BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

JANUARY 22, 1926.

I.—GENERAL; PLANT; MACHINERY.

Source of error in the mechanical analysis of sediments by continuous weighing. J. R. H. Coutts and E. M. Crowther (Trans. Faraday Soc., Nov., 1925. Advance proof).—Comparison has been made of the results obtained with the Odén–Keen balance when the shape, size, and position of the pan are altered. The low density of the suspension immediately below the pan after the sedimentation has proceeded for a few minutes sets up a flow of liquid which interferes with the free vertical fall of the particles; a direct consequence is that the observed yields are too low with narrow-rimmed pans. The magnitude of the disturbance varies with the particle size and produces a distortion of the distribution curve. Slight changes in the position of the pan when close to the base cause considerable changes in yield. F. G. Soper.

Simple method of obtaining the size distribution of particles in soils and precipitates. D. Werner (Trans. Faraday Soc., Nov., 1925. Advance proof).—The method is applicable to particles (diameter 10 to 150μ) which are too large to be measured by the automatic recording balance. A glass tube about 1·5 cm. in diameter and 1·5 m. in length is filled with the suspension, and the velocity with which the height of the sediment increases is taken as a measure of the velocity of sedimentation. Readings are taken every few seconds in the initial stages. The size distribution can be calculated from the accumulation–time curve according to the theory of Odén (Proc. Roy. Soc. Edin., 1924, 44, 98). The method was tested by means of sand particles, graded into known sizes by sieving, and good agreement was obtained between the calculated and actual size distribution. The size distribution of a clay and of precipitated strontium sulphate were also determined. F. G. Soper.

Use of metal filters for the removal of dust from air. M. Berlowitz (Gesundheitsing., 1925, 48, 397—403; Chem. Zentr, 1925, 96, II., 2075—2076).—The metal filter used in place of cloth filters for air filtration during the war is an extremely sensitive piece of apparatus, its efficiency varying with the load and the dust content of the air. It is suitable for use when the total dust content of the air to be treated is at least 1 mg. per cub. m., and when an efficiency of dust removal equal to 80% is sufficient. Should a higher efficiency be required, the metal filter is used as a pre-filter to a cloth filter. J. S. G. Thomas.

Patents.

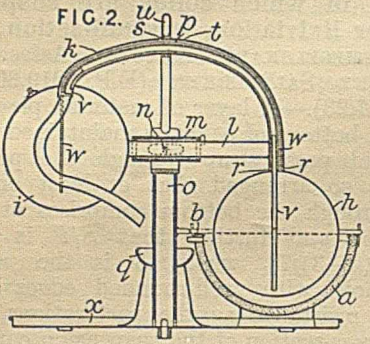
Vessels in which solids are suspended in liquids for lixiviation, crystallisation, and the like. Aktieselskapet Krystal, Assees. of A./S. de Norske Saltverker (E.P. 219,301, 7.7.24. Conv., 17.7.23).—A layer of material placed on the perforated bottom of a vat is maintained suspended in a liquid passing up through the perforations, which are so arranged that at least one vertical section through the bottom comprises at least two perforations and further that S/F is less than $1/[5-b/l+(a—3)/7]$, where S is the area of a circular hole with well-rounded edges and with the same resistance as the perforations, F is the greatest cross-section of the suspension compartment perpendicular to the flow, b the average width and l the average length of the least cross-section of the perforations, and a the average distance in cm. between their longitudinal axes. Under these conditions the granules of the material are maintained in continuous relative movement.
S. Binning.

Apparatus for concentrating and cooling aqueous liquids and producing therefrom crystals of ice or other substances. P. J. de St. Andre Meynardie (E.P. 232,589, 8.4.25. Conv., 16.4.24).—The solution is sprayed unto a high vacuum at the top of a barometric column where it is cooled by rapid evaporation, the crystals and liquid are caught in a receiver at the bottom of the column, which is open to the atmosphere, and from the receiver are pumped through a filter which separates the crystals not retained in the receiver, the liquid passing on to be again sprayed. The water vapour produced at the top of the column is absorbed by a liquid absorbent sprayed into an adjoining barometric column, and from the bottom of the latter column the bulk of the diluted absorbent is pumped through a cooler back to the absorption spray, but a part is passed through a heat interchanger where it is warmed and then down a tower or other contact apparatus where it meets a stream of hot gases of combustion which dry it. The hot dry absorbent is then cooled first in the heat interchanger and afterwards in the same cooler as the main stream, or in another cooler, and united with the main stream. The hot gases from the dryer may interchange their heat with the ingoing air for combustion.
B. M. Venables.

