of Paris, tinted by mixing various pigments with the dry plaster before being cast in moulds, are compared with the surface to be examined through a black screen provided with two holes. The standard discs are changed until one is obviously lighter and another obviously darker than the surface under observation.

B. M. VENABLES.

Measuring the amount of gas dissolved in a liquid. H. A. DAYNES, and CAMBRIDGE INSTRUMENT CO., LTD. (E.P. 259,086, 22.1.26).—The amount of gas dissolved in a liquid, more particularly oxygen in water, is measured by scrubbing a second gas (hydrogen) with the liquid, by which means the oxygen will be removed from solution, and comparing the heat conductivity of the hydrogen-oxygen mixture with that of the original hydrogen in a catharometer. (See E.P. 124,453; B., 1919, 393 A.)

B. M. VENABLES.

II.—FUEL; GAS; DESTRUCTIVE DISTILLATION; MINERAL OILS.

Determination of volatile matter in solid fuels. D. J. W. KREULEN (Chem. Weekblad, 1926, 23, 477–479).—The method proposed by de Waard (*cf.* B., 1925, 979) is criticised as unsuitable, differences of 2.12% having been found.

S. I. LEVY.

Rapid determination of sulphur in coal by the method of Bahr and von der Heide. W. MELZER (*Brennstoff-Chem.*, 1926, 7, 313—314; cf. B., 1925, 33).—Errors in the method, varying in amount with different coals, are introduced by the formation of volatile unsaturated compounds (*e.g.*, acetylene) when the melt is warmed with hydrochloric acid, so that more iodine is required than is equivalent to the hydrogen sulphide liberated. This error is eliminated by using, instead of commercial barium peroxide, hydrated barium peroxide containing 8 mols. of water of crystallisation prepared by dissolving barium hydroxide in water, filtering, precipitating with hydrogen peroxide, and drying the precipitate. W. T. K. BRAUNHOLTZ.

Determination of moisture in solid fuels. D. J. W. KREULEN (*Chem. Weekblad*, 1926, 23, 476—477).—A Russian anthracite was found to contain 5.26% of combined water and 3% of volatile matter, calculated on the pure coal substance. In determinations of combined water made at temperatures over 105° a correction for oxidation is desirable; where exact values are required, the xylene method should be used. S. I. LEVY.

Degree of swelling of caking coals, with particular reference to the geological and tectonic conditions of the coal seams. K. PATTEISKY (*Brennstoff-Chem.*, 1926, 7, 315—316).—The degree of swelling of the bright coal, representing the bulk of the coal, and containing 18—30% of volatile matter, is about the same for coals from a variety of seams, and is a function of the chemical composition of the coal (*i.e.*, nature of the parent substance and tectonic conditions), but is independent of its geological age. The contrary conclusion arrived at by Dolch (*cf. B.*, 1926, 729) is ascribed to the latter having considered an insufficiently wide variety of coals. W. T. K. BRAUNHOLTZ.

[Degree of swelling of caking coals etc.] M. DOLCH (*Brennstoff-Chem.*, 1926, 7, 316).—A reply to Patteisky (preceding abstract). It is incorrect to neglect the influence of geological age on the degree of swelling of coal and to regard the latter as a function only of tectonic conditions and the still unknown chemical nature of the parent substances. Patteisky also goes too far in stating that the chemical properties of a coal, including its content of bituminous oil and degree of swelling, follow more or less necessarily from its content of volatile matter. W. T. K. BRAUNHOLTZ.

Factors affecting carbonisation in continuous vertical retorts. T. F. E. RHEAD (*Gas J.*, 1926, 175, 843—859).—Experiments were carried out in a single Woodall-Duckham retort, using an improved governing device for controlling the gas pressure at the top of the retort. Imperfect governing of pressures within the retort causes alternate leakage of coal gas and furnace gas through the retort walls, thereby reducing the life of the plant and also promoting scurf formation. Two typical coals, one slightly swelling and the other strongly swelling, were examined. With slightly swelling coal, as normally crushed, the gas quality showed wider variations than were expected. This was attributed to irregularities in the movement of the charge within the retort, brought about by variations in the strength of

coke causing irregular discharge. The coal entering the retort was uniform in quality, but varied in size on account of segregation within the bunkers. To avoid these irregularities in further tests, the coals were graded and supplied in small batches to the retort hopper. Comparing, under the same conditions of temperature, steaming, and throughput, coal graded between 3 in. and 1½ in. with the same material crushed more finely, the larger coal gave a more porous charge which travelled uniformly and allowed freer circulation of the steam and gas, thus giving higher steaming and carbonising efficiencies, higher thermal yields of gas of uniform but slightly lower quality, higher tar and liquor yields, lower gas off-take temperatures, and steadier bottom pressures. The coke from large coal, however, was smaller and mechanically weaker than that made from crushed coal, and, whereas increased steaming of the charge from crushed coal did not materially affect the quality of the coke, steaming appeared to weaken the coke produced from larger coal and gave more breeze. Similar differences were exhibited between the same gradings of strongly swelling coal, but in both cases, compared with slightly swelling coal, the coke was larger and stronger. From trials of a number of methods of feeding coal into the retort it was found that by keeping the level of coal below the top of the retort the amount of rodding was considerably reduced. Experiments in which the heat distribution along the retort was varied showed that strongly swelling coals work well if "two stage" heating is adopted, *i.e.*, when the hottest part of the flue is midway down the retort, but not with high "top-heats." Less strongly swelling coals work equally well with either system, but with both classes of coal more efficient steaming and higher thermal yields are obtained with the maximum temperature near the middle of the retort. "Steam quenching" produced dry coke, but created a dust nuisance during discharging. Experiments on the production of water gas in vertical retorts filled with coke led to the suggestion that retorts requiring scurfing might be utilised with the double object of removing scurf and producing water gas. Attempts to crack vertical-retort tar in a stream of water gas by spraying the tar into the coke charge were unsatisfactory. S. PEXTON.

Carbonisation plant at the Leopold Collieries, Edderitz. A. SANDER (*A. E. G. Mitt.*, 1926, 175—178; *Chem. Zentr.*, 1926, II, 302).—A description is given of Geissen's lignite retort, working on the scavenging gas principle with internal heating. A closed vertical cast-iron drum rotates once in 3 minutes, and is enclosed in a stationary perforated gas-extracting drum. The material sinks downward in the space between the two drums, and is carbonised by the gases of combustion of gas burners, situated in the rotary drum and supplied with the carbonisation gases. The moisture in the latter is reduced from 50% to 5% by steam drying, and dust is removed before they are used for steam raising. The distillates are condensed, and tar, sulphurous water, benzine, and gases for heating separated. By arranging an upper and lower exit for the gases, rich gas and poor gas may be separately obtained. The space occupied by the retort for the same output is 1/10th that of a roller retort. H. MOORE.

Influence of the ash constituents in the carbonisation and gasification of coal. C. B. MARSON (GAS J., 1926, 176, 226—227).—A brief account of work already published (cf. B., 1925, 620). A. B. MANNING.

Carbonisation of wood. L. FAUQUE (Chim. et Ind., 1926, 16, 544—551).—A description of carbonising and by-product recovery processes and plant.

Thomas gas calorimeter. Factors affecting its precision, flexibility, and reliability. R. A. RAGATZ and O. L. KOWALKE (Ind. Eng. Chem., 1926, 18, 1087—1090).—The Thomas gas calorimeter, in which the heat of combustion of the gas is absorbed by a current of air, is practically independent of changes in the temperature of the tank, the atmospheric pressure, or the meter speed. These factors affect only the vapour pressure of the water in the meters, and this is compensated for by the temperature effect on the nickel wire used in the resistance thermometers. Comparative tests with a Junkers calorimeter showed a mean difference of 0.49% with various qualities of gas. The lag on variation in gas quality was found to be about 4 min. Variations in room temperature, atmospheric humidity, and in initial gas pressure from 2 to 8 in. water gauge, were found to have no appreciable effect. C. IRWIN.

Propagation of flame in mixtures of methane and air. IV. Effect of restrictions in the path of the flame. W. R. CHAPMAN and R. V. WHEELER (J.C.S., 1926, 2139—2147; cf. Mason and Wheeler, B., 1920, 775 A).—The velocity of a flame travelling in a methane-air mixture contained in a horizontal tube with a constriction decreases as the latter is approached, but increases again immediately before it is reached. Considerable acceleration occurs beyond the constriction. The same phenomena occur when the tube has a series of constrictions, provided they are spaced sufficiently, otherwise no appreciable retardation of velocity occurs between any two constrictions, though a large acceleration occurs after each is passed. The maximum flame-speed, 420 m./sec., was obtained when 12 constrictions are present irrespective of the length of the tube and the position of the first constriction; the flame under these conditions has a much greater actinic power, and a maximum pressure of 3.9 atm. is developed just beyond the last constriction. The effect of the constriction on the velocity of the flame is explained as the effect on the velocity of the current of gas which is shown experimentally to precede the travelling flame. S. K. TWEEDY.

Petroleum. III. Acid sludge from refining of Persian kerosene. I. Aromatic hydrocarbons. S. F. BIRCH and W. S. G. P. NORRIS (J.C.S., 1926, 2545—2554).—The dilution of the tar obtained by washing kerosene with fuming sulphuric acid (20% SO₃) gave an oil containing sulphur compounds and aromatic hydrocarbons. The presence of the following hydrocarbons was demonstrated by the preparation of suitable crystalline derivatives: toluene, *m*- and *p*-xylenes, mesitylene, ψ -cumene, hemimellitene, *p*-ethyltoluene, an ethylxylene, a diethylbenzene, naphthalene, β -methyl-naphthalene, a dimethylnaphthalene, and some indication of a trimethylnaphthalene. A satisfactory method for the identification of aromatic hydrocarbons is to replace all

the nuclear hydrogen atoms by bromine, with subsequent examination of the crystalline bromo-compounds.

H. BURTON.

Catalytic formation of petroleum hydrocarbons from fats. J. MARCUSSON and W. BAUERSCHÄFER (Petroleum, 1926, 22, 815—816; cf. B., 1926, 117).—The conversion of fats occurs at lower temperatures than those employed by Mailhe, the products obtained by whom were secondary. At low temperatures, avoiding distillation, heavy viscous oils are obtained as a primary product. Oil or fat was mixed with 20% of its weight of kieselguhr or sodium chloride and boiled for 20 hrs. under a reflux condenser, the temperature not exceeding 300°. The product, freed from catalyst and saponifiable matter, was fluorescent, had *d* 0.92 or 0.87, and iodine value 52 or 29 with linseed oil or tallow respectively as raw material. The acetyl values were 13 and 16, and the acetyl values of the hydrogenated products 32 and 61 respectively. H. MOORE.

Apparatus for examining oils, particularly motor lubricating oils for absorbed petrol ["crank-case dilution"], by distillation with steam. H. KIEMSTEDT (Brennstoff-Chem., 1926, 7, 309—311).—In this compact modification of the usual apparatus for distilling oils with steam a cylindrical vessel containing the oil is held suspended in the neck of the steam generator by a conical plug. The oil vessel is thus steam jacketed, and the steam is introduced into the oil through a number of U-tubes, one limb of which is slightly longer than the other, and passes through the bottom of the oil vessel. This combined still is connected with a spiral condenser and a graduated receiver, from which the condensed water is automatically siphoned off, the whole apparatus being attached to a single retort stand. The steam generator carries a release cock, which is opened at the end of the distillation to prevent oil being drawn back into it. The apparatus may also be used for determining the water content of oils, in which case toluene or xylene is boiled in the generator instead of water.

W. T. K. BRAUNHOLTZ.

"Saturation" of the petroleum lubricant hydrocarbons as shown by their reaction with bromine. C. F. MABERY (J. Amer. Chem. Soc., 1926, 48, 2663—2664).—When treated with bromine in carbon tetrachloride, a sample of Illinois oil, b.p. 280—282°/30 mm., and one of Pennsylvania oil, b.p. 275—280°/30 mm., each yielded a *monobromo*-derivative, with evolution of 1 mol. of hydrogen bromide. These derivatives react readily with alcoholic potassium cyanide, the resulting nitriles being hydrolysed to acids when boiled with aqueous sodium hydroxide. It appears, therefore, that these oils do not contain unsaturated constituents. Russian and Texas oils behave similarly.

F. G. WILLSON.

Counter-current jet condenser. B. MÜLLER (Petroleum, 1926, 30, 1140—1142).—The condensers (Borrmann system) consist of a scrubbing-tower fitted with layers of irregularly packed material supported on perforated plates. The improvement consists in the perforations which are formed into jets projecting alternately upwards and downwards, thus separating

the flow of vapours and steam upwards from the flow of water downwards.

W. N. HOYTE.

Determination of sulphur in liquid fuels. R. DE FAZI (*Annali Chim. Appl.*, 1926, 16, 405—406).—The Eschka method, which is one of the methods approved by the Italian Government Commission for the determination of sulphur in liquid fuels, gives results considerably lower than the concordant figures obtained by the Mahler bomb method and Gasparini's method (B., 1908, 340), and its abandonment is recommended.

T. H. POPE.

Apparatus for determination of water in oils etc. N. SCHAPIRO (*Chem.-Ztg.*, 1926, 50, 579).—The apparatus embodies the ordinary distilling flask and condenser, but is made in one piece, and is provided with a tubulus for filling.

S. I. LEVY.

Dielectric constant of petrols and paraffins. H. PÉCHEUX (*Compt. rend.*, 1926, 183, 530—532).—The dielectric constants ϵ and their temperature coefficients α , and the m.p. and b.p. of six petroleum oils and three paraffins have been determined. For liquid petrols and heavy paraffins respectively, α (which is negative) increases and decreases in absolute value with ϵ . In both cases ϵ increases with the density. For paraffins the value of α is one-half to one-third that for liquid petrols.

J. GRANT.

Volumetric determination of acetylene. R. STREBINGER and A. WOJS (*Z. anal. Chem.*, 1926, 69, 20—29).—A measured volume of the gas is passed at the rate of 1 c.c. in 2 min. through two U-tubes in succession, each maintained at 190—200°, and containing glass beads moistened with a solution of 2 g. of potassium iodate in 20—23 c.c. of concentrated sulphuric acid. When all the gas has passed through the tubes the apparatus is swept out by means of a slow current of air. The U-tubes are rinsed out with water, the solution is diluted to 400—600 c.c. and boiled until colourless, and the excess of iodate titrated with 0.1*N*-thiosulphate after cooling. The reaction is $C_2H_2 + 2KIO_3 + H_2SO_4 = 2CO_2 + 2H_2O + I_2 + K_2SO_4$. Traces of hydrogen and carbon monoxide are sometimes present in commercial acetylene, but the amount of iodate consumed by them is very small.

A. R. POWELL.

Sulphur content of mixed gas in the Siemens-Martin furnace. W. HÜLSBRUCH (*Gas- u. Wasserfach*, 1926, 41, 886—888).—See B., 1926, 859.

PATENTS.

Washing coal and other minerals. A. FRANCE (E.P. 251,246, 24.3.26. Conv., 23.4.25).—The material to be washed is carried along a bed by a current of liquid and jets of water play up through it from the bed and separate it into layers according to its specific gravity. Three layers are discriminated—clean coal, intermediate products, and waste products. They are separated in turn, the intermediate products being returned for re-washing. The process is particularly suitable for materials containing but little of the waste material of high specific gravity. In this case a suitably-sized foreign material of much the same specific gravity as the waste product is added, and the waste product

is then assimilated into the layer which the added product forms.

R. A. A. TAYLOR.

Coal concentration. W. TRURAN, Assr. to MINERALS SEPARATION NORTH AMERICAN CORP. (U.S.P. 1,595,745, 10.8.26. Appl., 24.5.22).—The mixture of coal and water is first aerated alone, and the froth separated, and then an oil is added and the mass aerated again, the froth being again separated. The two froths are mixed and aerated in the presence of starch, by which means a very clean froth is obtained.

E. S. KREIS.

Differential coal flotation. J. V. QUIGLEY, Assr. to MINERALS SEPARATION NORTH AMERICAN CORP. (U.S.P. 1,595,731, 10.8.26. Appl., 24.5.22).—In the process described in U.S.P. 1,595,745 (preceding abstract) the froth obtained by aeration without the addition of an agent is separated and the coal contained in it recovered separately, as it contains bright coal, with a much lower percentage of sulphur than the original. The coal in the froth obtained by aeration with the assistance of an oil is a dull coal, and this is also recovered separately.

E. S. KREIS.

Washing coal and ores. L. HOYOIS (E.P. 258,753, 28.11.25).—Coal carried by a stream of water is caused to pass over a weir, and then enters a trough having openings of adjustable size suitably distributed along its length. The openings allow successively lighter fractions to be collected, and the raw material can be graded into a number of products having densities defined within narrow limits.

S. PEXTON.

Treatment of peat. F. M. PERKIN (E.P. 258,419, 8.9.25).—Peat is elevated to a macerator consisting of pairs of counter-running toothed rollers, which are hollow and can be heated if desired. The disintegrated peat is forced through a screw conveyer, working in a perforated cylinder within an outer chamber which collects the extruded water into an autoclave. When this is suitably charged it is closed, superheated steam is admitted, and the mass is agitated. The pressure in the autoclave rises to a maximum, and the contents are then suddenly discharged through a valve communicating with a receiving chamber, where a large proportion of original water in the peat passes away as steam. The bottom of the receiving chamber is provided with a screw conveyer, which transfers the peat under pressure to a centrifuge or filter press, where it is briquetted. Using raw peat containing 80% of water, the moisture content of the briquetted product is 18—20%.

S. PEXTON.

Manufacture of active carbon. J. NAGTEGAAL (E.P. 257,766, 14.10.25).—The carbonaceous material is distilled in retorts situated in a furnace; the distillation gases are led back to the furnace for combustion, and the products directly into the same or another retort through apertures in the retort wall, this being effected by maintaining in the retort a pressure below that prevailing in the furnace.

A. C. MONKHOUSE.

Drying and low-temperature distillation of fuel by internal heating. METALBANK U. METALLURGISCHE GES. A.-G. (E.P. 242,618, 22.10.25. Conv., 4.11.24).—The plant comprises one or more distillation chambers, together with furnaces for providing heat which is

conveyed by circulating gases to the distillation chambers. Interposed between the furnaces and the distillation chambers are flues wherein the circulating gases are heated by admixture with the products of combustion from the furnaces. In this way heat is conserved, and local overheating of the distillation chambers is avoided. The temperature of distillation can be readily controlled and varied according to the proportion of combustion products in the circulating gases. S. PEXTON.

Retorts. KOHLENVEREDLUNG GES. M.B.H. (E.P. 245,773, 6.1.26. Conv., 8.1.25).—The retort consists of the annular space between two concentric cylinders. The inner is corrugated and designed to revolve, and the outer is provided with guide rings, inclined inwards and downwards, which direct the material to be carbonised against the wall of the inner cylinder as it revolves. The products of distillation pass off through slots under the guide rings into a second annular space between the outer cylinder and the outside wall of the plant. As the temperature of the charge rises in its path down through the retort, a partial fractionation of the distillation products may be effected by partition walls at varying heights in the outer annular space. The retort is heated by a flue carrying heating gas to the closed top of the inner corrugated cylinder, and the gas then passes down between the flue and the inner cylinder. R. A. A. TAYLOR.

Revoluble kilns for distilling bituminous materials. E. ROSER (E.P. 257,479, 29.12.25).—The retort is of the revolving drum type, in which the annular space is heated both internally and externally by heating gases either in parallel or in series. The annular drum is divided into partitions, so that as it revolves the gas is drawn off, either from each section into pipes passing along the inner chamber, or by one discharge pipe passing through the outer chamber. The operation is continuous, the coked material being withdrawn down a shoot as the drum rotates. A. C. MONKHOUSE.

Gas producer or generator. F. W. STEERE (E.P. 258,348, 17.6.25).—A gas producer is provided with one or more hollow pokers, which can be mechanically thrust upwards into the fuel bed from an air-tight ash-pit beneath the grate. The grate is composed of fixed and movable bars, the latter being raised and lowered by lugs on the movable pokers, to allow the clinker broken by poking to fall into the ash-pit. Another design of grate included comprises a series of toothed rotatable bars, geared externally, and operated by a lever system coupled to the movable poker so that, simultaneously with poking, the grate bars rotate and extract the crushed clinker. The position of the pokers, which are cooled by the air and steam which pass through them, can be so adjusted as to convey steam and air to any desired part of the fuel bed. S. PEXTON.

Conversion of heavy hydrocarbon oils into light hydrocarbon oils. F. LAMPLUGH, and RATOCZYN EXTENDED OIL FIELDS, LTD. (E.P. 258,656, 23.6.25).—Heavy hydrocarbon oils mixed with 0.4% of an aromatic hydrocarbon such as naphthalene are heated at about 600° under a pressure higher than the vapour pressure of the oils at that temperature. The apparatus for treatment consists of two steel pipes interconnected and

coiled about a vertical axis, the inner pipe being smaller in diameter than the outer one. The coils are directly heated, or preferably heated in a bath of molten metal. The oil is delivered to the inner coil by means of a pressure pump, and is either circulated slowly or treated statically. To the outlet of the outer coil are connected a cooler and a spring-operated release valve. The products of treatment are cooled under pressure to such a temperature that the heavier fractions remain liquid whilst the light hydrocarbons are discharged from the release valve as vapours and are separately condensed. S. PEXTON.

Continuous production of low-boiling-point hydrocarbons from hydrocarbons having a high boiling point. H. WOLF (E.P. 252,308, 6.7.25. Conv., 22.5.25).—Hydrocarbons are cracked under pressure and the products passed into a suitable solvent or wash oil, when the free carbon and highly carbonaceous substances, which would otherwise choke the apparatus, are held in suspension or solution. The mixture is distilled and the residue of heavy oils returned to the cracking process, or the lighter portions of the cracked products may be distilled off below the boiling point of the wash oil, which may be used again until fully charged with the detrimental carbonaceous substances, when it is run off. R. A. A. TAYLOR.

