

BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

APRIL 29, 1927.

I.—GENERAL; PLANT; MACHINERY.

PATENTS.

Method and apparatus for heating, cooling, and controlling reactions at high temperatures. C. FIELD, Assr. to CHEMICAL MACHINERY CORP. (U.S.P. 1,619,660—3, 1.3.27. Appl., [A] 4.3.20. Renewed 1.2.27; [B] 17.4.22; [C] 20.4.22; [D] 15.7.22).—The material under treatment is heated by the condensation of mercury vapour, and the temperature is regulated by the pressure of the vapour. That portion of the mercury condensed by doing useful heating flows to a reservoir or hot well, and thence to the mercury boiler. The other portion of the vapour passes through a separate condenser and flows back direct to the boiler. The pressure of the vapour may be regulated by a venting valve controlled by the temperature but not by the pressure, with provision of a second relief valve opening under pressure but unaffected by the temperature.

B. M. VENABLES.

Process and apparatus for reactivating adsorption media. METALLBANK U. METALLURGISCHE GES. A.-G. (E.P. 242,986, 10.11.25. Conv., 12.11.24).—The adsorption medium is regenerated by hot gases which are blown into it from a number of chambers buried in it, and the gases plus the adsorbed substance are collected in and drawn off through a similar number of chambers so situated that the substance to be removed has no chance of collecting in cooler zones of the absorbent. The adsorbent may be kept in motion while being regenerated, and the heat may be supplied otherwise than by heating the scavenging gases.

B. M. VENABLES.

Rotary furnaces. A. LACORE and J. PIRON (E.P. 259,238, 1.10.26. Conv., 2.10.25).—A rotary tubular furnace intended for burning lime, cement, minerals, etc. is provided with two portions enlarged to about double diameter, situated between three portions of normal diameter. The lowest (small) portion comprises the clinkering zone, the next large one the calcining zone, and the upper large one a dehydrating zone.

B. M. VENABLES.

Rotary hearth furnaces. INTERNAT. GENERAL ELECTRIC Co., Assees. of ALLGEM. ELEKTRICITÄTS-GES. (E.P. 259,570, 5.10.26. Conv., 6.10.25).—A continuously operating furnace is provided with one or more rotating annular hearths, and is heated electrically by resistors in the walls. Regeneration of heat is effected by radiation from the hot outgoing to the cold ingoing goods. If two hearths are used rotating in opposite directions, a single opening may serve for charging and discharging both hearths. If one hearth only is provided, there are two openings, and only one set of goods passes through

the electrically-heated zone, but on the rest of the circle between the two openings two sets of goods, outcoming and ingoing, are present on the hearth together.

B. M. VENABLES.

Apparatus for drying and heating. E. C. R. MARKS. From GRASSELLI CHEMICAL Co. (E.P. 265,771, 9.2.26).—A furnace similar in construction to a Herreshoff roaster of the muffled type, *i.e.*, the main heating gases do not make contact with the material, is arranged so that the air or gas which is used to cool the rabbles is withdrawn by a fan and supplied to the upper or drying hearth in contact with the material and under slight positive pressure.

B. M. VENABLES.

Means of pulverising and separating all kinds of cereals, minerals, and the like. J. C. CARLINE (E.P. 265,841, 17.6.26. Addn. to E.P. 244,146; B., 1926, 112).—A modification of the grinding and screening apparatus described in the original patent, mainly consisting in that the revolving brush rubs against a wire screen.

B. M. VENABLES.

Reduction of finely-divided material. W. GARDNER (U.S.P. 1,619,295, 1.3.27. Appl., 14.4.26).—The material is removed from a grinding mill before it has all been reduced to the finished size by an air stream of low velocity. The oversize is removed from the air stream in a settler and returned to the mill, and the finest material is collected in an air filter, the air not being returned to the grinding unit.

B. M. VENABLES.

Centrifugal treatment of liquids. K. J. SVENSSON and K. A. P. NORLING (E.P. 264,130, 3.9.26. Conv., 11.1.26).—A centrifugal separator provided with feed pump and electrical heater is arranged to have a supply of "wash" liquor which, in addition to serving the ordinary purpose of entraining solid particles and removing them from the main liquid being treated, will serve also to prevent the electrical heater burning out should the supply of main liquid cease. Claim is made for various methods of connecting up the pump or pumps, reservoirs, and heaters. The wash liquor may be returned for re-use.

B. M. VENABLES.

Filtration. [Separation of liquids.] H. S. HELESHAW and J. A. PICKARD (E.P. 265,674, 9.11.25).—A mixture of two liquids—preferably after separation as far as possible by other means—is passed through a filter comprising loosely packed solid threads of inorganic non-absorbent material (*e.g.*, asbestos, glass wool) to which the last trace of one liquid will adhere by surface tension even if it is very finely divided. The filter is cleaned by steam under pressure.

B. M. VENABLES.

Filters. C. E. and W. FOX (E.P. 265,856, 16.7.26).—A telescopic tube is perforated and wound with a spiral

of wire with interposition of gauze or other filtering medium between the wire and the tube if desired. The whole is enclosed in a pressure-tight casing to which the preflit is supplied. The filtrate is removed through a conduit passing from the interior of the tube, through a gland in the end of the casing, to the outside, and sediment may be dislodged from the filter medium by pulling this conduit, thus pulling apart the telescopic tube and simultaneously opening the spirals of wire.

B. M. VENABLES.

Drying liquid material. Apparatus for drying atomised material. OESTERREICHISCHE LANDWIRTSCHAFTS-GES. (Austr. P. 103,995—6, 21.9.21).—

(A) The material under treatment is discharged, after previous atomisation, into the conduit conveying air to the drying chamber, through a tube entering it at an acute angle, so that the material is still more finely divided. (B) Air for drying the material enters through a filter at the bottom of a tower-shaped drying chamber, and the material is charged in through an opening at the lower end of the sloping partition at the top of the tower.

L. A. COLES.

Continuous separation of gas mixtures. H. WADE. From N. V. PHILIPS' GLOEILAMPENFABR. (E.P. 266,396, 23.9.25).—The apparatus comprises a series of elements in each of which partial separation is effected by diffusion. The elements are so connected that the quantity of gas passing from one element to the next is approximately equal to that passing in the opposite direction. Pumps are provided between the elements to regulate the removal of the gases, and the resistance offered to the gases in their passage from one element to the other, caused by a porous wall in the one direction and by a number of tubes in the other, is regulated so as to be approximately the same in each case.

L. A. COLES.

Apparatus for the electrical purification of gases. SIEMENS-SCHUCKERTWERKE G.M.B.H., Assees. of R. HEINRICH (G.P. 435,093, 22.6.24).—The electrodes are constructed of corrugated sheet metal so arranged that the grooves are inclined to the horizontal and run obliquely to the direction of the gas stream. In treating chimney gases, the apparatus is placed in a conduit sloping upwards from the flue to the chimney. L. A. COLES.

Production of gas- and liquid-tight vessels and pipes. G. ADOLPH, A. PIETZSCH, and B. REDLICH (E.P. 252,366, 17.5.26. Conv., 22.5.25).—An acid- (or chemical-) proof container is constructed of sections of ceramic material, of single thickness and without external casing or support, the sections being joined only at their edges by means of an elastic binding medium composed of, e.g., rubber or cellulose. The elastic medium may be used only on the inside portion of the joints and ordinary cement outside, or acid-proof cement inside and the elastic medium outside. B. M. VENABLES.

[Disappearing filament] optical pyrometer. C. E. FOSTER (E.P. 266,060, 19.11.25).

Detection of impurities in fluids (E.P. 266,047).—See XI.

Pyrometer (E.P. 266,060).—See XI.

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

Low-temperature carbonisation. Vertical retorts at H.M. Fuel Research Station. C. H. LANDER and J. F. SHAW (Dept. Sci. Ind. Res., Fuel Res. Tech. Paper No. 17, 7 pp.).—An account is given of the construction and performance of two settings of vertical cast-iron retorts designed for the low-temperature carbonisation of bituminous coal. Each setting consists of two retorts, one pair being 21 ft. high and 6 ft. 6 in. \times 4 in. in cross-section at the top, widening to 6 ft. 10 in. \times 8 in. at the bottom; the retorts of the second setting are similar, but are 3 in. wider. The former pair proved to be too narrow for the continuous passage of small coal of caking quality; moreover, after being in operation a short time distortion occurred as a result of local overheating, and the retorts became unworkable. The wider retorts have been in satisfactory operation for 12 months at a working temperature of 625°, and with a throughput of 2½–4 tons per retort per day. The charge is not kept moving continuously, the extractor gear being operated for a short time at intervals of 1, 2, or 3 hrs., according to the nature of the coal being carbonised. The coke collects in a cooling chamber at the base of the retorts, and is discharged at intervals. The setting is heated by water-gas supplied to burners situated in corners built into the internal face of the setting so that the retorts are heated principally by radiation from the flames and brickwork, and direct contact of the flames with the walls of the retort is avoided. The consumption of water-gas is about 2500 cub. ft./hr. The tar yields vary from 11.1 gals./ton with Durham coal (run of mine) to 18.4 gals./ton with Garforth nuts. Excellent coke has been obtained from the fine coal (through a 3/8-in. screen), which amounted to 50–60% of the Durham coal used, by carbonising briquettes made with 74% of coal, 20% of low-temperature coke breeze, and 6% of pitch. The coke produced has proved very satisfactory as a domestic fuel. A. B. MANNING.

Caking power of coal. J. T. BURDEKIN (Dept. Sci. Ind. Res., Fuel Res. Survey Paper No. 8, 21 pp.).—“Caking-power curves” have been determined for a number of coals. 2 g. of powdered coal (60–90 mesh), or of a mixture of the coal and calcined anthracite, were carbonised at 860° in a silica crucible, and the crushing strength of the coke, as determined on a testing machine of the steelyard pattern, was plotted against percentage of inert material (cf. Badarau and Tidswell, B., 1923, 537 A). With a rate of heating such that the coal reached about 900° in 7 min., the curves exhibited sharp maxima in the neighbourhood of 30% of inert material; they gave, however, little definite information of the coking properties of the coal. With a much slower rate of heating (100° to 860° in 3 hrs.) a different type of curve was obtained with some of the coals, the coke made from the coal alone possessing the maximum strength and addition of inert material causing a rapid fall of strength to zero. The other coals still produced the first type of curve, but on further decreasing the rate of heating (100° to 860° in 3 hrs. 48 min.) all the coals examined except one (Mountain seam) gave curves

of the second type. This type of curve permits a quantitative comparison being made of the coking values of the coals, a relative measure of which is given by the area enclosed between the curve and the axis. A comparison of the curves throws light on the amount and thermal stability of the binding material in a coal.

A. B. MANNING.

Production of ammonia and hydrocarbons by the action of steam on lignite coke at 500°. K. A. HOFMANN and H. GROLL (Z. angew. Chem., 1927, 40, 282—287).—The reaction $C + 2H_2O = CO_2 + 2H_2$ proceeds at 500° practically to the exclusion of $C + H_2O = CO + H_2$, but with most forms of carbon the reactivity is insufficient at this temperature. It was found that lignite briquettes, coked at 500° and then treated with a mixture of steam and air to remove the gummy surface deposit, were sufficiently reactive to give considerable conversion figures at this temperature. Once the surface layer has been removed, the presence of air is injurious. The combined nitrogen in the coke is converted into ammonia in proportion to the carbon oxidised, the yield found being actually in excess of 100% owing to some catalytic synthesis from gaseous nitrogen under the influence of the ash. The ash content of the coked briquettes amounted to 10.3%, of which 28.0% was Fe_2O_3 . The effect of a 5% addition of iron, manganese, nickel, and cobalt in the form of oxides to the powdered coke used was then tested. The conversion found was of the same order, and no considerable synthesis of ammonia occurred, but a notable increase in the methane content of the gas was found. Whilst an equal mixture of nitrogen and steam, without catalyst, yielded a gas containing 19% H and 0.5% CH_4 , the same original gases in presence of 5% Mn gave a gas containing 13% H and 6.4% CH_4 . Nickel was less effective, and iron less again. With a mixture of nickel and cobalt and prolonged treatment with steam and nitrogen the deficit in the hydrogen content of the resulting gas was greater than the production of methane, and the presence of liquid and solid hydrocarbons was noticed. The same production of hydrocarbons occurred when the coke was treated with dry hydrogen at 500°; it is therefore established that the process is independent of any intermediate formation of carbon monoxide.

C. IRWIN.

Ternary coal mixtures. D. J. W. KREULEN (Chem. Weekblad, 1927, 24, 122—125).—Mixtures of varying proportions of a bituminous coal, a forge coal, and a gas coal were coked under standard conditions, and the swelling and coking properties tabulated. The influence of the gas coal on the degree of swelling is very marked. The nature of the coke given by the individual coals affords no indication of the character of the coke from the mixtures.

S. I. LEVY.

Colloidal properties of peat. A. DOUMANSKI (Bull. Soc. chim., 1927, [iv], 41, 166—185).—Peats on agitation with water yield a "hydro-mass" with the properties of a negatively-charged colloid. A highly-dispersed, stable hydrosol may be obtained from the mass if the peat is derived from *Sphagnum* residues; the suspensoid material has d 1.4 (approx.). This sol (as well as the original "hydro-mass") is coagulated by positively-

charged hydrosols, neutral and acid salts, and especially by free acids, the valency of the cation playing the most important part ($H > Al > Mg > Na$). Adsorption phenomena accompany the coagulation. Alkalis and alkali carbonates peptise the hydrosol. Freezing of both the "hydro-mass" and hydrosol is accompanied by coagulation.

S. K. TWEEDY.

Suitability of charcoal from apricot kernel shells for the production of activated charcoal. A. PALKIN (Bull. Univ. Asie centrale [Taschkent], 1926, 12, 89—100; Chem. Zentr., 1926, II, 2939).—After treatment with mineral acids, the charcoal absorbs up to 52% of its weight of chlorine, but is less active when treated with sodium hydroxide solution, or with organic liquids, such as alcohol, benzene, or ether. The absorptive capacity is increased to 61% by steeping the charcoal in platinic chloride solution followed by gentle heating, but if it is heated strongly, the absorptive capacity falls to 45%, apparently owing to the formation of platinum carbide. The charcoal is reduced to dust less readily than wood charcoal prepared by Zelinski's process. L. A. COLES.

Determination of nitrogen in fuels. G. LAMBRIS (Brennstoff-Chem., 1927, 8, 69—73).—With the object of completely oxidising the traces of methane that are liable to be found in the nitrometer in the usual Dumas method, the combustion is carried out in two stages. The narrow combustion tube and connexions are first swept free from air with carbon dioxide, and the sample (about 0.5 g.) is then burnt in a current of oxygen, the combustion products passing successively over red-hot copper oxide (to oxidise ammonia) and metallic copper (to reduce nitrogen oxides) into a gas reservoir containing a concentrated solution of potassium hydroxide. Conditions are so regulated that no free oxygen reaches the metallic copper during the primary combustion, but an excess of oxygen is passed through the tube after primary combustion is complete to sweep all combustion products into the reservoir. The mixture of combustion gases and oxygen is passed from the reservoir over a glowing platinum spiral, and, finally, through a tube containing heated metallic copper (to remove final traces of free oxygen) to the nitrometer. W. T. K. BRAUNHOLTZ.

Catalytic combustion. V. Union of carbonic oxide and other gases with oxygen in contact with a fireclay surface at 500°. W. A. BONE and A. FORSHAW (Proc. Roy. Soc., 1927, A, 114, 169—180; cf. A., 1906, ii, 434; 1926, 33, 250, 1109).—In most respects a fireclay surface catalyses the combination of moist carbon monoxide and oxygen in much the same way as a porous porcelain surface catalyses that of hydrogen and oxygen mixtures (*loc. cit.*), except that the catalysing power is weaker in the former case than in the latter. The rate of combination of a moist, theoretical mixture of carbon monoxide and oxygen, in contact with a fireclay surface at 500° in a "normal" state of activity, is always directly proportional to the pressure of the dry mixture, provided that the reaction product is rapidly removed from the system. The catalysing power of the surface can be highly stimulated by previous exposure to carbon monoxide at the experimental temperature, but the stimulus so imparted gradually disappears if the exciting cause is removed. A highly active surface exposed to

oxygen at the reaction temperature gradually loses its catalysing power, and becomes either "normally" active or very slightly more so. When either of the two reacting gases is present in excess, the rate of combination is proportional to the partial pressure of the carbon monoxide. Comparative experiments upon the relative speeds of the catalytic combustion of carbon monoxide, hydrogen, and methane, respectively, show that hydrogen is the most, and methane the least, amenable to the catalytic combustion. L. L. BIRCUMSHAW.

Drainage and effluents from gas works. E. JONES (Gas J., 1927, 177, 516–518).—The nature of the effluents from gas works is described, together with the methods of treatment of the effluent from ammonium sulphate plants before admission to the sewers, either by removal of the phenols from the ammonia liquor by means of benzol, or by subsequent bacterial treatment of the effluent. By the Bailey process, the toxicity of the effluent was reduced by evaporation of the "effluent" and "devil" liquors in two troughs arranged in a by-pass to the main flue, chimney gases being blown through the liquors. The efficiency of purification calculated on the oxygen absorption test was 33.5%. A. C. MONKHOUSE.

Absorption apparatus for the determination of organic vapours in air and gas. L. BREMER (Brennstoff-Chem., 1927, 8, 77–78).—A modified form of Kattwinkel's apparatus (cf. B., 1924, 546) is described and depicted, in which alterations are made to the upper valve and connexions and to the two water cocks, with a view of eliminating leakages which are otherwise found to develop in time.

W. T. K. BRAUNHOLTZ.

Determination of unsulphonated residue in petroleum spray oils. J. J. T. GRAHAM (J. Assoc. Off. Agric. Chem., 1927, 10, 124–130).—Sulphonation when used as an index of unsaturated hydrocarbons in oils for insecticidal sprays is an empirical procedure, as there is no sharp end-point, and no advantage is to be gained by prolonged heating and shaking. Blackening of certain oils is due to overheating rather than to carbonisation by the acid. Measurement of the unsulphonated residue in cases of excessive blackening is facilitated by addition, prior to sulphonation, of a measured volume of some other oil of known sulphonation value (e.g., kerosene). In the method proposed, the oil, after gradual admixture with 38*N*-sulphuric acid, the temperature meanwhile being kept below 60°, is heated for 10 min. at 60–65°, and shaken for periods of 20 sec. at 2 min. intervals. The unsulphonated residue is measured after centrifuging for 5 min. at 1200–1500 r.p.m.

H. J. DOWDEN.

Heat of combustion of marine animal oils. MARCELET.—See XII.

Bagasse as fuel. HUTCHESON.—See XVII.

Humic acids. FUCHS and LEOPOLD.—See XX.

PATENTS.

Process and apparatus for briquetting. E. B. A. ZWOYER, Assr. to GENERAL FUEL BRIQUETTE CORP. (U.S.P. 1,614,095, 11.1.27. Appl., 6.6.25).—In a process of briquetting loose materials with a liquid binder, an excess of binder is supplied from a tank to

the mixer by a pipe line provided with a by-pass. A regulated amount of binder is admitted to the mixer, the excess being withdrawn and returned to the tank.

S. PEXTON.

Manufacture of artificial fuel. M. F. MAGINNIS (U.S.P. 1,615,463, 25.1.27. Appl., 25.9.26).—Powdered or granular bituminous coal and finely-divided coke are heated and mixed with a hot solution of starch and glue, and then with hot alum solution. S. PEXTON.

Production of compact [metallurgical] coke from peat. GEWERKSCHAFT GEVENICH (G.P. 435,305, 13.11.24).—Coke suitable for metallurgical use is obtained by coking peat which has been dried in the usual way, and then subjected to electro-osmosis to remove further quantities of water. L. A. COLES.

Distillation of solid fuel. P. E. H. FORSANS (F.P. 609,814, 2.5.25).—The fuel falls gradually through a preheating zone, a distillation zone, and a zone for cooling the coke, in a vertical retort. L. A. COLES.

Fuel-distilling apparatus. F. E. HOBSON (U.S.P. 1,614,028, 11.1.27. Appl., 26.11.23).—In a cylindrical vertical retort externally heated is suspended a concentric, louvred gas collector, which is flexible and capable of being collapsed or extended vertically. The fuel to be distilled is fed into the top of the retort, and occupies the annular space between the gas collector and the retort walls, down which it travels. S. PEXTON.

Manufacture of adsorbent carbon. O. L. BARNEBEY and M. B. CHENEY (U.S.P. 1,614,707, 18.1.27. Appl., 14.2.25).—The temperature of activating carbonaceous material with steam is regulated so that the gaseous reaction products contain more carbon dioxide than carbon monoxide. S. PEXTON.

Method and apparatus for the manufacture of carbon black or lamp-black. E. B. BIRD, Assr. to J. W. TRIESCHMANN (U.S.P. 1,616,409, 1.2.27. Appl., 19.1.26).—Smoke from the combustion of carbonaceous material is passed through ducts with alternately contracted and expanded sections. The velocity of the smoke maintained in the contracted sections is sufficient to cause rapid expansion in the other sections, with deposition of the carbon black. S. PEXTON.

Manufacture of decolorising carbons from vegetable materials. O. L. BARNEBEY (U.S.P. 1,614,913, 18.1.27. Appl., 23.3.21).—Vegetable materials are carbonised with the recovery of by-products. The carbonised material is heated in the presence of chlorine, whereby the impurities are removed, some of them being volatile, and the others are extracted as soluble chlorides. S. PEXTON.

Revivifying process for carbons. F. B. ARENTZ, Assr. to U.S. INDUSTRIAL ALCOHOL CO. (U.S.P. 1,616,073, 1.2.27. Appl., 25.10.24).—Carbon used in the purification of ethylene is revived by exposure to live steam, and subsequently to a non-oxidising gas for the removal of condensed steam and odorous vapours. S. PEXTON.

Process and apparatus for distilling or cracking hydrocarbons and purifying the vapours. GRAY PROCESSES CORP., Assees. of T. T. GRAY (E.P. 249,871, 24.3.26. Conv., 24.3.25. Cf. E.P. 222,481; B., 1926, 230).—The process for removing unstable constituents from

hydrocarbons in the vapour phase by passage through catalysts causing polymerisation of such substances is modified by utilising a portion of the condensed vapours (simultaneously with the passage of steam) for cleansing the catalyst, condensation in the catalytic tower being so adjusted as to render the cleansing of the catalyst simultaneous with its use for purifying the vapours.

C. O. HARVEY.

Method and apparatus for distilling mineral oils, tar, and the like. R. NEUMANN and L. STEINSCHNEIDER (E.P. 257,257, 11.8.26. Conv., 22.8.25).—In a vacuum still, fired from below, when the vacuum gauge registers only 5 mm. pressure, the actual pressure at the heating surface may be as much as 100 mm. owing to the pressure exerted by the column of oil, and the oil therefore boils at a correspondingly higher temperature. In the present invention, cracking due to this cause is prevented by pumping oil from the bottom of a vacuum still through a pipe line into trays situated inside the still above the oil level, the conditions being so adjusted that vaporisation occurs only in the trays, the excess of oil overflowing back into the still. The still may be heated externally, internally by means of steam pipes, or by the insertion of a heater in the trays. The trays may be replaced by an oil distributor situated just below the level of the oil in the still.