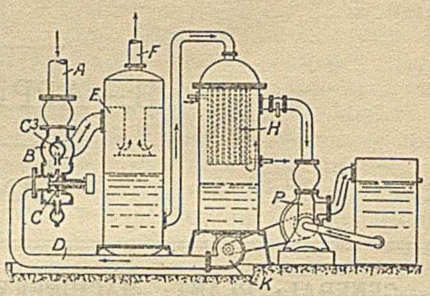
Crystallisation. H. Howard, Assr. to Grasselli Chemical Co. (U.S.P. 1,559,703, 3.11.25. Appl., 5.7.23).—By the introduction of a small stream of supersaturated solution of the material to be crystallised into an ascending current of the solution a supply of seed crystals is maintained, and on them material from the solution is deposited, causing the crystals to grow. H. Moore.

Absorption refrigerating machines. Gebr. Bayer (E.P. 234,110, 13.5.25. Conv., 16.5.24).*—The boiler-absorber, *i*, and the condenser-evaporator, *h*, are both spherical and are connected by a cross-arm, *l*, mounted on pivots, *n*, and also by a group of curved channels or pipes, *k*, *v*, *w*, the pipe, *k*, being divided by a partition, *p*, and provided with two water inlets, *s* and *t*. In the position shown in the figure the vessel, *h*, contains the volatile liquid from which vapour is drawn through the channel, *w*, by reason of the vacuum produced in the other vessel, *i*, by means of the cooling water flowing in at *s* and through the left-hand side of the conduit, *k*. The vessel, *i*, contains absorbing liquid, through which the volatile fluid bubbles from the conduit, *w*. The evaporation in *h* causes freezing of water contained in the bowl, *a*. When this is complete the bowl is broken away by shifting and turning the device and another bowl substituted. The transfer of the volatile fluid causes the vessel, *i*, to overweigh *h*, and it drops within range of a heater (not shown) and at the same time the cooling water supplied through *u* runs into the inlet, *t*, of the right-hand section of the conduit, *w*, spreading over the spherical surface of the vessel, *h*, and being caught in the bowl, *a*. In this position the volatile fluid is evolved from *i*, through the conduit, *v*, and is condensed in *h*, until the latter vessel becomes the heavier, and drops again into the bowl, *a*.
B. M. Venables.

FIG. 2.



Separation of vapours by absorption. P. C. Lemale (E.P. 241,752, 19.12.24).*—The absorbing liquid is fed by a pipe, *D*, to the rotor, *C*, provided with a number of radial nozzles, the jets from which enter the annular intake, C^3, and create a vacuum, drawing in the gases and vapour to be washed through *A* and *B* ; at the same time the spray formed absorbs the vapour. The mixture passes to a separator, *E*, whence the permanent gases pass out through *F* and the liquid solution of absorbent and vapour flows to a heater, *H*, where the absorbent is regenerated and returns by pipe, *D*, to be used again. The recovered vapour is liquefied in the condenser, *P*, and collected in a receiver.
B. M. Venables.



Pulverisers. [Rubber lining for ball mills.] B.F. Goodrich Co., Assees. of J. R. Gammeter (E.P. 240,124, 21.5.25. Conv., 20.9.24).—A resilient lining is secured to the interior of a ball mill by means such as metal plates and bolts which are buried in the lining and are not exposed in the interior of the mill ; the resilient lining is preferably thickened over the attachments, thus forming a wavy surface with the ridges running parallel to the axis. The sections of the lining overlap and are preferably formed with less curvature than that of the mill, so that when fitted the inner surface will be in compression. Preferably the resilient wearing surface of the lining is backed by a harder and cheaper material in which the means of attachment are buried, the two layers being integrally united. B. M. Venables.

Continuous crystallising apparatus. H. Howard, Assr. to Graselli Chemical Co. (U.S.P. 1,560,473, 3.11.25. Appl., 19.5.24).—The apparatus comprises a double-walled vertical vessel expanding upwards. A cooling medium is supplied to the inner vessel and the liquid to be crystallised to the annulus.
B. M. Venables.