Lubricating oil. A. SCHELLER (Can. P. 256,104, 9.5.22).—High-boiling oils are distilled in the presence of small quantities of alkaline oxides or hydroxides, without further drying or chemical or physical refining. H. MOORE.

Making low-boiling hydrocarbons from petroleum. J. H. JAMES, ASSR. to C. P. BYRNES (U.S.P. 1,597,796, 31.8.26. Appl., 13.11.19).—The mixture of partially oxidised hydrocarbons (cf. E.P. 209,128; B., 1924, 210), produced by passing a vaporised hydrocarbon mixture admixed with the necessary quantity of air over a catalyst, is condensed, and the lighter fractions are separated. The remainder is vaporised, mixed with steam, and passed over a catalyst, e.g., copper, at 450°. The metal is oxidised by the steam, with the liberation of hydrogen, which reacts with the hydrocarbon derivatives to give saturated hydrocarbons of lower molecular weight than the original constituents of the petroleum. According to the reactions shown, carbon monoxide is liberated in most of these reactions and is probably responsible for the reduction of the catalyst, since this always contains some free metal to combine with the oxygen of the steam and continue the reaction. E. S. KREIS.

Oxidising heavy hydrocarbons. J. H. JAMES, ASSR. to C. P. BYRNES (U.S.P. 1,597,797, 31.8.26. Appl., 8.12.21).—To oxidise a heavy mineral hydrocarbon (cf. E.P. 209,128; B., 1924, 210) it is mixed with a light petroleum and the mixture vaporised with the aid of steam. In this way, wax distillate, pressure tar, and heavy lubricating oils have been vaporised and passed through the catalyst screens without depositing on them and clogging them. It is found that in the vapour phase, the hydrocarbons of high mol. wt. are oxidised preferentially. The best results are obtained when only a portion of the necessary oxygen is added in the

vaporising chamber, the remainder being added after the mixture has passed through the first screen.

E. S. KREIS.

Treating liquid hydrocarbons. J. H. JAMES, Assr. to C. P. BYRNES (U.S.P. 1,597,798, 31.8.26. Appl., 21.7.22).—The partially oxidised hydrocarbons (cf. E.P. 209,128; B., 1924, 210) are condensed, and the lighter portion, boiling up to 200°, is separated and used as fuel for internal-combustion engines, for which, after it has been purified from acids by distilling from 5% of dry sodium hydrate, it possesses the advantages of being easily combustible and anti-knock. The heavier portion is mixed with fresh untreated petroleum and run through the cycle again, the lighter portion again being separated.

E. S. KREIS.

Treating petroleum emulsions. M. DE GROOTE and W. C. ADAMS, Assrs. to W. S. BARNICKEL & Co. (U.S.P. [A] 1,595,455 and [B] 1,595,456, 10.8.26. Appl., 6.4.25).—(A) Petroleum is separated from emulsions by the addition of a compound formed from a "modified" carbohydrate and a dissimilar substance, such as a fatty acid, a resin, or naphthenic acid. In an example, 1 pt. of the carbohydrate is treated with 15 pts. of sulphuric acid at a temperature not exceeding 60°, and 50 pts. of this mixture are heated with 100 pts. of oleic acid at a temperature not exceeding 80°; the resulting mass after neutralisation is treated with a solubilising agent which will give a dispersion in either oil or water. (B) 1 pt. of a protein is treated with 15 pts. of sulphuric acid, and then, after heating with oleic acid, used in the same way.

E. S. KREIS.

Treating petroleum emulsions. M. DE GROOTE and E. H. KEISER, Assrs. to W. S. BARNICKEL & Co. (U.S.P. 1,595,457, 10.8.26. Appl., 6.4.25).—The emulsion is broken down with the aid of the insoluble salt of a modified organic soap-forming material. For instance, rosin dissolved in oleic acid is sulphonated, and the alkaline-earth or other salts of the product are used to treat the emulsion.

E. S. KREIS.

Recovery of lime products from the manufacture of acetylene gas (E.P. 258,660).—See VII.

III.—TAR AND TAR PRODUCTS.

PATENT.

Hydrogenating tar oils. W. DEMANN (E.P. 236,230, 26.6.25. Conv., 30.6.24).—Dehydrated tar oil, suitably desulphurised, is hydrogenated at ordinary pressure by heating in shallow pans and bubbling in, in the presence of a suitable catalyst, coke-oven gas, which must necessarily be dry.

R. A. A. TAYLOR.

IV.—DYESTUFFS AND INTERMEDIATES.

PATENTS.

Manufacture of wool dyestuffs of the anthraquinone series. FARBENFABR. VORM. F. BAYER & Co. (E.P. 240,492, 28.9.25. Conv., 27.9.24).—Unsubstituted 1:1'-dianthraquinonylamine is sulphonated to a mono- and a di-sulphonic acid. *E.g.*, a solution of 10 pts. of 1:1'-dianthraquinonylamine in 100 pts. of 15% oleum is heated at 95–100° until a sample is completely soluble in hot water. After cooling and pouring into

600 pts. of water, the dye is salted out. It dyes wool yellowish-brown, unaltered by chrome mordants and fast to light, fulling, and carbonising. It is believed to be 1:1'-dianthraquinonylamine-4:4'-disulphonic acid, since on treatment with bromine in aqueous solution it yields 4:4'-dibromo-1:1'-dianthraquinonylamine. By sulphonation at 30° with 25% oleum a new monosulphonic acid is obtained, which dyes wool brownish-red. (Cf. E.P. 201,575, B., 1924, 861.)

A. DAVIDSON.

Preparation of [stable water-soluble derivatives of vat] dyes. SCOTTISH DYES, LTD., J. THOMAS, J. E. G. HARRIS, and B. WYLLAM (E.P. 258,626, 17.3.25).—Of the known processes for the preparation of derivatives of leuco-compounds of vat dyes (cf. E.P. 23,396 of 1899; 186,057, 202,630, 202,632, 245,587, 247,787, 248,802; B., 1900, 1101; 1924, 252, 375; 1926, 235, 403), those in which the leuco-compound is used as the starting material are improved in efficiency by the addition of a metal to the reaction mixture containing the leuco-compound, a suitable organic base and one of the following reagents, viz., chlorosulphonic acid and its salts, alkylsulphuric halides, oleum and its salts, sulphuric anhydride, alkylphosphoric halides, or phosphorus oxychloride. Suitable metals for this purpose are zinc, tin, magnesium and copper bronzes, or copper bronze mixed with 75% of zinc. *E.g.*, 5 pts. of dimethoxydibenzanthrone are reduced at 50° with 9 pts. of sodium hyposulphite and 18 pts. of sodium hydroxide in 800 pts. of water. The vat is filtered and, under hydrogen, is acidified, the leuco-compound filtered off, washed, and dried at 60° under a low pressure of hydrogen. 10 pts. of the dry leuco-compound are mixed with 10 pts. of zinc dust and stirred into a mixture made by slow addition of 34 pts. of methylsulphuric chloride to 75 pts. of well-cooled pyridine, in a vessel which may be open to the air. The melt is warmed to 60°, kept at this temperature for 30 min., and then stirred into 750 pts. of cold water. The precipitate is filtered off, washed, and extracted with 2–4% sodium carbonate solution at 40–50°. By adding salt to the filtered extract, a stable sulphuric acid derivative of dimethoxydibenzanthrone is precipitated. Other examples relate to the formation of derivatives of the leuco-compounds of indigo, thioindigo, indanthrone, and flavanthrone. The stable water-soluble products may be used for dyeing or printing textile fibres.

A. DAVIDSON.

Manufacture of chloro- and chloronitro-derivatives of *m*-hydroxybenzaldehyde. BRIT. DYESTUFFS CORP., LTD., and H. H. HODGSON (E.P. 258,060, 13.8.25).—*m*-Hydroxybenzaldehyde is chlorinated in cold glacial acetic acid until enough chlorine for a monochloro-derivative has been absorbed. Part of the 2-chloro-3-hydroxybenzaldehyde, m.p. 139.5°, which is formed crystallises out and the remainder is separated from accompanying 6-chloro-3-hydroxybenzaldehyde by fractional neutralisation of the evaporated residue with aqueous sodium carbonate. Further chlorination of the 2-chloro-compound yields 2:6-dichloro-3-hydroxybenzaldehyde, m.p. 140°. Nitration of the 2-chloro-compound in 50% acetic acid at 45–50° produces a mixture of 2-chloro-4-nitro-3-hydroxybenzaldehyde, m.p. 166°, and 2-chloro-6-nitro-3-hydroxybenzaldehyde, m.p. 154°, the

two being separated by steam distillation, when the volatile 4-nitro-compound distils. Nitration of the 2':6-dichloro-compound in glacial acetic acid at 60° yields 2':6-dichloro-4-nitro-3-hydroxybenzaldehyde, m.p. 80°.

A. DAVIDSON.

Preparing dyestuffs. BRIT. ALIZARINE CO., LTD., and C. M. BARNARD (E.P. 258,960, 4.7.25).—Amino-antraquinones and -benzanthrones are condensed with citric acid. For example, 20 g. of 1:4-diaminoanthraquinone are boiled with 80 g. of crystallised citric acid under reflux for 1 hr., without a diluent. The condenser is then removed and heating continued at 150° until a sample is completely soluble in sodium carbonate solution. The melt is then poured into 500 c.c. of hot water, boiled, cooled, and filtered. The solid is dissolved in sodium carbonate solution or aqueous ammonia and the dye salted out or the solution evaporated to crystallisation. The product dyes acetyl silk a magenta colour.

A. DAVIDSON.

Sulphonation of aromatic amines. J. W. LEITCH & Co., LTD., and A. E. EVEREST (E.P. 257,979, 2.6.25).—Aromatic amines such as aniline, *o*- and *p*-toluidines, *o*- and *p*-chloroanilines, *o*- and *p*-anisidines, *p*-phenetidine α - and β -naphthylamines, *m*-xylydine, and mixed xylydines are sulphonated by treating with sulphuric acid their condensation products with aromatic sulphochlorides. For example, 100 lb. of *p*-toluenesulpho-*p*-toluidide are stirred into 314 lb. of 95.5% sulphuric acid and the mixture warmed to 73°, when a reaction begins which, without further external heating, raises the temperature to 87°. After cooling to 50°, the mass is stirred into 1200 lb. of water and allowed to stand, when 4-aminotoluene-3-sulphonic acid crystallises. If 21.6% oleum is used, the reaction may be started at 22°. The process is, however, not effective with benzidine, tolidine, dianisidine, aminoazobenzene, aminoazotoluene, *m*-nitro-*p*-toluidine, *m*- and *p*-nitroanilines, 4-chloro-3-nitroaniline, 4-chloro-3:5-dinitroaniline, or 3:5-dinitro-*p*-toluidine.

A. DAVIDSON.

Quantitatively halogenising perylene. A. PONGRATZ and A. ZINKE (E.P. 244,739, 28.11.25. Conv., 19.12.24).—Perylene in solution in nitrobenzene or the like is acted on by nascent halogen. For example, to 1 part of perylene dissolved in 20 parts of nitrobenzene at 90° is added, during 1½ hrs., from one dropping funnel a mixture of 2 parts of concentrated hydrochloric acid and 18 parts of glacial acetic acid, and from another a mixture of 0.9 part of 30% hydrogen peroxide and 8 parts of glacial acetic acid. On cooling, 3:9-dichloro-*perylene*, brownish-yellow, m.p. 280°, separates. The preparation of 3:4:9:10-tetrachloro-*perylene*, reddish-orange, m.p. 350°, and of a hexachloro-*perylene*, yellow, m.p. 356—357°, by analogous methods is also described.

A. DAVIDSON.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Effect of ultra-violet light on wool. L. MEUNIER and G. REY (Compt. rend., 1926, 183, 596—598).—Wool becomes more acid when exposed to ultra-violet light, and develops a yellow colour with quinone in place of the usual violet colour. Bleached wool gives the same yellow coloration. Irradiated and sulphur-bleached

wool also fails to give the usual colours when treated with ninhydrin or allantoin owing to the presence of sulphur dioxide. The increase in labile sulphur content on irradiation is also shown by reduction of nitro-compounds to amines. Tips of wool which have been exposed to sunlight always behave differently on irradiation from wool situated nearer the skin.

L. F. HEWITT.

Comparison of "wetting-out" agents [for textile processes]. W. KIND and J. AUERBACH (Textilber., 1926, 7, 775—780).—Further investigations are recorded (cf. Auerbach, B., 1926, 705) in which the wetting-out powers of many proprietary substances are compared by determining the rates of sinking of a square of dry woollen fabric in their aqueous solutions (*ibid.*), and also by means of their drop-numbers (measured by means of Traube's stalagmometer).

A. J. HALL.

Determination of deliquescent substances in sized cotton materials. S. M. NEALE (J. Text. Inst., 1926, 17, T511—516).—Methods are described for the determination of chlorides (Volhard), zinc, magnesium, and glycerol in sized goods, which yield trustworthy results using 5—10 g. of yarn or cloth or 1 g. of size. For the separation of magnesium and zinc, the former is precipitated as magnesium ammonium phosphate from an ammoniacal solution and the filtrate is boiled to expel ammonia and rendered just acid to bromocresol-purple with acetic acid, when zinc ammonium phosphate separates. These precipitates are converted into ammonium phosphomolybdate, which is collected and decomposed in an excess of *N*-sodium hydroxide, the unused alkali being titrated. Glycerol is determined by extraction and oxidation to carbon dioxide in a gas burette. Full details are given.

J. C. WITHERS.

Decomposition of cellulose under pressure, with and without a liquid medium and an atmosphere of hydrogen. H. I. WATERMAN and J. N. J. PERQUIN (Rec. trav. chim., 1926, 45, 638—653; cf. A., 1913, ii, 579; J.S.C.I., 1925, 508 T).—Cellulose, in the form of cotton wool pellets, when heated under pressure at temperatures varying from 225° to 450° both in the presence and absence of hydrogen, was rapidly decomposed. At 225°, after 2 hrs.' heating, 85% of the cellulose was recovered as a black residue resembling coal (C 48.9%, H 6.1%). At 300°, after 1 hr. heating, only 54% of solid residue (C 71.0%, H 5.2%) was obtained, about half the cellulose being converted into carbon dioxide and water, together with a small amount of methane. At 450° a much more profound decomposition took place, the chief products being carbon dioxide, carbon monoxide, water, and methane and homologues, with 37% of solid residue (C 85.7, H 5.0%). The nature and quantity of the reaction products were not greatly affected by the presence of hydrogen, although the amount of hydrocarbons formed was increased. There was a considerable evolution of heat during decomposition. The heat of combustion of the solid residue obtained at 450° was 7832 g.-cal./g., against 4158 g.-cal./g. for the cellulose used. On heating the cellulose in the presence of a liquid medium (Borneo petroleum) an increase in the yield of methane and homologues and a decrease in the amount of solid residue resulted. Cellulose was also heated *in vacuo*

at 300°, and 38% of the material was recovered as a viscous liquid considered to be an intermediate product between cellulose and the solid residue obtained in the experiments under pressure. W. J. POWELL.

Decomposition of cellulose in the soil. S. WINOGRADSKY (Compt. rend., 1926, 183, 691—694).—A description of the appearance of *Spirochæta cytophaga* (Hutchinson and Clayton, J. Agric. Sci., 1919, 9, 143) in the various stages of its action on fibres of pure cellulose. The cellulose is transformed first into a translucent colloidal substance, believed to be an "oxycellulose." G. M. BENNETT.

Non-volatile constituents of the cotton plant. POWER and CHESNUT.—See XVI.

Deliquescent properties of magnesium chloride, calcium chloride, and glycerol. SWAN.—See VII.

Chemical characteristics of some trade wastes. BUSWELL, GREENFIELD, and SHIVE.—See XXIII.

Disposal of some organic trade wastes. BARTOW.—See XXIII.

PATENTS.

Washing or cleaning wool. E. C. DUHAMEL, and COMP. GÉN. DES IND. TEXTILES (E.P. 256,635, 2.3.25. Conv., 13.5.24).—Wool is washed by treatment with a concentrated suint liquor (*d* 1.029) in a machine which comprises a succession of washing bowls each followed by squeezing rollers, the wool passing continuously through at least four bowls. The suint liquors are maintained clean by periodically flushing out the mud which accumulates under the false bottoms of the bowls, and their concentration is maintained constant by the introduction of suint or soluble salts recovered from the wool after emerging from the washing process (cf. E.P. 240,482, 243,499; B., 1925, 985).

A. J. HALL.

Manufacture of cellulose acetate. H. J. MALLABAR (E.P. 258,020, 17.6.25).—Cellulose acetate which is soluble in acetone, free from sulphuric acid residues, and does not char when heated, is obtained by acetylating cellulose in the absence of sulphuric acid, but after a pre-treatment with a mixture of acetic acid and sulphuric acid, the sulphuric acid being subsequently neutralised before acetylation proper is effected. Zinc chloride is used as a catalyst during the acetylation. For example, 100 pts. of cellulose are treated for 24 hrs. with a cold mixture of 400 pts. of acetic acid and 2—5 pts. of sulphuric acid, and then 200 pts. of acetic acid, containing sufficient sodium acetate to convert the sulphuric acid into sodium sulphate, are added; subsequently 200 pts. of acetic acid, 15—25 pts. of zinc chloride, and 250—400 pts. of acetic anhydride are added, and the mixture is maintained at 30—40° until acetylation is complete. The resulting cellulose acetate may be precipitated directly from the product and afterwards converted into an acetone-soluble form by dissolving it in acetic acid, and maintaining the solution at 100°.

A. J. HALL.

Production of artificial yarns or threads. SOC. POUR LA FABR. DE LA SOIE RHODIASETA (E.P. 251,580, 18.6.25. Conv., 28.4.25).—The shading of artificial silk

with fugitive dyes in order to distinguish fibres of different nature and characteristics is effected, in the case of threads produced by the dry-spinning process, before, during, or after the association of the elementary filaments into a thread, or during the reeling operation. When the supply of dyes is limited and a large number of fibres of different character require differentiation, systematic irregularities may be introduced; for example, some of the elementary filaments of the thread may be dyed, while the other filaments remain undyed or are coloured with another dye. The shading device may be placed inside or outside the spinning chamber, and may consist of a roller, which is continuously impregnated with a solution, e.g., 1%, of acid carmine blue V, azo-naphthol red 6B, brilliant milling green NB, or the like. Mineral colours, such as ultramarine, may also be used, and are conveniently applied by spraying.

D. J. NORMAN.

Preparing artificial silk yarn. S. TODA (E.P. 243,009, 13.11.25. Conv., 14.11.24).—Untwisted viscose silk yarn is made by passing freshly-coagulated and washed viscose filaments in a bundle through a sizing bath, optionally containing softening agents. A suitable sizing bath is obtained by boiling 1 part of *Gloioipeltis* (a Japanese sea weed known as "funori"), 1 part of dextrin, 0.16 pt. of gelatin, and 0.5 pt. of wax in 100 pts. of water. The sized yarn is then reeled in the usual way. The protective coating of size prevents fluffing during weaving, and, when subsequently removed in the desulphurising and bleaching baths, leaves a fabric of softer feel than is obtained with twisted viscose silk yarn.

D. J. NORMAN.

Reducing the viscosity characteristics of nitro-cellulose. W. R. WEBB, ASSR. to EASTMAN KODAK CO. (U.S.P. 1,598,949, 7.9.26. Appl., 11.2.25).—Nitro-cellulosic material is treated with an aqueous liquor containing an acid and a wetting-out agent (an organic liquid) until the material has the desired reduced viscosity characteristics.

A. J. HALL.

Method of impregnating cellulose fibres. W. C. CARTER (U.S.P. 1,598,640, 7.9.26. Appl., 22.7.24).—The depth of superficial formation of cellulose xanthate within paper stock is controlled by limiting the swelling which accompanies the reaction.

A. J. HALL.

Manufacture of a derivative of cellulose. S. A. OGDEN (E.P. 246,476, 20.1.26. Conv., 20.1.25).—Cellulose is treated with sulphuric acid of 50—75% strength, at a temperature not less than 45°, nor exceeding 70°, the duration of the treatment depending on the strength of the acid, the temperature, and, under certain conditions, the pressure. The reaction product is obtained in paste form, and when washed free from acid, is an irreversible colloid which dries into a horny mass without the formation of acid salts on its surface. In its colloidal form this product is suitable either as a parent material for the manufacture of other cellulose derivatives, or as a binding agent for clay, paper, asbestos, rubber, etc. *Example:* Cellulosic material, preferably cotton, is agitated for about 20 min. in a bath of 64.8% sulphuric acid by weight at 70°. The resulting product is then washed until sufficiently free from acid to dry without

the appearance of acid salts on its surface. When the primary material contains animal fibres, which it is desired to recover, the mixed fabric is treated for not more than 5 min. in a bath of 73—84% sulphuric acid (by weight), at 60—70°; separation of the animal fibre is then effected in the first washing operation.

D. J. NORMAN.

Nozzles for use in the production of artificial filaments, threads, and the like. COURTAULDS, LTD., and J. E. CRIGGAL (E.P. 258,365, 23.6.25).—The nozzles are made by heavily compressing wire gauze until the perforations are reduced to the desired size.

D. J. NORMAN.

Treatment of waste paper and the like in the preparation of paper pulp. J. F. L. MOELLER (E.P. 258,630, 24.3.25).—Apparatus is described for de-inking waste paper, using preferably cold water as a cleansing agent, progressive mechanical disintegration followed at each stage by violent agitation with water being relied upon to loosen the inky materials. The process is continuous, the pulp being reduced in fineness until it is clean and sufficiently milled to run on a paper machine.

D. J. NORMAN.

Production of electrical insulating [fibrous] material (E.P. 236,224).—See XI.

Treatment of soda solutions contaminated with cellulose (E.P. 249,091).—See VII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Colour problems in the woollen and worsted industries. S. G. BARKER and H. R. HIRST (J. Text. Inst., 1926, 17, T483—510).—A survey is given of present knowledge concerning fading problems. New information includes the results of exposing patterns dyed with Victoria Blue to sunlight during the separate months January—June, and under five different cloud conditions. Full sunlight caused a fairly constant relative fading, and dull light had about one-tenth of the effect of full sun. In addition, comparative tests on dyed worsteds exposed to flame arcs, sunlight in Leeds, and sunlight in a country place near Leeds are recorded for 86 days.