C. O. HARVEY.

Distillation of hydrocarbons. A. M., G., T., and H. OFFERMANN (G.P. 435,575, 11.6.20).—Wet steam is passed into mixtures of hydrocarbons boiling under atmospheric pressure, and the vapours are fractionated, e.g., into benzol, gas oil, and machine and cylinder oil.

L. A. COLES.

Production of low-temperature tar from bituminous shale. A. PFAFF (G.P. 435,210, 6.3.20).—Fixed carbon in shale residues is burnt away as completely as possible in a continuously operated shaft furnace, the combustion gases being used for distilling fresh shale.

L. A. COLES.

Apparatus for separating oil, benzol, and similar liquids from waste water. J. ANDRESEN (G.P. 434,795, 12.2.25).—The apparatus comprises settling and separating compartments, and the overflow of the latter is provided with a valve which is closed automatically by the lower density of the benzol-oil layer, to prevent these escaping with the water.

L. A. COLES.

Process for converting or cracking hydrocarbon oils. W. E. TRENT, Assr. to TRENT PROCESS CORP. (U.S.P. 1,619,896, 8.3.27. Appl., 27.9.24).—Charging stock is partially vaporised in a heat interchanger, and the vapours, having been raised to a cracking temperature by compression, are passed back to the heat interchanger to supply heat for vaporising the charging stock.

C. O. HARVEY.

Process and apparatus for cracking petroleum oil. G. EGLOFF and H. P. BENNER, Assrs. to UNIVERSAL OIL PRODUCTS CO. (U.S.P. 1,619,921—2, 8.3.27. Appl., [A] 13.12.20; [B] 1.9.20. Renewed [A] 9.6.26, [B] 2.9.26).—(A) The oil is cracked under pressure by passage through a heated zone, and is delivered through a transfer line in a substantially liquid form to an expansion chamber. The vapours removed from this chamber at the end remote from the transfer line are subjected to

reflux condensation, the condensate passing back to the transfer line and thence, after mixing with the heated oil, to the expansion chamber. (B) In an apparatus for treating oil by the above process a cylindrical vaporising chamber and still member are arranged to rotate in unison, and are fitted with non-rotating ends carrying influx and efflux tubes, the transfer line, and outlets for the discharge of vapour and residuum.

C. O. HARVEY.

Apparatus for treating petroleum oil. H. J. HALLE, Assr. to UNIVERSAL OIL PRODUCTS CO. (U.S.P. 1,619,929, 8.3.27. Appl., 1.9.20. Renewed 18.9.26).—In an apparatus for cracking petroleum, a coil located in a furnace, and through which oil passes continuously, is also heated internally by an inner coil carrying flue gases, the annular oil passage between the coils being maintained by means of spirally arranged spacing lugs, which also act as baffles for the oil.

C. O. HARVEY.

Process and apparatus for treating oils. L. C. HUFF, Assr. to UNIVERSAL OIL PRODUCTS CO. (U.S.P. 1,619,977, 8.3.27. Appl., 3.7.24).—The oil undergoes preliminary heating in a number of streams during its initial flow through a heating zone, and, after uniting the streams, the rate of flow during the final heating is increased.

C. O. HARVEY.

Process and apparatus for refining petroleum. F. A., and J. A. MILLIFF (U.S.P. 1,620,163, 8.3.27. Appl., 11.1.26).—Hydrocarbon vapours, obtained by heating petroleum, are cooled to a predetermined temperature and caused to expand suddenly and rotate at an accelerating speed to separate out condensate formed during the cooling process. The collected condensate communicates with the vapour mixture, the latter imposing a partial vacuum upon the former.

C. O. HARVEY.

Bleaching cracked oils and oils produced by catalytic processes. A. MAILHE (F.P. 610,498—9, 15.5.25).—The oils are heated for about 1 hr. with stannous chloride under a reflux condenser, decanted off, washed with dilute sodium carbonate solution, and rectified by distillation.

L. A. COLES.

Process and apparatus for removing wax from oil. S. H. HALL, Assr. to DE LAVAL SEPARATOR CO. (U.S.P. 1,616,041, 1.2.27. Appl., 20.2.23).—Streams of waxy oil and a diluent, e.g., benzine, are fed preheated into separate compartments of a well from which the two are separately withdrawn in regulated quantities and mixed. The heated product is caused to exchange its heat with the oils flowing into the well, and is finally chilled by contact with coils containing cooled brine. The wax separates from solution and is removed by centrifuging the oil.

S. PEXTON.

Oil composition. A. A. SOMERVILLE (U.S.P. 1,617,826, 15.2.27. Appl., 19.6.26).—The addition of 0.5—1% of diacetoneamine, triacetoneamine, or similar compound, obtained by the condensation of a ketone with a nitrogenous base, to petroleum lubricating oil, increases the stability of the latter, and renders it more suitable for use as a lubricant at high temperatures, and as a transformer oil.

T. S. WHEELER.

Oxidation of paraffin hydrocarbons. I. G. FARBENIND. A.-G., Assees. of M. LUTHER (G.P. 434,923,

19.8.22. Addn. to G.P. 405,850; B., 1925, 179).—In the prior process, temperature control is improved by the use of aluminium or its alloys as filling materials for the reaction chamber. S. S. WOOLF.

Manufacture of highly-active charcoal. O. ERNST and O. NICODEMUS, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,621,195, 15.3.27. Appl., 9.7.23. Conv., 15.7.22).—See E.P. 200,839; B., 1924, 326.

Bitumen emulsions (U.S.P. 1,615,303 and 1,616,904).—See IX.

Insulating electric currents (E.P. 244,068).—See XI.

Lubricating oils (E.P. 250,947).—See XII.

Decolorising medium (U.S.P. 1,618,149).—See XVII.

Methane (E.P. 244,076).—See XX.

III.—TAR AND TAR PRODUCTS.

Apparatus for the determination of phenol and pyridine [in tar oils]. R. KATTWINKEL (Chem.-Ztg., 1927, 51, 159).—The apparatus is made in two sizes, a larger one for the determination of phenols and a smaller finely-graduated size for pyridine bases. It consists of a large upper bulb closed by a stopper and connected by a graduated tube to a smaller lower bulb with run-off cock. The sodium hydroxide or sulphuric acid is filled in to the zero mark, the oil added and the apparatus reversed, bringing the contents into the upper bulb where they can be agitated. C. IRWIN.

PATENTS.

Distilling tar (E.P. 257,257).—See II.

Flotation agent (E.P. 243,383).—See X.

Insulating electric currents (E.P. 244,068).—See XI.

Drying oil from coal tar (U.S.P. 1,616,321).—See XII.

IV.—DYESTUFFS AND INTERMEDIATES.

PATENTS.

Azo dyes for wool. FARBW. VORM. MEISTER, LUCIUS, & BRÜNING (E.P. 243,758, 27.11.25. Conv., 27.11.24).—Azo dyes are formed by coupling sulphonylpyrazolone-carboxylic esters with diazo compounds, dyes derived from pyrazolones containing a benzthiazole nucleus being excluded. Very level dyeings on wool are claimed. The preparation of methyl and ethyl 1-*p*-sulphophenyl-5-pyrazolone-3-carboxylates from phenylhydrazine-*p*-sulphonic acid, and of the corresponding chlorosulphotolylpyrazolone from 3-chlorotolyl-2-hydrazine-5-sulphonic acid, is described. Other pyrazolonecarboxylic esters mentioned are derived from 2:5-dichlorophenylhydrazine-4-sulphonic acid, phenylhydrazine-2-sulphonic acid, 2-chlorophenylhydrazine-5-sulphonic acid, 3-hydrazino-5-sulphosalicylic acid. Any diazo, tetrazo, etc. compounds may be used. [Reference is directed, in pursuance of Section 7, Sub-section 4, of the Patents and Designs Acts, 1907 and 1919, to E.P. 3373/08 (B., 1909, 239) and 765/97.] C. HOLLINS.

Production of polyazo colouring matters. L. H. FLETT, Assr. to NATIONAL ANILINE & CHEMICAL CO.,

INC. (U.S.P. 1,616,850, 8.2.27. Appl., 2.4.26).—Resorcinol is coupled with three molecular proportions of diazotised aromatic amines, which may or may not be different, and of which at least one contains a carboxylic or a sulphonic acid group. The products dye animal fibres and other substances yellow to orange to brown shades. *E.g.*, diazotised sulphanilic acid (2 mols.) is coupled with resorcinol (1 mol.), and the product is coupled with diazotised xylidine (1 mol.) to yield a *dye* which gives brown shades on sumac or chrome-mordanted leather, and chocolate shades on wood. T. S. WHEELER.

Dyed lacquers (Swiss P. 115,116).—See XIII.

Dyeing inks (F.P. 608,903).—See XIII.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Technical use of chlorine for the decomposition of raw vegetable fibres. P. WAENTIG (Papierfabr., 1927, 25, 144—148).—A reply to criticisms by Wenzl (B., 1927, 69) of the author's measurements of the heat evolved during the treatment of vegetable fibres with chlorine water and with gaseous chlorine. In the latter process the results vary with the moisture content of the fibre, owing to the formation of hydrochloric acid which at high concentrations affects the course of the reaction. Moisture must, however, be present for the reaction to proceed, and as far as the yield and properties of the cellulose obtained are concerned there is no fundamental difference between the two processes. Wood cellulose can be isolated by the chlorine method provided that the wood is finely divided before chlorination. W. J. POWELL.

[Decomposition of raw vegetable fibres by chlorine.] H. WENZL (Papierfabr., 1927, 25, 148—149).—The conclusions of Waentig (cf. preceding abstract) are not confirmed by the author's large-scale experiments. W. J. POWELL.

Deterioration of abaca (Manila hemp) fibre through mould action. F. B. SERRANO (Philippine J. Sci., 1927, 32, 75—101).—Deterioration is due to the action of cellulose-digesting organisms, *e.g.*, *Aspergillus*, *Penicillium*, *Chaetomium*, the growth of which is favoured by damp, poor cleaning, long storage, inadequate ventilation, and lack of care in handling. S. I. LEVY.

Steeping process. Constituents of cotton soluble in water or dilute mineral acids, and effect of their removal on subsequent scouring. R. G. FARGHER, L. R. HART, and M. E. PROBERT (J. Text. Inst., 1927, 18, T 29—45).—The weight lost by different cottons on thorough treatment with cold dilute mineral acids varies from 1½% to over 4%. American, South American, and Egyptian cottons usually lose 2—3% in weight, whilst Sea Island cottons exhibit lower and many native Indian cottons higher losses. With water, the losses are generally slightly lower than with acids. In both cases they increase slowly as the temperature is raised. After treatment with dilute mineral acids, the residual mineral matter is invariably lower than 1%. Hydrochloric and sulphuric acids show no significant difference, but with acetic acid elimination is rather less thorough. Water is less effective than acids, and there usually remains from 0.15 to 0.25%, the ash alkalinity being

correspondingly high. The reduction in nitrogen content is exceedingly variable, and tends to be greater with dilute acids than with water. In the removal of reducing substances, the effects of water and of dilute mineral acids appear to be identical, the copper numbers of the grey yarns falling usually to 0.3–0.5. There is no correlation between the fall in the copper number and either the total or the non-nitrogenous organic matter removed during the steep. Within the limits set by possible tendering of the cotton, treatment with mineral acids causes no observable hydrolysis of the fat and wax, but merely liberates a proportion of the small amount of fatty acids initially present as insoluble soaps. The results are discussed in relation to the analytical control of the steep. Except when the grey material contains china clay or other insoluble inorganic substances, large-scale treatment with water or enzyme preparations should reduce the ash content to approximately 0.25%, and the ash alkalinity accordingly, whilst still lower values should characterise a successful acid steep. The copper number after an efficient steep will generally vary between 0.3 and 0.5. The value of the nitrogen content test is confined principally to cases where hydrolysis of nitrogenous constituents is suspected. Experiments on the relative tendering of grey and scoured yarns by acids indicate that the grey yarns are attacked a little more slowly. A water steep prior to the scour yields an appreciably better final result, the elimination of fat and wax being more complete, the methylene blue absorption lower, and the "white" superior. Treatment with acids is superior to treatment with water in producing these effects. The action of a number of typical enzyme preparations on cotton is almost identical with that of water under similar conditions.

J. C. WITHERS.

Moisture relations of cotton. Absorption of water by cotton mercerised with and without tension. A. R. URQUHART (J. Text. Inst., 1927, 18, T 55–72).—One effect of tension during mercerisation is to decrease the moisture regain of the cotton from the value for cotton mercerised loose and therefore, presumably, its absorptive capacity generally. This effect is less pronounced and the variability of the material is less when using more concentrated alkali. The mercerisation ratio (ratio of moisture content of mercerised to unmercerised cotton) fell from 1.37 to 1.10 on applying tension when using 15% caustic soda, but only from 1.22 to 1.16 in 35% alkali. A slight tension is sufficient to bring about the full reduction, so that small variations in the tension usually applied in mercerisation are not likely to cause much variability in the absorptive capacity of the product. There were noticeable improvements in lustre, however, by increasing the tension, after the effect on the absorptive capacity had become negligible, and 15% caustic soda gave more lustrous yarn than 25%.

J. C. WITHERS.

Examination of the process of sizing cotton yarns on an experimental tape frame. F. D. FARROW and E. H. JONES (J. Text. Inst., 1927, 18, T 1–24).—A tape frame is described which accommodates only about 20 ends of yarn. With this machine it is possible to perform sizing experiments covering all sorts of conditions without much risk of obtaining results which would be different

from those of works experience. Experiments on (a) the relation between the compactness of a yarn (as governed by twist and grade of lint) and the amount of size picked up; (b) the sizing of yarns of different counts and (c) of different cottons spun to equal counts and twist; (d) the effects of size concentration and (e) viscosity; (f) the effect of the speed of the machine; and (g) the effect of the nature of the cloth covering the sizing roller and also the roller pressure were made. For the purpose of deciding many questions relating to penetration, use is made of cross-sections of the warps, stained with iodine. The results are discussed in a general review of the process of sizing in which the influences of the yarn properties (nature and extent of the surface), the size properties (concentration and viscosity), and the mechanism of the machine (roller covering, pressure, drying systems) are analysed.

J. C. WITHERS.

Chlorination of wool. J. B. SPEAKMAN and A. C. GOODINGS (J. Text. Inst., 1926, 17, T 607–614).—Examination of the chlorination of woollen cloth, and the shrinkage in area on subsequent milling with soap or dilute sulphuric acid, led to the view that the "unshrinkable finish" obtained was due to the formation of a layer of jelly between the unattacked cortex and the cuticle of the wool by the consecutive actions of chlorine and soap or soda, and that this layer and its surrounding scales are easily removed by friction and render the "unshrinkable" wool bad for wear. An improvement in this respect can be effected by hardening the jelly layer to the unattacked part of the cortex, the best method being by chrome mordanting. The practical difficulty in the way of attaining absolute unshrinkability is that of securing uniform chlorination of all the fibres.

J. C. WITHERS.

Action of ammonia on wool. H. E. FARRAR and P. E. KING (J. Text. Inst., 1926, 17, T 588–590).—The removal of sulphur from wool by heating with periodically replenished solutions of ammonia in sealed tubes at 50° or 70° was investigated. Sulphur was determined in the original cloth by fusion with sodium peroxide in a bomb as used for coal, and in the ammoniacal extract after oxidation with bromine water. In an extreme case the sulphur content fell from 3.9% to 2.0%, and about 14% of the wool substance was dissolved. The use of lime water, renewed daily, did not reduce the sulphur content below 3.3%.

J. C. WITHERS.

Action of formaldehyde on wool. H. S. BELL (J. Soc. Dyers Col., 1927, 43, 76–79).—The amount of formaldehyde taken up by wool varies directly with the concentration of the bath up to a maximum absorption with 3% formaldehyde solution; above this with increasing concentration the absorption is practically constant. After 30 min. treatment there is no increase in the amount of formaldehyde taken up by the wool. The amount taken up varies with the volume of the bath, a result typical of absorption phenomena. A large proportion of the absorbed formaldehyde is retained on drying, and of this about 55% is not removed on treatment of the fabric with 1% neutral hydrogen peroxide. Treatment with formaldehyde renders wool less liable to damage by alkali. The absorption of formaldehyde

from the bath was followed by titration with iodine; Blank and Finkenbeiner's method (B., 1899, 79, 614) is not sufficiently accurate with very dilute solutions.

R. BRIGHTMAN.

Chemical decomposition of wool at 100°. J. L. RAYNES (J. Text. Inst., 1927, 18, T 46—47).—Pure neutral wool containing moisture is attacked when heated at 100° in a sealed tube, ammonia being liberated. In a current of pure air, however, the decomposition is inappreciable unless the wool contains alkali. Normally scoured wool contains sufficient alkali to effect a considerable production of ammonia, especially if the wool is moist; in one case 0.105% N as ammonia was liberated in 1 hr. from a sample washed with soap, rinsed, and tested with 63% of moisture on the weight of the wool.

J. C. WITHERS.

Uniformity of heavy sizing in mill practice. S. M. NEALE (J. Text. Inst., 1927, 18, T 25—28).—Observations and records were taken in a mill concerned with the heavy sizing of dhootie warps and occasionally troubled with complaints of wide variations in cloth weight. The cause of the cloth falling short in weight was definitely traced in the size on the warp, and this to dilution of the size paste. Fluctuations in size concentration are shown to arise from condensation of the steam used for heating the size, combined with irregularity in size supply due to faulty operation of the automatic valve. Slight changes in temperature did not appreciably affect the amount of size picked up.

J. C. WITHERS.

Decomposition of cellulose in the soil. S. WINOGRADSKY (Compt. rend., 1927, 184, 493—497).—In continuation of earlier work (B., 1926, 975) a siliceous gel, p_H 7.0, impregnated with mineral salts, provided with nitrogen in the form of nitrate, and having a filter paper spread on the surface, has been used to isolate from soils a dozen bacterial forms, which are classified in two groups—cytophaga and vibrios. The former have a marked fibrolytic action, which converts the fibre of the paper into a transparent mucilage, the colour of which—red, orange, or yellow—is characteristic. The fibrolytic action of the vibrios, however, is less pronounced, but they spread rapidly through the paper; the course of the action is followed by the colour produced during the oxidation of the cellulose. In two cases the formation of a yellow colour soon stopped without the production of any mucilage, and the experiment could then be kept for weeks without further change. In two other cases the colour was yellowish-brown, and was accompanied by much mucilage. Another vibrio, isolated from undergrowth, transformed the paper into a swollen, brown, transparent jelly. Both groups, but especially the cytophaga, cause general autolysis of the cells. The fibres swell and lose their structure, while the microbes, also swollen, retain for a time the shape of the fibres, and then gradually disappear, leaving no spores, but only a few small grains. Unlike the anaerobic bacteria, these microbes evolve no gas and produce no volatile fatty acids; on the other hand, the siliceous gel becomes alkaline owing to the absorption of the nitrate ions. In most cases the cellulose is transformed into a mucilage which is soluble in dilute alkali.

J. M. GULLAND.

Alkali-cellulose. IV. E. HEUSER (Cellulosechem., 1927, 8, 31—32).—Polemical. A solution containing 16% of sodium hydroxide has the greatest swelling action on cotton cellulose, and converts it quantitatively into the alkali-cellulose derivative, whilst for ramie, artificial silk, and wood cellulose the concentration required is about 12%. The swelling of cellulose takes place even in presence of considerable quantities of alcohol (cf. B., 1927, 40).

W. J. POWELL.

Pulping of Scottish pinewood by the sulphite process. E. HÄGGLUND (Cellulosechem., 1927, 8, 25—31).—Scottish pinewood from young trees without heartwood, or sapwood of older trees, can be utilised for the preparation of sulphite pulp, especially if a solution of magnesium bisulphite is used. The product is, however, not uniformly pulped, and still contains resin, which is dissolved to a great extent at the beginning of the boil, and is later reprecipitated on the fibre. Thus the ether extracts of the original wood and the product after 6 and 8 hrs.' boiling are 2.76, 2.0, 3.25%, respectively, the corresponding benzene extracts being 1.72, 0.16, 0.28%. Scottish pine heartwood is not suitable for use in the sulphite process, as the product is not well pulped, and contains badly-boiled wood chips with high resin content. The resin can be removed from the wood by extraction with benzene or ether, but unless the solvent is removed completely from the extracted heartwood the latter is less amenable to treatment than before extraction. This is not due to the dehydration and hardening of the cell membrane by the solvent, since if the solvent used is completely removed by washing the extracted wood with acetone before boiling with bisulphite, a white, uniformly pulped product results. The strength of the fibre is not appreciably affected by the extraction process, although the fibre from benzene-extracted wood is slightly more brittle than that from unextracted wood. Pinewood can be dried at 70° before boiling without affecting the yield or the "bromine number" of the pulp, or the strength of the fibre, except for a slightly increased brittleness as shown by the folding test. The yield of pulp in the soda process from Scottish pine heartwood is uninfluenced by extraction of the wood with benzene, but if the solvent is removed by means of acetone before boiling, the pulping takes place more rapidly and the product is more uniform.

W. J. POWELL.

Chlorine consumption of wood pulps. A. EHRENFRIED (Papierfabr., 1927, 25, 130—131).—A modification of the Schwalbe-Sieber method for determination of the chlorine consumption value of wood pulps is proposed. After treatment for 1 hr. at 20° of 5 g. of the pulp with bleach liquor equivalent to 6% of active chlorine on the weight of the cellulose, 50 c.c. of the residual liquor are treated with 20 c.c. of 0.1N-arsenious acid solution and 3—5 drops of methyl orange added. The solution is treated with 10—15 c.c. of strong hydrochloric acid and titrated with 0.1N-potassium bromate solution. The discharge of the pink colour, due to the liberation of bromine, indicates the oxidation of the excess of arsenious acid.

J. F. BRIGGS.

Universal method for converting fibroin, chitin, casein, and similar substances into the ropy-plastic state, and into the state of colloidal solution

by means of concentrated aqueous solutions of readily soluble salts, capable of strong hydration. P. P. VON WEIMARN (J. Text. Inst., 1926, 17, T 642—644).—See B., 1927, 136.

PATENTS.

Manufacture of waterproofing compositions. NAUGATUCK CHEMICAL CO., ASSEES. OF A. F. OWEN (E.P. 251,961, 21.4.26. Conv., 7.5.25).—A water-insoluble and water-repellant saponification product of a metal (e.g., aluminium, zinc, or lead) with various resins or with stearic, oleic, or palmitic acids, with or without a filler, e.g., whiting, is mixed in the dry form either with an aqueous solution of a colloid, such as glue, or with water and ground in a mill. The product is stirred into a water dispersion of rubber latex (vulcanised or unvulcanised), or of any artificial rubber, and, if necessary, an oil or rubber softener in the form of a water emulsion is added. The product is specially suitable for paper. B. P. RIDGE.

Waterproofing vulcanised fibre. E. E. NOVOTNY and C. J. ROMIEUX, ASSRS. TO J. S. STOKES (U.S.P. 1,616,062, 1.2.27. Appl., 4.9.23).—Cellulosic material is impregnated with a synthetic resin, e.g., a phenol-furfuraldehyde resin (cf. U.S.P. 1,398,146; B., 1922, 66 A), and, after immersion in water, is treated with a solution of zinc chloride, washed, heated, and pressed. T. S. WHEELER.