J. C. WITHERS.

Standardisation of methods of testing the fastness of dyes. A. CRUMMETT (J. Soc. Dyers and Col., 1926, 42, 301—304).—Some notes on the testing of dyed natural silk as regards its fastness to light, water, washing (scouring), degumming, and perspiration. A. J. HALL.

Absorption of water by dried films of boiled starch. SWAN.—See XVII.

PATENTS.

Bleaching textile materials by the "pack" system with circulating liquor. F. KIESER (E.P. 258,448, 24.11.25).—A bleaching liquor is uniformly distributed in drops or in thin trickling streams from a sprinkler which is continually moved above the surface of the textile material contained in a suitable vat, the amount of liquor thus distributed being equal to that withdrawn from the bottom of the vat, and such that the textile material is maintained saturated with the bleaching liquor. The necessity for pressure or suction

is thus avoided, and easy passages for the bleaching liquor through the textile material are not formed.

A. J. HALL.

Dyeing [cellulose] acetate silk. BRIT. DYESTUFFS CORP., LTD., R. S. HORSFALL, L. G. LAWRIE, J. A. R. HENDERSON and J. HILL (E.P. 257,654, 29.5.25).—Water-soluble dyes which may be used for dyeing cellulose acetate silk without the use of a solubilising agent (cf. E.P. 219,349; B., 1924, 906) are obtained from many acid dyes by converting their sulphonic acid groups into sulphonamide groups (e.g., by successive treatment with phosphorus pentachloride and ammonia), or, alternatively, by synthesis of dyes of the acid type from components containing sulphonamide groups. Reddish-orange and orange dyes are obtained by coupling diazotised aniline with 1-naphthol-3 : 8-disulphonamide or 1 : 8-naphthasultam respectively.

A. J. HALL.

Dyeing cellulose acetate products in [oxidation] black shades. SILVER SPRINGS BLEACHING AND DYEING Co., LTD., and A. J. HALL (E.P. 258,699, 10.7.25).—Cellulose acetate silk is dyed in very fast black shades by application of 2 : 4-diaminodiphenylamine from aqueous solutions or suspensions and subsequent immersion in hot or boiling aqueous solutions of oxidising agents (cf. E.P. 246,879; B., 1926, 317), or by impregnation with a paste containing an oxidising agent, a catalyst, an acid, and 2 : 4-diaminodiphenylamine followed by exposure to a moist warm atmosphere for development of the black shade. Mixtures containing 2 : 4-diaminodiphenylamine and one or more aromatic amines such as aniline, *o*-toluidine, *p*-phenylenediamine, and *p*-aminodiphenylamine may be used.

A. J. HALL.

Methods and apparatus for dyeing, colouring, or coating materials [fabrics]. TWO-TONE CORP., Assees. of P. MIJER (E.P. 236,194, 9.6.25. Conv., 30.6.24).—Textile fabrics are passed transversely through a cloud produced by atomising a solution of a dye or coating composition, and are thereby coloured or coated on one side. The fabric may be calendered or heated before passage through the cloud and afterwards steamed and dried.

A. J. HALL.

[Re-lustreing] treatment of threads, fabrics, or other materials containing [cellulose acetate] artificial filaments. BRIT. CELANESE, LTD., C. W. PALMER, and S. M. FULTON (E.P. 259,266, 26.5.25).—Cellulose acetate silk threads which have lost their natural high lustre by immersion in boiling aqueous liquors are re-lustred to any desired degree by immersion in boiling, or nearly boiling, aqueous solutions of neutral salts (cf. E.P. 246,879; B., 1926, 317) or sugars. Suitable salts include the sulphates and chlorides of ammonia, sodium, potassium, and aluminium. For example, de-lustred cellulose acetate silk is re-lustred by immersion for 10—40 min. in a boiling aqueous solution containing 2—3% of ammonium sulphate or 5—10% of cane sugar. Alternatively, the de-lustred silk is subjected to the action of a swelling agent, e.g., ammonium thiocyanate (cf. E.P. 158,340; B., 1921, 213 A), before treatment with the re-lustreing solution.

A. J. HALL.

Treatment [mercerisation] of cotton fabrics containing [cellulose acetate] artificial silk. CALICO

PRINTERS' ASSOC., LTD., and L. A. LANTZ (E.P. 259,394, 29.10.25).—In the mercerisation at the usual temperatures of cotton fabric containing cellulose acetate silk, protective substances such as salts of alkali metals, aluminium, zinc, or inorganic or organic acids, polyhydric alcohols, carbohydrates, or phenols are added to the mercerising liquor for the purpose of preventing deterioration (by hydrolysis) of the cellulose acetate silk. Suitable protective substances include sodium chloride, chlorate, sulphate, and glycollate, zinc oxide, chloride, and sulphate, sucrose, glycerol, phenol, and resorcinol. For example, a satisfactory mercerising liquor consists of a solution containing 10–15% of sodium chloride and 15–20% of sodium hydroxide (cf. E.P. 210,484; B., 1924, 290).

A. J. HALL.

Treatment [with synthetic resins] of cotton, silk, or artificial silk or goods made therefrom. BRIT. CYANIDES CO., LTD., E. C. ROSSITER, and W. C. DAVIS (E.P. 258,357, 19.6.25).—Synthetic resins, particularly those made from formaldehyde and thiourea, and which in their first stage of condensation are water-soluble, are used, together with fillers such as starch, gums, china clay, etc., for stiffening textile materials. Thus, cotton goods are impregnated with a solution containing fillers, a water-soluble condensation product of thiourea and formaldehyde, and a condensing agent such as an acid or salt thereof (e.g., potassium tetroxalate) or the hydrochloride of an organic base, and then subjected to a high temperature (not exceeding 120–140°) whereby the condensation product is rendered water-insoluble.

A. J. HALL.

Dyeing of cellulose acetate. G. H. ELLIS, F. M. STEVENSON, and C. M. CROFT, Assrs. to AMERICAN CELLULOSE AND CHEM. MANUF. CO. (U.S.P. 1,600,277, 21.9.26. Appl., 15.9.24).—See E.P. 224,681; B., 1925, 39.

[Machine for] dyeing knitted and woven fabrics. C. CALLEBAUT and J. DE BLICQUY (E.P. 259,323, 16.7.25).

Tintometer (E.P. 258,366).—See I.

Producing artificial yarns etc. (E.P. 251,580).—See V.

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

Equilibrium in the causticising process. I. L. F. GOODWIN (J.S.C.I., 1926, 45, 360–361 T).—The figures obtained by Lunge for the percentage conversion of sodium carbonate into sodium hydroxide in the lime process are shown to be too high, especially for the more concentrated carbonate solutions. The author's results agree well with those of Le Blanc and Novotny (B., 1906, 1145) and of Walter and Wegscheider (B., 1907, 871). The causticity obtained on treating sodium carbonate solutions with excess of lime is as follows: 2% Na_2CO_3 , 99.4% conversion; 4%, 99.2%; 6%, 98.7%; 8%, 97.8%; 10%, 96.5%; 12%, 94.6%; 16%, 89.9%; 20%, 83.5%.

A. R. POWELL.

Effect of additions of sodium sulphide on the causticising equilibrium. II. L. F. GOODWIN and I. L. SILLS (J.S.C.I., 1926, 45, 362–364 T).—The presence of sodium sulphide in sodium carbonate solutions depresses the causticising conversion ratio

$\text{NaOH}/(\text{NaOH} + \text{Na}_2\text{CO}_3)$ but increases the total causticity, $(\text{NaOH} + \text{Na}_2\text{S})/(\text{NaOH} + \text{Na}_2\text{S} + \text{Na}_2\text{CO}_3)$, of the final solution. The results obtained indicate that, under the conditions of the experiment, sodium sulphide is hydrolysed to hydroxide and hydrosulphide to the extent of only about 60%.

A. R. POWELL.

Absorption of gases in milk of lime. H. C. WEBER and K. T. NILSSON (Ind. Eng. Chem., 1926, 18, 1070–1075).—The rate of absorption of carbon dioxide in lime was determined under constant temperature and pressure, but with varying concentrations. Dry calcium oxide and dry calcium hydroxide gave no measurable absorption. With a 3.3% milk of lime the absorption rate was constant within the limits of the experiments. With a 0.15% lime content the rate of absorption was found to be proportional to the distance from saturation. Increase of stirring rate caused an increase in absorption rate. At the highest rate of stirring splashing caused a more rapid increase in absorption. If sodium hydroxide is added to the milk of lime the initial rate of absorption is found to be greater, but the decrease more rapid. On the two-film theory of absorption the effect of the gas film under these conditions is negligible until an accumulation of inert gases, present as impurities in the carbon dioxide, has taken place.

C. IRWIN.

Production, properties, and investigation of burnt magnesite. A. STETBACHER (Chem.-Ztg., 1926, 50, 741–742, 771–774).—The various stages in the burning of magnesite may be followed by an examination of the refractive index, which increases as the change from carbonate to oxide proceeds. On exposure to air the natural burnt magnesite absorbs moisture and carbon dioxide, but to a much smaller extent than that prepared from precipitated magnesium carbonate. The absorbed water is partly "hygroscopic" and partly "combined" as hydroxide. It is often advisable to burn magnesite at a higher temperature than is actually necessary for decomposition, in order to diminish its hygroscopic character. The higher the temperature of burning the more easily is the setting with magnesium chloride controlled, and the higher is the tensile strength of the cement. Lime is a harmful impurity, but iron and alumina do not influence the formation of the cement. To ascertain the amount of active magnesia, i.e., free MgO , it is necessary to make a complete analysis; but the comparison of the percentages of total magnesia, loss on ignition, and carbon dioxide with similar determinations made immediately after the burning, gives a good idea of the commercial value of the magnesite and the changes it has undergone since burning. Two magnesium oxychloride cements made from the same materials, but from mixtures of different viscosity, had practically the same composition, e.g., loss on ignition 40.8% and 44.1%, MgCl_2 12.7% and 13.7%, moisture 8.8% and 9.9%, combined water 30.1% and 33.6%.

F. R. ENNOS.

Apparatus for the direct determination of carbon dioxide. J. E. UNDERWOOD (Ind. Eng. Chem., 1926, 18, 1069–1070).—The apparatus is designed to reduce the time required for the direct determination of carbon dioxide in limestone and its products while retaining accuracy. Wide absorption tubes are used with a

bulb at the upper end and a stopcock at the lower, and are charged respectively with water and sulphuric acid. They are followed by safety bulbs, charged with zinc in the one case and phosphorus pentoxide in the other. The carbon dioxide freed from hydrogen chloride and water is then absorbed in a Midvale bulb, charged with "Ascarite" and phosphorus pentoxide. Consistent results with limestone and hydrated lime are tabulated.

C. IRWIN.

Manufacture of barium sulphide. W. HIRSCHTEL (Chem.-Ztg., 1926, 50, 692—693).—The use of a gas-fired furnace is recommended for the economical reduction of barium sulphate to sulphide with coal. The primary and secondary air are so regulated that the percentage of carbon dioxide found in the flue gases approximates to the total carbon dioxide, which may be calculated from the rate of combustion of coal in the gas generator and from the rate of reduction of the barium sulphate, in the absence of excess of air, according to the reactions:— $\text{BaSO}_4 + 4\text{C} = 4\text{CO} + \text{BaS}$, $4\text{CO} + 2\text{O}_2 = 4\text{CO}_2$.

F. R. ENNOS.

Deliquescent properties of magnesium chloride, of calcium chloride, and of glycerol. E. SWAN (J. Text. Inst., 1926, 17, T 517—526).—The relative humidity of air at 20° over a range of solutions of magnesium chloride, calcium chloride, and glycerol has been determined. The data are useful to those who may need to control humidity in small vessels. For example, the air above a mixture of magnesium chloride and its saturated solution at 20° remains constant at 34% R.H. as long as crystals and liquid are both present; similarly, a mixture of ammonium nitrate and its saturated solution gives 64.5% R.H. (cf. Pridéaux, J.S.C.I., 1920, 39, 183r). The work was undertaken, however, to determine the relative values of the two chlorides and glycerol as deliquescents in size, and measurements were made of the hygroscopic properties of dried size film and sized yarn containing known proportions of the materials. The results show that the amount of water taken up by a sized cotton material in an atmosphere of a definite humidity is not simply the sum of the amounts which would have been absorbed by the separate constituents. The addition of a soluble salt to size does not necessarily increase the moisture regain of sized yarn.

J. C. WITHERS.

Influence of added substances on mode of fixation of nitrogen by mixtures of barium carbonate and carbon. P. ASKENASY [with J. BRING] (Z. Elektrochem., 1926, 32, 216—217; cf. B., 1922, 462).—At 1300° and 1400°, and in presence of 5% of vanadium or 2.5% of barium fluoride, the nitrogen combined is divided between cyanide and cyanamide in the ratio of about 9 : 1; with 5% of iron or nickel the ratio is about 7 : 3. Other metals have varying intermediate effects.

R. CUTHILL.

Determination of silicic acid and fluorine in fluorspar, sand, and silicates. H. DUBIEL (Oesterr. Chem.-Ztg., 1926, 29, 174—175).—A mixture of fluorspar, sand, and silicates can be conveniently analysed by successive treatment with hydrofluoric acid and concentrated sulphuric acid. A portion of the finely-powdered material is dried at 250° (glowing must be avoided) in

a platinum vessel, hydrofluoric acid is added, the mixture heated to dryness, and finally to 250°, and the process repeated until constant weight is reached. The loss of weight gives the content of silicic acid. The residue is repeatedly treated with concentrated sulphuric acid, heated to dryness, and finally to 250°, until constant weight is reached, the calcium and other basic constituents being thereby converted into sulphates. The increase of weight thus obtained + the already calculated silicic acid \times the factor 38/58 = the fluorine content. Metallic oxides are determined in the residue by digesting with hot, moderately dilute hydrochloric acid. The undissolved gypsum, filtered and washed, together with any calcium precipitated (as oxalate) from the filtrate, is converted into and determined as sulphate by treatment as above with sulphuric acid. Any remaining basic constituents are determined in the hydrochloric filtrate in the usual way. A modification is necessary if the original mixture contains calcium carbonate. After the first drying at 250°, the material is heated to dryness with 10% acetic acid, the residue (calcium acetate) being washed with distilled water, and added, together with the incinerated filter, to the crucible.

P. V. MCKIE.

Sodium perborate. SBORGI and LENZI.—See XI.

Action of citric acid solutions on phosphates. ANDREASEN.—See XVI.

Lime-sulphur-calcium arsenate spray. GOODWIN and MARTIN.—See XVI.

Solubility of the copper in basic copper carbonate. HALL.—See XIX.

Colorimetric determination of iron [in tea etc.] by the ferrocyanide method. MUMMERY.—See XIX.

PATENTS.

Treating soda solutions contaminated with cellulose-like substances. LA SOIE D'AUBENTON CO. (E.P. 249,091, 19.2.26. Conv., 11.3.25).—Caustic liquors containing cellulose products from the pressing operation in the manufacture of artificial silk by the viscose process are treated with carbon dioxide at the ordinary temperature, whereby the cellulose products are quantitatively precipitated, and are separated by decantation, filtration, or centrifuging, while the sodium bicarbonate formed is converted into carbonate, and is causticised for further use.

W. G. CAREY.

Manufacture of ammonia. H. W. BLACKBURN and W. THOMAS (E.P. 257,689 and 258,154, 9.6.25).—(A) Pure nitrogen and steam, in the proportion of 1 pt. of nitrogen by weight to 4 pts. of steam, are passed over a heated catalyst at a pressure of about 2 atm. The catalyst may be iron, for which the optimum reaction temperature is 500°, iron in presence of nickel at a temperature of 1000°, nickel oxide at 400°, or ferrous oxide at 500°. (B) A mixture of pure nitrogen and steam in the ratio of 1 pt. of nitrogen by weight to 4 pts. of steam is brought into contact with heated charcoal at a pressure of about 2 atm. The temperature may be between 450° and 1300°, but is preferably about 800°. The charcoal appears to act as a catalyst, and undergoes no permanent change.

W. G. CAREY.

Synthesis of ammonia. F. UHDE (E.P. 247,226, 8.2.26. Conv., 9.2.25).—Increased activity of the catalyst is obtained by using a solution of an alkali or alkaline earth metal in molten alkali amides; in such cases both metal and solvent act as cleansers for the gas, and the gaseous mixture of nitrogen and hydrogen may be passed through the catalyst at 200–250°.

F. G. CROSSE.

Apparatus for the production of synthetic ammonia. "MONTECATINI," SOC. GEN. PER L'IND. MIN. ED AGRIC., and G. FAUSER (E.P. 240,436, 8.9.25. Conv., 24.9.24).—An apparatus is described consisting of two steel cylinders connected together, the lower one containing a bundle of longitudinal heat exchange tubes, and the upper one another bundle of tubes, also longitudinal, and in the form of a truncated cone, a heat insulation lining surrounding the latter tubes to protect the outer cylinder, and a reaction chamber arranged inside the bundle surrounded by a refractory material with a thermo-electric coil between. The mixture of nitrogen and hydrogen is passed, under pressure, round the lower tubes, thereby becoming heated. This pre-heated mixture passes to the upper tubes, and there comes into contact with the thermo-electric coil, which raises it to its reaction temperature. F. G. CROSSE.

Apparatus for the synthesis of ammonia. G. CICALI (E.P. 258,340, 17.6.25).—The apparatus comprises an external cylinder with heat-resisting lining and three co-axial cylinders, by means of which the cold mixture which is to be subjected to catalysis is divided into two cold currents, one being conveyed direct on to the outer wall of the cylinder containing the catalyst, the other passing over and cooling the pressure-resisting walls, exchanging heat with a portion only of the hot gases leaving the reaction chamber, finally uniting with the first current. The united currents then absorb heat from the catalyst cylinder, the gases leaving the reaction chamber being divided also into two currents, one leaving the apparatus without exchange of heat, whilst the other exchanges heat with the second cold current. The whole of the ammonia is condensed in two condensers, one of which is water-cooled, the other cooled by the liquid ammonia condensed in both condensers.

H. ROYAL-DAWSON.

Production of solid compounds of ammonia, carbon dioxide, and water. SYNTHETIC AMMONIA & NITRATES, LTD., and T. COXON (E.P. 258,048, 23.7.25).—Ammonia gas and carbon dioxide are pumped at atmospheric pressure into water at 20–50° until the concentration of each gas is 30% by weight of the total solution. On precipitation of ammonium carbamate, the ammonia and carbon dioxide are supplied in the proportion of two parts of the former to one of the latter, thus establishing a continuous production of the carbamate salt, which is then separated from the solution together with some adherent mother liquor, the moist crystals being treated with carbon dioxide and extra water (as steam) until a final dry product remains.

H. ROYAL-DAWSON.

Manufacture of finely divided metal oxides and silica. J. Y. JOHNSON. From BADISCHE ANILIN & SODA-FABRIK (E.P. 258,313, 15.5.25).—Iron or other metal carbonyl, or a volatile halide, is thoroughly

mixed with air or a combustible liquid, *e.g.*, alcohol, and forced through a nozzle into a spray by means of air or oxygen, and ignited by means of platinised asbestos, the resulting metallic oxides being then separated from the products of combustion.

H. ROYAL-DAWSON.

Manufacture of pure hydrochloric acid. VEREIN FÜR CHEM. & METALLURG. PROD. (E.P. 248,738, 25.2.26. Conv., 9.3.25).—Gaseous hydrochloric acid is treated with chlorine sufficient to oxidise the impurities, then filtered through activated carbon.

H. ROYAL-DAWSON.

Manufacture of hydrochloric acid. D. TYRER (E.P. 259,348, 19.8.25).—A mixture of ferrous chloride with an iron compound, *e.g.*, yellow hydrated oxide or hydrated ferrous oxide, is decomposed at a suitable temperature (350–450°) by a current of air or oxygen and steam. The ferrous chloride solution—a by-product of galvanising baths—is evaporated down with a finely-divided iron oxide, and the granular mixture exposed in thin layers to the oxidising atmosphere, the amount of water vapour being so adjusted that acid of a commercial strength is produced.

F. G. CROSSE.

Treating residue from the manufacture of acetylene for the recovery of lime products. A. STEPHENSON, and ALLEN-LIVERSIDGE, LTD. (E.P. 258,660, 24.6.25; cf. following abstract).—Quick lime is added to the residue and the mixture agitated in an apparatus adapted for de-watering during transit to the screening apparatus, the larger products from which are returned for further treatment with or without crushing.

H. ROYAL-DAWSON.

Production of blanc fixe from barium sulphide. A. JAHL (E.P. 259,102, 25.2.26. Conv., 5.11.25).—An alkali sulphate is added to an aqueous solution of barium sulphide containing relatively more hydrosulphide than hydroxide, formed by the addition of the requisite amount of an acid or acid salt to convert 10–15% of sulphide into hydrosulphide.

H. ROYAL-DAWSON.

Production of soluble fluorides. A. L. MOND. From CHEM. FABR. GREISHEIM-ELEKTRON (E.P. 257,981, 4.6.25).—The process consists in heating fluor spar with hydrochloric acid in the presence of silicic acid and barium or sodium fluoride. Sparingly soluble silico-fluorides are produced which are filtered and decomposed by means of ammonia or potash, giving easily soluble fluorides and a residue which is used again in the first part of the process.