Washing and cleaning preparations [for textiles]. BADISCHE ANILIN- U. SODA-FABR. (E.P. 244,104, 3.12.25. Conv., 5.12.24).—Sodium isopropyl-naphthalene- β -sulphonate (3 pts.) in water (7 pts.) is mixed with a "synthol" fraction (3 pts.) of b.p. 145–165° (isobutyl and higher alcohols); or an aqueous solution of a syntan (e.g., formaldehyde-cresolsulphonic acid) is mixed with cyclohexanol. The claims cover mixtures of aromatic (excluding hydroaromatic) sulphonic acids, having more than 10 carbon atoms in the molecule, with higher aliphatic alcohols, including alicyclic alcohols when the sulphonic acid has tanning properties. C. HOLLINS.

Manufacture of artificial light filters. C. HOLUB (E.P. 265,455, 13.7.26).—Silk or artificial silk fabric is washed with soapy water, hardened by dipping it into 50–60% formaldehyde or a dilute aqueous solution of alum, tannic acid, gallic acid, or potassium dichromate, and dried. It is then coated with a viscous colloidal substance such as gelatin, agar-agar, etc., to which a saturated solution of copper sulphate or chloride is added to colour it, and, while still wet, is exposed to formaldehyde fumes until the film coating is rendered insoluble. The filter is preserved by hermetically enclosing it in a transparent casing. B. P. RIDGE.

Artificial textile products. H. DREYFUS (U.S.P. 1,616,787, 8.2.27. Appl., 5.2.25. Conv., 29.3.24; cf. E.P. 209,125; B., 1924, 213).—Cellulose acetate or other cellulose derivative is dissolved in a low-boiling solvent, e.g., formaldehyde or acetaldehyde, containing a higher-boiling precipitant, e.g., benzene or alcohol, and the solution is spun into an evaporative atmosphere. A homogenous filament is obtained. T. S. WHEELER.

Weighting natural silk. R. CLAVEL (E.P. 266,640,

11.11.26. Conv., 17.9.26).—Substances which interact to form an insoluble weighting compound (e.g., stannic chloride and sodium phosphate) are applied to the silk in the same bath which also contains one or more agents which hinder precipitation, e.g., acids, acid salts in relatively high concentration, or such protective colloids as glue, gelatin, soap, etc. The weighting process is thereby considerably shortened and intermediate washings of the fabric are avoided. The colloid protects the silk from injurious acid attack, and may be applied separately before weighting. If necessary, two or more weighting baths may be used, without intermediate washing of the fabric, the latter being finally squeezed and treated with an alkaline solution such as ammonium carbonate to which substances containing tannin may be added for subsequent dyeing purposes. B. P. RIDGE.

Production of weighted artificial silk. E. CADGENE, ASSEE. OF G. RIVAT (E.P. 259,899, 11.1.26. Conv., 15.10.25).—Cellulose acetate silk is treated with a gelling agent (15–20% formic or acetic acid), drained, steeped in a heavy-metal salt solution, e.g., stannic chloride, washed, again gelled, and the tin fixed by means of a sodium phosphate bath at 40–45°; finally, the material is washed and soaped. Alternatively, gelling and weighting may take place simultaneously by the addition of acetic acid to the stannic chloride solution. From 30 to 100% weighting may thus be obtained, the material remains soft and lustrous, and has an increased affinity for certain dyestuffs. B. P. RIDGE.

Degreasing raw wool etc. A. M. BRUCKHOFF (E.P. 266,436, 23.11.25. Addn. to E.P. 241,314; B., 1926, 9).—Instead of acetone, other mild grease solvents, such as methyl acetate, methyl alcohol, etc., or mixtures thereof (e.g., wood spirit) which are soluble in water in the ratio of at least 1:10 by wt. are used. Raw wool or wool waste containing fat or mineral oil is dried until it contains only 2–3% of moisture, extracted with the solvent at a temperature below its b.p., and subsequently washed with water, the solvent and dirt being thereby removed. Potassium compounds are recovered from the washing water. B. P. RIDGE.

Manufacture of pulp or fibrous material. R. A. MARR, and RAMAR SYNDICATE, INC. (E.P. 266,168, 24.4.26).—Cellulosic or ligneous material is digested with 0.05–3.5% solutions of the sulphates, chlorides, or nitrates of the alkali, alkaline-earth, or earth metals (except zinc), or combinations of these, at 30–120 lb. excess pressure per sq. in., the intercellular cementitious material being thus rendered friable and removable by washing after the product has been crushed. The product is finally pulped by passing through a beater. The cementitious material is filtered off and pressed into moulds, or may be mixed with resinous or sizing materials before being moulded. B. P. RIDGE.

Decomposition of cellulosic materials. G. MEUNIER (F.P. 609,191, 28.11.25).—Wood or straw is decomposed when warm by means of steam (mixed, if necessary, with other vapours or gases), acid, and neutral solutions, and, if required, oxidising or reducing agents. The gaseous products, besides lignin, acetic and formic acids, furfuryl and methyl alcohols, acetone, and ferment-

able sugar, are recovered. The treatment gives results equal to those obtained by means of mineral acids.

B. P. RIDGE.

Treatment [precipitation] of cellulose. K. B. HEBERLEIN (F.P. 610,417, 29.1.26).—Cuprammonium cellulose solutions are subjected to electrolytic treatment to remove the metallic constituents. L. A. COLES.

Production of cellulose product. H. H. CLARK, Assr. to CLARK FIBRE PRODUCTS CORP. (U.S.P. 1,618,572, 22.2.27. Appl., 8.3.24).—Cellulose fibre is saturated with a mixture of 100 pts. by wt. of an aqueous solution of zinc chloride, *d* 2 (approx.), and 3–10 pts. of phosphorus oxychloride. The mass is compacted and the liquid gradually removed from it by successive washings in progressively weakened baths of the same solution. The product (*d* over 1.25), containing about 0.1% of added compounds, is semi-plastic under stress, and has useful mechanical properties.

B. P. RIDGE.

Manufacture of cellulose acetate. L. A. LEVY and O. SILBERRAD (E.P. 265,267, 7.8.26).—Cellulose is treated with a mixture of acetic acid and acetic anhydride in the presence of chromium as a catalyst. The metal may be present as acetate, sulphate, butyrate, or in any other form capable of producing salts with the acetylating mixture.

B. P. RIDGE.

Coating articles with cellulose acetate. F. T. RIDLEY (E.P. 265,257, 28.9.25).—Cellulose acetate in the form of sheets or tubes is treated with an acetone-water or an alcohol-water solution until it is of the consistency of indiarubber, stretched over the object to be covered, and allowed to harden. The former solution contains, by volume, 75–55 pts. of water, 25–45 pts. of acetone, and sufficient ether to saturate it, the latter containing about 70 pts. of water, 30 pts. of alcohol, and 15 pts. of ether, a small quantity of soap being added in each case if desired. Solutions which have deteriorated through use are revived by heating them to below the b.p. of the lowest-boiling constituent.

B. P. RIDGE.

Cellulose acetate products. I. G. FARBENIND. A.-G. (Swiss P. 115,676, 8.4.25. Conv., 29.4.24).—Material capable of acting as a solvent or swelling agent for cellulose acetate, *e.g.*, acetone or formaldehyde, is added to the precipitation bath.

L. A. COLES.

Manufacture of benzylcelluloses. W. CARPMAEL. From I. G. FARBENIND. A.-G. (E.P. 265,491, 1.10.26).—Crude benzylcellulose is purified by mixing with a water-soluble salt (preferably of the alkali or alkaline-earth metals, *e.g.*, sodium chloride), extracting the impurities with a solvent, or a succession of different solvents, *e.g.*, benzene, ethyl alcohol, acetone, and finally washing out the residual salt with water. Alternatively, the impurities are only partly removed before washing out the salt and the remainder extracted afterwards.

B. P. RIDGE.

Process and apparatus for making paper etc. C. H. ALLEN (U.S.P. 1,620,860, 15.3.27. Appl., 11.1.26).—The consistency of certain stock ingredients, such as ground wood pulp, is automatically controlled and maintained near the source of supply. The material is continuously delivered to a common stream where

mixing occurs, and a continuous flow is maintained direct to the paper-making machine. B. P. RIDGE.

Manufacture of decorated paper, or similar material. V. LEFEBURE (E.P. 265,334, 7.12.25).—A mixture of a phenol- or carbamide-formaldehyde synthetic resin (in the form of a solution, syrup, or powder) with a colouring matter is printed or stencilled on to the entire surface of the paper, which may or may not have been previously impregnated with a solution of the resin; the paper is dried below 100°, pressed, and finally heated at a higher temperature to cure the resin. Such paper may be cured on to a backing of asbestos cement.

B. P. RIDGE.

Paper sizing. J. A. DE CEW, Assr. to PROCESS ENGINEERS, INC. (U.S.P. 1,621,399, 15.3.27. Appl., 11.4.23).—Rubber emulsions are coagulated on to paper-making fibres while preparing the stock for the paper machine by mixing the emulsions with the fibres in the presence of precipitated aluminium hydroxide.

B. P. RIDGE.

Non-inflammable lacquers for fabrics (E.P. 243,031).—See XIII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

PATENT.

Production of Aniline Black reserves by means of vat dyes. E. ZEIDLER (Austr. P. 103,622, 29.12.23).—The vat dye is printed according to the soda-potash-hydrosulphite process with addition of zinc oxide and sodium acetate on the unprepared goods, which are then treated in an air-free Mather-Platt machine with wet steam until the vat dye is completely vatted, and are finally entered into the Prudhomme Aniline Black bath, to which may be added *p*-phenylenediamine. The reserves are fast to light and washing. C. HOLLINS.

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

By-product hydrochloric acid. Its use in the extraction of phosphate rock. E. J. Fox and C. W. WHITTAKER (Ind. Eng. Chem., 1927, 19, 349–353).—American-produced potash is largely potassium chloride. As the sulphate is preferred for some purposes and commands a higher price per unit of K_2O , it is proposed to convert the chloride into sulphate and utilise the hydrochloric acid produced in the extraction of phosphate rock. Florida pebble phosphate has the composition $Ca_3P_2O_8 \cdot 3CaO$. On dissolution in hydrochloric acid a mixture of phosphoric acid and monocalcium phosphate is produced, the maximum concentration of phosphorus in solution occurring when half of it is in each form. To convert the solution into dicalcium phosphate lime must then be added. It is calculated that 100 tons of rock require the addition of 57 tons of hydrogen chloride and 33 tons of calcium carbonate, the products being 60.5 tons of dicalcium phosphate and 80 tons of calcium chloride. Phosphate rock cannot be used to neutralise the acid solution, the rate of reaction being very slow. If calcium carbonate is used, part of the phosphate is converted into the tricalcium salt. It is therefore proposed to precipitate the solution with milk of lime.

Experiments in support of these conclusions are described. The milk of lime precipitate contains about 40% P_2O_5 , only traces of which are citrate-insoluble. C. IRWIN.

Instability and explosiveness of bleaching powder and calcium hypochlorite. H. KAST and L. METZ (Z. Elektrochem., 1927, 33, 21—39).—The following materials were examined: (1—3) commercial bleaching powders containing respectively 36.5%, 32.5%, and 20% of active chlorine; (4) chemically pure bleaching powder, free from carbonate, containing about 42% of active chlorine; and (5) "Perchlaron," a technical calcium hypochlorite containing 68.1% of available chlorine. The free lime (including carbonate) in these five materials was about 11.7, 20.6, 34.7, 14.0, 13.6% CaO respectively. The behaviour of the materials was examined under the following conditions: (A) Heated in glass tube over flame. (B) Heated in glass tube for 1 hr. at various constant temperatures between 56° and 135° and the amounts of chlorine and oxygen evolved determined: (1) and (4) are most easily decomposed, yielding much more chlorine than oxygen; (2) decomposes less but yields a larger proportion of oxygen; (5) is still more stable and gives more oxygen than chlorine; (3) is the most stable and evolves oxygen only. (C) Heated at constant temperature of 79° for long periods: only (1) gives notable amounts of chlorine, but all give off oxygen, the amount increasing in the order (3), (1), (5), (2). (D) Effect of moisture on decomposition during 1 hr. at various constant temperatures: the rate of decomposition is increased, particularly with (5), which now evolves a large proportion of chlorine. (E) Carbon dioxide passed through a column of the material at room temperature: no oxygen was obtained in any case; the amount of chlorine obtained from (1) was generally large, but varied enormously with different samples; (4) gave less chlorine than was obtained from any sample of (1); (2) gave intermediate amounts, but (3) gave none. With moist carbon dioxide, decomposition was much more considerable for (1) and (2), and was detectable for (3). Hence exposure to the atmosphere can greatly accelerate the decomposition of bleaching powder. (F) Sensitiveness of mixtures of bleaching powder or Perchlaron with benzene, tetralin, mineral oil, sawdust, wood charcoal, iron oxide, or iron powder, towards rise in temperature, exposure to an open flame, and subjection to mechanical shock, was examined. Mixing a large proportion of tetralin with (1) causes vigorous action; a marked rise in temperature also occurs on mixing (1) with wood charcoal or (5) with tetralin in suitable proportions. Mixtures of bleaching powder with the various materials specified are generally not sensitive to an open flame (a combustible addition agent merely burns off), nor do they exhibit any definite explosion phenomena when subjected to a hammer blow. Perchlaron mixtures, however, are very sensitive to flame; mixtures with tetralin or mineral oil burn like black powder, and also behave as weak explosives when struck by a drop hammer. Detonation in a lead cylinder or an iron tube shows that neither bleaching powder, Perchlaron, nor Perchlaron + 8% of tetralin is really explosive, but Perchlaron + 8% of mineral oil has a notably explosive character, though not as great as

that of black powder. Mixtures of (1) with wood charcoal or with tetralin in large proportions undergo vigorous decomposition and the gases produced soon burst a closed container. It is concluded that neither high-grade bleaching powder nor Perchlaron is to be regarded as an explosive, but merely as an oxygen carrier comparable with potassium nitrate and less active than potassium chlorate; they differ from these salts in giving up their oxygen at lower temperatures, though at ordinary temperatures they are fairly stable, and their stability is increased by the presence of free lime. In spite of its higher available chlorine content, Perchlaron is safer to transport than bleaching powder, which decomposes slowly at ordinary temperature, but where contact with organic matter is possible, Perchlaron is the more dangerous. H. J. T. ELLINGHAM.

Wear on copper preheater tubes in potash plants, and the detection of traces of copper in concentrated alkali chloride solutions. G. JANDER and H. BANTHIEN (Z. angew. Chem., 1927, 40, 287—288).—Brine for the dissolution of potassium chloride is usually preheated in copper tubes surrounded by steam. The wear on these tubes is considerable, and the effect of electrical protection uncertain. In a particular works it was calculated that the solution leaving the tubes must contain 0.3—0.5 mg. Cu per litre. This copper remained in solution after the liquor was crystallised, was in the cupric state, and was scarcely precipitable by hydrogen sulphide. It was determined by precipitating, along with iron, with potassium ferrocyanide, decomposing with sulphuric acid, and proceeding by Classen's method. During the passage of the liquor through the copper tubes ferric iron is reduced to the ferrous state and the reaction $2Fe^{+++} + Cu = Cu^{++} + 2Fe^{++}$ probably occurs. The corrosion might be avoided if the solution was, previous to its contact with the copper, reduced by passing over iron borings or scrap copper.

C. IRWIN.

Industrial preparation of fluorine. P. LEBEAU (Bull. Soc. d'Encour., 1927, 126, 15—35).—Types of cell used for the preparation of fluorine since its discovery are reviewed. The earlier ones employed a platinum anode, which was rapidly corroded, in the electrolysis of hydrogen fluoride at low temperatures. Later ones used Acheson graphite as anode and worked with fused salts, such as potassium hydrogen fluoride. In this case carbon tetrafluoride is formed, the amount increasing with the temperature, the current density, and the *E.M.F.* used. The salt $KF \cdot 3HF$ melts at 56° and $KF \cdot 2HF$ at 70°, whilst the m.p. of $KF \cdot HF$ is very much higher. It is, therefore, advantageous to use the first-named salt in the fused state, as some acid may be lost without necessitating any considerable rise of temperature. Under these conditions a nickel anode is not attacked, and is employed in the author's apparatus. The cell is of copper, the walls forming the cathode. The nickel anode in the form of a cylindrical bar, the lower part of which is hollow, is supported within a copper bell which dips below the surface of the bath, and the lower part of which is perforated. When electrolysis commences, this copper bell becomes immediately covered with a coating of copper fluoride, and fluorine is henceforth produced only at the nickel. The

bell thus serves as the diaphragm. The evolved gas is removed from an outlet in the bell, and with 2.1 amp. and 30 volts the yield is 845 c.c./hr. The acidity of the bath is maintained by addition of hydrogen fluoride to the outer portion from a copper cylinder of the liquefied acid. The initial electrolyte, KF_3HF , is prepared by weighed addition of hydrogen fluoride to $\text{KF}\cdot\text{HF}$ in a copper bottle. The apparatus works smoothly, and yields of above 96% were obtained at 56°. With increase of temperature the efficiency gradually falls. The *E.M.F.* used need not exceed 8–10 volts. As anhydrous hydrogen fluoride can be easily prepared by heating dry potassium hydrogen fluoride in an apparatus entirely of copper, the laboratory preparation of fluorine is now relatively simple. The extension of the method to industry only depends on applications for the element, which may include its employment in the preparation of ozone, or, in the form of metallic perfluoride, as an oxidising agent in organic chemistry. C. IRWIN.

Twenty-five years of progress in the cyanamide industry. W. S. LANDIS (Trans. Amer. Electrochem. Soc., 1927, 51, 79–86).

Ammonia from lignite coke. HOFMANN and GROLL.—See II.

Behaviour of oxides in salt solutions. FEITKNECHT.—See IX.

PATENTS.

Manufacture of sulphuric acid. R. G. Y DE SOTTO (E.P. 265,857, 20.7.26).—An increased yield of some 30% of acid is obtained if the gases containing sulphur dioxide, prior to treatment in the Glover tower or catalyst chamber, are subjected to the action of radium emanations, and also to the influence of ultra-violet rays produced by a quartz lamp. An electrical resistance maintains a temperature of 900–1200° round the tube containing the radium or radium salt. W. G. CAREY.

Apparatus for the manufacture and delivery of hydrocyanic acid gas. H. LAINÉ (E.P. 262,423, 30.11.26. Conv., 5.12.25).—Hydrocyanic acid gas is produced safely in an apparatus consisting of a circular vessel containing acid or a reactive powder surmounted by a cylindrical vessel fitted with a gas outlet and with baffles inside to retain particles of acid which tend to be drawn along by the gases evolved. A reservoir containing a cyanide solution is situated above the cylindrical vessel, the solution being admitted to the acid container by an external tube fitted with a needle valve.

W. G. CAREY.

Production of phosphoric acid from moist producer gas containing phosphorus compounds. W. KYBER (G.P. 434,922, 29.1.26).—Sufficient air or oxygen is added at 100–1000° to the gas to convert any phosphine present into phosphorous acid, which is then heated at 400° to convert it into phosphoric acid and phosphine, the latter being returned to the process.

L. A. COLES.

Production of phosphoric acid and acid phosphates. CHEM. FABR. BERNBURG Dr. H. WAGNER & Co., and A. FINKELSTEIN (G.P. 434,985, 19.6.25).—Dialkali phosphates or alkali pyrophosphates are converted by electrolysis into alkalis and trialkali phosphates on the one hand, and into phosphoric acid and mono-alkali phosphates on the other.

L. A. COLES.

Field tube evaporator for alkali hydroxide solutions. G. SAUERBREY MASCHINENFABR. A.-G. (G.P. 435,266, 10.8.24).—The individual tubes in each group are connected in series in such a manner that the steam passes through the head to the far end of the tube and then back to the head, whence it passes to the next tube of the series. The tube heads in each series are connected with those of the series above by tubes for conveying away condensed water. A maximum heating effect is attained by widening the ends of the steam inlets.

L. A. COLES.

Catalyst for ammonia synthesis. L. H. GREAT-HOUSE (U.S.P. 1,618,004, 15.2.27. Appl., 31.3.22. Cf. F.P. 436,472; B, 1912, 432).—Ferric oxide or manganese dioxide is mixed with aluminium powder, just sufficient when the thermit reaction is initiated to fuse all the oxide, no substantial portion of which is reduced. When cold the hydroxide is ground and reduced in a current of hydrogen. The metal so obtained is an active catalyst for the synthesis of ammonia.

T. S. WHEELER.

Purifying salt [potassium alum] crystals from iron contaminants. H. P. BASSETT, Assr. to ELECTRO Co. (U.S.P. 1,616,250, 1.2.27. Appl., 27.3.25).—Potassium alum crystals which are contaminated with adhering ferrous and ferric sulphates are purified by washing first with sodium chloride solution, then with water.

T. S. WHEELER.

Production of potassium nitrate from crude potassium salts. WOLFF & Co., and F. FROWEIN (G.P. 435,155, 31.3.25).—Blanc fixe and magnesium nitrate solution for use in the production of potassium nitrate are obtained by the action of 47–49% nitric acid upon a suspension of barium carbonate in magnesium sulphate solution. The carbon dioxide liberated and sodium salts remaining after extraction of the potassium salts in the crude salts are used for the manufacture of sodium carbonate.

L. A. COLES.

Production of potassium chloride from carnallite. B. STOLLBERG (G.P. 435,212, 25.10.21).—Carnallite is extracted with hot liquor in two stages such that in the first only magnesium chloride and in the second practically only potassium chloride is dissolved. The artificial carnallite which crystallises out on cooling the liquor obtained in the first stage is treated with the second extract to dissolve out the magnesium chloride, and the solution thus obtained is used in the first stage of the extraction of fresh material.

L. A. COLES.

Production of anhydrous sodium sulphate. J. W. HILL (Can. P. 261,891, 22.6.25).—Anhydrous sodium sulphate is precipitated by heating sodium sulphate solution saturated at about 32.4°.

L. A. COLES.

Production of sodium sulphite and ammonium chloride. CHEM. FABR. KALK G.M.B.H., and H. OEHME (G.P. 434,983, 7.7.25).—Sodium sulphite formed by the double decomposition of ammonium sulphite and sodium chloride is crystallised as completely as possible from the hot solution and removed, after which the residual sodium sulphite in the solution is wholly or partially converted into sodium bisulphite, and the solution cooled to below 35°, sodium chloride being added to it.

L. A. COLES.

Saturator for the production of ammonium

sulphate. L. CHEVALET (F.P. 610,936, 15.12.25).—The apparatus consists of an inclined hemicylinder, the inner walls being of sheet lead of which the upper and lower portions are joined by bolts. The ammonium sulphate passes through the apparatus in counter-direction to the ammonia. L. A. COLES.

Production of alkali sulphates and ammonium sulphate, or their double salts. F. STEIN (F.P. 610,906, 20.10.25. Conv., 20.10, 11.11, and 23.12.24).—Magnesium sulphate and calcium sulphate and, if desired, an alkali salt, such as the sulphate or chloride, are treated with ammonia and carbon dioxide.

L. A. COLES.

Manufacture of basic calcium hypochlorites. S. URANO and S. IMAI (E.P. 266,180, 18.5.26).—Slaked lime is added to a clear aqueous solution of bleaching powder, and the solution, containing about 3% of available chlorine, is evaporated *in vacuo* to a concentration of 6.5% of available chlorine, when dibasic hypochlorite containing 45% of available chlorine separates out. The monobasic salt is obtained if the original solution is concentrated to 10% of available chlorine.

W. G. CAREY.

Manufacture of pure calcium hypochlorite. S. URANO and S. IMAI (E.P. 266,181, 18.5.26).—Dibasic calcium hypochlorite is agitated with water for 1 hr., and the insoluble calcium hydroxide separated by filtration, the filtrate being evaporated *in vacuo* until calcium hypochlorite crystals are obtained, which are dried *in vacuo*.

W. G. CAREY.

Production of calcium arsenate. H. K. MOORE, Assr. to BROWN Co. (U.S.P. 1,619,267, 1.3.27. Appl., 14.2.25).—Finely-divided arsenious acid is added to a solution containing calcium hydroxide and a substance capable of evolving nascent oxygen, the whole being constantly agitated.

H. ROYAL-DAWSON.

Manufacture of copper sulphate from precipitates containing copper. J. Y. JOHNSON. From I. G. FARBERIND. A.-G. (E.P. 266,237, 23.9.26).—Copper sulphate free from chlorine for electrolysis is obtained by dissolving the basic copper chloride precipitate in sulphuric acid, concentrating until the solution contains not more than 25% Cl, and crystallising the copper sulphate. The crystallisation of pure copper sulphate may also be effected in solutions containing not more than 10–15% Zn, or zinc sulphate may be added equivalent to the basic copper chloride, with the formation of zinc chloride and copper sulphate. W. G. CAREY.

Method and apparatus for recovering and regenerating leaching solutions. H. E. WETHERBEE, Assr. to R. F. GRANT and H. M. HANNA (U.S.P. 1,615,970, 1.2.27. Appl., 10.5.24).—The ferrous sulphate solution, obtained by leaching copper ores with ferric sulphate and precipitating the extracted copper with scrap iron, is treated with sodium hydroxide solution, the precipitate oxidised with air, and treated with sulphuric acid to yield ferric sulphate solution. The sodium sulphate solution obtained is electrolysed to give sodium hydroxide and sulphuric acid.

T. S. WHEELER.

Manufacture of aluminium chloride. F. W. HALL, Assr. to TEXAS Co. (U.S.P. 1,619,022, 1.3.27. Appl., 30.12.21).—An alumina-carbon mixture con-

taining excess of carbon is passed through a retort the mixture is treated with chlorine, and the aluminium chloride vapours are continuously removed from the retort. The excess carbon is continuously discharged into a chamber communicating with the retort where combustion takes place, the resultant hot gases heating the retort.

W. G. CAREY.

Manufacture of chromates and manganates. COMP. GÉN. DES PRODUITS CHIMIQUES DE LOUVRES, and P. PIPEREAUT (E.P. 255,078, 8.7.26. Conv., 8.7.25).—Alloys of iron with chromium and with manganese containing about 6% C, obtained by treating the ores in electric furnaces in presence of charcoal, are pulverised to pass 100-mesh and mixed in a pan or furnace with alkali or alkaline-earth carbonates and an oxidising agent, *e.g.*, sodium nitrate. The reaction is started by heating the furnace or by internal ignition, when self-combustion takes place, the reaction being completed and the molten mass stirred by blowing in air or oxygen. The mass is tapped off and dissolved in water.

W. G. CAREY.

Producing metal compounds. A. F. MEYERHOFER (E.P. 265,880, 28.5.26. Addn. to E.P. 245,719; B., 1926, 1013).—The method of producing metal compounds by the decomposition of a silicofluoride or borofluoride, described in the prior patent, is modified so that the sparingly soluble fluorides of silicon or boron are not used to produce the original silicofluoride or borofluoride, but are used to produce some other silicofluoride or borofluoride, such as the zinc compound, from which the original complex fluoride is obtained by treatment with a salt containing the required base.

W. G. CAREY.

Production of phosphorus, phosphorus pentoxide, and phosphoric acid. I. G. FARBERIND. A.-G. (F.P. 610,520, 2.2.26. Conv., 6.2.25).—The gases issuing from retorts for the manufacture of phosphorus pass through a filter chamber maintained at a temperature above the dew point of phosphorus, in which they are subjected to electrical treatment if necessary.

L. A. COLES.

Production of ozone or ozonised oxygen. H. FILZ (G.P. 435,265, 14.1.23).—The gas is formed by the slow combustion of mixtures containing salts with a high oxygen content, such as chlorates or nitrates, metal oxides, material capable of supporting and retarding combustion, binding agents, and coniferous resins with a high terpene content, moulded into a porous mass or packed in suitable containers.

L. A. COLES.

Process and apparatus for the manufacture of concentrated carbon dioxide. V. DREWSSEN, Assr. to WEST VIRGINIA PULP & PAPER Co. (U.S.P. 1,619,336, 1.3.27. Appl., 12.10.21).—Carbon dioxide in kiln or other gases is absorbed in sodium carbonate liquor in a connected series of pressure absorption tanks having agitators, the sodium bicarbonate thus formed is centrifugally separated, and the carbon dioxide recovered from a heated evaporating pan provided with a reflux condenser.

W. G. CAREY.

Manufacture of porous adsorbents. J. Y. JOHNSON. From I. G. FARBERIND. A.-G. (E.P. 266,133, 22.2.26).—Natural or artificial zeolites or slags are treated with acids to produce a jelly, or a sol which subsequently

forms a jelly, which, after complete or partial drying, is washed and gradually heated to about 220°.

W. G. CAREY.

Manufacturing nitric acid and its salts. G. KASSNER (U.S.P. 1,616,900, 8.2.27. Appl., 24.3.24. Conv., 29.3.23).—See E.P. 213,571; B., 1925, 9.

Lining for alkali recovery furnaces (U.S.P. 1,619,785).—See IX.

VIII.—GLASS; CERAMICS.

Tentative specifications for clay firebrick for malleable furnaces with removable bungs and for annealing ovens. AMERICAN REFRACTORIES INSTITUTE (Tech. Bull., 1926, No. 3). CHEMICAL ABSTRACTS.

Systems of oil burning and their possible application to the potteries. F. L. BOLT (Trans. Ceram. Soc., 1926, 25, 263—288).

PATENTS.

Refractory articles. ALUMINUM CO. OF AMERICA, Assees. of B. T. HORSFIELD (E.P. 262,403, 2.11.26. Conv., 7.12.25).—Hollow globules of a fused refractory oxide low in silica, *e.g.*, alumina or a mixture of alumina with a small proportion of other refractory oxides, are moulded under pressure with the addition of a small proportion of a suitable binder, preferably containing a relatively large proportion of the oxide forming the globules, *e.g.*, sodium or calcium aluminates. The product, after drying and firing, has a high thermal resistance and m.p. with good mechanical strength at high temperatures.

B. W. CLARKE.

Manufacture of refractory articles. CARBORUNDUM CO. LTD. From CARBORUNDUM CO. (E.P. 266,165, 9.4.26).—A porous grog is made by burning a mixture of pure kaolin clay and an organic filler, *e.g.*, wood flour, and, after grinding, 4 pts. of this porous aggregate, 1 pt. of kaolin clay, and 1 pt. of wood flour are moulded, dried, and burnt to form porous ceramic articles capable of resisting shrinkage at high temperatures.

B. W. CLARKE.

Sheet abrasive material. U.S. SAND PAPER CO., Assees. of H. JOSEPH (E.P. 252,165, 11.5.26. Conv., 12.5.25).—A flexible sheet abrasive material comprises a waterproofed flexible backing, with a suitable abrasive secured by a waterproof, varnish-like adhesive, both backing and adhesive being fireproofed with suitable agents, *e.g.*, triphenyl phosphate or ammonium sulphate.

B. W. CLARKE.

Arc shield. C. T. EVANS, Assr. to CUTLER-HAMMER MANUF. CO. (U.S.P. 1,617,515, 15.2.27. Appl., 20.4.21).—A shield of the requisite electric and heat resistance, which is not liable to crack or spall, is made by bonding silicon carbide (92%) with a semi-refractory clay (8%) into the desired form and burning. F. R. ENNOS.

Magnesite refractory. U.S. METALS REFINING CO., Assees. of A. MARKS (U.S.P. 1,616,055, 1.2.27. Appl., 8.6.26).—See E.P. 244,391; B., 1926, 586.

Electric furnace for melting glass (E.P. 249,554).—See XI.

IX.—BUILDING MATERIALS.

Behaviour of difficultly soluble metal oxides in solutions of their salts. II. Magnesium oxide cements. W. FEITKNECHT (Helv. Chim. Acta, 1927, 10, 140—167; cf. B., 1927, 73).—The desiccation curves of the solid masses obtained by mixing magnesium chloride solutions with magnesium oxide have a point of inflexion corresponding with the presence in the partially dried mass of 6 mols. of water per mol. of magnesium chloride in addition to the water required to convert the oxide into hydroxide. For the crystallised oxychlorides the corresponding figure was 4.4—6.7. On rehydration, those specimens take up most water which contained most originally. If the solid cement is immersed in a 5N- or 8N-magnesium chloride solution, magnesium chloride is taken up relatively rapidly at first, then more slowly, the rate of absorption in this latter stage being the more rapid the less the amount of chloride originally present in the cement. After some time fine crystals appear near the cement, indicating that the chloride-oxide mixture contains even after setting unchanged oxide, which first dissolves in the concentrated chloride solution and then separates out as oxychloride. The smaller the amount of water used to mix the cement, the greater is its hardness when set, as measured by the load necessary to break a cylinder of it supported horizontally at its two ends. The concentration of the magnesium chloride used to mix the cement must exceed a certain minimum value, which depends on the physical state of the oxide used, for setting to occur at all. With increase in the concentration beyond this value, the hardness of the cement increases at first rapidly and subsequently more slowly. For a given composition of the initial mixture, the hardness of the cement varies considerably with the fineness and mode of preparation of the oxide; in general the fine-grained oxide prepared from the oxalate yields the hardest masses. With increasing temperature, the minimum chloride concentration which will produce hardening increases. The hardening powers of the magnesium salts decrease in the order: chloride, bromide, sulphate, nitrate. On desiccation at the ordinary temperature the hardness increases slowly at first, then, when most of the water has been lost, much more rapidly. Rehydration causes the hardness to fall below its initial value. On dehydration at higher temperatures, the hardness commences to decrease again after a certain point, which, however, corresponds with no particular stoichiometric composition of the mass. Microscopical examination indicates that setting is not due to the formation of crystalline oxychlorides, but to the chloride solution causing the grains of oxide to swell, owing to some chemical change in their interior, until they come into such close contact that they cohere. The effect of various salt solutions on the hardened cement has been examined. Ferric, aluminium, stannic, and cupric chlorides dissolve it to form colloidal solutions. Zinc and nickel chlorides harden it, whereas calcium and barium chlorides soften it. R. CUTHILL.

PATENTS.

Material for lining alkali recovery furnaces. J. BEVERIDGE (U.S.P. 1,619,785, 1.3.27. Appl., 7.11.25).—Concrete is made from soapstone in broken pieces

and Portland cement, excess of the former being present.

W. G. CAREY.

Manufacture of sheet material. A. E. HILLS (E.P. 266,125, 17.2.26).—Sheet material is prepared by incorporating an organic colloid, *e.g.*, rubber, with a mixture of Portland cement and asbestos fibre, together with a solvent and fillers, *e.g.*, ground chalk, if desired.

B. W. CLARKE.

Waterproof coatings and damp courses for buildings and structures. C. N. FORREST (E.P. 266,224, 25.8.26).—A loosely-woven, fibrous, textile fabric, impregnated with a molten mixture of blown asphalt and a suitable petroleum oil, is described.

B. W. CLARKE.

Production of bituminous emulsions. L. KIRSCH-BRAUN (U.S.P. 1,615,303, 25.1.27. Appl., 21.11.29).—Bitumen in a fluid state is added to a suspension of clay in water. The mixture is agitated and maintained at such a temperature that the bitumen will be dispersed without coalescence.

S. PEXTON.

Production of [bitumen] emulsion. L. KIRSCH-BRAUN (U.S.P. 1,616,904, 8.2.27. Appl., 7.12.25).—Bitumen emulsions of the type described in U.S.P. 1,302,810 and 1,517,075 (B., 1919, 494 A; 1925, 65) can be rendered more fluid by vigorous agitation.

T. S. WHEELER.

Electric furnace for cement production (E.P. 249,554).—See XI.

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

Second experimental report to the Atmospheric Corrosion Research Committee (British Non-Ferrous Metals Research Association). W. H. J. VERNON (Faraday Soc., March, 1927, advance proof, 113—183).—In atmospheric "indoor" tests on the corrosion of copper, the influence of purity of the metal is negligible compared with the nature of the atmosphere and the metal surface. Tarnishing of copper is initiated by atmospheric sulphur, equivalent in concentration to more than 1 vol. of hydrogen sulphide in 600 million vols. of air, and, when once started, the thickness of tarnish follows a parabolic relationship with time irrespective of later considerable fluctuations in the sulphur content of the atmosphere. If, at the commencement, sulphur is present in less than the tarnishing concentration, a thin oxide film is formed which protects the metal from subsequent increase in the sulphur content of the atmosphere. Close contact of copper with smoke from cellulose produces considerable immunity from tarnishing. Oxide corrosion of zinc follows a linear form and suggests a granular structure of the corrosion film which has been corroborated under the microscope. In an atmosphere of low relative humidity, both 70/30 and 60/40 brass simulate the behaviour of copper for a considerable time, but later revert to the straight-line curve characteristic of zinc, the latter occurring wholly in a more humid atmosphere. The first attack is chiefly directed upon the α -constituent, which tarnishes, and subsequently pitting of the β -constituent occurs. Low-temperature oxide films have relatively little effect upon the tarnishing of brass, though films produced at higher

temperatures exerted some protective influence, as did also treatment with lanoline. Progress of corrosion of lead and aluminium is at first parabolic, quickly retarding until after 10—14 days the oxide film has ceased to thicken. In an ordinary room atmosphere of low humidity, as obtains under conditions of artificial heating, rusting of iron is controlled entirely by the presence or absence of solid impurities in the atmosphere, and rusting may be inhibited by either filtering the air or screening the specimen behind a single thickness of muslin. Under such conditions iron develops a protective film analogous to other metals, which afterwards definitely resists attack for a time and then breaks down locally with accelerating effect. In a saturated atmosphere, the presence of suspended solid particles is not necessary to start rusting which accelerates from the start. Open-air exposure tests showed the following order for erosion: copper containing small quantities of arsenic, nickel, or tin (43—76), ordinary copper (81), H.C. copper (100), 70/30 brass (140), zinc (155), and 60/40 brass (227).

C. A. KING.

Mechanism of inverse segregation in alloys.

R. GENDERS (Inst. Metals, March, 1927, advance copy, 27 pp.).—Existing theories of the cause of inverse segregation are critically reviewed, and it is considered that they all fail to account satisfactorily for the phenomenon, although the interdendritic flow theory of Bauer and Arndt (B., 1922, 220 A) is regarded as a partial explanation. The evolution of gases plays an important part, and it seems probable that inverse segregation is produced by the same mechanism in all alloys. Results of a systematic exploration of different regions in bronze ingots containing 5% Sn cast by different methods are considered with respect to ingot formation. The three essential factors in inverse segregation are a temperature range between the liquidus and solidus, the presence of dissolved gases, and an initially rapid rate of cooling, decreasing before complete solidification to below the critical rate necessary to retain the alloy as a super-saturated metal-gas solution. Inverse segregation may be minimised by processes of degasification, or by inducing solubility of the gases in the solid alloy.

M. COOK.

Accurate determination of copper in bronze by electrolysis. R. A. F. HAMMOND (Inst. Metals, March, 1927, advance copy, 3 pp.).—Details are given of modifications of a method devised by Etheridge (B., 1924, 750) for the determination of copper in bronze which yield absolute results, accurate to $\pm 0.02\%$, and comparatively accurate to $\pm 0.01\%$.

M. COOK.

Silver-lead ore concentration. E. W. ELLIS (Eng. Min. J., 1926, 122, 815—816).—Table concentration yielded a larger recovery of lead than of silver; the loss of silver was caused by the presence of tetrahedrite. Fine grinding, and possibly flotation, of both middlings and tailings is indicated.

CHEMICAL ABSTRACTS.

Analysis of cassiterite, SnO_2 . P. WENGER and (Mlle.) E. ROGOVINE (Helv. Chim. Acta, 1927, 10, 244—245).—The cassiterite is rendered soluble by fusion with sodium peroxide. Permanganates and manganates are precipitated as manganese dioxide by warming the solution with hydrogen peroxide, and the

solution is filtered. Silica is separated from the filtrate in the usual manner, and the tin is precipitated as sulphide and weighed as dioxide. The precipitate is dissolved in hydrochloric acid and copper precipitated as sulphide. Iron, in the ferric state, is separated from any zinc, nickel, and calcium by the barium carbonate method, and these metals are then separated and determined in the usual way.

R. CUTHILL.

Micro-determination of small quantities of platinum in ores and minerals. G. LUNDE (Mikrochem., 1927, 5, 16–20).—1 g. of the finely-divided ore is fused with 2 g. of lead acetate, 2 g. of potassium sodium carbonate, and 2 g. of powdered borax glass in a porcelain crucible over a blast burner. The resulting lead button is scorified with borax in an unglazed porcelain crucible in a slow stream of oxygen, and finally cupelled in a similar crucible without borax. The bead of precious metal which still contains lead is heated with a blowpipe in a borax bead suspended on a quartz fibre until all lead and silver are expelled. The diameter of the resulting metallic bead is a measure of its weight. Further work is in progress to separate interfering elements, *e.g.*, the other platinum metals.

A. R. POWELL.

Aluminium from Oersted to Arvida. J. D. EDWARDS (Trans. Amer. Electrochem. Soc., 1927, 51, 59–62).—Historical.

Dissolution of lead by water. FARINE.—See XXIII.

PATENTS.

Manufacture of metals and alloys in the electric furnace. D. CROESE (E.P. 266,658, 27.8.25).—Finely-divided ore, *e.g.*, iron sand, or other mineral substance passes under the action of gravity through a furnace comprising a series of electrode chambers in each of which a baffle or other device is provided in order to maintain the substance under treatment in contact with the electric arcs for sufficient time. The lowest of the chambers communicates with a heated crucible in which molten metal separates from other substances produced in the electrode chambers.

J. S. G. THOMAS.

Electric smelting [of zinc]. F. THARALDSEN (U.S.P. 1,618,316, 22.2.27. Appl., 1.10.23. Conv., 23.9.22).—A resistor consisting of a bath comprising an acid slag containing 15–25% Fe and 45–60% SiO₂ is used in the process of electrically smelting zinc.

M. E. NOTTAGE.

Manufacture of metals and objects therefrom. J. MERLE (E.P. 265,243, 29.7.25).—Metals or alloys are fed rapidly at temperatures well above their m.p. into rotary moulds and subjected during casting to an intense regulated centrifugal pressure. M. E. NOTTAGE.

Cupola furnace. J. DECHESNE (E.P. 265,827, 14.5.26).—The fore-hearth of a cupola furnace is adapted to be agitated mechanically; *e.g.*, the side nearest to the cupola may be mounted on a pivot, the other side being alternately raised and suddenly lowered by means of cams, the cam portions being of varying sizes.

C. A. KING.

Cementation of iron and steel. R. BELLAK (E.P. 260,986, 1.11.26. Conv., 4.11.25).—A carburising agent

for iron and steel consists of powdered tobacco waste which may be mixed with charcoal. C. A. KING.

Rendering iron and steel non-oxidisable. E. G. CAUGHEY, Assr. to EDGEWATER STEEL Co. (U.S.P. 1,617,616, 15.2.27. Appl., 26.1.22).—Iron is rendered non-oxidisable or resistant to oxidation at high temperatures by incorporating in the metal sufficient aluminium to form a saturated solution at the temperature at which it is desired to prevent oxidation. C. A. KING.

Eliminating phosphorus from pig iron. P. C. RUSHEN. From GELSENKIRCHENER BERGWERKS A.-G. (E.P. 266,033, 12.11.25).—Phosphorus is removed from pig iron by bringing the metal into contact with carbon monoxide or gases rich in carbon monoxide, and basic materials, at a temperature slightly above the m.p. of pig iron. The process is conveniently carried out by blowing carbon monoxide into a Thomas converter charged with additions of lime. C. A. KING.

Manufacture of alloys of copper, nickel, and aluminium. INTERNAT. NICKEL Co., Assees. of W. A. MUDGE (E.P. 250,194, 4.3.26. Conv., 31.3.25).—The physical properties of an alloy containing at least 40% Ni, up to 54% Cu, up to 17% Al, and small amounts of iron, manganese, and carbon may be materially improved by heat treatment. The alloy is first made dead-soft by quenching from 816°; subsequent heating to 316° produces no change in the physical properties; from 316° to 538° these properties show a gradual increase, reaching a maximum from 538° to 649°, above which temperature a decrease is observed. The maximum improvement is produced by extending the time of heating and decreasing the rate of cooling, and a still further slight improvement occurs as the material is aged.

M. E. NOTTAGE.

Flotation agent for use in concentrating minerals. BARRETT Co., Assees. of F. G. MOSES and E. J. CANAVAN (E.P. 243,383, 21.11.25. Conv., 22.11.24).—A flotation agent is prepared by treating acid constituents of coal tar with sulphur chloride and mixing the product with coal tar or tar oil. Or coal tar (100 pts.) may be treated directly with sulphur chloride (1–25 pts.). The sulphur compounds formed remain undecomposed for a long period.

C. A. KING.

Concentration of slimes by flotation. G. A. BRAGG, Assr. to METALS RECOVERY Co. (U.S.P. 1,619,790, 1.3.27. Appl., 28.9.26).—Slimes consisting mostly of particles smaller than 200-mesh are agitated vigorously with lime to condition the sulphide minerals for a subsequent flotation operation in the presence of a non-oleaginous mineral-collecting agent. C. A. KING.

Extraction of precious metals from their ores and concentrates. MOND NICKEL Co., and R. H. ATKINSON (E.P. 266,040, 14.11.25).—A mixture of an oxidised ore or concentrate, lead, and zinc (or zinc alloy) is heated at a temperature between the m.p. of lead and the sintering point of the ore, using one or more chlorides as a flux. The metallic beads are separated from the residue and the precious metals are recovered by a process similar to Parkes' process. The residue may be treated by magnetic means and retreated for further recovery of metallic values. C. A. KING.

Soldering aluminium or its alloys. L. R. PRESTON (E.P. 265,733, 14.12.25).—A solder for aluminium or aluminium alloys is composed approximately of 75% Sn, 22% Zn, 2% Al, and 1% Bi. The solder is coated with a mixture of 25% of stearic acid, 25% of silver sand, and 50% of phosphor-tin (5%). C. A. KING.

Production of mechanically very solid bodies of suitable shapes from carbides of metals having high fusing points, such as tungsten carbide, for tools and like articles. H. LOHMANN (E.P. 246,487 and 248,336, 21 and 22.1.26. Conv., [A] 24.1.25, [B] 24.2.25).—(A) An acidic oxide, anhydride, or imperfectly reduced oxide of a highly refractory metal, *e.g.*, tungsten, is mixed with a small percentage of thorium, uranium oxide, tantalum or its oxide, or molybdenum oxide, and the mixture fused when actually in a carbon mould of the desired shape. (B) For the production of tools of tungsten carbide, raw unfused tungsten is mixed with thorium carbide (5–10%) and fused, as distinct from sintering in a carbon mould. The addition of 3–5% of molybdenum aids the homogeneity of the product. C. A. KING.