H. ROYAL-DAWSON.

Production of anhydrous magnesium chloride. A. L. MOND. From I.-G. FARBENIND. A.-G. (E.P. 259,498, 13.5.26).—A self-binding mixture of oxidic compounds, molten hydrates of magnesium chloride, or magnesium chloride lyes, with carbon or sawdust is made which, at temperatures below the melting-point of magnesium chloride, forms a coke and occupies a large space, giving the necessary porosity for the reactions, and leaving sufficient space for its increase in volume on conversion by chlorination into solid magnesium chloride. An example is given in which 200 kg. of $MgCl_2 \cdot 6H_2O$ are fused, and to the melt is added 40 kg. of ground burnt magnesite with 18 kg. of carbon. The mixture swells and solidifies. After preliminary drying it is broken up and chlorinated at 500–550°. A mixture

of caustic burnt magnesite, charcoal, and sawdust, saturated with magnesium chloride lye (about $d\ 1.18$), may be used. This is granulated, dried at 350° , and treated as before.

F. G. CROSSE.

Manufacture of alumina salts from aluminosilicate and minerals containing alumina. O. LEDERER and W. STANCZAK (E.P. 246,512, 23.1.26. Conv., 24.1.25).—Clay or other aluminous material is boiled with a concentrated solution of sodium carbonate, under 14 atm. pressure, at about 200° for $1\frac{1}{2}$ hrs. After refrigeration the filtered solution of sodium carbonate is concentrated and re-used, the residue being rendered easily soluble in acids. A sample of blue clay of Wildstein containing 34.41% Al_2O_3 and 50.03% SiO_2 yielded 98.45% of its alumina content in a pure state.

F. G. CROSSE.

Manufacture of aluminium chloride. R. J. DEARBORN, Assr. to the TEXAS Co. (U.S.P. 1,600,216, 21.9.26. Appl., 26.2.25).—A mixture of aluminium ore and carbonaceous material is simultaneously coked and purified by heating and chlorinating at a relatively low temperature, and the mass is further chlorinated at relatively high temperature without loss of heat.

H. ROYAL-DAWSON.

Cyanide product. K. F. COOPER, Assr. to AMER. CYANAMID Co. (U.S.P. 1,599,212, 7.9.26. Appl., 29.5.23).—Crude cyanide containing decomposition products is improved by fusion with ferrocyanide, and removing any iron that may separate out during the process, the iron-free product being then cooled and recovered.

H. ROYAL-DAWSON.

Performing chemical reactions (E.P. 231,901).—See I.

VIII.—GLASS; CERAMICS.

Premature failure of combustion chamber material. A. J. DALE (Gas J., 1926, 175, 862—865).—A highly siliceous refractory material which had failed in use in the combustion chamber of a gas retort setting was examined according to the Mellor—Moore load test. Samples of the unused material were heated at a fixed rate under loads of 50, 10, and 4 lb./sq. in. respectively, and the deformation of the sample was plotted against temperature. In all cases the expansion ceased at about 1000° , showing that a uniformly distributed portion of the material had become plastic. Under loads of 10 and 50 lb./sq. in. the specimen collapsed at 1100° and 1150° , respectively. Under 4 lb./sq. in. the rate of subsidence decreased between 1150° and 1320° , after which the specimen collapsed. This diminished rate is due to the specimen yielding to internal stresses caused by expansion during the conversion of quartz to cristobalite. The causes of failure in use were twofold: firstly, the premature fusion of the bond and the lack of cohesion of the bond in the viscous state with the siliceous grains, and, secondly, internal stresses due to the rapid expansion of unconverted quartz.

S. PEXTON.

PATENTS.

Apparatus for melting and fining glass. R. D. PIKE, Assr. to COLE—FRENCH Co. (U.S.P. 1,598,307, 31.8.26. Appl., 25.10.22).—The apparatus consists of an open-hearth regenerative furnace, the dimension of

which with the flame is over twice as great as that transverse to the flame. The raw mix is fed through small bays into the furnace and leaves the latter by a submerged port, the refractories surrounding which are protected by a water jacket. The glass passes through a fining compartment, pursuing a tortuous up and down path, the temperature being maintained by a flame counter current to the glass. The fined glass then enters a working compartment, whence it may be delivered as desired.

R. B. CLARKE.

Fining glass. R. D. PIKE, Assr. to COLE—FRENCH Co. (U.S.P. 1,598,308, 31.8.26. Appl., 1.11.22).—To facilitate removal of the gaseous products of decomposition produced in glass fining, the glass on leaving the melting furnace passes through a vacuum chamber wherein decreased pressure causes the dissolved and absorbed gases to be liberated. The temperature of the glass while passing through the chamber is maintained electrically.

R. B. CLARKE.

Glass furnace. C. D. MCARTHUR, Assr. to BLAW-KNOX Co. (U.S.P. 1,598,779, 7.9.26. Appl., 11.3.21).—A glass tank furnace is provided with a bottom formed of refractory blocks seated upon a series of hollow water-cooled members, which are independent of each other and separately removable.

B. W. CLARKE.

Ceramic safety tile. M. C. BOOZE, Assr. to NORTON Co. (U.S.P. 1,600,925, 21.9.26. Appl., 27.10.22).—A safety tile is described consisting of wear-resisting, abrasive, anti-slipping grains of porcelain bonded into an integral non-homogeneous highly porous mass by a vitrified ceramic bond, which is softer and more vitreous at the firing temperature than the grains, and forms 25—60% by weight of the total mass.

B. W. CLARKE.

IX.—BUILDING MATERIALS.

Silica-lime bricks. R. DE FAZI (Annali Chim. Appl., 1926, 16, 400—404).—Bricks with a compressive strength of 200 kg./sq. cm. may be made by mixing 85% of Ostia sand with 15% of lime and simultaneously quenching the lime with steam at about 8 atm. pressure; the pressed bricks are kept for 10 hours in an autoclave at a pressure of 8 atm. When subjected to a temperature of -5° for periods varying from 10 to 40 days, such bricks undergo no physical or chemical changes adversely affecting the strength, which in most cases exhibits appreciable increase.

T. H. POPE.

Determination of free lime in hydraulic cement. F. L. BRADY and F. J. MCCONNELL (Dept. Sci. Ind. Res., Building Res., Tech. Paper No. 4, 1926, 1—13).—“Wet” methods of determining the free lime in hydraulic cements are not in general so satisfactory as “dry” methods, owing to the fact that further hydration proceeds during the determinations and produces more free lime. Extraction with a 20% sugar solution gives useful information for set cements, and is a rapid method for testing where only small quantities of material are available. Passow's method (see Zement, 1923, 12, 87) in which ammonium carbonate is heated with the cement and forms calcium carbonate with the free lime, is not very satisfactory owing to hydration effects, ammonium carbamate giving better results. The most

satisfactory method for determining free lime is a thermal method, in which the cement is heated at 900° for ten minutes, converting the calcium hydroxide into calcium oxide, which is then determined by the rise in temperature produced when it is mixed with water. This gives reliable results for set and unset cements, and is especially valuable in investigating the fire-resisting properties of cement or concrete, which depend apparently on the free lime content, and also in determining the degree of aeration of the cement.

B. W. CLARKE.

Burnt magnesite. STETTbacher.—See VII.

Stability of blast furnace slag and cause of its disintegration. GUTTMANN.—See X.

PATENT.

Hydration of concrete and other similar materials. F. W. V. FITZGERALD (E.P. 258,320, 9.6.25).—Cement or plaster is mixed with materials which liberate water when subjected to heat or pressure, such as salts containing water of crystallisation, the gelatinous precipitate formed by adding ammonium carbonate to a solution of alum, a solidified solution of sodium or potassium silicate or the like, and the mixture pressed into moulds at a temperature of about 100°. Bitumen, wax, stearine, colouring and filling materials may be added if desired.

B. W. CLARKE.

Manufacture of cementitious substances. P. BUDNIKOV (E.P. 258,727, 7.9.25).—Finely ground overburnt gypsum or anhydrite is mixed with a "catalytic" agent such as a mixture of a bisulphate of an alkali metal with copper sulphate or ferrous sulphate, with or without the addition of iron filings, calcium phosphate, powdered glass, organic matter such as peat, and asbestos.

B. W. CLARKE.

Making cement from town refuse. G. E. HEYL (E.P. 259,503, 31.5.26).—Refuse is calcined in a rotary kiln at a temperature not exceeding the fusion temperature of the ash, with the addition of suitable fuel, by means of hot combustion gases from another furnace. The product is ground and mixed with the necessary calcareous and aluminous materials to form a raw mixture suitable for making Portland cement, which is calcined in a rotary kiln in the usual manner.

B. W. CLARKE.

Manufacturing artificial stone. F. R. A. SUNDELL (E.P. 239,497, 5.8.25. Conv., 6.9.24).—Glue is dissolved in water to the extent of 1 pt. in 40–70 pts., and 8–12 pts. by weight of this solution are mixed with 1 pt. of a suspension of lime in water (1–4 pts. by weight of lime in 3 pts. of water), gypsum being added in sufficient quantity to produce a mass of the required consistency for artificial stone. This is moulded on a glass plate if a polished surface is required, and subsequently loosened by the application of hot ashes to the back of the plate.

B. W. CLARKE.

Manufacturing porous artificial stone. J. A. ERIKSSON (E.P. 258,073, 31.8.25).—A finely divided intimate mixture of lime and a siliceous material, e.g., calcined slate (alum shale ashes), is mixed with powdered aluminium or zinc, which generates gas when the mass is treated with water. After gauging with water, with or without the addition of Portland cement, the porous mass

is subjected to the action of steam under pressure, thereby producing, after 5–10 hours' hardening, a strong and durable porous artificial stone (gas concrete).

B. W. CLARKE.

Supplying raw slurry to rotary cement-burning kilns. N. NIELSEN (E.P. 258,199, 4.5.26).—Raw slurry is subjected to a screening process before being supplied to the atomising nozzle of a rotary kiln. The cement dust, usually carried over by the smoke from the end of the kiln, is collected in a suitable dust chamber, elevated by buckets, and allowed to return to the kiln by gravity, or, alternatively, admixed with a small quantity of air so that it can be pumped back to the kiln, or blown into the kiln with the powdered coal used for burning. This obviates waste of heat in redrying the collected dust, which by present methods is returned in a wet state. A dust filter consisting of chains kept wet by sprinkling with water or slurry is preferably provided in the drying zone of the kiln, and pressure-regulating devices are provided with the feed pipe from the raw slurry tank to prevent damage to the nozzle if choking occurs.

B. W. CLARKE.

Improving the properties of wood. W. H. KOBBE, Assr. to TEXAS GULF SULPHUR Co. (U.S.P. 1,599,135, 7.9.26. Appl., 24.11.25).—Wood in its natural state is immersed in a bath of sulphur at a temperature of 140–150°, until practically the whole of the moisture has been expelled from the pores of the wood. The temperature of the bath is then reduced to about the melting point of sulphur, and maintained at this temperature until the sulphur has sufficiently penetrated the pores, the sulphur finally being allowed to congeal within the pores.

B. W. CLARKE.

Prevention of sap staining and molding [on wood]. E. BATEMAN and E. E. HUBERT (U.S.P. 1,598,699, 7.9.26. Appl., 23.5.24).—The process consists in impregnating the wooden products with an aqueous solution of an alkali phenolate which will react with the air forming an alkali carbonate and free phenol, which is dissipated by the air as the water evaporates.

F. G. CROSSE.

Materials for coating walls. O. KUNZE (E.P. 258,164, 26.2.26).

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

Influence of materials and operation duration on the heat equilibrium and temperature in the Thomas process. H. BANSEN (Stahl u. Eisen, 1926, 46, 1277–1283).—Each constituent of a Thomas converter charge is considered in relation to its heat contribution to the thermal equilibrium and to its effect on the temperature produced. Variation of efficiency with time of operation is also considered. L. M. CLARK.

Graphitisation at constant temperature. H. A. SWARTZ (Trans. Amer. Soc. Steel Treat., 1926, 9, 883–906).—Four typical graphitisation curves at a temperature above Al are given for irons containing 2.25–2.60% C, the ordinates representing the degree of completion of graphitisation. The curves can be brought into coincidence by shifting them horizontally.

Photomicrographs show that graphitisation proceeds by an increase in size rather than in number of carbon nodules which are surrounded by solid solution lower in carbon content than the austenite in which the nuclei are formed. A mathematical analysis is made of the data of graphitisation, and it is shown that the rate of graphitisation is determined by the rate of migration of carbon in some form through solid solution or ferrite. It is concluded that the graphitisation rate is proportional to an experimental constant which provides a valuable means of determination of this rate. Either carbon in all its forms migrates in iron at the same rate, or the form in which it migrates is always the same or changes continuously with a corresponding change in the graphitising rate. The logarithm of the rate of graphitisation is proportional to the temperature. Equal increments of silicon multiply the graphitisation rates by equal amounts, except as regards low silicon contents. Silicon also decreases the thermal coefficient of the velocity of graphitisation. The *modus operandi* of the process of graphitisation is discussed.

T. H. BURNHAM.

Irregular carburisation of iron and iron alloys—the cause and prevention. W. J. MERTEN (Trans. Amer. Soc. Steel Treat., 1926, 9, 907—928).—The conditions for consistently uniform carburisation are discussed. The mixture should not dissociate until the critical point has been passed, and the residue should be regenerative. The steel parts should have clean surfaces free from matter chemically active below or at the carburising temperature. They should possess a uniform grain structure produced by normalising or annealing prior to treatment. The articles should be so arranged as to expose all parts uniformly to the carburising gas. A self-sealing box with copper gaskets to maintain a positive pressure is recommended. For partial or selective cementation the use of solid copper protectors is preferred. For carburising by purely gas contact, a set of copper screens were used which prevented the compound from coming into contact with the parts. By this means the uniformity and depth of case were improved.

T. H. BURNHAM.

Progressive carburisation in rotary electric furnaces. H. E. MARTIN (Trans. Amer. Soc. Steel Treat., 1926, 9, 933—937).—Experiments on firing heat-treatment furnaces with city gas, producer gas, oil, and electricity resulted in the adoption of the last-named on account of greater control and flexibility of heat input, improved working conditions, and greater output. For case hardening, three rotary 500-kw. furnaces were erected of 26 ft. 3½ in. outside diam., the total loaded weight of the rotary tables being 60—70 tons. The table speed was 10½—15½ hrs./rev. The heating elements were 80—20 nickel-chromium ribbon, the current density being 8 watts/sq. in. The carburisation was uniform with practically no rejections. The process was continuous, over 7.7 million lb. of material being treated each year at approximately 0.5 kw./lb. power consumption.

T. H. BURNHAM.

Iron and steel: sulphuric and nitric [acid] corrosion. S. C. BATE (Chem. Age, 1926, 15, 419—420).—Oleum and strong (100%) sulphuric acid dissolve steel

somewhat more readily than iron, whereas 65—95% sulphuric acid dissolves iron slightly more readily than steel, and weaker acid iron much more rapidly than steel. Nitric acid solutions stronger than 65% have a very energetic action on iron, but only a slight action on steel; weaker solutions, however, dissolve both metals readily. Mixtures of sulphuric and nitric acids containing up to 10% of the latter react readily with iron, and the rate of action is increased by the addition of water; steel, on the other hand, is only slightly affected when less than 25% of water is present. Acid mixtures containing more than 10% of nitric acid exert the minimum corrosive action on iron when 20% of water is present, and on steel when 15% of water is present. A protective action is afforded by the addition of 30—35% of nitric acid to sulphuric acid-water mixtures, but the presence of nitrous acid has the opposite effect, and causes rapid dissolution of both iron and steel in acid mixtures. Prolonged exposure of iron or steel to the action of acids of such concentration that corrosion is fairly slow results in an appreciable retardation of the rate of dissolution of the metal after a certain period owing to the formation of a protective coating on its surface. If this coating is removed the subsequent rate of corrosion is still somewhat less than the original rate, and is also more uniform.

A. R. POWELL.

Transformations in hardened steel during tempering. H. HANEMANN and L. TRAEGER (Stahl u. Eisen, 1926, 46, 1508—1514).—Prolonged tempering of quenched steel at temperatures between 50° and 450° results in three changes in the structure and properties of the metal. The first change begins at 75°, and is complete in 14 hrs. at 100°; the metal contracts 0.12% when 0.97% C is present, and the hardness suffers a sudden slight fall, whilst a change takes place in the martensite needles, causing them to be more readily attacked by etching reagents. On further heating to 235° a dilatation of 0.035% takes place in a 0.97% C steel, and the hardness falls somewhat more than at the previous transformation point. As this second change does not occur in steels containing less than 0.8% C, it appears to be due to the decomposition of the austenite phase. The third transformation occurs at 300°, and is accompanied by a contraction of 0.18% and a sudden fall in hardness, but by no visible structural change. Above 400°, however, the usual sorbitic structure appears. Reasons are advanced for assuming that the transformation at 100° is accompanied by the formation of a new phase, which the authors designate as the ζ phase and suggest that it consists of a new carbide characterised by ready solubility in acid, a smaller electrical resistance and hardness than martensite and a greater hardness than the heterogeneous cementite-α-iron phase; in the microstructure after etching with nitric acid the ζ constituent appears as black needles. This constituent seems to be identical with the α-martensite described by Honda, but, contrary to the latter's observations, it can not be produced directly by quenching austenitic steel in oil at 200°. Once the ζ-phase has been produced by tempering at 100° the steel suffers no further volume change below 200°. The usual tempering temperature of steel is between 200° and 300°, but the period of tempering is

never sufficiently prolonged to obtain even approximate equilibrium between the various phases, so that if it is desired to obtain a tempered steel which will not suffer any volume change at temperatures above 280° it must be tempered at 400° to obtain the α -iron-cementite structure.

A. R. POWELL.

Influence of silicon on the magnetic properties of steel. K. DAEVES (Z. Elektrochem., 1926, 32, 479—481).—Mainly a discussion of previous work (cf. B., 1924, 983) with reference to possible reduction of power losses in transformers and dynamos. With steel containing more than 1.3% of silicon the α and δ forms of iron are interconvertible without the intermediate formation of γ -iron, so that the grain size in the cold metal is dependent only on the extent of working and the annealing temperature. A coarse-grained metal is consequently obtainable, and this is advantageous, since, for silicon steel of low carbon content or with most of the carbon converted into graphite by heating at about 800°, the power loss decreases nearly linearly with increase of grain size. Theories of the effect of grain size on power losses are discussed.

H. J. T. ELLINGHAM.

Determination of sulphur in iron. K. K. JÄRVINEN (Z. anal. Chem., 1926, 68, 397—404).—A long series of tests has been carried out to determine the quantitative relative effects of the various sources of error, and the following rapid and accurate method has been worked out: 5 g. of the filings are treated slowly in presence of 100 c.c. of water with 8—9 c.c. of bromine, the excess is removed by boiling, and 20—30 c.c. of 3*N*-barium chloride, with water to make 100—150 c.c., are added after cooling. After 3 hrs. the precipitate is filtered, washed, and ignited, and the residue fused with sodium potassium carbonate and a little sodium nitrate. The melt is dissolved, and the filtered solution acidified with hydrochloric acid, heated, and treated with dilute barium chloride, a few drops of lacmoid or Congo-red being added to prevent the barium sulphate passing through the filter.

S. I. LEVY.

Determination of gases in iron and steel. P. KLINGER (Stahl u. Eisen, 1926, 46, 1245—1254, 1284—1288, 1353—1356; cf. B., 1925, 993).—Methods for determining the amounts of gas mechanically contained or dissolved in iron or steel are critically reviewed. The total amount of gas is obtained either by heating the material *in vacuo* with or without a flux or by dissolving it in a suitable reagent. The results from basic Siemens-Martin steels of varying carbon content depend on the method used, treatment of the sample *in vacuo* giving the greatest amount of gas. The production of carbon monoxide by reaction of cementite or graphite with oxides of iron, manganese, silicon, and aluminium is investigated, and it is considered that both carbon monoxide and carbon dioxide obtained in vacuum extractions of steels or on dissolving in chemical reagents are products of such reactions, and are not in solution in the steel. The amount of these reaction gases provides an index to the amount of oxygen present in the sample. The most trustworthy method for the determination of nitrogen and hydrogen is considered to be fusion of the sample with a tin-antimony flux, whereby iron nitride is completely decomposed. The formation of blow-

holes in steel is ascribed to liberation of carbon monoxide as a reaction product. This gas carries with it from the fused metal some hydrogen and nitrogen, which remain in the blowhole when the monoxide is decomposed at the wall of the cavity.

L. M. CLARK.

Testing the stability of blast-furnace slag by means of ultra-violet light and the cause of the disintegration of the slag. A. GUTTMANN (Stahl u. Eisen, 1926, 46, 1423—1428).—On exposing pieces of iron blast-furnace slags to ultra-violet light, characteristic fluorescence colours are produced which serve to distinguish stable slags from those which will disintegrate on keeping. The former show on freshly fractured surfaces an evenly distributed dark to light violet fluorescence, and on surfaces that have been exposed to the weather yellowish-white spots on a violet background. Unstable slags, on the other hand, show numerous yellow to red or cinnamon-brown spots often gathered in large clusters on a violet background. Dark violet spots on a nearly black background are simply reflexion phenomena from the crystal faces. From the examination of numerous slags in this way, as well as under the polarising microscope, it is shown that the cause of the disintegration of unstable slags is the slow transformation of α - and β -dicalcium silicate into the γ modification which is associated with an increase of 10% in the volume of this compound, and that the γ -form is the cause of the red or brown spots mentioned above. The formation of unstable slags may be avoided by reducing the lime content of the charge or by substituting a certain amount of magnesia or other bases for part of the lime; too high a content of ferrous oxide is inadvisable, as it results in a slag which decomposes somewhat readily in moist air.

A. R. POWELL.

Transformations of aluminium-bronzes. J. BOULDOIRES (Compt. rend., 1926, 183, 660—661).—Transformation points are recorded for an aluminium-bronze containing 87% Cu, which was heated to 850° and allowed to cool slowly in 15 hrs., at 515°, 560°, and 690° during the heating period, and at 650°, 510°, and 480° during the cooling period. When this sample is reheated to 530° the first transformation does not take place. If cooling takes place quickly in a jet of air, the transformation points are found at 635°, 500°, and 460°. The resistivity is also affected by the rate of cooling. In the cases of tempered samples heated for a second time to various temperatures, maximum values of resistivity are recorded for 500°. At lower temperatures the reheating has the least effect. Micrographical observations indicate that acicular structures correspond with the maximum resistivity, since they are brought about by the same conditions of tempering and reheating.