Magnetic alloys and their application in the manufacture of telegraphic and telephonic cables. W. S. SMITH and H. J. GARNETT (E.P. 266,066, 20.11.25).—Alloys suitable for the manufacture of wire or tape for use in telegraphic or telephonic cables (see B., 1925, 76) contain 75–76% Ni, 16–18% Fe, 5% Cu, a small quantity of manganese, and 2% of an element to increase the electrical resistance, *e.g.*, tungsten, chromium, silicon, titanium, or molybdenum. C. A. KING.

Pulverising and separating minerals (E.P. 265,841).—See I.

Compact coke (G.P. 435,305).—See II.

XI.—ELECTROTECHNICS.

Use of electric furnaces at Niagara Falls, 1902 to 1926. F. A. J. FITZGERALD (Trans. Amer. Electrochem. Soc., 1927, 51, 47–50).

Electrometric determination of ash in sugar. ŠANDERA.—See XVII.

PATENTS.

Insulating high-tension electric currents. O. Y. IMRAY. From AKTIEN-GES. FÜR ANILIN-FABR. (E.P. 244,068, 12.11.25).—The product obtained by the removal of olefines from the extract resulting from the treatment of suitable mineral oils, coal tar, etc. with liquid sulphur dioxide, as in the Edeleanu process, is used as insulating material. J. S. G. THOMAS.

Electric [arc] furnace. BRITISH THOMSON-HOUSTON Co., LTD., Assees. of V. J. CHAPMAN (E.P. 249,880, 25.3.26. Conv., 26.3.25).—An electric arc furnace comprising a furnace chamber and a refractory crucible is provided with a bottom electrode arranged between the wall of the crucible and the wall of the chamber, and having its lower end completely enclosed in a wall of the furnace. Electrical connexion with this electrode is made by a member of relatively high electrical conductivity which is maintained in good electrical engagement with the electrode at a point within the

furnace, although the respective coefficients of expansion of the different parts may be unequal. The part of this conducting member projecting outside the furnace forms a terminal, and is provided with cooling means.

J. S. G. THOMAS.

Electric furnace for melting or producing glass, water-glass, Portland cement, aluminous cement, etc. C. E. CORNELIUS (E.P. 249,554, 19.3.26. Conv., 23.3.25).—The substance to be melted or produced forms the furnace resistance, and is heated between or in contact with metallic electrodes which may be corrugated so as to be of large area.

J. S. G. THOMAS.

Filling element. F. EHRHARDT (G.P. 435,028, 7.10.24).—Electrodes wrapped in capillary material are saturated with a reversible colloidal solution and dried. The device ensures uniform distribution and adequate rigidity of the electrolyte employed.

J. S. G. THOMAS.

[Electrolytic] means for indicating the presence of saline, alkaline, and acid impurities in water and other fluids. W. CROCKATT & SONS, LTD., and W. C. CROCKATT (E.P. 266,047, 16.11.25).—In conjunction with a conductivity cell containing the fluid, and provided with electrodes connected to a source of current, means are provided for indicating a change of electrical conductivity of the fluid, and a variable resistance or potentiometer is inserted in the external circuit in order to vary the current in the circuit. The effect of variation of temperature upon the indication is automatically eliminated.

J. S. G. THOMAS.

Treatment of cellulose (F.P. 610,417).—See V.

Phosphoric acid and phosphates (G.P. 434,985).—See VII.

Arc shield (U.S.P. 1,617,515).—See VIII.

Magnetic alloys for cables (E.P. 266,066).—See X.

XII.—FATS; OILS; WAXES.

Opaque drying of tung oil. O. MERZ (Chem. Umschau, 1927, 34, 45–49).—The author observes the behaviour, particularly changes in appearance, of films of raw and “treated” tung oils (boiled oil, stand oil, etc.) dried in desiccators and in the open under various conditions—different sources of light, presence or absence of air currents, etc. The theory that ultra-violet light is responsible for the frosting, webbing, and similar phenomena observed in the drying of tung oil films is untenable, since clear films are obtained under the pure ultra-violet light of the analytical quartz mercury-vapour lamp. The experimental conditions chosen establish temperature fluctuation as the deciding factor. Such fluctuation and not any action ascribable to the gas mixture is the explanation of the “coal-gas test.” Tung oil films were found to dry without frosting in the desiccator in a constant-temperature stream of the products of combustion of coal gas. S. S. WOOLF.

Detection of whale oil. J. DAVIDSOHN (Chem. Umschau, 1927, 34, 49–50).—The method suggested by Tsujimoto (B., 1926, 986) for detection of whale oil by means of the turbidity and precipitates given by its

freed fatty acids with Wijs reagent under specified conditions was not corroborated on examination. The octabromide test remains the only reliable one for normal whale oil, and a qualitative modification is described. Bromides are prepared by shaking the fatty acids isolated from the oil under test with Halphen's reagent (4 vols. of nitrobenzene, 1 vol. of bromine, and 28 vols. of glacial acetic acid). Octa- and deca-bromides characteristic of whale oil are insoluble in benzene.

S. S. WOOLF.

Odoriferous oil and linoleic tetrabromides from Philippine lumbang oil. S. SANTIAGO and A. P. WEST (Philippine J. Sci., 1927, 32, 41–52; cf. West and Montes, B., 1921, 896 A).—By hydrolysis of the glycerides and conversion of the potassium soaps into zinc soaps, removal of these, and extraction of the residue with ether, a colourless oil, b.p. 80–95°, soluble in ether and in water, containing aldehydes and unsaturated compounds, and having an intense lumbang odour, was obtained; the yield was about 2%. The ethereal solution of the free mixed acids was brominated at –10°, the insoluble linolenic hexabromide removed, the solution evaporated to dryness, and the residue washed with light petroleum to remove oleic dibromide. By fractional crystallisation, first from ethyl and then from methyl alcohol, four tetrabromides were obtained; α , m.p. 112.3–114.3°; β , m.p. 59–60°; γ , liquid; and δ , m.p. 57–58°. It is suggested that lumbang oil contains the four possible geometrically isomeric linoleic acids.

S. I. LEVY.

Heats of combustion of some oils from marine animals. H. MARCELET (Compt. rend., 1927, 184, 604–605).—The heats of combustion and temperatures of inflammability and combustion of a number of oils from marine animals, and of squalene, have been determined with the object of using the oils in semi-Diesel engines. The highest calorific powers recorded are of the same order as those of the petrols.

J. GRANT.

Determination of the iodine value [of oils] in aqueous emulsions. J. FIALKOV (Z. anal. Chem., 1927, 70, 227–229).—The following modification of the method of Margosches (B., 1924, 639) gives good results with oils, but not quite satisfactory results with fats: 0.1–0.15 g. of oil is mixed with half its weight of powdered gum arabic and one or two drops of water to a smooth emulsion to which are added 5–10 c.c. of water and 20 c.c. of 0.2*N*-iodine solution. After titrating to 200 c.c. the liquid is shaken vigorously and titrated after 5 min. with thiosulphate as usual. A. R. POWELL.

Analysis of alkaloids. WATKINS and PALKIN.—See XX.

PATENTS.

Preparation of a non-gelatinising tung-oil product. G. HALL (G.P. 434,202, 12.10.21).—The gel obtained by heating tung oil alone or in the presence of catalysts at a temperature below 200° is reliquefied by further heating at 250–300° to form a varnish base that may be combined with other oils, resins, etc.

S. S. WOOLF.

Manufacture of a drying and polymerising oil. J. J. KESSLER (U.S.P. 1,616,321, 1.2.27. Appl., 9.5.24).

—The coal-tar fraction, b.p. 150–250°, is heated with an excess of formaldehyde or other aldehyde in presence of a trace of ammonia or sodium hydroxide at 150°. The oil obtained dries on exposure to air, and slowly polymerises at 150°.

T. S. WHEELER.

Manufacture of highly viscous lubricating oils. G. SCHICHT A.-G. (E.P. 250,947, 14.4.26. Conv., 14.4.25).—A mineral oil-fatty oil blend suitable for use as a lubricant, particularly at high temperatures, is obtained by polymerising a drying oil in a current of non-oxidising gas at about 300° until the multiply unsaturated fatty acids are for the most part or completely saturated, drying power being lost accordingly. From $\frac{1}{2}$ to 1 pt. of mineral oil is added to 1 pt. of drying oil, either at the outset or during the heating operation, the latter being discontinued before the thickened drying oil becomes insoluble in mineral oil.

S. S. WOOLF.

Production of vitaminised oils. A. W. OWE (E.P. 266,139, 2.3.26).—To obviate the reduction in vitamin content unavoidable in attempts to remove the objectionable flavour and smell from vitamin concentrates before introducing them into edible oils, the unrefined vitamin concentrate is dissolved in the oil, and the resulting solution is subjected to a mild refining treatment, depending on the nature of the concentrate, in the absence of air and at low temperatures.

S. S. WOOLF.

Refining oils. F. J. RESINES, Assr. to BY-PRODUCTS RECOVERY Co. (U.S.P. 1,619,486, 1.3.27. Appl., 28.9.23).—Vegetable oil is agitated, neutralised with caustic alkali solution, and immediately separated by centrifugal action. The neutral oil is again similarly treated to decolorise it.

H. ROYAL-DAWSON.

Manufacture of soap. A. C. NESFIELD and L. F. GOODRICKE (E.P. 266,435, 23.11.25).—Optimum proportions of the saponifiable material and the alkaline reagent, both heated slightly below 100°, are brought into intimate contact in a described emulsifying vessel, fitted with baffles and other suitable devices. The emulsifier discharges the material on to the surface of a spreading disc (rotated if desirable) in a boiling vat provided with coils to which superheated steam at 315° is admitted. Before discharge into a secondary vessel, in which glycerin recovery and admixture of colouring matter, scents, etc. take place, the boiling liquid can be circulated through the emulsifier as many times as is found necessary according to the nature of the substance under treatment.

S. S. WOOLF.

Manufacture of soap [flakes]. E. FLAMMER and C. KELBER (E.P. 265,714, 23.11.25).—The water content of soap made from a mixture of saturated fatty acids and unsaturated fatty acids of the erucic or ricinoleic type is reduced to 8–14%, and perborates or other compounds containing active oxygen are incorporated. Hydrocarbons, e.g., hexadecane, or their hydroxy-compounds, e.g., slightly oxidised paraffin wax, cetyl alcohol, cetyl palmitate, may be added at this stage. Such mixtures are not brittle, and can be converted satisfactorily into thin flakes, a suitable rolling and cutting apparatus being described. A soap mixture consisting of 17% of potassium soaps and 83% of sodium soaps is preferred.

S. S. WOOLF.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

PATENTS.

Producing light-resistant lithopone. J. E. BOOGE, Assr. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 1,617,311, 8.2.27. Appl., 22.10.23. Renewed 30.4.26. Cf. U.S.P. 1,535,760; B., 1925, 514).—Crude lithopone of low chloride content, which has been calcined in presence of a small quantity of oxygen, is quenched with water, acidified with sulphuric acid, washed with water and with sodium carbonate, blued, dried, and ground. It is resistant to light, and has a good colour.

T. S. WHEELER.

Increasing the resistance of lithopone to sunlight. H. G. SCHANCHE, Assr. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 1,619,376, 1.3.27. Appl., 5.9.23).—Crude lithopone is calcined and quenched, and after wet-grinding the product it is treated with an acid solution.

H. ROYAL-DAWSON.

Ingredient for printing ink. J. H. CAUGHLAN (E.P. 265,787, 22.2.26).—A mixture of aluminium resinate and gelatinous aluminium hydroxide, prepared by precipitating a boiling sodium resinate solution with aluminium sulphate, is washed, filtered, and ground as a wet pulp with lithographic varnish. The product is used in printing inks.

S. S. WOOLF.

Dyeing inks. I. G. FARBEININD. A.-G. (F.P. 608,903, 2.1.26. Conv., 3.1. and 13.1.25).—Formaldehyde and/or an alkali, or substances producing them, are added to solutions of substantive dyestuffs.

S. S. WOOLF.

Production of solutions for lacquering, impregnating, coating, doping, etc. of fabrics, fibrous and solid materials, etc. A. EICHENGRÜN (E.P. 243,031, 17.11.25. Conv., 17.11.24).—Non-inflammable or difficultly inflammable solutions are obtained by dissolving acetone-soluble cellulose acetate (or a mixture of acetone- and chloroform-soluble cellulose acetates in which the acetone-soluble variety preponderates) in a mixture of methylene chloride (a non-solvent for cellulose acetate) with small amounts of inflammable solvents, *e.g.*, alcohol, acetone, etc., in which mixture cellulose acetate is soluble. Relatively concentrated solutions and films of high lustre are produced by this method.

S. S. WOOLF.

[Nitrocellulose] varnishing preparation. K. TAKEMURA and K. OIWA (E.P. 266,214, 12.8.26).—A varnish suitable for the protection of ships' bottoms, and having good insulating properties, consists of 15 pts. of nitrocellulose, 35 pts. of amyl acetate, and 10 pts. each of ether and acetone (solvents), 20 pts. of alcohol or benzol (diluent), 5 pts. of dibutyl tartrate (plasticiser), 5 pts. of pulverised bamboo (filler), and 3 pts. of potassium ferrocyanide (anti-corrosive agent).

S. S. WOOLF.

Preparation of dyed lacquers. I. G. FARBEININD. A.-G. (Swiss P. 115,116, 18.2.25. Conv., 1.3.24).—Aqueous suspensions of dyestuffs are mixed with cellulose ester solutions compatible with the water so introduced. A typical solvent mixture is acetone, butyl alcohol, cyclohexanol, cyclohexyl acetate, and butyl acetate.

S. S. WOOLF.

Oxidation of rosin (colophony) by air or oxygen. A. RIEBECK'SCHE MONTANWERKE A.-G. (G.P. 434,419,

12.3.22).—Rosin in solution in low-boiling solvents, *e.g.*, glacial acetic acid, is oxidised in the presence of catalysts, *e.g.*, sodium nitrate, to yield shellac substitutes.

S. S. WOOLF.

Manufacture of artificial resins. BRITISH CYANIDES Co., LTD., and E. C. ROSSITER (E.P. 266,028, 5.11.25).—A mixture of carbamide and thiocarbamide is condensed with formaldehyde, or the separate condensation products are blended at an intermediate stage in their preparation. The combined resin retains the solubility of the thiocarbamide resins, but "cures" more rapidly. If 25% or less of the thiocarbamide be replaced by carbamide, clear resin syrups are obtained. Above this figure the resins obtained are turbid, but "cure" rapidly, and may be clarified partially by the addition of ammonia.

S. S. WOOLF.

Preparation of linoxyn-like substances. CONSORTIUM FÜR ELEKTROCHEM. IND., G.M.B.H., Assees. of H. DEUTSCH and W. O. HERRMANN (G.P. 434,318, 19.6.24).—Aldehyde-resins are incorporated with hydroxy-acids or substances containing them, subjected to a preliminary or continued oxidation. Further additions are made, *e.g.*, resins, waxes, tung oil, hydrogenated phenols or hydrogenated naphthalene, etc. The products are used in the manufacture of linoleum, artificial leather, ivory-substitutes, etc.

S. S. WOOLF.

Composition of material [resin]. O. A. CHERRY, Assr. to CUTLER-HAMMER MANUF. Co. (U.S.P. 1,616,741, 8.2.27. Appl., 18.6.23).—Sulphur chloride (200 pts.), sulphur or selenium (50–150 pts.), and phenol (100 pts.) react when mixed to form a synthetic resin. In place of phenol, naphthalene or anthracene can be employed.

T. S. WHEELER.

Chromo-lithographic transfers. H. COURMONT (E.P. 265,651, 9.10.25).

Waterproofing fibre (U.S.P. 1,616,062).—See V.

Decorated paper (E.P. 265,334).—See V.

Light filters (E.P. 265,455).—See V.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

PATENTS.

Vulcanisation of rubber. I. G. FARBEININD. A.-G., Assees. of W. KROPP (U.S.P. 1,616,378, 1.2.27. Appl., 5.3.26. Conv., 6.8.25).—The products obtained by the condensation of $\alpha\beta$ -dialkylacetaldehydes, *e.g.*, α -ethyl- β -propylacetaldehyde, with aniline or other aromatic amine, are of value as accelerators for the vulcanisation of rubber. They are oily liquids, and can be obtained by heating the components together, with or without addition of a solvent, *e.g.*, benzene, and a condensing agent, *e.g.*, zinc chloride.

T. S. WHEELER.

Vulcanising rubber. M. L. WEISS, Assr. to DOVAN CHEMICAL CORP. (U.S.P. 1,616,936, 8.2.27. Appl., 29.7.25. Renewed 5.11.26; cf. U.S.P. 1,411,231 and 1,546,876; B., 1922, 383 A; 1925, 1000).—Compounds of the type NH:C(NHR)(NR.) , where R = aryl, *e.g.*, *as*-triphenylguanidine, are of value as accelerators of the vulcanisation of rubber. About 1% of the weight of the rubber is required.

T. S. WHEELER.

Method of vulcanising rubber. L. B. SEBRELL, Assr. to GOODYEAR TIRE & RUBBER Co. (U.S.P. 1,616,994, 8.2.27. Appl., 8.11.24).—Piperazine or a derivative, *e.g.*, piperazine stearate, is used as an accelerator.

T. S. WHEELER.

Vulcanising rubber. T. W. MILLER, Assr. to FAULTLESS RUBBER Co. (U.S.P. 1,617,411, 15.2.27. Appl., 12.5.23).—Rubber (100 pts.) is dusted on the surface with a mixture of a metallic oxide (10 pts.), sulphur (3 pts.), and an organic accelerator (2 pts.), and heated. Vulcanisation occurs at a comparatively low temperature.

T. S. WHEELER.

Manufacture of goods from india-rubber. A. FRASER (E.P. 266,041, 14.11.25).—Receptacles such as battery boxes, with a hard vulcanite interior and a soft elastic rubber exterior, are formed from a rubber mixture by differential vulcanisation, *e.g.*, by applying heat only to the portion of the mould in contact with the cavity, thereby ensuring the necessary temperature gradient in the wall.

D. F. TWISS.

Process and apparatus for concentration of [rubber] latex. K.D.P., LTD. (E.P. 255,014, 13.11.25. Conv., 9.7.25. Addn. to E.P. 244,727; B., 1927, 52).—Rubber latex is concentrated in an externally heated, rotating drum; a loose roller resting in the lowest part of the drum serves as a spreading device. The rate of evaporation may be controlled by altering the volume and temperature of the air passing through the drum.

D. F. TWISS.

Production of aqueous rubber dispersion. W. B. PRATT, Assr. to RESEARCH, INC. (U.S.P. 1,621,468, 15.3.27. Appl., 2.7.23).—See E.P. 217,612; B., 1924, 757.

XV.—LEATHER; GLUE.

Tannin-gelatin reaction. I. P. BAUGHMAN (J. Physical Chem., 1927, 31, 448—458; cf. Thomas and Frieden; A., 1923, ii, 664).—The determination of tannin in small amounts, the tannin-gelatin reaction near the maximum flocculation point, and the effects of various electrolytes and of the age of the gelatin on this reaction, have been studied. 1 c.c. of a saturated solution of ferrous ammonium sulphate is added both to 10 c.c. of the tannin solution containing not more than 0.0002 g./c.c., and to 10 c.c. of a standard solution of pure tannin (Kahlbaum), and the two solutions are compared colorimetrically. The method is sensitive to ± 0.000005 g./c.c. In the tannin-gelatin reaction maximum flocculation occurs with 0.5% of tannin and gelatin solutions, but beyond this point the protective action of an excess of gelatin on the tannin is marked. Gelatin can be completely precipitated by tannin, but some tannin remained in solution in all the series used. Sodium chloride (1%) reduces the amount of tannin remaining in the filtrate, but 1—4% solutions of sodium sulphate or of magnesium, aluminium, and mercuric chlorides increase this amount. In agreement with Thomas and Frieden (*loc. cit.*), the age of a sterilised gelatin solution has no effect on the tannin-gelatin reaction.

L. S. THEOBALD.

PATENTS.

Manufacture of chamois and like leather. A. KEMMLER (E.P. 266,622, 13.9.26).—Skins to be tanned

are prepared in the usual way and dressed in a fulling mill with egg oil to which 0.5—2% of 40% aqueous formaldehyde is added (according to the thickness of the leather). The customary drying and softening operations are then employed.

S. S. WOOLF.

Production of mineral-tanned leather. F. W. WEBER (U.S.P. 1,616,400, 1.2.27. Appl., 19.3.25. Cf. U.S.P. 1,221,929; B., 1917, 605).—Dry pickled hides are soaked in sodium chloride solution, to which is then added a solution of the basic acetates of the rare-earth metals. The hides are dried after 3—5 hrs., acetic acid being evolved, and oxides of the metals deposited on the hides, which are then returned to the bath containing the basic acetates. To this solution is now added a colloidal solution of ferric chloride which has been neutralised by addition of carbonates of the rare-earth metals. Tanning is complete in 2 hrs. The hides, when dried and treated with a neutral soap solution at 40—50°, yield a strong waterproof leather. In place of ferric chloride, chromium alum and aluminium sulphate can be employed.

T. S. WHEELER.

Manufacture of horn-like materials from albuminous substances. DEUTSCHE KUNSTHORN G.M.B.H. (E.P. 247,955 and 261,009, [A], 16.2.26. Conv., 21.2.25. [B], 4.11.26. Conv., 4.11.25. Cf. B., 1926, 840).—(A) Paraformaldehyde that has been previously treated with acids, *e.g.*, sulphuric acid, formic acid, etc., is used as hardening agent in the preparation of artificial horn from albuminous substances, *e.g.*, casein, the acid treatment retarding the hardening action of the formaldehyde sufficiently to allow plastification and moulding to take place. The moulded plastic mass is then dried and hardens. (B) The moulded plastic masses containing hardening agents are preferably allowed to remain quiescent in closed vessels for a varying period before the drying and hardening operations are undertaken.

S. S. WOOLF.

XVI.—AGRICULTURE.

Basis of microbiological experiments in soils. A. RIPPEL (Z. Pflanz. Düng., 1927, A, 8, 268—276).—The lack of co-ordination between field observations and the results of laboratory culture experiments with soil organisms is discussed from the point of view of the difference in the environment of the organisms necessitated by the present methods of microbiological technique.

A. G. POLLARD.

Microbiology of forest soil. R. BOKOR (Biochem. Z., 1927, 181, 302—304).—In light, well-aerated, sandy soil, aerobic bacteria are predominant, the production of carbon dioxide and putrefactive changes are most intense, the amounts of humus and organic matter least, and the number of cellulose-attacking bacteria is proportional to the production of carbon dioxide by the soil. In an alder swamp, however, the number of bacteria is large, but the production of carbon dioxide is small owing to the high percentage (56%) of water which enables anaerobic bacteria to predominate.

P. W. CLUTTERBUCK.

Buffer capacity in acid soils. H. KAPPEN (Z. Pflanz. Düng., 1927, A, 8, 277—288).—The term "buffer capacity" may cover a number of chemical and physical

processes, *e.g.*, neutralisation, dissociation, ampholytic action, adsorption, etc. Its value from this general standpoint is discussed. The measurement of "buffer area" (Jensen) is considered a valuable figure in the characterisation of soils. Measurements based upon p_H values are not always expressive of the true condition of soils, and methods involving these measurements (*e.g.*, Arrhenius) become of value only when actual changes in hydrogen-ion concentration following the addition of acid or alkali are compared.

A. G. POLLARD.

Physiological significance of nutrient extracts in the determination of the manurial requirement of soils by chemical means. E. BLANCK and F. SCHEFFER (*Z. Pflanz. Düng.*, 1927, A, 8, 298—302).—Comparison is made of measurements of the availability of potassium and phosphate in soils by the acid extraction method and that of Neubauer. Values for phosphate showed fair agreement, but discrepancies are apparent in comparing values for available potash. The nature and concentration of acid used in preparing extracts have a much greater effect on the solubility of potash than of phosphates. Owing to the different nature of the compounds of potash and of phosphate in soils it is not to be anticipated that any one solvent will give a satisfactory measure of the availability of both. A. G. POLLARD.

Pot experiments with various fertilisers. E. BLANCK, F. GIESECKE, and F. SCHEFFER (*Z. Pflanz. Düng.*, 1927, B, 6, 49—67).—The results of pot experiments with some new fertilisers are given. "Leunaphos," prepared by mixing ammonium sulphate with diammonium phosphate, proved equally efficient with other soluble nitrogenous and phosphatic fertilisers. "Bio-phosphat," a preparation containing mineral phosphate and estuarine alluvial clay containing a high proportion of colloidal silicic acid, proved considerably less efficient than ordinary phosphatic fertilisers. "Schlick-Kalkstickstoff," a similar preparation, but containing nitrogen, also proved unsatisfactory. "Asahi-Promoloid," a colloidal silicic acid preparation, showed some effect in pot experiments, but no effect in field experiments.

G. W. ROBINSON.

Determination of the fertiliser requirements of soils [by the Neubauer seedling method]. H. WIESSMANN (*Z. Pflanz. Düng.*, 1927, B, 6, 68—82).—In experiments on the utilisation of phosphoric acid by seedlings using the Neubauer method, utilisation was complete only with the smallest dressings. The seedling method cannot therefore be used to determine exactly the content of available phosphoric acid in soil. The method gives satisfactory results for the available potassium content of soils. G. W. ROBINSON.

Manuring experiments on hops, 1925. A. H. BURGESS (*J. Inst. Brew.*, 1927, 33, 138—140).—Two series of plots at Chilham and Horsmonden each comprise six different manurial treatments. Taking the average of the crops for the years 1922—1925, the effects of the various treatments at Chilham bear the following relationships:—Complete manure (mineral) 100.0; complete manure (including dung) 99.5; without phosphate 94.0; without nitrogen 60.2; without potash 51.6; unmanured 38.8. The corresponding

figures for Horsmonden are:—Complete manure (mineral) 100.0; without phosphate 96.7; without potash 95.0; complete manure (including dung) 81.0; unmanured 59.5; without nitrogen 57.9. No conclusion can be drawn at present with regard to the effect of manuring on the preservative value of the hops. C. RANKEN.

Influence of boron on the growth of the soya bean plant. G. H. COLLINGS (*Soil Sci.*, 1927, 23, 83—105).—Experiments are described on the effect of boron on the germination and growth of soya beans in water, sand, and soil cultures. In water culture, 0.4—0.5 mg. of boron per litre of nutrient solution is toxic to soya beans in the seedling stage, and concentrations as low as 0.1—0.2 mg. per litre cause characteristic injury to the leaves of older plants. The toxicity is practically the same whether the boron is present as boric acid or as potassium or sodium borate. Boron is not necessary for the growth of seedling soya beans, nor for the production of mature plants. In sand cultures, germination is delayed or inhibited by the presence of boron. In sand and soil cultures, injury to the leaves and a reduction of dry weight of the plants was caused by the use of sodium borate or its equivalent at the rate of more than 1 lb. per acre. No appreciable stimulation due to boron was noted with soya beans grown in sand or soil, or with seedlings in water culture, but with plants grown to maturity in water culture, boric acid, and to a less degree sodium borate, exerted a stimulating influence, which was greatest at 2.5 mg. of boron per litre of solution. C. T. GIMMINGHAM.

Organic matter changes in two soil zones, as influenced by difference in form, fineness, and amount of calcium and magnesium compounds. W. H. MACINTIRE, W. M. SHAW, and E. M. CRAWFORD (*Soil Sci.*, 1927, 23, 107—117).—Experiments are reported on the changes of organic matter in an originally uniform soil, due to addition of calcium hydroxide, mixtures of calcium and magnesium oxides, limestone, or dolomite, the last two at varying degrees of fineness. In one series the materials were incorporated with the surface half or zone, and in another, with the lower half (subsurface zone), the soil being exposed to natural leaching in lysimeters and kept uncropped and unstirred. In general, oxidation of organic matter was accelerated by the additions, the effects in the two zones being comparable. Conditions in the subsurface zone, even without additions, were, however, more conducive to oxidation than in the surface zone. No positive differences were attributable to variation in the fineness of the limestone. C. T. GIMMINGHAM.

Contraction and expansion of soils when wetted with water. G. J. BOUYOUCOS (*Soil Sci.*, 1927, 23, 119—126).—When absolutely dry soils are wetted with water, the original volume of soil and water decreases. The amount of contraction varies with different soils, and bears a close relationship to the content of organic matter and to the heat of wetting of the soils. It is also related to the colloidal content, but less closely and consistently. The contraction in volume is attributed principally to condensation of some of the water on the surface of the colloids. The determinations were made in a special dilatometer, the method involving the

temporary exclusion of water from the dry soil by the use of carbon tetrachloride. C. T. GIMINGHAM.

Absorption of moisture by soils. J. N. SEN and B. M. AMIN (Mem. Dept. Agric. India, 1926, 8, 235—253).—In nine out of eleven soils tested, the amounts of water absorbed from an atmosphere in equilibrium with a 25% aqueous solution of glycerin were dependent on the percentages of clay. The two exceptions were unusual types of soil, and it is suggested that the determination of the absorbing capacity gives useful indications as to the type of colloids present in the soil and its behaviour under cultivation. Determinations at 20–60° showed that the absorbing capacity decreases as the temperature rises. C. T. GIMINGHAM.

Colloidal behaviour of soils and soil fertility.
III. Cation replacement and saturation of soil with calcium. J. S. JOFFE and H. C. McLEAN (Soil Sci., 1927, 23, 127—135. Cf. B., 1925, 858; 1926, 457).—The relation of the various exchangeable cations present in the soil complex and the methods used in determining base-exchange capacity and degree of unsaturation of soils are discussed. Experimental data on the relation between "lime requirement" and degree of unsaturation are given, and it is suggested that a determination by the replacement method gives results from which the "lime requirement" can be obtained. The possibility of subsoiling for the purpose of preserving bases that are being leached out from the surface soils is considered. C. T. GIMINGHAM.

Factors influencing efficiency of different forms of nitrogen as related to soil type and cropping system in the Atlantic coastal plain region. I. A. M. SMITH (Soil Sci., 1927, 23, 137—164).—The influence of temperature and water content of a sandy loam soil on the rate of nitrification of various nitrogenous materials, and the leaching of nitrates from the soil, as influenced by these materials, have been studied. The data have a bearing on the choice of a fertiliser which will yield sufficient nitrates for rapid early growth, but will not give a large accumulation to be lost by drainage. C. T. GIMINGHAM.

Nitrifying power of some Philippine soils. M. M. ALICANTE (Philippine J. Sci., 1927, 32, 1—27).—The nitrifying powers of over 100 samples from six different provinces, to which ammonium sulphate, alone and with a slight excess over the theoretical quantities of calcium carbonate, and copra cake, alone and with slight excess of calcium carbonate, had been added, are tabulated, and are found to be closely proportional to the productivities. Soils devoted to sugar cane converted their original nitrogen more slowly than did those devoted to rice, hemp, tobacco, coconut, and citrus; soils containing high proportions of clay converted both original and added nitrogen very slowly. Addition of calcium carbonate generally accelerated nitrification, except in one case when applied with copra cake. Ammonium sulphate was generally converted more rapidly than the cake. The nitrifying power of Philippine soils is on the average lower than that of Hawaiian but higher than that of United States soils. S. I. LEVY.

Nature of soil acidity. H. J. PAGE (Trans. 2nd Comm. Int. Soc. Soil Sci., 1926, A, 232—244).—The

views of a number of workers are discussed and shown to be capable of explanation on a common basis, if the conception is admitted that the absorbing complex of the soil is an insoluble colloidal acid (or acidoid) associated with surface-active basic and hydrogen cations. The existence of replaceable aluminium ions in the complex and the possibility of hydroxyl-ion adsorption are debatable points. A. G. POLLARD.

Soil acidity. S. D. CONNER (Trans. 2nd Comm. Int. Soc. Soil Sci., 1926, A, 18—21).—The nature of the acidity of a number of Indiana soils can be explained adequately by Kappen's theories. Hydrolytic and exchange acidity is ascribed mainly to the presence of acid silicates resulting from the leaching out of bases by solutions of weak organic acids and carbon dioxide. Both hydrogen and aluminium ions exist in acid soils. The toxicity of these varies with different plants. It is seldom profitable or necessary to neutralise all of the hydrolytic acidity by liming. In acid soils containing much soluble aluminium, treatment with phosphates is even more valuable than liming. A. G. POLLARD.

Relation between soil acidity and the physiologically acid reaction of some fertiliser salts. H. KAPPEN (Trans. 2nd Comm. Int. Soc. Soil Sci., 1926, A, 245—248).—Changes in soil acidity brought about by the use of physiologically acid or basic fertilisers were examined by the Neubauer method. Except in soils heavily denuded of replaceable bases the main cause of plant toxicity in acid soils lies within the soil itself, and is not markedly affected by the physiological reaction of added fertilisers. A. G. POLLARD.

Value of iron in zeolitic silicates in regard to soil reaction. L. SMOLIK (Trans. 2nd Comm. Int. Soc. Soil Sci., 1926, A, 25—28).—Aluminium in zeolitic silicates may be partially replaced by iron. In soils containing such substituted zeolites it is impossible to judge the reaction by determinations of the molecular structure of the silicate. Where the molecular ratio $\text{SiO}_2 : \text{Al}_2\text{O}_3 : \text{other bases}$ is $3 + : 1 : < 1$, the soil may be neutral or alkaline if more than 0.6 mol. of iron replaces aluminium. A. G. POLLARD.

Determinations of p_H of soil by the Billmann quinhydrone method. D. J. HISSINK and J. VAN DER SPEK (Trans. 2nd Comm. Int. Soc. Soil Sci., 1926, A, 29—40).—In using the quinhydrone electrode for determining p_H values of soil suspensions, the following details of technique were found advantageous. A period of 30 min. is allowed between the immersion of the electrode and the measurement of the potential difference. For the complete peptisation of the clay in air-dried samples of soil, the suspension should be kept about 20 hrs. Soil suspensions are preferable to centrifuged extracts for the determination. Maximum p_H figures are recorded when a suspension of 1 pt. of soil in 4 pts. of water is used. It is important to adhere strictly to a particular soil : water ratio in comparative work. A. G. POLLARD.

Action of non-diffusible ions in soil phenomena. N. M. COMBER (Trans. 2nd Comm. Int. Soc. Soil Sci., 1926, A, 43—45).—The presence of non-diffusible (or slowly diffusible) ions in the soil solution and of continuous membranes formed by colloidal matter

forms the basis of the conception that ionic concentration in the soil solution varies in different local areas of the soil.

A. G. POLLARD.

Reaction of Finland soils. W. BRENNER (Trans. 2nd Comm. Int. Soc. Soil Sci., 1926, A, 48—54).—Acidity in Finnish soils is influenced by the water level in the subsoil, which determines the level at which acid aluminium salts are concentrated. The formation of humus which has a p_H value of 3.5—6.5 also tends to render surface soils acid, irrespective of the influence of the subsoil. In a general classification of soils, buffer values should be expressed as alterations in p_H values resulting from the addition of definite amounts of acid or alkali. For comparative work, the best measure is the "reaction amplitude," viz., the sum of p_H changes following the addition of a definite amount of acid and an equivalent amount of alkali.

A. G. POLLARD.

Determination of exchangeable cations, degree of saturation, and relative acidity of soils. A. A. J. VON SIGMOND (Trans. 2nd Comm. Int. Soc. Soil Sci., 1926, A, 55—71).—Comparison is made of the methods of Hissink, Gedroiz, and Kelley for determining the degree of saturation of exchangeable bases in soils. Simple determination of p_H values of soils can give no reliable information as to their lime requirement. The value ($T - S$) [Hissink] is too high, and better results are obtained by electrometric methods. The use of sodium chloride solutions in preparing soil extracts for this purpose is unreliable for soils containing considerable amounts of finely-divided calcium carbonate and sulphate and/or magnesium carbonate. p_H values should be supplemented by measurements of buffer capacity and exchange acidity. This is particularly emphasised in the case of alkali soils.

A. G. POLLARD.

Determination of the lime requirement of the soil. H. R. CHRISTENSEN and S. T. JENSEN (Trans. 2nd Comm. Int. Soc. Soil Sci., 1926, A, 94—115).—Acid soils were treated in the field with varying amounts of lime, and curves obtained showing the relationship of lime added to the p_H value produced. Similar curves were obtained in the laboratory by adding successive amounts of calcium carbonate to soil suspensions. In general, the lime required to produce p_H 6.8—7.2 in the field was three times that in laboratory tests. Sandy soils required more lime to produce a specific change in p_H than did loams. The reverse is the case for the mineral acidity determined by the Daikuhara method. The acidity of sandy soils depends more on humic matter than in the case of loams. The Daikuhara method for lime requirement usually indicated too low a figure.

A. G. POLLARD.

Determination of the lime requirement of humus sandy soils. J. HUDIG (Trans. 2nd Comm. Int. Soc. Soil Sci., 1926, A, 116—125).—In the examination of the effect of lime on humus soils it is considered that the basis of comparison should be the amount of humus present (loss on ignition) rather than the total amount of soil. The buffer capacity of the humus has a definite bearing on the lime requirement of the soil. Repeated field trials and pot experiments are necessary before the lime requirement of a soil can be satisfactorily

determined. The "lime condition" of a humus soil is expressed as the number of g. of calcium carbonate required to neutralise 100 g. of humus. Negative values indicate lime required. Biilmann's quinhydrone electrode is the most satisfactory for p_H determinations in this work.

A. G. POLLARD.

Lime requirement of soils. A. GEHRING (Z. Pflanz. Düng., 1927, A, 8, 257—267).—Recognised methods for determining the lime requirement of soils are discussed from the point of view of their effectiveness in soils of different types. A modification of the Hissink method is suggested. The degree of saturation is measured by the original method, but in measuring the total capacity of a soil for calcium the sample is prepared by shaking with lime water for 20 hrs. Excess lime is removed by means of carbon dioxide, and the adsorbed calcium is now determined by the original process. Soil type and the presence of zeolitic material affect the value of the process, and soils which appear neutral by a number of chemical processes still show a lime requirement in field trials.

A. G. POLLARD.

Determination of the lime requirement of some Brunswick soils. A. GEHRING, A. PEGGAU, and O. WEHRMANN (Trans. 2nd Comm. Int. Soc. Soil Sci., 1926, A, 153—169).—The lime requirement of a number of soils was calculated from (1) a determination of replaceable calcium by extraction with sodium chloride, and (2) the maximum calcium adsorption obtained by a similar process after saturating the soil with lime water. On this basis soils showing 70% saturation with lime gave no increased crop yields after liming, provided little or no hydrolytic acidity was observed in the original soil. The degree of saturation with lime showed a fairly close inverse relationship to crop increases following requisite liming. The discrepancy frequently observed between the results of field trials and the determination of lime requirements by the usual chemical processes is discussed.

A. G. POLLARD.

Effect of regulated treatment with hydrochloric acid on the lime requirement of a mineral subsoil. G. MILNE (Trans. 2nd Comm. Int. Soc. Soil Sci., 1926, A, 126—133).—Extraction of soil by hydrochloric acid solutions of increasing strength (0.02—5.5N) showed that following the weaker acid extractions the lime requirement of the soil residue increased to a maximum and then steadily decreased as more concentrated acid was used. The initial increase in lime requirement is attributed to the replacement of exchangeable basic ions by hydrogen ions. The subsequent decrease in lime requirement represents the steady decomposition of colloidal matter.

A. G. POLLARD.

Reaction between soils and hydroxide solutions. S. J. SAINT (Trans. 2nd Comm. Int. Soc. Soil Sci., 1926, A, 134—148).—The absorption of bases by soil is measured by treatment with alkaline-earth hydroxides of varying concentration. Means for determining the "base requirement" of soils from these measurements are described. When the hydroxides of sodium and potassium are used the results differ from those obtained with alkaline-earth hydroxides by an amount which is constant for any particular soil. The method may be used

to measure replaceable hydrogen ions in the soil. Increased absorption of bases after extracting the soil with very dilute acid is equivalent to the replaceable bases removed by this means. The "base requirement" is unaffected by the ratio of soil to solution used, but is slightly increased by the time of contact and the fineness of grinding of the soil. Evidence is advanced to show that the soil colloids are not flocculated directly by the hydroxides of sodium and potassium, but that flocculation results from the activity of the exchangeable calcium ions so displaced. A. G. POLLARD.

Relation between soil reaction and plant growth. L. VON KREYBIG (Trans. 2nd. Comm. Int. Soc. Soil Sci., 1926, A, 149—152).—The range of p_H value of a soil for optimum plant growth is not an absolute figure. In soils exhibiting hydrolytic or exchange acidity (Kappen) or having a strong reducing power for permanganate the optimum ranges may vary considerably. Lucerne is a particularly sensitive crop in this respect. Successful crops are only produced on soils having a high buffer capacity. A. G. POLLARD.

Investigations of K. K. Gedroiz on base exchange and absorption—a résumé. H. J. PAGE (Trans. 2nd Comm. Int. Soc. Soil Sci., 1926, A, 208—231).—The theories of the mechanism of base exchange, clay flocculation, energy of base absorption, etc. are based on the conception that a replaceable base in the soil can be completely replaced by another base, but the process is only complete after repeated treatment with a salt solution. Details of the process for carrying out this replacement in the laboratory are given and adaptations for alkali soils are indicated. A. G. POLLARD.

Losses of phosphoric acid by leaching from upland soils in North Wales. G. W. ROBINSON and J. O. JONES (Agr. Progress, 1926, 3, 39—42).—Phosphate added as basic slag or Gafsa phosphate to soils devoid of calcium carbonate gradually disappears from the upper layers, and is precipitated in the lower layers, probably in combination with hydrated sesquioxides. Extraction with 0.2N-nitric acid appeared to give a degree of discrimination as to the combination of the phosphoric oxide which was not attained by extraction with 1% citric acid solution. CHEMICAL ABSTRACTS.

Carbon dioxide production in soil and solution. D. V. BAL (Ann. Appl. Biol., 1926, 13, 231—243).—Dextrose, lævulose, sucrose, lactose, and maltose are decomposed by *Bacillus prodigiosus* in decreasing order of readiness; ethyl alcohol, acetone, and organic acids are produced in addition to carbon dioxide. The maximum production of carbon dioxide is attained in 3—4 days. The lowering of the carbon dioxide production in soil is not due to exhaustion of the total available carbon, the formation of a film on the particles of organic matter, or the exhaustion of available mineral constituents. Addition of organic matter to soil, after carbon dioxide production has declined, restores the process to its initial level. CHEMICAL ABSTRACTS.

Nature of the colloidal soil material. P. L. GILE (Third Colloid Symposium Monograph, 1925, 216—227).—Colloidal soil material consists chiefly of silica, alumina, iron, organic matter, water not removed at 110°, and

smaller quantities of magnesium, potassium, calcium, titanium, sodium, phosphorus, and manganese. The colloid is not wholly amorphous. A dispersed particle of soil colloidal material acts like a loose mosaic of mixed ingredients with an internal pore space. Replaceable bases are mainly held at the surfaces presented by silica and organic matter.

CHEMICAL ABSTRACTS.

Influence of soil, season, and manuring on the quality and growth of barley. IV. E. J. RUSSELL (J. Inst. Brew., 1927, 33, 104—110. Cf. B., 1925, 1002).—The influence of nitrogenous manures has been practically the same as in previous years. The use of ammonium sulphate has not adversely affected the quality and has increased the yield. On an average, the addition of 1 cwt. of ammonium sulphate increased the yield of total grain by 7.4 bushels per acre. The nitrogenous manures, however applied, almost always raised the percentage of nitrogen in the grain. Ammonium chloride can be safely used as a substitute for ammonium sulphate. In addition to increasing the yield and relatively lowering the nitrogen content of the grain, it increases the number of grains per acre reaching the standard of head corn by reducing the number of infertile florets or of immature corns. The effect of phosphate has been to give a more marked increase than usual, whilst potassium sulphate was without effect. C. RANKEN.

Unsulphonated residue in spray oils. GRAHAM.—See II.

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

Nitrogen in cocoa by-products. WALTON and GARDINER.—See XIX.

PATENTS.

Treatment of calcium cyanamide. G. BARSKY, Assr. to AMERICAN CYANAMID Co. (U.S.P. 1,618,047, 15.2.27. Appl., 29.12.23).—Finely-divided calcium cyanamide (100 pts.) is mixed with water (200 pts.), and added to sulphuric acid (d 1.71, 900 pts.). Decomposition of the cyanamide to carbamide and ammonium sulphate proceeds smoothly without formation of by-products, e.g., dicyanodiamide. Phosphate rock (1000 pts.) can then be added if desired. T. S. WHEELER.

Removing dust from calcium cyanamide and deodorising the same. J. BRESLAUER, Assr. to COMP. DE L'AZOTE ET DES FERTILISANTS SOC. ANON. (U.S.P. 1,619,185, 1.3.27. Appl., 8.1.26. Conv., 10.1.25).—The cyanamide is simultaneously treated with a current of carbon dioxide and superheated steam for a period insufficient to cause any marked evolution of ammonia. H. ROYAL-DAWSON.

Compost manures. F. MÜHLBACHL (Aust. P. 103,913, 28.12.25).—Bones and combustible material are separated from domestic refuse. The combustible material is burnt and the ashes are mixed with the bones. The mixture is moistened with dilute sulphuric acid, and turned over from time to time with fresh additions of acid. Other refuse, including excreta, mixed with calcium carbonate is added, and the mixture is allowed to ferment. G. W. ROBINSON.

Fertilisers. ELEKTRIZITÄTWERK LONZA (GAMPEL U. BASEL), and E. LÜSCHER (Swiss P. 116,162—3, 3.3.25).—A solution containing phosphoric acid and ammonia in the proportions requisite for the formation of diammonium phosphate is atomised in a stream of air containing ammonia and water vapour. The phosphoric acid solution can also be absorbed in peat, and two layers can be treated with a current of air containing ammonia, until the lower layer contains ammonia in excess of that required for the formation of diammonium phosphate. It is then treated with a current of air almost free from ammonia. The phosphoric acid solutions may be obtained by extracting superphosphate with water or with carbamide solutions. Dicyanodiamide present in crude carbamide solutions is changed by the acid of the superphosphate extracts into guanylcarbamide.

G. W. ROBINSON.

Insecticide. H. HOWARD, Assr. to GRASSELLI CHEMICAL Co. (U.S.P. 1,620,208, 8.3.27. Appl., 15.9.24).—Barium silicofluoride is claimed as an insecticide.

G. W. ROBINSON.

Copper-lime dust. G. E. SANDERS, Assr. to RICHES, PIVER & Co. (U.S.P. 1,620,490, 8.3.27. Appl., 9.8.24. Cf. U.S.P. 1,541,753; B., 1925, 689).—A fungicide is prepared by adding copper sulphate crystals to quicklime, whereby the copper salt becomes dehydrated.