J. GRANT.

Influence of chemical composition of alloys on the power of obtaining moulded pieces (or flowability). L. GUILLET and A. PORTEVIN (Compt. rend., 1926, 183, 634—636).—The authors distinguish between the fluidity of an alloy and its power of filling a mould completely (flowability). The latter has been determined at 550° and 450° for alloys of tin with bismuth and with lead, by measuring the length of a horizontal spiral-shaped channel filled by the liquid alloy. The

curves obtained are of the same form, maximum values being obtained at the eutectic points. The latter phenomenon is due to the low m.p. of the alloy, and it is suggested that the "flowability" varies as a continuous function of the excess temperature of the melt over that at which solidification starts. The speed of solidification is a specific property of the alloy, and must also be taken into account.

J. GRANT.

PATENTS.

Steel alloys [for tools]. GELSENKIRCHENER GUSSSTAHL U. EISENWERKE A.-G., ABT. STAHLWERKE KRIEGER, and B. RASCHKE (E.P. 250,560, 26.3.26. Conv., 11.4.25).—A durable steel for rolling mill mandrels is suggested having, in addition to the usual small traces of phosphorus and sulphur, the following composition: 0.33% C, 0.16% Si, 0.20% Mn, 0.46% Cr, 1.69% Mo, 4.18% Ni.

F. G. CROSSE.

Increasing the fluidity of molten metal [iron and steel]. A. PACZ (U.S.P. 1,596,888, 24.8.26. Appl., 7.11.22).—Molten cast iron or steel, which has cooled too much in pouring, can be rendered sufficiently fluid to complete the operation by adding a mixture of powdered aluminium, boric, and ferric oxides. The heat evolved by the ensuing "thermite" reaction raises the temperature of the metal, the fluidity of which is also increased by the formation of an alloy of iron and boron which has a relatively low m.p. The presence of boron is not injurious, but increases the tensile strength of the product. The addition of boric oxide to the mixtures employed in thermite welding, and, mixed with thermite as above, to other molten metals, is also of advantage.

T. S. WHEELER.

Blast furnace. J. KENNEDY (U.S.P. 1,598,777, 7.9.26. Appl., 2.7.25).—A blast furnace is described consisting of a small and a large bell, the former being laterally adjustable and acting as a guide for a rod supporting the large bell.

B. W. CLARKE.

Production and treatment of refractory metals [chromium]. A. S. CACHEMAILLE. From WESTINGHOUSE LAMP Co. (E.P. 258,024, 19.6.25).—Powdered pure chromium is agglomerated into a bar and slowly heated in a high vacuum, so as to sinter the particles into a compact mass. The bar is then further heated to just below the fusing temperature by electro-magnetic induction, and after cooling to redness the metal may be hammered, rolled, or drawn until the desired ductility is obtained.

C. A. KING.

Extracting volatile metal from ore. E. M. JOHNSON (E.P. 258,948, 1.7.25).—In conjunction with a series of horizontal retorts arranged both laterally and vertically, and adapted for the volatilisation of metals, travelling cars, carrying a charge of ore in troughs corresponding in position with that of the retorts, are caused to register with both ends of the retort bench and charge the retorts simultaneously.

C. A. KING.

Copper-silicon alloys. W. DENECKE (E.P. 259,091, 2.2.26).—Resistant alloys for use in chemical industry contain Si 5–10%; Fe, Ni, Co (separately or together) 1.5–12%; the remainder being copper. The alloys

may also contain up to 5% of tungsten, molybdenum, titanium, or vanadium, and up to 1% of arsenic.

C. A. KING.

Alloy [for printing rollers]. J. WALRATH (E.P. 258,490, 15.3.26).—An alloy suitable for the production of printing rollers and blocks used in the manufacture of wall paper contains Al 84%, Sn 10%, Zn 6%.

C. A. KING.

Silver alloy. SOC. FRANÇ. DE MONNAYAGE (E.P. 259,108, 5.3.26. Conv., 2.2.26).—A homogeneous silver alloy, of white colour, suitable for goldsmiths' work, contains 30–70% of silver, also nickel, copper, and zinc, the last being wholly or partly replaceable by cadmium. Two typical alloys have the compositions Ag 40% (50), Ni 12% (10), Cu 35% (30), Zn 13% (10). In order to prevent volatilisation of zinc during the preparation of an alloy, a silver-zinc alloy of correct composition is first prepared by heating a mixture of finely-divided zinc and silver at a comparatively slow rate, so that a continuous formation of intermediate alloys occurs from about 420°.

C. A. KING.

Flux materials for use in arc welding and methods of coating electrodes. HUME STEEL, LTD., and W. R. HUME (E.P. 258,036, 6.7.25).—Electrodes for use in arc welding are coated with potassium dichromate. A suitable method of preparing such an electrode is by dipping the red-hot electrode wire in a mixture of powdered potassium dichromate and a refractory material, e.g., asbestos.

C. A. KING.

Electrode for welding and like purposes. H. D. LLOYD and C. E. HILL, Assrs. to THE WHITECROSS Co., LTD. (U.S.P. 1,599,056, 7.9.26. Appl., 12.11.23. Conv., 18.12.22).—A coating composition for electrodes contains siliceous fireclay and titaniferous iron ore, and is substantially free from carbonates and carbon.

J. S. G. THOMAS.

Electrode for use in electric arc welding and the cutting of metals. THE QUASI-ARC Co., LTD., and A. P. STROHMENGER (E.P. 259,365, 16.9.25).—A metallic core is provided with a yarn or fibre covering having as a substantial constituent a fibrous silicate, e.g., amosite, or a mixture of amosite and crocidolite, the iron content of which exceeds 30%.

J. S. G. THOMAS.

Metallising fine ore concentrates. D. M. CRIST, Assr. to TRIUMPH STEEL Co. (U.S.P. 1,595,454, 10.8.26. Appl., 26.12.24).—The ground ore is mixed with carbonaceous material and passed continuously through a zone where it is heated out of contact with air to such a temperature and for such a time as to become completely reduced without fusion. The gas evolved is burnt under the furnace.

E. S. KREIS.

Protecting metallic articles from oxidation, deterioration, or corrosion. METALLISATION, LTD., and W. E. BALLARD (E.P. 259,289, 4.7.25).—The method consists in forming on the articles, cleaned by sand-blasting, a coating 0.005–0.006 in. thick of aluminium by means of the Schoop metal-spraying process, which is then covered with a carbonaceous material, e.g., lamp black or bitumastic paint, and heated to 650°.

F. G. CROSSE.

See also Class XI (following): **Electrolytic deposition of chromium** (E.P. 258,724 and 259,118); **Extraction of tin from alloys containing lead** (E.P. 240,147); **Electrolytic deposition of metallic coatings on metals** (E.P. 259,307); **Cleaning silver etc.** (E.P. 258,726).

XI.—ELECTROTECHNICS.

Electrolytic preparation of sodium perborate. U. SBORGI and D. LENZI (Giorn. Chim. Ind. Appl., 1926, 8, 423—427).—A mixture containing 23% of crystallised sodium carbonate, 3.3% of borax, 1.5% of sodium bicarbonate, and 10.5% of chromic oxide, together with a small quantity of salt, is electrolysed, using a gilded copper sheet anode and an iron cathode. Further powdered borax and carbonate are added during the reaction. With a current of 20—25 amp. (10—12 volts) a solid, well-crystallised perborate, of 99—100% purity, representing a yield of 35—40% on the current used, is obtained. At intervals of 24 hrs. the reaction is stopped, and the mixture centrifuged and washed rapidly with cold water. The filtrate can then be used for further electrolysis.

P. V. MCKIE.

PATENTS.

Building and starting electric induction furnaces. C. A. BRAYTON, JUN., Assf. to INDUCTION FURNACE CO. (U.S.P. 1,598,236, 31.8.26. Appl., 24.9.20).—A refractory lining is packed about a short-circuited metallic core, a casing for which is provided in which the cross-sectional air space is sufficient to permit lateral displacement of the core during expansion, thus forming a furnace channel. A low current is induced in the core to heat it and dry out the lining, the current being then increased to melt the core.

L. M. CLARK.

High-frequency electric furnace. C. LORENZ A.-G. (E.P. 249,843, 11.3.26. Conv., 30.3.25).—In a high-frequency electric furnace in which alternating current is passed through a heating coil outside the crucible, and metal contained in the crucible is heated by the induced eddy currents, the heating coil is so wound that its turns decrease in diameter towards either or both of its ends, thereby minimising marginal dispersion or fringing of the magnetic field with respect to the charge.

J. S. G. THOMAS.

Electrolytic apparatus. F. LAWACZEK (U.S.P. 1,600,478, 21.9.26. Appl., 13.10.24. Conv., 20.10.23).—A number of cells, insulated from each other, are arranged in a pressure vessel containing electrolyte and communicate with the electrolyte therein. Current is supplied to the first of the series of cells and means are provided for collecting separately, under pressure, the gases liberated from the electrolyte.

J. S. G. THOMAS.

Electric furnace. J. K. KIDDLE (E.P. 259,296, 6.7.25).—In a rotary electric furnace of the type in which the rotating element comprises a shell enclosing an electrical resistance and the refractory tube for containing the material to be treated, the rotating element has the form of a tubular shell reinforced by surrounding annular discs mounted thereon and braced together near the periphery by longitudinal stay-rods.

J. S. G. THOMAS.

Electrodeposition of chromium. C. L. LONG, D. J. MACNAUGHTAN, and G. E. GARDAM (E.P. 258,724, 4.9.25).—Chromium is deposited electrolytically from an electrolyte having a chromic acid base to which is added a proportion not exceeding 3% by weight of copper, zinc, or nickel or any combination of these metals. Thus the electrolyte may consist of an aqueous solution containing 30% of chromic acid, 0.5—2% of chromium sulphate, and 0.25—2% of dissolved copper. The process permits the production of coherent deposits free from laminations and cracks by the use of high current densities, e.g., 200 amp./sq. ft., at temperatures below 20°.

J. S. G. THOMAS.

Electrolytic separation of chromium. R. APPEL (E.P. 259,118, 19.3.26. Conv., 26.11.25).—An adherent deposit of chromium is obtained by the electrolysis of a bath containing about 50 g. of chromic acid, or chromates, and 0.5 g./litre of sodium sulphate. Plates of rolled lead proved the most satisfactory material for anode material. The bath is maintained at 35—40° and the current density at 0.6 amp./sq. cm., and if at first a brown colloidal oxide be deposited, a few drops of sulphuric acid should be added to the bath.

C. A. KING.

Extraction of tin from alloys containing lead by electrolytic means. H. and S. BONDI and B. NEURATH (E.P. 240,147, 31.8.25. Conv., 19.9.24).—An almost quantitative separation of tin and lead is effected if the electrolyte is such that the cathode potentials of the metals are made to differ so that the formation of a tin-lead alloy at the cathode is impossible. Thus, the addition of 10 g./litre of sulphuric acid, or 30 g./litre of sodium sulphate, or 30 g./litre of hydrogen iodide or potassium iodide to the hydrochloric acid electrolyte is effective. An extension of this process can be used in the separation of copper and antimony from tin by the addition of suitable substances capable of forming complex ions or salts with these metals.

F. G. CROSSE.

Electrolytic deposition of metallic coatings upon metals. A. C. BARLOW (E.P. 259,307, 8.7.25).—The surface of the metal to be coated, e.g., aluminium, magnesium, or an alloy of these metals, is roughened by the application of a weak solution of hydrofluoric acid, and the metal then used, without being washed or dried, as the cathode in an electrolytic bath containing boric acid as electrolyte and an anode of the metal to be deposited, e.g., nickel, cobalt, or iron. Finally, the coated metal is washed in boiling water.

J. S. G. THOMAS.

Anodes for production of organic acids. F. TALLADA (E.P. 257,826, 18.2.26).—The anode system consists of a conducting, insoluble core directly connected with the positive pole of a generator and an insoluble, perforated conducting casing or concentric series of such casings around, but out of direct contact with, the core, the space between core and casing being free or filled with an insoluble porous substance. The use of such a system prevents the formation of by-products in the production of organic acids, such as acetic, oxalic, or citric acids, by electrolysis of their salts.

L. M. CLARK.

Electrolyte for electrical batteries. G. A. HOWLAND (E.P. 259,099, 15.2.26).—An electrolyte for secondary batteries is described consisting of a mixture of $\frac{1}{2}$ soapstone, carbon dust, gypsum, sulphuric acid ($d = 1.125$), snake oil, salicylic acid, sodium chloride, sodium chlorate, and potassium silicate solution.

J. S. G. THOMAS.

Depolarising agent for voltaic battery. T. A. EDISON, Assr. to T. A. EDISON, INC. (U.S.P. 1,599,121, 7.9.26. Appl., 26.2.24).—Chemically produced cupric hydroxide is combined with the hydroxide of an alkaline-earth metal.

J. S. G. THOMAS.

Apparatus for electrical precipitation of suspended material from gases. C. H. WEISKOPF, Assr. to INTERNAT. PRECIPITATION Co. (U.S.P. 1,600,496, 21.9.26. Appl., 28.11.23).—In an electrical precipitator a number of collecting electrode members have the form of parallel vertical plates with vertical flanges extending transversely thereto, and dividing the spaces between the plates into vertical flues. The flanges are not attached to the plates at their outer edges, in order to allow free vibration of the plates and flanges.

J. S. G. THOMAS.

Electrolytic purification of graphite. L. C. HAFNER (U.S.P. 1,600,730, 21.9.26. Appl., 31.7.22).—Impurities in a solution containing graphite in suspension are removed by electrolysis.

J. S. G. THOMAS.

Cleaning and polishing silver, plate, etc. THE POLIVIT MANUF. Co., LTD. From F. J. M. VALENTIN (E.P. 258,726, 7.9.25).—Articles of silver, silver plate, etc. are cleaned electrochemically by immersion in an alkaline bath in the presence of aluminium and its alloys. Thus the articles may be immersed in a solution of washing soda to which, if desired, ammonia or an ammonium salt is added, in the presence of an alloy containing, e.g., 95–97% Al, 3–2% Zn, 1–0.5% Cu, and 0.5–0.25% Ag.

J. S. G. THOMAS.

Production of electrical insulating material. H. FRIEDLÄNDER, Assec. of A. JANSER (E.P. 236,224, 25.6.25. Conv., 26.6.24).—Fibrous material, e.g., cardboard, felt, papier-mâché, etc., is impregnated with a hard wax or mixture of hard waxes, e.g., montan wax, carnauba wax, together with, if desired, resins or their derivatives, metal salts of fatty acids, and derivatives of hard waxes, in the absence of alum and of substances liable to cause softening of the wax, so that the pores and voids in the fibrous material are completely filled.

J. S. G. THOMAS.

Manufacture of electrical insulators and other moulded articles. A. H. BROWN, and THE SILUMINITE INSULATOR Co., LTD. (E.P. 259,505, 8.7.25).—Portland or similar cement, together with, if desired, one or more non-binding fillers, e.g., asbestos, powdered slate, clay, etc., is moulded and, after setting and hardening, is impregnated with one or more incompletely condensed liquid synthetic resins at a temperature of 60–80°, sufficiently high to cause the resin to permeate the whole, and finally heated to 100–130° to harden the resins.

J. S. G. THOMAS.

Arc welding. (E.P. 258,036 and 259,365 and U.S.P. 1,599,056).—See X.

XII.—FATS; OILS; WAXES.

Examination of ancient Egyptian (Tutankhamen) cosmetic. A. C. CHAPMAN and H. J. PLENDERLEITH (J.C.S., 1926, 10, 2614–2619).—Examination of a 3300 years' old sterile cosmetic contained in a calcite jar showed the presence of (1) ether-soluble, saturated fatty matters (nearly 90%), (2) a resinous portion, (3) a small residue of calcium salts obviously derived from the action of free fatty acids present on the jar. The fatty matters consisted of (a) light petroleum soluble fatty acids, chiefly palmitic and stearic acids, (b) light petroleum insoluble "oxidised acids" apparently obtained by the oxidation of acids of the oleic type, and (c) glycerol, free and combined, to the extent of 5.46%. The very small amount of unsaponifiable matter present did not contain cholesterol or phytosterol. It is suggested that the cosmetic consisted of about 90% of a neutral animal fat with about 10% of some resin or balsam.

H. BURTON.

[Detection of] whale oil. M. TSUJIMOTO (Chem. Umschau, 1926, 33, 268–269).—In the determination of the iodine value of whale oil by the Wijs method a turbid solution results, whilst with vegetable oils the solution remains clear. This phenomenon now forms the basis of a method for detecting whale oil. The test is best applied to the freed fatty acids of the sample, the procedure being as follows: 0.5 g. of the acids from the oil is dissolved in 10 c.c. of ether and mixed with 3–5 c.c. of a glacial acetic acid solution of iodine monochloride. The mixture, at room temperature, is shaken at intervals during 2 hrs. In the presence of large amounts of whale oil the solution becomes turbid and deposits a fine precipitate. Smaller amounts give turbidity of longer duration, and finally a precipitate. With vegetable drying oils the solution remains quite clear if it is not kept for an excessive time, and if the temperature does not fall below 15°. A table is given showing the character of the precipitates from the fatty acids of linseed oil, Japanese sardine oil, herring oil, clupanodonic acid, and various mixtures, and it is demonstrated that the method detects 1% of sardine oil or 5% of herring oil in linseed oil, or 0.2% of clupanodonic acid in the acids of linseed oil. It is suggested that the actual yield of ether-insoluble iodochlorides is a useful value in fat analysis. These are white powders which become rose-pink when heated to 50–60°, and blacken without melting at 170–178°, giving off iodine vapour. The ether-insoluble iodochlorides from sardine oil and herring oil are essentially different from those of linolenic acid.

E. HOLMES.

Rate of oxidation of linseed oil. W. ROGERS, JUN., and H. S. TAYLOR (J. Physical Chem., 1926, 30, 1334–1347).—A simple apparatus (cf. Genthe, B., 1907, 56) giving true oxidation values for non-volatile oils is described, and the effect of various factors on the rate of oxidation has been studied. Increase in temperature increases oxidation and shortens, but does not eliminate, the induction period. As the concentration of the drier, in this case cobalt linoleate, is increased (i) the effect of increasing temperature becomes less marked, (ii) the induction period is shortened but never eliminated, and (iii) at a given temperature the rate of oxida-

tion approaches a maximum. This value is reached with 0.0003% of cobalt as linoleate, at 100°. Inhibitors (quinol, β -naphthol, and diphenylamine) are in general more effective at lower temperatures, and must be soluble in the oil to give reproducible results. There is evidence that the inhibitor does not act solely by the suppression of the catalyst, and both inhibitor and catalyst may work independently. With visible and ultra-violet light at the ordinary temperature, the rate of oxidation is not directly proportional to light intensity, and the reaction probably has a chain mechanism.

L. S. THEOBALD.

Reaction of the oils containing sulphur in olive oil. S. FACHINI (Giorn. Chim. Ind. Appl., 1926, 8, 428).—The oils containing sulphur are readily recognised by treatment of the oil in the presence of potassium hydroxide in alcoholic solution with lead, copper, or mercury, whereby the sulphur is converted into the characteristic sulphides. The reaction is of importance in modern methods of refining, for it is possible thereby to eliminate the last traces of sulphur. Other solvents, such as trichloroethylene and benzene, are suitable. The use of the characteristic chromate reaction as a means of distinguishing between oils extractable by solvents and those by pressure is confirmed (cf. B., 1926, 592).

P. V. MCKIE.

Lime seed oil and oil cake. A. E. COLLENS (Analyst, 1926, 51, 510—511).—A yield of about 70% of the oil present may readily be obtained from lime seeds (pips) by expression after preliminary heating. The filtered oil was brownish-yellow, and had the following characteristics:— $d_{15.5}^{27}$ 0.9138; solidif. pt. -3° ; n_D^{23} 1.4740; acid value 11.2; saponif. value 193.5; iodine value (Hübl) 109.7; solubility in alcohol 0.18%; unsaponif. matter 0.72%. The bitter taste of the oil may be removed by alcohol. Dominica press cake (30% expression of oil) contained nitrogen 4.1, potash 0.58, and phosphoric anhydride 0.89%, and analysis of a press residue shows moisture 15.08, ash 3.17, oil 14.2, crude protein 30.5, crude fibre 20.05, and carbohydrates 17%.

D. G. HEWER.

Saturated aliphatic alcohols from sperm whale oil and spermaceti. E. ANDRÉ and T. FRANÇOIS (Compt. rend., 1926, 183, 663—665; cf. B., 1926, 247).—By esterification of sperm whale oil and spermaceti with acetic anhydride, fractional distillation, and hydrolysis, a small quantity of tetradecyl alcohol, m.p. 38° (*phenylurethane*, m.p. 70°), large quantities of hexadecyl alcohol, m.p. 49° , and a small quantity of octadecyl alcohol, m.p. 61° (*phenylurethane*, m.p. 79.5°), were obtained. No dodecyl alcohol was isolated. The *phenylurethane* of dodecyl alcohol has m.p. 78° .

L. F. HEWITT.

Determination of mixtures of two and three [vegetable] oils by means of separation temperatures from various solvents. J. D. JANSEN and W. SCHUT (Chem. Weekblad, 1926, 23, 498—502).—Separation temperatures of mixtures of rape, arachis, cotton seed, sesamé, soya bean, and linseed oils with aniline (1:4) and with acetone (2:3) have been determined; temperature-composition curves for mixtures of two oils are given. For mixtures of three oils no suitable second solvent to be used in conjunction with aniline has been

found, and the use of another constant, in conjunction with the temperature of separation from aniline, is suggested.

S. I. LEVY.

Petroleum hydrocarbons from fats. MARCUSSON and BAUERSCHÄFER.—See II.

Deliquescent properties of magnesium chloride, calcium chloride, and glycerol. SWAN.—See VII.

PATENTS.

De-acidification of oils and fats. H. BOLLMANN (E.P. 258,786, 3.3.26).—The losses due to formation of emulsions and to splitting when oils and fats are de-acidified by the action of alkalis under heat are avoided by using as de-acidifier a freely flowing aqueous composition containing an acid fixer, e.g., sodium hydroxide solution, intimately mixed with a heavy material such as talc, bole, powdered marble, metal powder, etc., in the presence or absence of mucilaginous matter, e.g., gelatin, agar-agar, etc. With slight warming, the soaps arising from the free acid originally present are brought down by the heavy material, and may be readily removed by filtration.

S. S. WOOLF.

Oxidation of fats, oils, waxes, resins, etc. J. Y. JOHNSON. From BADISCHE ANILIN & SODA FABRIK (E.P. 258,099, 16.10.25).—A gas containing oxygen is blown through the heated mixture of oils, waxes, resins, etc. to be oxidised, in which are placed a number of disconnected rings, balls, etc. of clay, glass, earthenware, or metal (particularly aluminium or its alloys). The heat developed in the reaction is utilised for preheating a new charge.

S. S. WOOLF.

Deodorising, clarifying, and neutralising animal and vegetable oils, fats, and waxes. E. FORAY (F.P. 601,919, 4.8.25).—The oils or liquefied fats are mixed with animal or vegetable charcoal, with or without the addition of a catalyst such as manganous oxide, and separated by filtration.

A. RAYNER.

Treatment of oily vegetable materials for the separate recovery of their constituents. L. F. DAVID and G. FÉLIZAT (F.P. 603,836, 29.12.24).—The materials are ground up with alkaline solution, by which the oils are emulsified and the albumins dissolved. The cellulose is recovered by sieving, the starch by decantation, the oil by centrifuging, and the albumins by precipitation by an acid.

A. RAYNER.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Chemistry of satin white. P. FUCHS (Chem.-Ztg., 1926, 50, 769—770).—The formation of satin white from aluminium sulphate and milk of lime takes place only when the sulphate is basic and contains 80—85% of the sulphuric acid content of the normal salt. Determination of the calcium sulphate in the final product shows that the reaction is: $Al_2(OH)_2(SO_4)_2 + Al_2(SO_4)_3 + 11Ca(OH)_2 = 5(CaSO_4 \cdot 2H_2O) + 2Al_2Ca_3O_6 + 2H_2O$ (cf. Cobenzl, B., 1920, 664). Satin white is a mixture of gypsum and calcium aluminate in the molecular ratio 5:2, together with small varying amounts of calcium hydroxide.

F. R. ENNOS.

Coniferyl reaction of some resins. F. REINITZER (Z. anal. Chem., 1926, 69, 114—121).—The following

gums and resins give a red colour with phloroglucinol and hydrochloric acid (coniferyl reaction): Siam and Sumatra benzoin, tolu and Peru balsams, storax, asafetida, and galbanum, the resins extruded from pines, firs, and larches, acaroid resin, dammar, Manila elemi, copaiba balsam, and olive resin. A weaker reaction is given by olibanum, myrrh, and mastic. The reaction is due to the presence of coniferyl alcohol or a substance bearing a close relationship to it in the case of all the resins in the above list down to and including acaroid. The reaction of elemi is due to the presence of elemicin and of myrrh to the presence of eugenol; the cause of the reaction in the other resins could not be ascertained. Ferulic acid and *p*-cumaric acid do not give the reaction, and it is doubtful whether pure caffeic acid does, although the crude acid usually gives a feeble red colour.

A. R. POWELL.

Rate of oxidation of linseed oil. ROGERS.—See XII.

PATENTS.

Anti-corrosive preparations. S. FOWLER and E. EDSEY (E.P. 258,795, 24.3.25).—Mixtures of neutral soap-free wool fat (*adepts lanæ*) with non-volatile thinning agents, *e.g.*, neutral lubricating oil, afford a protective layer to metal surfaces. A preferred method of purifying the wool fat is that described in E.P. 253,995 (B., 1926, 759).
S. S. WOOLF.

Protective coating or impregnating compositions. A. C. and M. HOLZAPFEL (E.P. 259,292, 6.7.25).—An alkali fluoride is dissolved in oleic acid, and made up as a paint with varnish gum and a usual solvent. As a wood preservative the fluoride solution is mixed with any impregnating oil suitable for the purpose, zinc oxide being sometimes added to give the required viscosity.

F. G. CROSSE.

Preparation of lacquers from tung oil. W. SCHMIDTING (E.P. 247,599, 13.2.26. Conv., 13.2.25).—Tung oil is rapidly heated almost to gelatinisation, and when the desired consistency is reached the other molten or heated raw materials, such as resins, resinates, oils, etc., are run in from a secondary varnish kettle situated above the kettle proper.
S. S. WOOLF.

Manufacture of covering materials. KÖLN-ROTTWEIL A.-G. (E.P. 241,528, 1.9.25. Conv., 17.10.24).—Oxidised oils, with or without the addition of a resin, are mixed with cellulose nitrate, plasticisers, and, if desired, filling and colouring materials, and the mass, after being rendered homogeneous on hot rollers, is finely ground and moulded for use as a resilient covering material.
S. S. WOOLF.

High-grade wood rosin. HERCULES POWDER CO., Assees of H. E. KAISER and R. S. HANCOCK (E.P. 253,082, 19.4.26. Conv., 5.6.25).—Low-grade wood rosin containing objectionable colouring matter is dissolved in gasoline, and furfuraldehyde is added. On refrigeration in one or more stages, some of the rosin and a major portion of the furfuraldehyde, holding in solution all the colouring matter, settle out. On removal of this layer, high-grade wood rosin suitable for use in high-grade soap manufacture may be recovered from the gasoline solution to the extent of 70–75% of

the original rosin. Medium-grade rosin may be obtained from the precipitate by gasoline extraction. Both solvents are recovered.
S. S. WOOLF.

Resinous compositions. BRIT. THOMSON-HOUSTON CO., LTD., Assees. of C. F. PETERSON (E.P. 250,949, 14.4.26. Conv., 14.4.25).—Relatively small proportions of phenol-formaldehyde resin are added to glycerol-phthalic anhydride resins. The polymerisation (“curing”) of the latter is accelerated, and the resulting material has less tendency to soften under heat than the usual cured “glyptal.”
S. S. WOOLF.

Producing resinous substances.—CHEM. FABR. DR. K. ALBERT, G.M.B.H., A. AMANN, and E. FONROBERT (E.P. 259,030, 5.10.25).—The still acid reaction product of rosin (colophony), or a similar natural acid resin, and resins of the phenol-carbonyl type is neutralised by a reagent each molecule of which is capable of combining with at least two resin acid groups, *e.g.*, polyhydric alcohols or oxides of polyvalent metals, glycerol and zinc oxide being typical. Before the final neutralisation, the mass may be distilled *in vacuo* to remove all or part of the volatile constituents of the natural resins which have not been combined with the phenol-carbonyl compound. The mol. wt. of the resulting resin is greater than that of molten natural copals.
S. S. WOOLF.

Manufacture of articles from synthetic resins. BRIT. CYANIDES CO., LTD., and E. C. ROSSITER (E.P. 258,950, 1.7.25).—The conversion of the first (water-soluble, fusible) or second (water-insoluble, fusible) stage condensation product of thiourea and formaldehyde into the final (insoluble, infusible) stage is assisted by the incorporation with the resin-intermediate and filling materials of an acid condensing agent such as oxalic acid, sodium hydrogen sulphate, potassium tetroxalate, aniline hydrochloride, or similar compounds.
S. S. WOOLF.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Influence of diphenylguanidine on the mechanical properties of vulcanised rubber. L. STOLL (Gummi-Ztg., 1926, 41, 193–196).—Investigation is made of the effect of variations in temperature of vulcanisation and in the proportion of diphenylguanidine and the accompanying sulphur and zinc oxide on the tensile strength, extensibility, and other physical characteristics of the vulcanised product. The first small proportions of zinc oxide have a much more marked effect than subsequent increments. Reversion on vulcanisation with small proportions of sulphur is less marked with diphenylguanidine than with “vulcone.” An increase from 55 to 65 lb./sq. in. in the pressure of the steam used for vulcanisation results in vulcanisation proceeding 1.8 times as rapidly. The optimum proportion of diphenylguanidine is 1.5–2% (on the rubber), and of sulphur approximately 5%.
D. F. TWISS.

PATENTS.

Treatment of rubber and apparatus therefor. DUNLOP RUBBER CO., LTD., H. C. YOUNG, and J. D. CAMPBELL (E.P. 259,028, 3.10.25).—Rubber is mixed with all the intended ingredients, excepting sulphur, by means of a machine of the ordinary or the “internal mixer” type; the sheeted mixing then passes along

a cooling conveyor to another mill, or by a circuitous route back to the sheeting mill, where the sulphur can be introduced without fear of premature vulcanisation.

D. F. TWISS.

Treatment of rubber and the like and apparatus therefor. DUNLOP RUBBER Co., LTD., and A. E. PENFOLD (E.P. 259,022, 26.9.25).—In calendering rubber into sheet form the material is batched up inside a roll of damp cloth instead of in the usual roll of "faced" sheet.

D. F. TWISS.

Vulcanisation of rubber. R. V. H. HEUSER, Assr. to A. C. BURRAGE (U.S.P. 1,597,233, 24.8.26. Appl., 27.2.23).—*s*-Phenyl-*o*-tolylguanidine is used as vulcanisation accelerator.

XV.—LEATHER; GLUE.

Chemical nature of vegetable tanning. A. W. THOMAS (J. Amer. Leather Chem. Assoc., 1926, 21, 487—516).—The rate of fixation of commercial tannins by pelt in a given time has been measured at different p_H values and shows a minimum at p_H 5.0 rising to a maximum at p_H 2.0. From the Procter-Wilson theory it follows that pelt will have a gradually increasing potential difference as the p_H decreases to 2.0, consequently the reaction of the positively charged collagen with the negatively charged tannin particles should exhibit a minimum rate of fixation at p_H 5.0 and increase from 5.0 to 2.0. This explains the rate of tanning at p_H values < 5.0, but not in the alkaline region. The increase in the rate of fixation of commercial tannins from p_H 5.0 to 8.0 is attributed to the β form of collagen suggested by Wilson and Gallun (cf. B., 1923, 236 A), and having its isoelectric point at p_H 7.7. With increasing amounts of β , positively charged, in the solution, as the p_H increases from 5.0 to 7.7, reaction will take place at an increasing rate with the negatively charged tanning particles. Experiments with quinone-free tannins, e.g., gallotannic acid, show no fixation of tannin on the alkaline side of p_H 8.0, but commercial tannins contain quinonic compounds, and it is probably these which combine with the pelt at values of p_H > 8.0. All these facts favour a chemical theory of tanning in which there is chemical combination between the amino- and possibly imino-groups of the complex collagen cations, and the anions of the complex weak organic acids, the tannins, the rate of combination being a function of the p_H value of the tannin solution. Experiments with de-aminised calf skin show that the isoelectric points are p_H 4.0 and 8.3, and the point of minimum fixation of tannin is p_H 3.5, the amounts of tannin fixed in a given time are consistently less than with ordinary calf skin, and the rate of fixation of tannin increases rapidly on the alkaline side of p_H 3.5, rising to a maximum at p_H 8.0 and dropping sharply at p_H 9.0 and 10.0. These results show the importance of the amino-groups in the tanning process. De-aminised collagen combines with less quinone than untreated collagen, thus confirming Meunier's theory of the quinone tannage.

D. WOODROFFE.

Physical and chemical properties of vegetable tanned insole bellies. V. Wear-resistance. D. WOODROFFE (J. Soc. Leather Trades Chem., 1926, 10, 266—

272).—The wear-resistance of various samples of vegetable-tanned insole bellies was determined by holding the leather on a rapidly revolving buffing wheel fitted with a fine carborundum paper. The paper was changed every minute to avoid clogging. The time was noted for the leather to wear through and the time calculated for one-inch thickness to be worn through. No relationship could be traced between the wear-resistance and the degree of tannage, contrary to Powarnin and Schichireff's claims (cf. B., 1926, 683). The wear-resistance increases as the content of water-soluble matter increases, attains a maximum with leathers containing about 20.5% of water-soluble matter, and then diminishes with higher water-soluble content.

D. WOODROFFE.

Extraction of sumac for analysis. Comparison of various methods. T. G. PARKER and L. WINCH (J. Soc. Leather Trades Chem., 1926, 10, 272—280).—Comparative analyses of different samples of sumac have been made, using infusions obtained by Procter's method, a continuous percolation method, and the present official method of intermittent siphoning. The last-named method extracted more soluble matter, but gave a slightly lower tannin content than the Procter method or the continuous method. Extraction of sumac at 45° did not remove all the tannin. Soaking overnight was necessary to obtain concordant results. The period of soaking should not exceed 16 hrs., and the temperature of the water should not exceed 13°. The minimum time for the extraction of 14—16 g. of sumac is 3 hrs. The method of extraction prescribed by the American Leather Chemists' Association gave a higher yield, both of tannin and extracted matter, and it possesses several advantages. A more thorough extraction is obtained by using 2 litres of water.

D. WOODROFFE.

Treatment of tannery waste. MOHLMAN.—See XXIII.

PATENTS.

Treatment of bones and the like for the production of bone meals and the like. W. H. BOORNE (E.P. 258,686, 1.7.25).—Ground bone meal is degreased with boiling water, and chlorinated water is introduced into the pans. Where steam is used for degreasing, chlorinated water or chlorine gas may be introduced simultaneously, but if solvents such as benzene are used the meal is first degreased, then chlorinated.

D. WOODROFFE.

Production of aqueous solutions or dispersions of isinglass. W. M. CARPENTER (E.P. 258,444, 17.11.25).—A special apparatus is used comprising two vessels arranged one above the other, each provided with vertical shafts coaxially located, the upper shaft being furnished with a propeller, and the lower one is fitted with devices adapted to travel over the surface of a perforated partition in the base of the lower vessel. A driving connexion can be established or interrupted between the shafts. The isinglass is agitated in the upper vessel with a mixture of water and acid until sufficiently swollen (six days), then delivered into the lower vessel. The partition in the lower vessel forms a cone or hopper through which the swollen isinglass is discharged.

D. WOODROFFE.

Transforming glue, gelatin, etc. in melted or solution form to granules or pearls. AKT.-GES. F. CHEM. PRODUKTE (E.P. 244,406, 29.6.25. Conv., 15.12.24).—Glue, gelatin, etc., melted or in solution form, is dropped from a device comprising a series of nozzles, arranged vertically above a revolving cooling drum mounted on a horizontal axis, or a belt conveyer or rotary table which is not coated with any solid or liquid lubricant. The cooling surface can be arranged to pass through a cooling bath. The resulting granules are detached from the cooling surface when sufficiently solidified. D. WOODROFFE.

Manufacture of glue or gelatin in the form of discs or tablets. COMP. NAT. MAT. COL. ET MANUF. DE PROD. CHIM. DU NORD RÉUNIES, ETAB. KUHLMANN (E.P. 239,531, 4.9.25. Conv., 4.9.24).—A solution of glue or gelatin is fed, drop by drop, on to a suitable surface, e.g., a cylinder or metallic or canvas belt, cooled below 15°, and coated with some oily or waxy substance. The drops solidify to form small tablets, which are detached and dried. D. F. TWISS.

XVI.—AGRICULTURE.

Infertility of the subsoil. C. R. VAN DER MERWE (J. Agric. Sci., 1926, 16, 507—521).—The author has compared the physical and chemical properties of the soil and subsoil of a ferruginous clay soil occurring in the Transvaal. The data relate to virgin soil. The infertility of the subsoil is not considered to be due to the presence of "active" aluminium compounds, or to deficiency in potash. Chemical analyses and pot experiments show that the principal cause of infertility is deficiency in available phosphate. Available nitrogen is also deficient owing to bacterial inactivity, but no beneficial effect is produced by the use of nitrogenous dressings in the absence of adequate dressings of phosphate. G. W. ROBINSON.

Scottish drift soil. IV. Exchangeable bases. J. HENDRICK and G. NEWLANDS (J. Agric. Sci., 1926, 16, 584—595).—Data are given for the exchangeable base content of a Scottish drift soil. The presence of silicon, aluminium, iron, and manganese is noted in the extracts in addition to calcium, magnesium, potassium, and sodium. The relative proportions of the different exchangeable bases are: calcium, 85.02%; magnesium, 8.11%; potassium, 2.18%; sodium, 4.68%. The results are in agreement with those generally found for acid soils. G. W. ROBINSON.

Soil "humus." III. Nature of the substances contributing to formation of humus. S. A. WAKSMAN (Soil Sci., 1926, 22, 323—333; cf. B., 1926, 892).—The decomposition of various straw preparations by pure cultures of some soil organisms, including both fungi and bacteria, has been investigated. Rye straw was subjected to a series of extractions, and the residue after each treatment used for the study of its decomposition by the organisms in sand or soil media. The lignins are the most resistant of the constituents of straw; their accumulation accounts for much of the soil "humus" formed as a result of the decomposition of the straw. Moreover, the decomposition of celluloses and hemi-

celluloses by fungi in the soil is to some extent prevented in the presence of lignins. The breaking down of the celluloses and other constituents of straw involves the conversion of considerable amounts of nitrogen into microbial protoplasm, which also forms part of the soil "humus." C. T. GIMINGHAM.

Availability of nitrogen in green manures. F. LÖHNIS (Soil Sci., 1926, 22, 253—290).—The results are recorded of many series of vegetation experiments on the effect on the yield and composition of a number of different crops, of incorporating various leguminous plants with the soil as green manures. A poor heavy clay and a fertile greenhouse soil were used. The experiments extended over ten years. The legumes were grown on field plots, harvested at three stages of growth, and dried before use; they were applied at rates equivalent to 4½, 1½, and ½ tons of air-dry material per acre. The availability of the nitrogen of the green manures showed wide variations dependent on the quality and quantity of the material and on the character of the soil. An average return of 50—60% of the nitrogen applied was recorded, but not more than 50—75% of this amount was contained in the first crop. Crop increases were larger and more lasting on the poor soil. In a soil not too poor in humus, green manures tend to accelerate the activities of the micro-organisms, with the result that there is an intensified nitrification of the humus nitrogen, and more nitrogen may be found in the first crop increases than has become available from the green manures. C. T. GIMINGHAM.

Lime-sulphur-calcium arsenate spray. W. GOODWIN and H. MARTIN (J. Agric. Sci., 1926, 16, 596—606).—It is improbable that stable tricalcium arsenate can be formed by precipitation from aqueous solution. Calcium hydroxide and dicalcium arsenate give a series of basic arsenates which are hydrolysed in aqueous suspension. Addition of lime to dicalcium arsenate thus reduces, temporarily, the amount of arsenic in solution, but on exposure to atmospheric carbon dioxide, the original solubility is restored. Addition of "lime sulphur" to lime-calcium arsenate spray reduces the concentration of soluble arsenic, and hence the risk of injury to foliage. The precipitation of sulphur from calcium polysulphides is unaffected by calcium arsenate. The reduction in the precipitation of sulphur by lime is dependent on the rate of carbonation of the lime on the leaf surface. The fungicidal action of calcium polysulphides is thus unaffected by calcium arsenate, but may be reduced by an excess of lime. G. W. ROBINSON.

Losses in the tower silo. H. E. WOODMAN and A. AMOS (J. Agric. Sci., 1926, 16, 539—550).—The destruction of carbohydrate by oxidation during ensilage bears no relationship to the temperature attained during the process. "Acid brown" silage and "sweet" silage can be made with an average loss of 5—6% of the dry matter originally present. With "green fruity" silage the average loss is 8—9%. Losses of dry matter may be excessive if very wet material is preserved. The optimum dry matter content is about 26—34%. A period of about a fortnight is apparently sufficient for a green crop to acquire the character of silage. G. W. ROBINSON.

Seasonal changes in the composition of winter wheat plants in relation to frost resistance. R. NEWTON and W. R. BROWN (J. Agric. Sci., 1926, 16, 522—538; cf. B., 1924, 484).—The authors have studied the seasonal changes in the distribution of the more important constituents between physiologically active cell fluids and supporting tissue in wheat plants. One of the most important changes is the reduction in moisture content, which is greatest in hardy varieties, and, by causing a concentration of colloids and sugars in cell fluids, increases resistance to frost. The cell colloids are mainly proteins, 90% of the total protein of the plants being present in the fluids. Pentosans are mainly in structural tissue, although pentose sugars occur in small concentrations in the fluids. Ash is mainly in the fluids. The accumulation of sugar in the autumn is greatest in hardy varieties, and tends to protect proteins against denaturation by frost. No connexion was observed between lipid or amino- and coagulable-nitrogen changes and frost resistance. G. W. ROBINSON.

Non-volatile constituents of the cotton plant. F. B. POWER and V. K. CHESNUT (J. Amer. Chem. Soc., 1926, 48, 2721—2737).—The raw material for this investigation consisted of the foliage, "squares," and flowers of the cotton plant, all the bolls which had been developed having been removed. The loss in weight on drying was nearly 80%. Preliminary tests indicated the presence of chlorine and the absence of enzymes capable of hydrolysing β -glucosides. The main bulk of the dried material (29 kg.) was extracted by percolation with 95% alcohol. This extract was acid, but the distillate therefrom was alkaline owing to the presence of ammonia and trimethylamine (cf. Power and Chesnut, B., 1925, 612). Steam distillation of the concentrated alcoholic extract afforded an essential oil (8.9 g.) together with formic and acetic acids, whilst the residue consisted of an aqueous solution (A) and a black, oily resin (B). (A) contained potassium nitrate and potassium chloride in considerable amount, quercetin, betaine, choline, and succinic acid, together with a trace of salicylic acid and of an acid, m.p. 105—106°, and a neutral, crystalline substance, m.p. 140—143°. Reducing sugars were also present. (B), amounting to 3.134% of the dried material, contained a *phytosterol*, $C_{27}H_{46}O, H_2O$, m.p. 135°, $[\alpha]_D^{20} - 32.9^\circ$ in chloroform (acetyl derivative, m.p. 121°), a *phytosterol glucoside*, m.p. 218—223°, apparently identical with "ipurganol" (cf. Power and Rogerson, B., 1910, 232), pentatriacontane, $C_{35}H_{72}$, palmitic acid, a *phenolic acid*, m.p. 188—189°, butyric, valeric, and *n*-hexoic acids, and a *phenolic substance*, not identical with that previously isolated (Power and Chesnut, *loc. cit.*). Vacuum distillation of a portion of the unsaponifiable material afforded dipentene, a *substance*, $C_8H_{10}O$, b.p. 200—220°/5—9 mm., $d_{15}^{20} 0.9153$, a *sesquiterpene*, $C_{15}H_{24}$, b.p. 250—280°/5—9 mm., $d_{15}^{20} 0.8909$, $n_D^{20} 1.4891$, $[\alpha]_D^{20} + 0.28^\circ$, and *diterpenes*, b.p. 300—350°/5—9 mm., $d_{15}^{20} 0.9120$. F. G. WILLSON.