G. W. ROBINSON.

Plant sprays. I. G. FARBENIND. A.-G., Assees. of A. STEINDORFF and H. MEYER (G.P. 435,389, 19.12.22. Addn. to G.P. 433,653; B., 1927, 233).—Plant sprays are prepared consisting of halogenated naphthenic acids or their salts mixed, if desired, with hydrocarbons or their halogen substitution products. The halogenated naphthenic acids have a weaker odour and are less harmful to plants than the unsubstituted acids mentioned in the earlier patent, whilst their insecticidal action is increased. They have an emulsifying effect on the hydrocarbons or their derivatives, which also increase the insecticidal effect.

G. W. ROBINSON.

Dusting powder adherent to plants. R. LIESKE, A. THAUSS, and W. BONRATH, Assrs. to WINTHROP CHEMICAL Co., INC. (U.S.P. 1,616,323, 1.2.27. Appl., 25.9.25. Conv., 3.4.25).—The addition of a small quantity (0.3%) of a condensation product of cellulose and a halogenated aliphatic acid, such as is described in G.P. 332,203 (B., 1921, 344 A), to an insecticidal powder for plants greatly improves its adherence.

T. S. WHEELER.

XVII.—SUGARS; STARCHES; GUMS.

Starch nitrate. H. OKADA (Cellulose Ind., Tokyo, 1927, 3, 3—14).—With suitable cooling and stirring there is no difficulty in introducing the starch into the mixed acids and obtaining nitrates in theoretical yields. Stabilisation is readily effected by washing the nitrate with hot, strong, aqueous alcohol, to which may be added a small quantity of acetone. The starch is regenerated quantitatively by denitration with alcoholic ammonium hydrosulphide of low concentration and thoroughly cooled. The sulphur is removed from the product by careful treatment with hydrogen peroxide,

hot alcohol, and hot acetone. The regenerated starch has a low copper value of 1—3; it gives a blue reaction with iodine, and a clear solution in cold water. Thus it represents the ideal soluble starch, only physically modified, without chemical hydrolysis or oxidation. The washing and stabilisation of the starch nitrate are facilitated by swelling the granules. The swelling action of alcohol, alcohol-acetone, and water-acetone was studied; water-acetone is the most suitable agent. In spite of the higher density of starch as compared with cellulose, starch nitrate shows no higher content of sulphuric esters than does nitrocellulose.

J. F. BRIGGS.

Rapid method for determination of starch.

O. S. RASK (J. Assoc. Off. Agric. Chem., 1927, 10, 108—120).—Treatment with cold hydrochloric acid renders starch completely water-soluble and subsequently coagulable by alcohol. There is an optimum time, temperature, and acid concentration relationship to secure complete conversion without hydrolysis. The action of acid is made the basis of a method for the determination of starch. 1—4 g. of material are ground, transferred to a filter paper, and successively extracted with ether, 10% alcohol, and water in the order named. The paper and residue are then stirred with 20—25 c.c. of dilute hydrochloric acid. The suspension is diluted to 100 c.c. and filtered through dry asbestos. (The residue should show no starch reaction.) 50 c.c. of the filtrate are pipetted into 110—115 c.c. of 95% alcohol, stirred for 1 min., and the precipitate allowed to settle. The flocculate is filtered, washed with 96% alcohol, and dried to constant weight. (The filtrate should show no reaction of carbohydrates by the Molisch test.) Application of the method to a variety of starches and cereal products revealed that it determines starch, and starch only, with a high degree of accuracy. The results are considerably higher than those given by the diastase method.

H. DOWDEN.

Relative sweetening power of sucrose and lævulose.

O. SPENGLER and A. TRÄGEL (Z. Ver. deut. Zuckerind., 1927, 1—12).—Tasting tests in which 8 or 9 persons participated gave the following values for the two sugars: 100 g. of lævulose = 108 g. of sucrose, the values being approximately the same when the solutions were made with distilled water, tap water, or tap water with an addition of 0.01% of sodium chloride.

J. P. OGILVIE.

Clarification for polarisation. R. T. BALCH (Sugar, 1926, 28, 551).—Hydrated aluminium silicate is ground to an impalpable powder in a ball mill, and mixed with distilled water to form a 5% suspension, the water being added in small portions at first, and thoroughly mixed after each addition until the tendency to lump is overcome, after which the remainder of the water is added in a single portion. For most purposes 5 c.c. of this suspension are sufficient for the clarification of 100 c.c. of solution for polarisation. It fulfils requirements much more effectively than the alumina cream usually added, not only assisting the rate of filtration, but also effecting some decolorisation.

J. P. OGILVIE.

Bagasse as fuel. R. F. HUTCHESON (Int. Sugar J., 1926, 28, 652—658).—Assuming the following principal data: cane crushed per hr., 50 tons; fibre in cane,

16% ; bagasse in cane, 34% ; fibre in bagasse, 47% ; sugar in bagasse, 4% ; water in bagasse, 48%, the following values are calculated : actual heat absorbed by water in the boilers, 2702 B.Th.U. ; fuel efficiency, 75% ; volume of flue gases, 115 cub. ft., and boiler h.p., 2266. J. P. OGILVIE.

Determination of cuprous oxide produced in sugar analysis. C. S. BISSEON and J. G. SEWELL (J. Assoc. Off. Agric. Chem., 1927, 10, 120—124).—Cuprous oxide formed by the reduction of Fehling's solution, after filtration and washing, is completely oxidised by a measured volume of standard permanganate solution. The precipitate is dissolved in sulphuric acid (d 1.495), and a measured volume of standard ferrous sulphate solution added, in excess of that required to destroy the colour of the permanganate. After dilution to standard volume, the excess ferrous sulphate is titrated with permanganate to the usual end-point. The method is an improvement on that of Caven and Hill (cf. B., 1897, 981 ; 1898, 124). H. J. DOWDEN.

Determination of sulphur dioxide in sugar factory products. J. P. OGILVIE (Int. Sugar J., 1926, 28, 644—647).—Very sensitive results are yielded by the sulphide stain method, using modifications communicated by J. S. MANN, in which a flask is provided with a thistle funnel and a tap funnel, and a leading tube to which is attached a glass tube holding a small cotton plug, and a funnel, this latter having a clamp for holding filter-paper impregnated with lead acetate. About 50 g. of purest granulated zinc (previously washed with dilute hydrochloric acid to remove traces of sulphur always present) are placed in the flask, just covered with water, and 50 c.c. of pure dilute hydrochloric acid (1 : 2 of water) are run slowly from the tap funnel through the thistle funnel over the zinc, the gases evolved being passed through the lead-impregnated paper for 30 min., at the end of which time no discoloration of the paper should have resulted. A series of standard stains are prepared by the introduction into the flask of known amount of sodium sulphite dissolved in pure sugar liquor, so as to represent quantities of 0.0025, 0.0020, 0.0015, and 0.0010% SO_2 in samples of a sugar product when 5 g. are taken for the determination. J. P. OGILVIE.

Apparatus for the electrometric determination of ash in sugar factory products. K. ŠANDERA (Z. Zuckerind. Czechoslov., 1927, 51, 205—211).—Instead of using a Wheatstone bridge with telephonic indication, the author utilises alternating current from the lighting main divided into four resistances, two of which are lamp bulbs, the others being the liquid under examination and a constant resistance. By altering the distance between the electrodes in the cell containing the assay liquid, the resistance is altered and balanced with the constant resistance, the two lamps being equally illuminated at the point of equilibrium. An apparatus constructed on this principle is said to have yielded sufficiently precise results in the electrometric determination of mineral matter in sugar products, the difference between them and the values given by the gravimetric method in the case of raw sugars being less than 0.02% in 68% of the samples examined, and exceeding 0.04% only in four cases. J. P. OGILVIE.

Fermentable sugars of malt. WRIGHT.—See XVIII.

PATENTS.

Absorbent decolorising medium. C. B. DAVIS (U.S.P. 1,618,149, 15.2.27. Appl., 14.12.23).—A porous carbon base such as carbonised bones, carbonised gel of raw sugar gums, or the exhausted carbon used in decolorising sugar liquors, after cleaning with dilute sodium hydroxide solution and hydrochloric acid, is heated at 250—1000° with the pyro-bituminous gas from the "cracking" of heavy oil distillates, in the presence of a limited amount of oxygen. The hard, finely-divided carbon structure formed is strongly absorbent. F. R. ENNOS.

Purifying carbohydrate solutions etc. C. B. DAVIS (U.S.P. 1,618,148, 15.2.27. Appl., 21.2.23).—By the addition of a small, predetermined quantity of colloidal tannate of iron to the carbohydrate solution at 70°, impurities consisting of electro-positive colloids are neutralised and precipitated. After removal of the precipitate by a filter press, the liquid is decolorised by passing through a char filter. F. R. ENNOS.

Manufacture of an adhesive. L. FACKLER, Assr. to STEIN-DAVIES Co. (U.S.P. 1,618,150, 15.2.27. Appl., 15.12.21).—A colourless liquid adhesive is made by mixing dry dextrin with dry sodium perborate, and subsequently adding water. The oxygen evolved bleaches the dextrin, and the residual boron compound accelerates its dissolution. F. R. ENNOS.

XVIII.—FERMENTATION INDUSTRIES.

Influence of the hydrogen-ion concentration on the velocity of the fermentation and yield of alcohol. J. DEHNICKE and W. KILP (Z. Spiritusind., 1927, 50, 69—70).—Worts of varying hydrogen-ion concentration prepared from maize and from potatoes were fermented after adjustment to equal extract contents. The highest yields of alcohol were obtained with an initial p_H 4.6—5.3 for the maize worts and 5.0—5.5 for the potato worts, and these yields were attained at a stage of the fermentation on an average, 20 hrs. earlier than with worts having p_H values outside those limits. Worts prepared similarly from molasses gave irregular results, which were probably due to the greater salt content of the molasses. C. RANKEN.

Influence of soil, season, and manuring on the quality and growth of barley of the 1925 crop as indicated by the malts made therefrom. IV. H. M. LANCASTER (J. Inst. Brew., 1927, 33, 111—119 ; cf. B., 1926, 103).—The malting loss, malt extract, and valuation of the barley were the points taken for comparison of the barleys. The malting loss was calculated on raw barley so that any loss of dry matter incurred during the sweating process was included. The malts were all made from barley of the same pure variety of seed, and whilst the similarity of the malts from the same farm under different manurial conditions was remarkable, the difference due to soil and climate was very great. In general malting value, Spratt-Archer and Archer-Goldthorpe were slightly superior to Beaven's Archer and Webb's Sunrise, but all these varieties produced good malting barleys. The results

of the analyses of the malts described are recorded in an appendix by H. L. HIND. C. RANKEN.

Strength of yeast cells. S. B. SCHRYVER, E. T. THOMAS and S. G. PAINE (*J. Inst. Brew.*, 1927, 33, 120—137).—The softening of yeast (autolysis) does not depend upon the state of the cell walls, but is the result of chemical changes, which seem to be bound up with the nitrogen content and its distribution in the cell. During the softening of yeast there is an increase in the amount of material which can be extracted with water, and the amount of protein diminishes with an increase in the non-protein content. Following a latent period there is a rapid degradation of the protein which is not due to bacteria, which only find a suitable pabulum after autolysis has started. Autolysis, which takes place only in acid media, is inhibited by higher concentrations of the acid. No autolysis occurs if the yeast is thoroughly washed in water and allowed to remain in a wet condition. The water removes some product which is essential to autolysis and concentrated washings from yeast accelerate autolysis. The washings apparently contain one or more proteolytic enzymes. Pressure on the yeast also favours autolysis. C. RANKEN.

Fermentable sugars of malt. I. G. S. WRIGHT (*J. Inst. Brew.*, 1927, 33, 151—170).—The soluble constituents of malt include, in addition to sucrose, dextrose, and lævulose, a series of fermentable polysaccharides which are products of the malting process. Among these polysaccharides a carbohydrate which may have the structure of a dextrose-lævulose-galactose trisaccharide is indicated, also a gluco-glucoside and other carbohydrates in which dextrose, lævulose, and galactose are constituted. No indications of maltose were afforded in any of the malts examined either by the osazones or considerations of the reducing and rotatory powers. Notes on the determination of the cold-water extracts of malt are appended. C. RANKEN.

Manuring experiments on hops. BURGESS.—See XVI.

Carbon dioxide production. D. V. BAL.—See XVI.

XIX.—FOODS.

Reductase test. E. R. HISCOX (*Agr. Progress*, 1926, 3, 102—103).—The reductase test gives erratic results, and is inferior to the plate count method for grading milk according to the English system.

CHEMICAL ABSTRACTS.

Technique of the Gerber test. J. GOLDING and A. WAGSTAFF (*Agr. Progress*, 1926, 3, 103—104).—Sulphuric acid (d 1.820—1.825, 10 c.c.) is automatically measured into a butyrometer bottle, and amyl alcohol (d 15.5 0.8145—0.816, 1 c.c.) is run on to the surface; milk (11 c.c.) is added (not using a pipette with a wide delivery tube), the bottle is closed with a grey rubber stopper, wrapped in cloth, shaken by hand, and centrifuged for 3 min. Before reading off the fat, the bottle is placed in water at 65.5°. CHEMICAL ABSTRACTS.

Technique in testing for vitamin-B. A. L. BACHARACH and G. A. HARTWELL (*Analyst*, 1927, 52, 145—149).—The weight curves of rats on vitamin-B-free diet did not vary for two separate inbred stocks, and similar

curves were obtained by two workers in different laboratories with their own and each other's animals. In order to test for the absence of vitamin-B, the quickest results were obtained by using "raw" rather than "cooked" food; the latter method is, however, a more sensitive way of showing its presence. D. G. HEWER.

Recent advances in the bacteriological examination of food and water. W. G. SAVAGE (*Analyst*, 1927, 52, 117—127).—The correlation of hydrogen-ion concentration in water, as determined by the use of methyl red, with the Voges and Proskauer and the Koser reactions, has been studied, and a division of the lactose-fermenting bacilli into high and low types was found to correspond with primary and, possibly, fundamental differences. Detection of tubercle bacilli and problems in connexion with streptococci are discussed, together with laboratory methods for judging the extent of clean milk production. Details in connexion with the investigation of outbreaks of food poisoning with no ascertainable cause are considered, and a systematic method of examining canned foods is outlined, the range of culture media and incubation temperatures sufficient to include all types of spoilage organisms being indicated. D. G. HEWER.

Analysis of flours. G. SMIRICH (*Annali Chim. Appl.*, 1927, 17, 81—82).—The separation of fragments of husk etc. from flour, bread crumb, and the like, for microscopical identification may be effected by heating 5—10 g. of the material for 5—10 min. with 50—100 c.c. of 85% glycerol containing 20 g. of concentrated sulphuric acid per litre. The hot liquid is centrifuged, and the residue of bran etc. examined. T. H. POPE.

Relation of the magnesium in the ash and the lipid-protein ratio to the quality of wheats. B. SULLIVAN and C. NEAR (*J. Amer. Chem. Soc.*, 1927, 49, 467—472).—Wheat of 20 varieties (of strain or place of growth) was examined with regard to protein content, gluten content and quality, proportion and constituents of ash, and lipid content. The magnesium content of the ash has a direct relationship to the strength of the wheat as determined by protein content and quality of the gluten. The latter was not related to the calcium, potassium, and phosphorus contents of the ash. The lipid contents were all between 2.53% and 3.84%. Softer wheats show a higher ratio of lipid to gluten or lipid to protein. F. G. WILLSON.

Significance of solubility and "activity" of nitrogen in cocoa by-products. G. P. WALTON and R. F. GARDINER (*J. Assoc. Off. Agric. Chem.*, 1927, 10, 135—142).—The water-soluble nitrogen content, which has been taken as a criterion of fertiliser value, has been determined for the cocoa by-products, press-cake, solvent-extracted cocoa, and cacao shell meal. The total content of nitrogen in dry fat-free press-cakes and solvent-extracted cocoas averages just under 5%, of which one third is water-soluble. 50—58% of the water-soluble nitrogen is represented by theobromine and caffeine, the fertiliser value of which compounds is questionable. The "activity" or ease with which water-insoluble nitrogen is rendered water-soluble, as determined for press-cake by the neutral permanganate method, was found to be above the acceptance value of

80%, but by the alkaline permanganate method to be less than one half of the "passing" limit of 50%. The validity of the "activity" determination is dependent upon rigid adherence to the standard procedure, for drying the water-insoluble portion at 70° prior to the neutral permanganate treatment decreased the "activity" from 89.7% to 76.7%. H. J. DOWDEN.

Determination of caffeine in de-caffeinated coffee. G. BONIFAZI (Ann. Chim. Analyt., 1927, [ii], 9, 33—38).—25 g. of coffee and 5 c.c. of 5% ammonia solution are extracted for 3—4 hrs. with chloroform or ether, the solvent is distilled off, the residue extracted with cold water, and the solution boiled with 1 g. of magnesia. After filtering and washing the residue with boiling water, the filtrate is evaporated to dryness, taken up in boiling water, and 5 c.c. of 1% potassium permanganate solution are added. The solution is decolorised with 3% hydrogen peroxide containing 1 c.c. of glacial acetic acid per 100 c.c. The residue is extracted with boiling chloroform. When the chloroform is nearly evaporated the solution is transferred to a subliming capsule, the residue of solvent evaporated, and the sublimed product weighed. Purification of the caffeine may be further effected by a second treatment with permanganate, or by successive sublimations. D. G. HEWER.

Analysis of egg yolk preserved with glycerin. T. COCKBURN and M. McF. LOVE (Analyst, 1927, 52, 143—144).—Moisture is determined by drying *in vacuo* over sulphuric acid for 48 hrs.; fat by the Gottlieb method, since chloroform cold or hot dissolves appreciable amounts of glycerin; and glycerin by making 10 g. of the sample into a thin paste with water at 45—50°, and adding dialysed iron (B.D.H.) drop by drop until the proteins are precipitated. The mixture is filtered, the filtrate and washings are made up to 250 c.c., and the glycerol is determined in 100 c.c. by the acetin method. The approximate proportion of glycerin present may be arrived at by shaking some of the above filtrate twice with ether to remove fat, adding the water washings of the ethereal solution to the original aqueous layer, evaporating to dryness, and weighing. D. G. HEWER.

Variations in the composition of Colorado potatoes. N. E. GOLDTHWAITE (Colorado Agric. Exp. Sta. Bull., 1925, [296], 3—77).—No two individual potatoes have the same composition. The percentages of dry matter, starch, and total carbohydrates vary inversely with the percentage of water. There is little relationship between the nitrogenous matter and ash. For irrigated potatoes, the percentage of dry matter is approximately 6.71% of the total greater than that of the starch, the relation being 1.42 : 1, and that of the total carbohydrates to dry matter 1 : 1.15. The ratios starch : water and total carbohydrates : water are very approximately 1 : 1.5 and 1 : 3.897. On the dry basis, the ratio starch : dry matter is 1 : 1.25.

E. CHEMICAL ABSTRACTS.

Determination of starch.—RASK.—See XVI.

PATENTS.

Treating milk products. U. G. TODD, Assr. to PFAUDLER CO. (U.S.P. 1,618,789, 22.2.27. Appl., 20.5.24).—Milk, the acidity of which has been adjusted so as to prevent coagulation in the subsequent process, is heated

at 60—65°, and subjected, while in a finely-divided state obtained by spraying, to the purifying action of a current of steam or steam and air in a partial vacuum, whereby undesirable flavours and odours are removed.

F. R. ENNOS.

Production of dry milk. W. B. McLAUGHLIN (U.S.P. 1,616,631, 8.2.27. Appl., 31.3.23).—Milk, with the addition of 2% of sugar, is concentrated under reduced pressure to *d* 1.1, heated to the b.p. by passing steam into it, and maintained under the influence of its own contained heat for 1 hr. in a heat-insulated tank. After spray-drying the treated milk, a product is obtained of altered flavour, improved solubility, and better keeping qualities.

F. R. ENNOS.

Producing commercial baking dough. D. S. DONOVAN and J. R. BROWN (U.S.P. 1,617,514, 15.2.27. Appl., 6.7.26).—Sponge dough ingredients, including the yeast, are mixed and allowed to remain for 2 hrs. at 24—27°, so that fermentation is substantially complete. Soda and baking powder are then added to the mixture, which is cooled, preferably in small lots, to 0—2° before the aerating agent can react, and maintained in this condition until ready for baking.

F. R. ENNOS.

Manufacture of biscuits, cakes, and similar food products. O. A. ELLIAS (E.P. 266,101, 12.1.26).—The baking process is carried out in the presence of artificially-produced ultra-violet rays. The temperature of the oven, which is heated by both light and radiant heat, is maintained at about 90°, although it may be raised for a short period to 200°. The product has an increased food value.

F. R. ENNOS.

Preserving food products. J. J. BARRY, Assr. to GENERAL SEAFOODS CORP. (U.S.P. 1,617,006, 8.2.27. Appl., 1.10.24).—Maize or other food product is stirred and heated at 100° while the air is withdrawn and replaced by carbon dioxide under pressure. After reduction of the pressure, the cooked food product is transferred to containers, which are sealed and heated at the sterilising temperature (112°) for 30 min.

F. R. ENNOS.

Treatment of vegetable produce. S. G. M. NESBITT, J. B. BUTLER, and J. J. DRUMM (E.P. 266,069, 30.11.25).—The vegetables are boiled with water and steeped in a non-toxic, alkaline buffer solution (4—8% solution of crystalline disodium phosphate). They are then packed in sealed containers with the usual sugar-salt solution, together with enough buffer solution so that after sterilisation by heat the product has p_H 7.3—8.3, when the original green colour is preserved.

F. R. ENNOS.

Method and apparatus for sterilising and preserving food. R. KRISTEN (E.P. 265,859, 26.7.26).—The food contained in preserve glasses is inserted in a vessel with an air-tight fitting lid, and a small quantity of alcohol in the vessel is exploded by means of an ignition device operated from the outside. The oxygen in the vessel and in the preserve glasses, the lids of which are slightly lifted by the explosion, is thus rapidly burnt and the harmful germs are killed, the combustion gases being expelled into a collecting rim surrounding the air-tight lid, which is lifted against spring pressure. Admission of air into the vessel instantaneously closes the lids of the glasses, which are then removed.

F. R. ENNOS.

Preparation of a food-colouring composition. W. D. BOST, ASSR. to ORANGE CRUSH CO. (U.S.P. 1,616,739, 8.2.27. Appl., 18.7.21).—A colouring compound for potable liquids is prepared by heating carmine with alkaline aqueous glycerin. After intensifying the colour by boiling with concentrated ammonia solution, the product is rendered slightly acid by boiling with phosphoric acid, and, before use, is diluted with sugar solution (*d* 1.21 or over). F. R. ENNOS.

Improving the qualities of coffee. O. GEWALT (E.P. 265,865, 16.8.26).—The coffee, preferably when green, is subjected to a temperature of about -8° for 20 hrs. or more, when any unpleasant odour and taste are removed. F. R. ENNOS.

Pulverising and separating cereals (E.P. 265,841).—See I.

Vitaminised oils (E.P. 266,139).—See XII.

Sterilising putrescible liquids (E.P. 254,725).—See XXIII.

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

Titration of tartaric acid after drying at 100° . A. ENGLER (Chem.-Ztg., 1927, 51, 158—159).—Degener (B., 1898, 700) has stated that tartaric acid after drying at 100 – 105° suffers a diminution of titration acidity, presumably owing to the formation of anhydride. The author repeated this experiment using chemically pure tartaric acid dried at 105° for 17 hrs. It was then titrated with 0.533*N*-caustic potash with phenolphthalein or litmus paper. Identical results were obtained at 0° and at room temperature. By heating at 95° the neutral solution was rendered very faintly acid. It is concluded that Degener's results were erroneous. C. IRWIN.