Action of citric acid solutions of varying ammonia content on di- and tri-calcium phosphate. A. H. M. ANDREASEN (Z. anal. Chem., 1926, 69, 107—113).—The solubilities of tricalcium phosphate and of dicalcium

hydrogen phosphate in mono-, di-, and tri-ammonium citrate and in citric acid have been determined by shaking the precipitated phosphates with citrate solutions of varying concentration for periods of 0.5, 4, and 20 hrs. In all cases solution is shown to be due to the conversion of the calcium phosphates into monocalcium tetrahydrogen phosphate with the simultaneous formation of acid calcium citrates which, in the more concentrated solutions, slowly crystallise out in the form of needles. There is also some evidence of the formation of complexes containing 1 mol. of tricalcium phosphate and 4 mols. of citric acid or 1 mol. of dicalcium phosphate and 1 mol. of citric acid, but no solid compounds of these compositions could be isolated. A. R. POWELL.

Argillaceous colloids of the soil. DEMOLON (Chim. et Ind., 1926, 16, 552—555).

Decomposition of cellulose in soil. WINOGRADSKY. —See V.

PATENTS.

Transforming organic matter [to render the nitrogen available for fertilising]. E. P. COOKE, ASSR. to AMERICAN BECCARI CORP. (U.S.P. 1,597,724—5, 31.8.26. Appl., 2 and 13.6.23).—A fermentation process for transforming organic matter into a form in which its nitrogen is available for use as a fertiliser consists in supplying air to the material so as to favour the growth of the micro-organisms concerned, and in regulating the temperature in accordance with their requirements (e.g., at about 63°). C. T. GIMMINGHAM.

Breaking up cellulosic constituents in vegetable substance for production of manure. FÄKALTORF-STUDIENGES.M.B.H., and A. BAUMGARTEN-CRUSIUS (E.P. 258,149, 21.1.26).—The process consists in propagating aerobic and anaerobic types of cellulose-fermenting bacteria from a variety of sources, combining them into a mixed culture, and adding the culture to the disintegrated vegetable material which it is desired to decompose. C. T. GIMMINGHAM.

Fertiliser. G. BARSKY, ASSR. to AMER. CYANAMID CO. (U.S.P. 1,599,198, 7.9.26. Appl., 28.7.23).—In order to eliminate the risk of fire in the manufacture of a fertiliser containing a nitrate, calcium cyanamide is added to the material to the extent of 50%. F. G. CROSSE.

Fertiliser. J. M. BRAHAM and F. E. ALLISON (U.S.P. 1,598,638, 7.9.26. Appl., 6.12.23).—A mixture of cyanamide and calcined phosphate obtained by calcining a mixture of phosphate rock, together with an alkali metal salt and carbonaceous matter, is suggested for the composition of a fertiliser. F. G. CROSSE.

Manufacture of phosphatic fertilisers. O. R. OLSEN and E. TORKILDSEN (E.P. 258,144, 11.1.26).—Ground phosphate rock is mixed with at least 25% of its weight of an alkaline-earth carbonate and rapidly heated in an oxidising atmosphere to a temperature between 1000° and 1600°. Addition of an oxide of iron reduces the temperature of the reaction. The product contains a high proportion of citric acid-soluble phosphoric acid. C. T. GIMMINGHAM.

XVII.—SUGARS; STARCHES; GUMS.

Polarimetric determination of sucrose in sweetened condensed milk. P. HONEGGER (Analyst, 1926, 51, 496—503).—The method used is a modification of that of Revis and Payne (cf. B., 1914, 1166), whereby 26 g. of condensed milk are made up to 90 c.c. with boiling water and heated for 3 min. 3 c.c. of acid mercuric nitrate are added to the cooled solution, the volume made up to 100 c.c. at 20°, and 4 c.c. of water at 20° added. After shaking vigorously for 1 min. and filtering the polarimetric reading is made at 20°. After inversion (7 min. in boiling water), cooling, and filtering, the reading is again taken. Results obtained by this method agreed closely with those by the gravimetric method except from March to September, and the irregularity was probably due to variability of the volume of the condensed milk derived from the original fresh milk, the fat and colloidal substances being the chief factors. To overcome this the method may be modified so that quantities are made up to definite weights after dilution.

D. G. HEWER.

Absorption of water by dried films of boiled starch. II. Absorption and desorption between 20° and 90°. E. SWAN (J. Text. Inst., 1926, 17, 527—536 T).—The absorption curves (connecting moisture taken up with atmospheric humidity) for starch films are plotted for the range 20—90°. They are S-shaped, and indicate that except at humidities above 90% R.H. starch becomes less hygroscopic as the temperature is raised. At about 90% R.H. there is some evidence of the curves for higher temperatures crossing those for lower. A new set of curves (desorption) is obtained on bringing the starch back from moist conditions to dry. These lie higher than the absorption curves (regains being the ordinates). The hysteresis depends on the treatment of the film. If this has had prolonged heating or been evaporated at a high temperature it absorbs less on being placed in a moist atmosphere, but retains more on "drying" again. This effect of heat treatment in lowering the hygroscopicity of starch or increasing its retentive power may be expected to have practical significance in the sizing and starching of cotton goods.

J. C. WITHERS.

Occurrence of gentiobiose in the products of the commercial hydrolysis of corn [maize] starch. H. BERLIN (J. Amer. Chem. Soc., 1926, 48, 2627—2630).—The unfermentable portion of "hydrol"—the final mother-liquor in the manufacture of dextrose from maize starch—contains about 18.3% of gentiobiose, which was identified as the octa-acetate. When treated with phenylhydrazine, the purified, unfermentable residue from "hydrol" yields a *phenylosazone*, $C_{24}H_{32}N_4O_9 \cdot H_2O$, m.p. 150—152°, $[\alpha]_D^{25} = 20.24^\circ$ in methyl alcohol, closely resembling Fischer's *isomaltosephenylosazone* (A., 1891, 412). "*isoMaltose*" thus appears to be a mixture of carbohydrates.

F. G. WILLSON.

PATENTS.

Crystallisation of sugar solutions etc. F. LAPEUILLE (E.P. 245,114, 18.12.25. Conv., 24.12.24).—Apparatus for crystallising sugar massecuites or other supersaturated solutions comprises a rotary horizontal cylinder provided with means for producing a uniform

cooling both from one transverse section to any other transverse section and from the periphery to the centre of the same section, cooling being maintained during the entire operation of the apparatus. Cooling is effected by arranging the tubes in such a way that on any circle concentric with the apparatus, traced on any section, there are two tubes which are symmetrical relative to the axis of the apparatus, cooling water circulating through these in opposite direction. Alternatively, the tubes are arranged in spirals so as to admit the cooling water simultaneously through the outermost tube of one of the sets of tubes and through that tube of the other set which is nearest the centre end of the apparatus. Three other modifications of the tubular cooling system are described.

J. P. OGILVIE.

XVIII.—FERMENTATION INDUSTRIES.

Fermentation of cellulose and its derivatives.

H. B. SPEAKMAN (Canad. Chem. Met., 1926, 10, 229—231).—See B., 1926, 687.

PATENTS.

Recovery of alcohol, organic acids, and fertiliser from fermented saccharine materials. G. T. REICH (U.S.P. 1,599,185, 7.9.26. Appl., 15.6.25).—The neutralised fermentation liquid is evaporated and a fraction collected containing the bulk of the alcoholic content. The organic acids and fertilising materials are recovered from the calcined evaporation residue.

C. RANKEN.

Dealcoholising beverages (U.S.P. 1,598,601).—See XIX.

XIX.—FOODS.

Nutrition studies and statistics. I. Chemical composition of wheat grains. II. Grain size and weight per hectolitre of wheat. III. Cellulose content of wheat grains. L. BERZELLER and H. WASTL (Biochem. Z., 1926, 177, 168—180, 181—189, 190—195).—I. From a study of Zaharia's figures ("Le Blé roumain," Bucharest, 1910) it is shown that the average chemical composition of wheat of one season, or of a number of seasons, shows characteristic deviations from the binomial curve with regard to protein, cellulose, fat, and ash content. The extent of the variations, which differs for individual components, is least in the case of fat and greatest in the case of protein. Only in the former case was a relationship found between the extent of the variations and the maximal frequency value. II. The binomial curve does not apply to grain size nor to weight per hectolitre, nor do the values found show the same regularities as the chemical properties. III. Zaharia's figures show a marked increase in maximal frequency value of the cellulose content of wheat grains over the period 1900—1905.

J. PRYDE.

Milling and panification with cereals other than wheat. D. MAROTTA (Annali Chim. Appl., 1926, 16, 333—399).—Results are given of a large number of milling and baking experiments with mixtures of different cereals, with a view of economising wheat. The best mixtures for baking purposes are those of wheat with either rye or barley or both, the mixture containing at least 50% of wheat flour. Satisfactory results are still obtained if one-half of the rye or barley in such mixtures

is replaced by maize or rice. Numerous photographs and analytical results are given. T. H. POPE.

Breadmaking. D'ARBOUET (Rev. gén. Colloid., 1926, 4, 199—201, 225—228).—The principles underlying the making of bread are discussed. Special importance is attached to the work of Lüers and Schwartz (B., 1925, 469), and to the investigations of Dearsley on the value of p_H determinations as indicative of the baking values of flours. A. G. POLLARD.

Application of the Feder ratio to tinned sausages. A. GRONOVER and E. WOHNLICH (Z. Unters. Lebensm., 1926, 52, 53—60).—The validity of the use of the normal Feder ratio values for cooked meats in the examination of tinned sausages is discussed. During the sterilisation of sausages in tins considerable absorption of water takes place, often increasing the moisture content by as much as 20%. The rate and extent of absorption of water are irregular and vary with the method of preparation and treatment of the meat, but appear to be less where the fat content of the meat is high. A. G. POLLARD.

Solubility of the copper in basic copper carbonate [used for treating wheat]. T. D. HALL (J. S. Afr. Chem. Inst., 1926, 9, 10—17).—Wheat previously dusted with basic copper carbonate for the control of covered or stinking smut, *Tilletia tritici*, and germinated in paper for 9—11 days at 22—26.5°, gives a water-soluble extract containing copper, the amount of which is increased if germination is carried out in moist soil. Results, expressed in mg. of copper, show that approximately 5—12% of the copper attached to the wheat grains during dusting is made soluble on germination. H. BURTON.

Colorimetric determination of iron [in tea etc.] by the ferrocyanide method. W. R. MUMMERY (Analyst, 1926, 51, 511—512).—Walker's modification of the ferrocyanide method (B., 1925, 573) makes use of nitric acid for the extraction of the ash. This was found to cause low results; a mixture of 5 c.c. of concentrated hydrochloric acid and 2 c.c. of distilled water (sufficient for two extractions of the ash) should be used, followed by evaporation to dryness and subsequent solution in 3 c.c. of concentrated nitric acid. The ash of tea was the only ash which was found to yield its total iron on extraction with nitric acid. D. G. HEWER.

Nutrients required for milk production with Indian foodstuffs. E. J. WARTH, L. SINGH, and S. M. HUSEIN (Mem. Dept. Agric. India [Chem.], 1926, 8, 153—187).

Determination of mixtures of two and three [vegetable] oils by means of separation temperatures from various solvents. JANSEN and SCHUT.—See XII.

Sugar in condensed milk. HONEGGER.—See XVII.

Chemical characteristics of some trade wastes. BUSWELL, GREENFIELD, and SHIVE.—See XXIII.

Treatment of packing-house and corn-products waste. MOHLMAN.—See XXIII.

Disposal of some organic trade wastes. BARTOW.—See XXIII.

PATENTS.

Food product. W. D. RICHARDSON, Assr. to SWIFT & Co. (U.S.P. 1,599,030, 7.9.26. Appl., 4.8.25).—A mixture of blood and carbohydrate material is fermented by means of lactic acid bacteria, the fermentation being allowed to proceed to completion and the product dried and ground. C. RANKEN.

Food product. K. K. JONES, Assr. to SWIFT & Co. (U.S.P. 1,599,031, 7.9.26. Appl., 4.8.25).—A mixture of blood and carbohydrate material is fermented by means of yeast, and the resulting product dried. C. RANKEN.

Treatment of fruit for the prevention of decay. W. R. BARGER and L. A. HAWKINS, Assrs. to PEOPLE OF THE U.S. (U.S.P. 1,598,697, 7.9.26. Appl., 25.1.26).—The decay of fruits by green mold caused by *Penicillium digitatum*, Sacc., is prevented by treating them with a solution of 1 part of borax and 2 parts of boric acid in water, such solution containing 8% of the combined substances. F. G. CROSSE.

Dealcoholisation of beverages and the like. C. H. CASPAR (U.S.P. 1,598,601, 7.9.26. Appl., 27.4.20).—The fermenting liquid is circulated through the gases and vapours generated by fermentation and the alcohol condensed therefrom. The temperature of the liquid is maintained at a point less than that at which ebullition occurs. C. RANKEN.

Purification of phosphatides [from soya beans etc.]. H. BOLLMANN (E.P. 259,166, 9.8.26. Conv., 6.10.25).—Phosphatides, accompanied by water, oil, free fatty acids, bitter substances, etc., are separated from the main quantity of an oil, and subjected to distillation under reduced pressure. Water may be added to the phosphatide-containing mixture prior to the distillation, or during it. The distillate may be treated with strong alcohol under heat, the undissolved matter separated, the solutions fractionally cooled, and the products precipitating out during cooling later separated, animal charcoal or other decolorising agent being added before such cooling takes place. J. P. OGILVIE.

Nitrogenous extracts from albuminoid substances. SOC. FRANÇ. DES PROD. ALIMENTAIRES AZOTÉS (E.P. 246,779, 15.4.25. Conv., 29.1.25).—A solid albuminous substance, e.g., fish, is boiled with water; the fatty matters liberated are removed and the residue is then subjected to heterolysis by proteolytic ferments, preferably obtained by autolysis of an albuminoid substance (e.g., fish residue), or of brewers' or distillers' yeast. W. T. LOCKETT.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Isolation and properties of by-product in saccharin manufacture. W. HERZOG (Oesterr. Chem.-Ztg., 1926, 29, 173—174).—In the saccharin mother-liquor of the alkaline oxidation of *o*-toluenesulphonamide a small amount of a very bitter-tasting substance

can be recognised (cf. "Chem. Tech. org. Verbindungen." Herzog, 1912, II, 507). Strong acidification of this mother-liquor yields a curdy precipitate containing, as well as some saccharin and *p*-sulphamidobenzoic acid, the bulk of this bitter substance. The filtrate from repeated boilings with water yields on slow cooling, white needles, m.p. (from water) 248°, $C_{14}H_{12}O_4N_2S_2$. A sodium salt of excessively bitter property is obtained by treatment with moderately dilute sodium hydroxide.

P. V. MCKIE.

Determination of arsenic in small quantities of organic compounds. O. WINTERSTEINER and H. HANNEL (Mikrochem., 1926, 4, 155—167).—From 7 to 12 mg. of the compound are heated with 1 c.c. of 30 vol. % sulphuric acid and a few drops of concentrated nitric acid in a small Kjeldahl flask until copious fumes are evolved; 5—6 drops of perhydrol are added and heating is continued for a few minutes, after which the excess of peroxide is decomposed by two evaporations with 1 c.c. of water. If the substance contains iodine or bromine 0.3 c.c. of 4% potassium iodide solution is added and evaporation repeated to expel liberated iodine; re-oxidation with perhydrol and subsequent evaporation with water is then necessary. The acid is diluted with 1 c.c. of water and the solution transferred to a small flask, boiled to expel air, and cooled. The Kjeldahl flask is rinsed with previously boiled hydrochloric acid, and the rinsings are added to the main solution, which, after addition of 2 c.c. of 4% potassium iodide solution, is diluted to 20 c.c. The liberated iodine is titrated with 0.01*N*-thiosulphate delivered from a Pregl microburette, 5 drops of starch solution being added towards the end of the titration. A feeble rose tint is taken as the end-point. The results obtained are extremely good when the original substance does not contain bromine or iodine. The presence of these elements leads to slightly erratic results, even when the modified procedure mentioned above is adopted; without it, the results are much too high.

A. R. POWELL.

De Myttenaere index for the chemical determination of the toxicity of arsenobenzenes. A. CONTARDI and U. CAZZANI (Boll. Chim. farm., 1926, 65, 513—522).—In its latest modification, the method of determining the so-called D.M. index or the toxic arsenic in arsenobenzenes, is as follows: a solution of 1 g. of the product dissolved in 90 c.c. of boiling water is treated with 10 c.c. of dilute acetic acid and heated on a water bath, with occasional shaking, for 10 min. after precipitation commences. After being left for 10—12 hours in a cool place, the liquid is filtered, the filtrate heated to 60° with 5 c.c. of hydrochloric acid, and saturated with hydrogen sulphide, the temperature being kept at 60°. The liquid is filtered, the precipitate washed until neutral, and digested with 20 c.c. of ammonium carbonate solution. The filter is washed with water and the filtrate heated on a sand bath until the ammonia is eliminated, 10 c.c. of hydrogen peroxide and 10 c.c. of 50% sulphuric acid being carefully added and the liquid heated until white fumes are emitted. When cold the solution is again treated with 5 c.c. of hydrogen peroxide and evaporated. The cold liquid is treated cautiously with 10 c.c. of water and sufficient 1% permanganate

solution to colour it permanently and then decolorised by 2% oxalic acid solution. The solution, mixed with 20 c.c. of 25% potassium iodide solution, is heated for 20 min. on a water bath, then cooled, and decolorised exactly with 0.1*N*-sodium thiosulphate solution. After addition of 25 c.c. of cold, saturated sodium carbonate solution and excess of sodium hydrogen carbonate, the liquid is titrated with 0.01*N*-iodine solution; the number of c.c. of this is the D.M. index, which should not exceed 12 (cf. B., 1924, 32). The authors' results show that the heating with acetic acid alters the novarsenobenzenes to an extent varying with their stability and with the nature of the salts present, and the precipitate formed by hydrogen sulphide may originate in this way. Since, also, *p*-hydroxy-*m*-aminophenylarsenious oxide does not respond to the above procedure, the authors consider that the D.M. index has no precise chemical signification (cf. Valeur and Launoy, B., 1925, 113). T. H. POPE.

Determination of total alkaloids, sugar, and oily substances in opium. J. N. RAKSHIT (Analyst, 1926, 51, 491—495).—*Total alkaloids.*—10 g. of opium are triturated with 50 c.c. of water for 30 min., the liquid is filtered, and the residue transferred to a mortar, with 50 c.c. of 4% hydrochloric acid, and ground for 15 min. After again filtering, the residue is extracted three times with 200 c.c. of ether and the united extracts are shaken with 50 c.c. of the dilute acid until the aqueous extract gives no precipitate with excess of sodium carbonate solution. The residue from the ethereal extract and all the filter papers is rubbed in a mortar with 25 c.c. of the dilute acid, the mixture filtered, and the process repeated until there is no precipitate with sodium carbonate solution after keeping for some time. The aqueous and acid extracts are treated with 25 g. of anhydrous sodium carbonate, added in very small quantities, and after keeping overnight the precipitate is filtered off, as in the B.P. process for morphine. After removal of the alkaloidal precipitate, the alkaline filtrate is evaporated to dryness, powdered, and repeatedly extracted with a boiling mixture of equal volumes of chloroform and absolute alcohol. Total alkaloids thus obtained varied from 35.0% in Hill opium from Kohat to 48.6% in a Chinese chandu sample. *Sugar* has a retarding effect on the precipitation of morphine, and is best determined by titration with Fehling's solution after removal of the bulk of the alkaloids. "*Added oil*" or *wax* is determined from a consideration of the figures for the proportions of natural wax, saponification value of the natural wax, and saponification value of the sample. Further, a natural raw opium containing varying quantities of added oily substances shows a fairly sharp gradation in the change of appearance when heated on a porcelain plate over steam.

D. G. HEWER.

Examination of hydroaromatic alcohols and ketones. A. NOLL (Z. Deut. Oel Fett Ind., 1926, 46, 689—690).—The determination of a ketonic group by means of hydroxylamine hydrochloride has been applied to the examination of commercial specimens of *cyclohexanol*, the mixed methylcyclohexanols, and the corresponding hexanones. The boiling range and ketonic content of samples of these solvents of German manufacture are given.

E. HOLMES.

Physiological assay of preparations of digitalis. E. KNAFFL-LENZ (J. Pharm. Exp. Ther., 1926, 29, 407—425).—Various biological methods for the assay of digitalis preparations are described and discussed.

W. O. KERMACK.

Manufacture of calcium citrate and citric acid from lemon juice. B. MELIS (Giorn. Chim. Ind. Appl., 1926, 8, 467—469).—See B., 1926, 690.

Non-volatile constituents of the cotton plant. POWER and CHESNUT.—See XVI.

PATENTS.