[Determination of] ethyl phthalate. IV. J. A. HANDY and L. F. HOYT (J. Amer. Pharm. Assoc., 1926, 15, 454—461).—The sample (0.1 c.c.) is heated on a steam bath with ethyl-alcoholic potassium hydroxide free from aldehydes (1 c.c.) until the alcohol is completely removed, the resorcinol-sulphuric acid reagent (0.5 c.c.) added, and the mixture heated at 150° for 3 min., then diluted with 40 c.c. of water and rendered alkaline with 10 c.c. of 10% sodium hydroxide solution to produce the fluorescence. The addition of 1 c.c. of alcoholic potassium hydroxide to 1 c.c. of the sample containing 0.5% or more of ethyl phthalate yields crystalline potassium phthalate. By using 10 c.c. of the sample and 1 c.c. of alcoholic potassium hydroxide, 0.05% of ethyl phthalate may be detected. CHEMICAL ABSTRACTS.

Errors in analysis of alkaloids caused by presence of fatty acid or soap. H. R. WATKINS and S. PALKIN (J. Assoc. Off. Agric. Chem., 1927, 10, 130—135. Cf. B., 1926, 848).—Determination of alkaloids by chloroform extraction is often vitiated by the presence of fatty acid or soap, especially when calcium or magnesium compounds are present. Potassium soaps lead to the formation of difficult emulsions, rendering the extraction incomplete. Calcium and magnesium soaps, being slightly soluble, are extracted simultaneously with the

alkaloid and give rise to a high assay. Ammonium soaps are hydrolysed and the free acid is extracted, to be deposited on the walls of the vessel during the final titration, but without influencing the determination. Sodium soaps, however, in small quantities do not give this deposit. When soap settles out during the final titration, a few c.c. of 0.1*N*-acid should be added, and the fat removed by extracting twice with chloroform, the aqueous alkaloidal solution being then made ammoniacal and re-extracted. H. J. DOWDEN.

Analysis of sodium salicylate and sodium benzoate. D. HENVILLE (Analyst, 1927, 52, 149—150).—The weighed sodium salicylate is transferred to a separator, neutral ether and methyl orange are added, and 0.5*N*-hydrochloric acid is run in until the indicator is a distinct red. The aqueous layer and ether washings are run off and neutral ether is added, when, on shaking, the indicator reverts to yellow. Titration is continued to the end-point, which is quite sharp. In the presence of sodium or potassium carbonates or bicarbonates, the total combined alkali is obtained as above, the carbonates are removed, the solution is filtered, washed, and titrated as before, or the boiling solution is titrated with standard acid, the figure calculated to carbonate or bicarbonate, and the difference from the original ether titration figure calculated to sodium salicylate. D. G. HEWER.

Microchemical examination of santonin and herapathite [quinine periodide]. C. VAN ZIJP (Pharm. Weekblad, 1927, 64, 278—284).—If a sublimate of pure santonin be covered with water, it slowly dissolves. On evaporation of the water, the santonin separates in oily drops, but if the glass be scratched before evaporation, or seeded, the crystalline form separates again readily. A solution of the sodium compound gives crystalline deposits readily with calcium, strontium, cadmium, cobalt, or lead acetates. Conditions for microchemical examination using these reactions are described. Herapath's reaction is suitable for microchemical identification of quinine; suitable conditions by which the test may be carried out, even in the presence of twice the quantity of cinchonidine, are described. S. I. LEVY.

Humic acids. I. Methylation and treatment with ammonia of some humic acid samples. W. FUCHS and H. LEOPOLD (Brennstoff-Chem., 1927, 8, 73—77).—Three samples of humic acid, viz., Merck's humic acid, and humic acid prepared from starch and from quinol, were subjected to repeated methylation (with methyl sulphate and alkali) and treatment with ammonia. The products from the three samples gave, respectively, the following limiting values: methoxyl content, 6.9%, 7.6%, 2.5%; total nitrogen, 7.50, 5.95, 11.46; nitrogen removable with alkali, 4.20, 3.15, 4.53; fixed nitrogen, 3.30, 2.80, 6.93. Reckoning with a mol. wt. of 1400, the molecule of humic acid contains only one phenolic hydroxyl group to not less than twenty carbon atoms. Exhaustive methylation considerably reduces the reactivity of the samples towards ammonia, and *vice versa*. This observation and the hypothesis that coal is formed from lignin *via* humic acids and humins, are briefly discussed.

W. T. K. BRAUNHOLTZ.

[Composition of plants.] E. V. LYNN and P. Y. CHENG (J. Amer. Pharm. Assoc., 1926, 15, 105—108).—An examination of *Lysichiton camtschatcense* (skunk cabbage), *Asarum canadense* (wild ginger), *Gaultheria shallon* (salal), and *Micromeria douglassii* (tea vine). Wild ginger contains a small amount of volatile oil, f.p. 4—5°, n_D^{20} 1.5195. CHEMICAL ABSTRACTS.

Essential oils of *Mentha aquatica* and *M. sylvestris* from Sicily. G. ROMEO and U. GIUFFRÈ (Annali Chim. Appl., 1927, 17, 83—87).—Oil of *Mentha aquatica* from Messina has d^{15}_4 0.9671, α_D^{20} 39° 55', n_D^{20} 1.4883, solubility in 75% alcohol 1:1.5, acid value 1.45, saponification value 64.85, esters (as menthyl acetate) 22.41%, combined alcohols (as menthol) 17.66%, free alcohols 28.53%, ketones (as menthone) 0.77% (cf. Kremers, B., 1922, 647A). Oil of *Mentha sylvestris* from Messina has d^{15}_4 0.9687, α_D^{20} +20° 15', n_D^{20} 1.4841, solubility in 75% alcohol 1:1, acid value 1.40, saponification value 82.6, esters (as menthyl acetate) 28.71, combined alcohols (as menthol) 22.62%, free alcohols 30.84%, ketones and aldehydes, trace (cf. Schimmel's Report; B., 1910, 716). T. H. POPE.

Essential oils of *Calamintha nepeta* and *Mentha pulegium*. G. ROMEO and U. GIUFFRÈ (Annali Chim. Appl., 1927, 17, 87—88. Cf. B., 1926, 107).—Oil of *Calamintha nepeta*, var. *Canescens* (*Mentha pulegium*, var. *tomentosa*), obtained in 0.7 (0.9)% yield from the dry plant, has d^{15}_4 0.9218 (0.9262), α_D^{20} +20° 10' (+38° 40'), α_D^{20} 1.4778 (1.4733), solubility in 75% alcohol 1:1.5 (1:1.25), acid value 1.12 (1.55), saponification value 7.03 (6.8), esters (as menthyl acetate) 2.09 (1.85)%, combined alcohols (as menthol) 1.64 (1.46)%, free alcohols 16.67 (10.23)%, ketones (as pulegone) 56.10 (70.54)%. T. H. POPE.

Pyrogenic dehydration of fusel oil. M. GIUA and L. THUMINGER (Atti R. Accad. Sci. Torino, 1926, 61, 149—158). See B., 1926, 687.

PATENTS.

Production of methane. CHEM. FABR. GRIESHEIM-ELEKTRON (E.P. 244,076, 19.11.25. Conv., 3.12.24).—Methane is produced from carbon monoxide and hydrogen or gas mixtures containing hydrogen, by means of nickel catalysts, the rate of reaction being increased and the use of smaller contact furnaces or of a smaller amount of contact substance being made possible by working at atmospheric pressure and at temperatures above 500°.

C. O. HARVEY.

Preparation of concentrated acetic acid from dilute aqueous or crude dilute pyroligneous acid. H. SUIDA (E.P. 255,043 and 255,047, [A] 21.6.26, [B] 24.6.26. Conv. [A, B], 13.7.25).—(A) The high-boiling extraction media used according to E.P. 230,447 (cf. B., 1925, 827) to recover from the aqueous effluents the solvents (of higher b.p. than acetic acid) which remove the acetic acid from its superheated mixture with steam, are replaced by low-boiling chlorinated solvents, e.g., trichloroethylene, chloroform, carbon tetrachloride, ethylene dichloride, etc. From the solutions obtained, the low-boiling solvent is distilled off, the high-boiling acetic acid extraction medium (e.g., tar cresol) remaining. [B] A superheated mixture of acetic acid and water vapour is treated in an extraction column

with a mixture of an acetic acid extraction medium (hydroxylic aromatic compounds, e.g., tar cresol) and a low-boiling chlorinated solvent for the latter (e.g., trichloroethylene). Mixed vapours of water, solvent, and a little extraction medium pass to a column in which a fractional condensation is effected, such that only a vapour mixture of solvent and a little water passes through a dephlegmator and condenser to a cold-washing column. The rest of the vapour entering the fractionating column, containing a mixture of nearly all the water, all the extraction medium, and a little solvent, condenses, and passes through another condenser to a separator, where a mixture of extraction medium and solvent falls to the bottom, and is returned to the extraction column, while practically pure water, containing a little extraction medium, rises to the surface, and is run off to the lower part of the washing column, where it meets the heavier mixture of solvent and a little water. Pure water issues from the top of the column, and from the bottom a mixture of solvent and extraction medium, which is returned to the tank.

B. FULLMAN.

Manufacture of organic compounds containing oxygen [methyl alcohol, etc.]. J. Y. JOHNSON. From BADISCHE ANILIN- & SODA-FABR. (E.P. 266,405, 19.10.25. Cf. E.P. 229,714; B., 1925, 338).—The catalytic production of methyl alcohol etc. from carbon oxides and hydrogen is carried out under pressure and at a high temperature with gas mixtures containing a high percentage of non-reacting gases; the process is circulatory, fresh gas mixture being added and treated gas removed to maintain a substantially constant composition of the circulating gas mixture.

B. FULLMAN.

Manufacture of methyl alcohol and other oxygenated organic compounds. J. Y. JOHNSON. From BADISCHE ANILIN- & SODA-FABR. (E.P. 266,410, 23.10.25).—Coal gas, coke-oven gas, natural gas, cracking gas, etc., together with large quantities of water vapour and/or carbon dioxide, are partially oxidised catalytically (cf. E.P. 231,218; B., 1925, 357), the hydrocarbons being thereby converted into carbon monoxide and hydrogen. As catalysts, nickel-coated magnesium oxide or molten iron alloys are especially suitable. The product is passed either directly or after removal of sulphur compounds and/or adjusting the ratio of carbon monoxide to hydrogen if desired, over a suitable catalyst, with formation of methyl alcohol.

B. FULLMAN.

Production of dicyanodiamide. G. BARSKY, ASST. to AMERICAN CYANAMID Co. (U.S.P. 1,618,504, 22.2.27. Appl., 9.6.23).—The transformation of cyanamide into dicyanodiamide is controlled by maintaining a suitable hydrogen-ion concentration. The latter is then increased to prevent decomposition of the latter compound, which is recovered by evaporating the solution.

B. FULLMAN.

Manufacture of new complex metal alcoholates. CHEM. FABR. AUF AKTIEN (VORM. E. SCHERING) (E.P. 261,377, 9.11.26. Conv., 12.11.25).—Complex mixed metallic alkoxides, such as the *aluminium magnesium ethoxides* $[\text{Al}(\text{OEt})_4]_2\text{Mg}$ and $[\text{Al}(\text{OEt})_6]_2\text{Mg}_3$, and *magnesium sodium* and *aluminium sodium ethoxide* are produced by heating the requisite alkoxides together,

preferably in the presence of a solvent, or by the action of a metallic alkoxide on another metal in the presence of alcohol, or by the action of alcohol on a mixture of two metals or an alloy, or by decomposing a metallic salt with excess of a metal alkoxide in alcoholic solution. These substances are very soluble in organic solvents, and are used as condensing agents. B. FULLMAN.

Process and apparatus for denicotining tobacco, tobacco waste, and tobacco products. J. SARTIG (E.P. 265,427, 20.4.26).—The tobacco material is placed in a wire basket which rests on a perforated plate in a closed container. By means of an outer heating bath, the material is heated at below 100°. Into the container is run preheated water (if free nicotine is to be extracted) or water containing 0.25% of ammonia (for combined nicotine), air being excluded throughout the process. By continued heating, aqueous or ammoniacal vapours, after passing through the tobacco, impinge with their nicotine content on a sloping or conical cover, and are condensed, the liquid running down the sides without wetting the tobacco. B. FULLMAN.

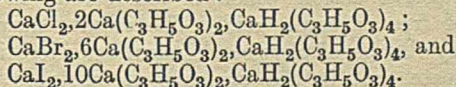
Production of aryl-peri acids [phenyl- α -naphthylamine-8-sulphonic acid]. H. D. GIBBS and E. L. FREDERICK, Assrs. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 1,617,313, 8.2.27. Appl., 11.10.20. Renewed 24.6.26).—Naphthylamine-8-sulphonic acid (100 pts.), aniline (300 pts.), and water (50 pts.) are heated under pressure at 170° for 5 hrs. when pure phenyl- α -naphthylamine-8-sulphonic acid is obtained. T. S. WHEELER.

Synthetic perfume. C. S. MINER, Assr. to QUAKER OATS Co. (U.S.P. 1,617,412, 15.2.27. Appl., 26.12.22).—Esters of pyromucic acid and aliphatic alcohols are of value as perfumes, flavouring agents, and the like.

T. S. WHEELER.

Manufacture of quinine solutions suitable for subcutaneous injections. F. B. DEHN. From CHEM.-PHARM. A.-G. BAD HOMBURG (E.P. 266,209, 1.7.25).—Stable solutions of quinine are prepared by dissolving quinine in olive oil in the presence of a terpene, e.g., terpineol, or a mixture of terpenes. B. FULLMAN.

Production of double salts of calcium halides with calcium lactate. J. COLMAN (E.P. 266,607, 28.7.26).—Non-deliquescent calcium halide-lactates, suitable for therapeutic use, are prepared by the action of 10% halogen hydracids on calcium lactate. The following are described:



B. FULLMAN.

Pharmaceutical products. H. HAHN, Assr. to WINTHROP CHEMICAL Co., INC. (U.S.P. 1,616,365—6, 1.2.27. Appl., [A], 5.10.25; [B], 16.12.25. Conv., [A], 28.11.24; [B], 19.2.25).—(A) A solution of the sodium salt of a hydroxyquinolinesulphonic acid is treated with excess of antimony hydroxide, the solution obtained is filtered, and treated with alcohol, when a compound of the type $[\text{C}_9\text{H}_6\text{-xN}(\text{SO}_3\text{H})_x\text{O}]_3\text{Sb}$ is obtained. (B) Thioglycollic acid (20 pts.), antimony pentoxide (11 pts.), and water (500 pts.) are heated until complete solution occurs, the liquid is neutralised with sodium carbonate, and evaporated at a low

temperature. A product, $[\text{C}_2\text{H}_4(\text{CO}_2\text{Na})\text{S}]_5\text{Sb}$, is obtained. These products have therapeutic value.

T. S. WHEELER.

Secondary butylallylbarbituric acid. A. W. DOX, Assr. to PARKE, DAVIS AND Co. (U.S.P. 1,615,870, 1.2.27. Appl., 7.8.23).—5-sec.-Butyl-5-allylbarbituric acid (cf. Volwiler, A, 1925, i, 1173) is claimed as a new compound of therapeutic value as a sedative.

T. S. WHEELER.

Production of modified pneumococcal antigen and antipneumococcal serum. W. P. LARSON (U.S.P. 1,621,117, 15.3.27. Appl., 27.8.25. Renewed 7.1.27).

Production of modified bacteria and toxins, and immunising serums. W. P. LARSON (U.S.P. 1,621,118, 15.3.27. Appl., 4.11.25. Renewed 30.7.26).

Scarlet fever antigen. W. P. LARSON (U.S.P. 1,621,119, 15.3.27. Appl., 27.1.26. Renewed 26.11.26).

Manufacture of diaminodiarlylcarbamides. I. G. FARBERIND. A.-G., Asses. of F. HEINZE (U.S.P. 1,617,847, 15.2.27. Appl., 27.5.26. Conv., 10.6.25).—See E.P. 254,667; B., 1926, 769.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Contrast of photographic printing paper. L. A. JONES (J. Franklin Inst., 1926, 202, 589—625; 1927, 203, 111—156. Cf. B., 1926, 996).—Analysis of the errors involved in the sensitometry of printing papers shows that the reading error (involved in the measurement of density) is of the greatest magnitude, although of itself small. The total density error of a characteristic curve, based on the average of five sensitometric strips, should not exceed ± 0.015 . The effect of time of development on the characteristic curve of papers is considered. With the exception of bromide papers, development is very rapid. Maximum density and maximum gamma (and contrast) are obtained relatively quickly, after which prolongation of development produces only a lateral shift of the entire curve. Contrast is dependent on development time unless development is carried to the point at which equilibrium in the shape of the curve is reached. Results of the sensitometric examination of each of the thirty-seven positive materials used are given. Four critical points are denoted on the characteristic curves. From the co-ordinate values of these points all of the necessary sensitometric constants, with the exception of D_{max} , can be computed. This method gives additional sensitometric constants, and results in a more complete expression in numerical terms of the characteristics of the material as expressed by the D -log E function. The colour coefficient of the negatives is computed, using the sensitometric curve for each material, and the values of maximum and minimum density for the optimal prints. The method gives good agreement with direct determinations of colour coefficient by strictly sensitometric methods. Using the statistical data relating to the characteristics of the optimal positives, and the sensitometric data from the characteristic curves for the positive materials, the portion of the curve used in making each optimal positive is determined. The limiting gradient of the curves is discussed (i.e., the value of $dD/d \log E$ at the point on the characteristic

curve which marks the limit of the utilised portion). The limiting gradient is not constant, but depends on the contrast of the positive material. There is no reason to believe that the limiting gradient in the high-light region is different from that in the shadow region for any particular optimal positive. The ratio of the shadow and high-light limiting gradients depends vitally on the printing exposure used in making the positive. A change in the printing time to equalise limiting gradients results in an improvement of photographic quality. The equalised limiting gradients for each of the optimal positives is determined. The following formula is evolved, for computing contrast in absolute terms: $\Omega = 1/(\Delta D)^2 \cdot DS \cdot \bar{G}(D)$, where ΔD = least perceptible difference in density, = 0.007; DS = density scale; $\bar{G}(D)$ = average gradient evaluated with respect to equal density increments. A graphic method for evaluating contrast directly in terms of an enclosed area is derived, and the method is applied to determine numerical values of total contrast for each of the positive materials, and values of partial contrast for each of the optimal positives. The relation between contrast and magnitude of density scale is shown graphically for typical cases. Experimental evidence shows that it is not possible to use directly the value of the gradient evaluated with respect to equal increments in $\log E$, for the evaluation of contrast. A contrast scale for practical use is proposed.

W. CLARK.

Mordanting of silver images by cupric thiocyanate. A. and L. LUMIÈRE and A. SEYEWETZ (Bull. Soc. Franç. Phot., 1927, 68, 305).—See B., 1926, 933.

XXII.—EXPLOSIVES; MATCHES.

Mayrhofer's method for testing the stability of nitroglycerin powders. M. TONEGUTTI (Annali Chim. Appl., 1927, 17, 60—65).—The test proposed by Mayrhofer (B., 1919, 603 A) and approved by Will (B., 1919, 926 A) does not allow of the detection of differences in the degree of stability of powders of the cordite type. The test does reveal differences in stability with powders of the ballistite type, but, owing mainly to the temperature employed, which is too high for powders so rich in nitroglycerin and devoid of added stability agents, its indications are not so distinct or certain as those furnished by the silvered vessel test or the Taliani test (cf. B., 1926, 174).

T. H. POPE.

PATENT.

[Sensitised] ammonium nitrate explosive. W. O. SNELLING, Assr. to TROJAN POWDER CO. (U.S.P. 1,617,182, 8.2.27. Appl., 10.6.22; cf. 1,510,348; B., 1925, 28).—A saturated aqueous solution of ammonium nitrate (95 pts.) in water is mixed in the warm with a saturated, alcoholic solution of trinitrotoluene (5 pts.), and the mixture cooled, when ammonium nitrate with trinitrotoluene uniformly disseminated through it is obtained. Modifications of the process are described.

T. S. WHEELER.

XXIII.—SANITATION; WATER PURIFICATION.

Calcium and magnesium hydroxides as coagulating agents. M. E. FLENTJE (J. Amer. Water Works Assoc., 1927, 17, 253—260).—The water supply of Oklahoma City after preliminary sedimentation is aerated,

softened with lime, clarified with iron and alum, settled, carbonated with flue gases, filtered, and chlorinated. The water contains very little non-carbonate hardness, and requires only lime for softening. Formerly just sufficient lime was added to the water to reduce the total alkalinity to 50 p.p.m., at which point little or no removal of magnesium took place. Enough lime is now added to give an excess of lime of 6—12 p.p.m. Over-treatment in this manner results in the precipitation of a part of the magnesium and a substantial saving in coagulants (iron and alum). Distilled water rendered turbid by addition of clay deposited from the raw water on addition of lime alone remains opalescent, but is clarified by treatment with lime and magnesium chloride.

W. T. LOCKETT.

Critical review of the methods of analysing water, sewage, and effluents, with suggestions for their improvements. J. W. H. JOHNSON (Analyst, 1927, 52, 128—142).—Methods now in use for water and sewage analysis are unsatisfactory owing to marked discrepancy between analytical results and practical requirements; inadequacy; inherent difficulties such as increase of nitrification products in modern purification processes; obscurity of biochemical conditions present in biological oxygen-absorption tests; and consequent uncertainty of results. Modifications of the fundamental organic nitrogen and oxygen-absorption tests are suggested: (1) A modified Kjeldahl process in which nitrites or nitrates do not interfere; (2) an albuminoid nitrogen process carried out under strictly controlled conditions, and with results in relatively close agreement with practical requirements; all acid oxidation processes are condemned. (3) Modification of the Royal Commission test which gives definite results strictly comparable *inter se*. The results so far recorded of this test are largely the outcome of unnatural conditions, and curves obtained should be strictly rectilinear.

D. G. HEWER.

Dissolution of lead by water in pipes. A FARINE (Schweiz. Chem.-Ztg., 1927, 29—32).—Under similar conditions, distilled water saturated with air, distilled water containing (a) air and carbon dioxide, (b) air and sodium bicarbonate, (c) air, sodium bicarbonate, and free carbon dioxide, when passed at a fixed rate through a tube packed with lead shavings, dissolved, respectively, 110, 10.5, 0.6, and 1.0 mg. of lead per litre. It follows that sodium bicarbonate exerts a strong protective action which is less strong in the presence of free carbonic acid. The results may be explained by the use of physico-chemical considerations, which indicate that in the presence of insoluble lead carbonate the concentration of the lead dissolved is directly proportional to that of the carbonic acid and inversely proportional to the square of the concentration of the bicarbonate.

W. T. LOCKETT.

PATENT.

Sterilising or pasteurising putrescible liquids. H. STASSANO (E.P. 254,725, 30.6.26. Conv., 1.7.25).—The liquid, e.g., milk, beer, etc., is allowed to flow at a rate of about 2 m./sec. through an annular space of a thickness of about 1 mm., formed by co-axially disposed metal tubes which are maintained at the required temperatures for pasteurisation or sterilisation, and adapted to cause the liquid to travel over a long path.

W. T. LOCKETT.