Manufacture of acetic anhydride. H. DREYFUS (E.P. 257,968, 9.4.25).—Acetic anhydride may be prepared by passing acetic acid vapour over water-binding agents such as bisulphates or pyrosulphates (especially of the alkali and alkaline-earth metals), zinc chloride, etc., at 200—1000°, under reduced pressure if necessary. The acid vapour is led over or through the solid or molten agent, which may be spread on porous material. The agent may be continuously regenerated by heating it in a chamber connected with the reaction chamber. The anhydride may be separated from the reaction gases by fractional condensation.

B. FULLMAN.

Process for the manufacture of tartrates. CHEM. FABR. DR. H. STOLTZENBERG (E.P. 242,590, 6.6.25. Conv., 5.11.24).—Tartrates are obtained by halogenating neutralised fumaric acid or maleic acid, or a salt of the acids, and heating the resultant product in the presence of a carbonate or bicarbonate; or the product may be heated in an autoclave with carbon dioxide under pressure at 100°. A metallic catalyst such as bronze may be present in the treatment of the halogenated product. Two examples are given.

B. FULLMAN.

Production of isoborneol from a mixture of camphene and associated oils. H. GAMMAY (E.P. 258,475, 4.2.26).—The mixture of pinene hydrochloride and accompanying hydrochlorides obtained by saturating pinene with hydrogen chloride is dechlorinated, and the resultant mixture of camphene and associated oils converted into a bornyl ester and hydrolysed. From the isoborneol the oil may be removed by centrifuging, the residual isoborneol being separated from the oil by distillation.

B. FULLMAN.

Production of camphor from isoborneol. H. GAMMAY (E.P. 258,462, 7.1.26).—To isoborneol, subdivided in water (a small quantity of a non-oxidisable solvent being added if necessary) a mixture of sodium dichromate and dilute sulphuric acid is added. When the temperature rises to the m.p. of camphor, the reaction mixture is cooled and more chromic acid mixture again added, and so on. The sulphuric acid may be originally admixed with the isoborneol, sodium dichromate being added.

B. FULLMAN.

Manufacture of esters of isoborneols and borneols. CHEM. FABR. AUF ACTIEN (VORM. E. SCHERING) (E.P. 250,555, 16.3.26. Conv., 11.4.25).—*iso*Borneol and borneol esters of greater purity than usual are obtained by treating camphene with excess of concentrated fatty acids in the presence of weak acids such as pyrophos-

phoric, boric, oxalic, and toluenesulphonic acids, or in the presence of strong mineral acids at temperatures substantially below 20°. For example, 10 parts of camphene, 20 parts of 95% formic acid, and 2 parts of pyrophosphoric acid are heated to 60°. The temperature rises to 70°, which must not be exceeded. In a few minutes the reaction is completed; the excess of formic acid is distilled off *in vacuo*, and the reaction product washed until neutral. The ester has a saponification value of 308, corresponding to 100% *isobornyl* formate, with d_4^{20} 1.01.

B. FULLMAN.

Production of symmetrical diarylguanidines. SILESIA VEREIN CHEM. FABR. (E.P. 258,203, 28.5.26. Conv., 23.9.25).—*s*-Diarylguanidines are obtained almost quantitatively by treating the corresponding diarylthiocarbamides, suspended, together with metallic oxides, in organic solvents, with ammonia under pressure, at ordinary temperature. For example, *s-di-o-tolylguanidine*, m.p. 170°, is obtained in 92% yield by stirring 1 kg. of *di-o-tolylthiocarbamide*, 1.1 kg. of lead oxide, and 10 kg. of xylene, in the presence of ammonia maintained at a pressure of 3 atm., for 3 hrs., at about 20°.

B. FULLMAN.

Process of making aldols. C. J. HERRLY, ASST. to CARBIDE AND CARBON CHEMICALS CORP. (U.S.P. 1,598,522, 31.8.26. Appl., 22.5.24).—Acetaldehyde, or a higher homologue, contained in a closed vessel, is neutralised at 10° by adding dilute sodium hydroxide solution in a non-oxidising atmosphere, *e.g.*, nitrogen. The neutral aldehyde is then made slightly alkaline and maintained at 40° for nine hours by circulation of brine. After cooling to 20° dilute sulphuric acid equivalent to the total alkali used is added. The unconverted aldehyde is then distilled off *in vacuo* below 50°. An 83% yield is obtained, based on the aldehyde used.

R. B. CLARKE.

Nitrated ester. C. E. BURKE and R. L. KRAMER, ASSRS. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 1,598,474, 31.8.26. Appl., 18.9.24).—The patent relates to the preparation of esters of the formula $\text{CHMe}(\text{ONO}_2)\cdot\text{CO}_2\text{R}$, where R represents the radical of a monohydric alcohol containing more than three carbon atoms. These new compounds are almost insoluble in water and acids, soluble in organic solvents, good colloid agents for nitrocellulose and of low volatility. *n*-Butyl nitrolactate is prepared as follows: *n*-Butyl lactate is first prepared by esterifying lactic acid with *n*-butyl alcohol in the presence of sulphuric acid. The ester is gradually added with vigorous agitation to a mixed acid of equal parts of sulphuric and nitric acids, the temperature being maintained at 15°. The mixture separates into two layers, the upper layer consisting of the nitrated ester, which is separated, washed, and dried.

R. B. CLARKE.

Process for producing 3:5-di(acetoxymercuri)-4-nitro-*o*-cresol and compounds thereof. ABBOTT LABORATORIES, ASSEE. of G. W. RAIZISS (E.P. 236,538, 20.6.25. Conv., 2.7.24).—To minimise the formation of nitroindazole, 4-nitro-*o*-cresol is prepared by nitration of *o*-toluidine and diazotisation of the resultant 4-nitro-*o*-toluidine. The crude nitrocresol is dissolved in water

and sodium hydroxide and heated with mercuric acetate for 2 hrs. at 100°. The 3:5-di(acetoxymercuri)-4-nitro-*o*-cresol is separated as a brownish-yellow solid from the admixed mercury derivative of nitroindazole by extraction with alkali. It has germicidal properties. Its alkali metal salts are prepared by pouring its solution in the appropriate hydroxide into methyl alcohol and precipitating with ether.

B. FULLMAN.

Manufacture of organic compounds of bismuth for therapeutic purposes. R. W. E. STICKINGS, and MAY & BAKER, LTD. (E.P. 258,641, 19.6.25).—Double salts of aliphatic hydroxy-polybasic acids (tartaric, citric, malic, etc.) with bismuth and organic bases (diethylamine, diethylaminoethanol, hexamethylene-tetramine, piperazine, etc.) are prepared by adding an acid bismuth salt (such as bismuthyltartaric acid) to the base until solution is effected and a neutral product formed; or a neutral bismuth salt is treated with 1 mol. of base; or an acid salt of the base is treated with as much bismuth hydroxide as will dissolve, the resultant acid product being neutralised by further addition of base; or a neutral bismuth salt is treated with the corresponding salt of the base, the product when acid being neutralised with base, or the neutral product is obtained by carrying out the reaction in the presence of free base. The products are isolated by pouring the aqueous reaction solution into a non-solvent of the compound (alcohol etc.); or the solution may be stabilised for therapeutic use by addition of a reducing sugar such as glucose. These compounds have therapeutic advantages over the corresponding double salts of the acids with bismuth and the alkali metals.

B. FULLMAN.

Manufacture of quinine salts of [hydr]oxyphenyl-arsinic acids. F. HOFFMANN-LA ROCHE & Co. A.-G. (E.P. 259,153, 9.6.26. Conv., 6.11.25).—Quinine salts of hydroxyphenylarsinic acids (e.g., the *p*-hydroxyphenylarsinate, m.p. 177—178°) are prepared by reaction between quinine and the free acids, or between soluble quinine salts and salts of the acids.

B. FULLMAN.

New complex alkali or alkaline-earth antimony compounds. W. CARMAEL. FROM FARBENFABR. VORM. F. BAYER & Co. (E.P. 258,973, 17.7.25).—New complex alkali or alkaline-earth antimony compounds of trypanocidal action are obtained by treating the appropriate neutral salt of a mercaptocarboxylic acid with an oxygen compound of trivalent antimony; or by treating the free acids with the antimony compound and neutralising with an alkali or alkaline earth without isolation of the complex antimony acid produced (this method must be used in the preparation of derivatives of thioglycollic acid); or the complex acid may be isolated and afterwards neutralised. For example, sodium antimony trithioglycollate, $\text{Sb}(\text{S}\cdot\text{CH}_2\cdot\text{COONa})_3$, is prepared by heating 20 parts of thioglycollic acid with 6 parts of freshly precipitated antimony trioxide and 50 parts of water for some time, filtering, neutralising with sodium carbonate, and evaporating to dryness. Barium antimony trithioglycollate and sodium antimony thioalicylate are also described.

B. FULLMAN.

Manufacture of new organic phosphorus compounds. A. J. RANSFORD. FROM L. CASSELLA & Co., G.M.B.H. (E.P. 258,744, 20.10.25).—9-Alkyl- (or benzoyl-) carbazolephosphinous acids (having antirachitic properties) are formed by the action of phosphorus trichloride on 9-alkyl-(or benzoyl-)carbazoles. Thus, melted 9-methylcarbazole is heated to 150° and phosphorus trichloride gradually added. The product, after cooling, is added to a mixture of sodium hydroxide solution (*d* 1.36), cooled with ice. After extraction with ether, the solution is concentrated and 9-methylcarbazole-3-phosphinous acid precipitated by addition of acid. 9-Ethylcarbazole-3-phosphinous acid is also described. The compounds are very resistant to acids.

B. FULLMAN.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Contrast of photographic printing paper. L. A. JONES (J. Franklin Inst., 1926, 202, 177—204, 469—516).—The psychophysical basis of contrast is discussed. Like subjective contrast, contrast as applied to photographic materials is a function of a rate or gradient factor and an extent factor, which are dependent respectively on the differential of density with respect to $\log E$, and on the density scale available or used. In relative terms, contrast may be specified as the product of the two factors. The straight-line part of the characteristic curve of printing papers is generally so small that gamma is not a satisfactory specification of the gradient characteristic, and, in order to evaluate total contrast or contrast capacity, means for determining the mean effective value of $dD/d \log E$ are necessary. In practice the brightness scale of a subject rarely exceeds 250 and can in general be completely rendered on the straight-line part of a negative characteristic curve. This is not so with developing-out papers, and the entire density scale must generally be used. A statistical method of determining the portions of the positive material curve which can be utilised for reproducing a particular brightness scale is considered. As object a "typical landscape," in which the brightness contrast was 39 was used. Using a panchromatic plate which had just sufficient exposure latitude to render the object on the straight-line part of the characteristic curve, a group of nine negatives, equally exposed, was made, the development time being varied to give gamma values ranging from 0.38 to 1.32. The densitometric characteristics were determined on the negatives and on sensitometric strips developed with each negative. From the appropriate negatives groups of prints were made on 37 different developing papers, covering the entire range of contrast available in this type of material. From the prints on each paper judgment was made by 75 observers on the negative producing the optimal photographic quality. The data obtained are critically examined, and conclusions are drawn relating to the characteristics of the observers, the repeatability of judgments of print quality, and the average photographic quality considered as optimal by observers of different degrees of training in print judgment. The

gamma of the optimal negative for each paper is obtained, and from density measurements on the positives the density scale for optimal positives is obtained. These values form part of the data from which values of contrast for the positive materials will be computed.

W. CLARK.

Comparison of metol-quinol and metoquinone developers. E. MULLER (Bull. Soc. franç. Phot., 1926, 13, 226—229).—The experiments of Lumière and Seyewetz (B., 1925, 786) were repeated. Grinding together the metol and quinol of a metol-quinol developer before dissolving gives no increase in development rate. It is confirmed that the energy of a metoquinone sulphite developer is superior to that of a metol-quinol developer containing two mols. of metol and one mol. of quinol, with sodium carbonate equivalent to the sulphuric acid of the metol. If the carbonate content is doubled, a developer identical in properties with the metoquinone developer is produced.

W. CLARK.

Metoquinone developer. A. HÜBL (Phot. Korr., 1926, 62, Mar. 31; Bull. Soc. franç. Phot., 1926, 13, 229—231, cf. preceding abstract).—The difference in development rate between metoquinone and metol-quinol found by Lumière and Seyewetz is confirmed. If the carbonate equivalent to the sulphuric acid of the metol in the metol-quinol formula is replaced by the equivalent of caustic soda, a developer identical in properties with the metoquinone formula is obtained. The carbon dioxide freed in the first developer probably decreases the activity of the developer. If the carbonate is doubled, bicarbonate is formed, and the developer is as active as the metoquinone formula. Addition of 0.5% of bicarbonate to the metoquinone developer does not affect its activity. Quinol can be eliminated from the metol-quinol formula containing carbonate equivalent to the sulphuric acid of the metol without affecting its developing power. A metoquinone developer can be regarded merely as a metol developer. Only if alkali is added does the quinol become active. Metoquinone can in all cases be replaced by metol-quinol. Metoquinone without added alkali corresponds to neutralised metol, and alkaline metoquinone to a normal metol-quinol developer.

W. CLARK.

PATENTS.

Photographic copying. A.-G. F. ANILIN-FABR. (E.P. 243,023, 16.11.25. Conv., 14.11.24).—Printing surfaces and preliminary copies are prepared by the reflection copying method in such a way that the picture is formed on the layer and not within it. The sensitised colloid layer may be converted into a flat printing surface by development and treatment as in preparing a colotype printing surface or the printing surface may be inked with a fatty ink and then sprayed, after drying, with bronze powder etc. An exposed sensitised colloid layer which is soluble in water or which swells in presence of water, is inked with a fatty ink and then developed with water containing, if necessary, lactic acid etc. to assist in development. After exposure and moistening, a sensitised hygroscopic colloid layer is sprayed with fine powder. A sensitive silver halide

emulsion may be used and developed either physically or chemically with intensification by physical means.

W. CLARK.

Pictures by the dye-transfer process. R. VON ARX (E.P. 245,163, 24.12.25. Conv., 24.12.24).—Pictures are produced by converting a positive silver image into a mordant, e.g., of copper silver ferrocyanide, dyeing with a dye having an affinity for this mordant, and printing from this on to a simple layer, such as of collodion, or a layer carrying a mordant, e.g., gelatin cuprous thiocyanate, the affinity of which for the dye exceeds that of the positive mordant. Polychrome images are produced by successive printing from a set of mordant colour selection positives, or from positives prepared by the selective colour method from negatives made with multicolour screens and fixed or treated in dilute acid. The mordant may be removed after printing by an agent not affecting the colours.

W. CLARK.

Photographic reversal processes. KODAK, LTD. From EASTMAN KODAK Co. (E.P. 258,814, 11.5.26).—Reversal in the second development in the production of direct positives by reversal (cf. E.P. 176,357 and 218,632) is prevented by the addition of soluble silver salts to the bleaching solution in order to eliminate by precipitation the effects of harmful impurities, such as halogen salts, which may be present. A suitable bleaching solution consists of dilute solutions of potassium permanganate, sulphuric acid, and silver nitrate.

W. CLARK.

Kinematograph pictures in natural colours. F. LIERG and K. POKORNY (E.P. 245,470, 2.1.26. Conv., 2.1.25).—A three-colour image is formed by using a positive film projected through two of the colours in the form of screens, and itself toned or dyed the third colour, either on one or both sets of pictures. The colour screens may be modified from being complementary to the taking screens, and the colour of the toned silver image may be modified, in order to obtain a truer rendering on projection. The filter colours may be formed on the film itself by providing one set of component film pictures with a waterproof protective coating bearing the respective filter colour, the other set being dyed by immersing the whole film in the complementary colour. By hardening the gelatin portions containing the coloured silver image by a suitable composition of the toning or developing bath, on subsequent dyeing the colouring is stronger in the clear parts of the gelatin film than in the portions containing the silver image.

W. CLARK.

Photographic film for colour photography. R. BERTHON, ASS. to SOCIÉTÉ DU FILM K.D.B. (U.S.P. 1,600,923, 21.9.26. Conv., 4.12.22).—The emulsion is coated on a support having its outer face formed with a net of microscopic lenticular elements, in number more than 500 /sq.mm., so as to produce diffraction in addition to refraction.

W. CLARK.

XXIII.—SANITATION; WATER PURIFICATION.

Determination of toxic substances in insecticides etc. I. Volumetric determination of thallium in "Zelio" preparations. J. BODNÁR and A. TERÉNYI

(Z. anal. Chem., 1926, 69, 29—36).—Thallium may be determined volumetrically in "Zelio" preparations (rat poison) by dissolving the thalious chromate obtained by the method of Mach and Lepper (B., 1926, 320) in hydrochloric acid and potassium iodide and titrating the liberated iodine but, owing to the time consumed in the preliminary operations, the method is slow. A much more rapid, although not quite so accurate procedure consists in carbonising the paste at as low a temperature as possible, extracting the thallium from the powdered residue by boiling with 50 c.c. of 10% sulphuric acid, adding 2—3 c.c. of 10% hydrochloric acid, and titrating the thallium with permanganate at 70—90°. The solution is standardised against pure thalious sulphate under the same conditions. The results obtained for thallium should be increased by 0.04%.

A. R. POWELL.

Chemical characteristics of some trade wastes.

A. M. BUSWELL, R. E. GREENFIELD, and R. A. SHIVE (Ind. Eng. Chem., 1926, 18, 1082—1084).—Wastes produced in a pea cannery, in strawboard, paper, and roofing factories, in two distilleries, and in a corn cannery have been examined and shown to consume from 10 to more than 100 times as much oxygen per unit as is consumed by ordinary sewage.

D. G. HEWER.

Treatment of packing house, tannery, and corn products wastes. F. W. MOHLMAN (Ind. Eng. Chem., 1926, 18, 1076—1081).—The methods used in Chicago for combating the effect of the major industrial wastes are evaluated, together with results of experimental treatment of the water for the last 15 years. The activated sludge process is recommended for packing-house wastes, preliminary screening and settling in a Dorr clarifier and subsequent mixing with large volumes of domestic sludge for tannery wastes, and trickling filters for corn products wastes. D. G. HEWER.

Disposal of some organic trade wastes. E. BARTOW (Ind. Eng. Chem., 1926, 18, 1085—1086).—For packing-house wastes the activated sludge process is regarded as best, unless there is a chance of high dilutions; for beet sugar factories the greatest problem is the disposal of the Steffens waste, from which potassium chloride, potassium sulphate, potassium nitrate, betaine hydrochloride, and glutamic acid have been obtained. For starch wastes, concentration of the wastes should be reduced within the plant and subsequent treatment in a sprinkling filter type of plant is recommended.

D. G. HEWER.

Apparatus for measuring turbidity and colour of water. W. OLSZEWSKI (Chem.-Ztg., 1926, 50, 694).—The water under examination in a tube 20 cm. long is compared with distilled water in a similar adjacent tube by means of a half-shade photometer. The colours of the two are matched by the insertion of suitable coloured glasses, while the relative turbidities, against Ostwald's normal white, are determined by varying the amount of light passing through the distilled water by means of a graduated slit.

F. R. ENNOS.

Effect of X-rays of long wave-length on *B. prodigiosus*. J. J. TRILLAT (Compt. rend., 1926, 183, 614—

616).—X-Rays of long wave-length ($\lambda = 2.23$ A.) render cultures of *B. prodigiosus* sterile in 1—2 hrs. with direct irradiation; with oblique irradiation, colonies on the edge of the beam of rays showed increased growth.

L. F. HEWITT.

Rôle of the chemist in the investigation of problems of industrial hygiene. C. A. KLEIN (J. Oil Col. Chem. Assoc., 1926, 9, 270—290).—Presidential address, delivered on October 22.

PATENTS.

Treatment of sewage. K. IMHOFF (E.P. 255,833, 17.6.26. Conv., 22.7.25).—Sewage is treated in settling basins containing colloid collectors (consisting of light matters, e.g., coarse wood wool, held together by a wire or wickerwork net) by imparting to the sewage, by means of air forced from below the colloid collectors, a circulating current upwards through the collectors and downwards in the free spaces of the settling basin laterally thereof. Accumulated sludge may be removed from the colloid collectors from time to time by increasing for a short period the supply of air, and with a large breadth of colloid collector the air supply pipe may be moved to and fro over the bottom. W. T. LOCKETT.

Antiseptic. G. E. E. CROSNIER (E.P. 258,058, 12.8.25).—A chemically neutral, odourless, non-toxic and readily soluble antiseptic and deodorant is prepared by mixing together zinc phenolsulphonate, preferably the *p*-compound, a second zinc salt, preferably zinc sulphate, and an acetate, e.g., sodium acetate. W. T. LOCKETT.

Disinfectants. A. BRICK (E.P. 258,110, 29.10.25).—A disinfectant in solid form is prepared as follows:—Rice starch is soaked in a solution of potassium permanganate and subsequently dried and powdered. The powder is mixed with a deodorising composition consisting of, for instance, oil of turpentine, pine-needle oil, musk, terpineol, lemon-grass oil, geranium oil, camphor oil, and juniper berry oil and to the pulpy mass obtained are added kieselguhr, rice flour, soap flakes, and soap powder and finally, paraformaldehyde. The mass is then dried and pressed. W. T. LOCKETT.

Disinfectant composition. G. G. GORDON (E.P. 258,678, 29.6.25).—One or more oils or extracts of the eucalyptus species are mixed with an oleaginous substance (e.g., oleic acid) or resin until the latter is dissolved. An aqueous alkaline solution containing 2½% of sodium hydroxide is then added until the eucalyptus oil content approximates 37% of the whole. W. T. LOCKETT.

Fumigant. G. H. BUCHANAN (E.P. 258,324, 13.6.25).—The fumigant consists of cyanogen chloride or a mixture of cyanogen chloride and hydrocyanic acid in liquid form, prepared so as to give a slightly acid indication with methyl orange to prevent decomposition. A small amount of cyanogen chloride or a mixture rich in cyanogen chloride is first introduced into the space to be fumigated, to act as a warning to persons who may be present, and then the proper amount of the fumigant of the desired composition. W. T. LOCKETT.

Vermin-killer. E. DERRÉGIBUS (E.P. 258,953, 2.7.25).—A mixture of coal tar, methyl salicylate, and naphthalene.