Heating of liquids by direct contact with combustion products. Combustion reactions and their utilisation. S. C. Smith (E.P. 242,680–1, 12.5.24). — (A) Liquids are heated for evaporation or other purposes by means of products of combustion issuing from a burner directly into the liquid. The burner consists of an inner chamber of refractory material in which combustion is practically completed ; the refractory material is surrounded by a pressure-tight casing and between the two are one or more annular spaces in which one or both elements of the combustion (*e.g.*, gas and air) are preheated by passing over the outer surface of the refractory material. The elements of combustion are usually supplied under pressure. The outer surface of the combustion chamber is kept cool by the incoming air, and the nozzle of the burner, which projects into the interior of the vessel containing the liquid to be heated, is reduced in size, giving a high velocity of efflux and rapid transfer of heat to the liquid, so that even rubber-like non-corrodible coatings may be used in the vessel. In addition to the vessel in which the burner is fixed, additional means such as columns or towers may be used for further abstracting the heat from the gases. Combustion is started by means of a special torch. (B) An apparatus as described in (A) is employed to utilise the heat of combustion of substances other than ordinary fuels. For example, sulphur or hydrogen sulphide is burnt with air or oxygen and the products are injected into sulphuric acid with the double object of concentrating the sulphuric acid already formed and of using the vapours to form fresh acid. Hydrogen and chlorine may be burnt together and injected into a liquid or suspension which it is desired to treat with hydrochloric acid. B. M. Venables.

Production of colloidal suspensions. G. C. Hurrell (E.P. 242,689, 17.7.24).—To produce an emulsion of an insoluble solid, *e.g.*, sulphur, in a medium boiling below the liquefaction point of the solid at atmospheric pressure, the solid is liquefied under pressure, in communication with the dispersion liquid, *e.g.*, water containing a small amount of electrolytes or protective colloids, and the two liquids are emulsified in a homogeniser or colloid mill. The emulsion is cooled under pressure until the previously solid particles re-solidify in suspension. B. W. Clarke.

Temperature - sensitive fusible elements. H. J. C. Forrester. From Federated Engineers Development Corp. (E.P. 242,745, 1.10.24).—A non-metallic substance which remains solid substantially up to its melting point and does not become plastic like wax, resin, etc., is used as a fusible element in temperature-sensitive devices. Crystalline organic compounds selected according to the atmospheric conditions are suitable materials. B. W. Clarke.

Combined washers and dryers of the continuous centrifugal type. E. D. Eddy and A. W. Campbell (E.P. 242,829, 24.1.25).—The solid materials to be treated, *e.g.*, seeds or other granular substances, are mixed with liquid and supplied to the interior of a rapidly rotating cylindrical screen, which is divided into two sections. In the first section the liquid is removed and in the second the material is washed and dried; the wash liquor and original liquor are discharged through separate outlets. Within the cylindrical screens are conveying and scraping devices, which rotate at a slightly different speed to the screen. The conveying device consists of a number of inclined flights which do not quite touch the interior surface of the screens, and do most of the work of pushing the material forward; these are immediately followed by an equal number of scraping blades which remove the smaller material, fluff, etc., and keep the screens clear. B. M. Venables.

Non-aerating apparatus for centrifugally purifying liquids. S. H. Hall, Assr. to De Laval Separator Co. (U.S.P. 1,561,784, 17.11.25. Appl., 8.10.24).—A centrifugal separating bowl is provided with feeding means controlled so as to prevent either overflow of liquid or admission of air. The purified liquid is exhausted through the neck of the bowl to a conduit provided with means to maintain a pressure above that of the atmosphere. The neck is surrounded by a bearing which is supplied with liquid at a point near the outlet end of the neck; the liquid flows through the bearing, both downwards to an escape outlet and upwards to the main liquid discharge. Any liquid which works down below the bearing escape outlet is returned upwards to it by means provided in the bearing. B. M. Venables.

Producing catalytic reactions. H. E. Haggenmacher (U.S.P. 1,557,687, 20.10.25. Appl., 13.4.21).—The catalytic material is introduced into the top of a vertical cylinder up which the reacting gases are passed, and is withdrawn from the bottom of the cylinder, revivified if necessary, and used again. Accumulation of catalyst poisons and production of side reactions are thus prevented. T. S. Wheeler.

Material for absorbing gases, liquids, and solids, and for effecting catalytic reactions. Badische Anilin- u. Soda-Fabr., Assees. of A. Mittasch and J. Jannek (G.P. 418,032, 27.2.23).—The material is obtained by extracting humic coal, *i.e.*, lignite with a high humin content, with alkaline solutions. The solutions obtained may be used direct, or may be dried, or the material precipitated by acidifying the solutions, or solutions containing the precipitated material may be used. L. A. Coles.

Foam-stabilising-composition. G. J. Esselen, jun., Assr. to Badger Fire Extinguisher Co. (U.S.P. 1,558,599, 27.10.25. Appl., 22.4.24).—A mixture of sodium resinate (0·5 pt.) and the product (20 pts.) obtained by neutralising sulphite-cellulose waste liquor with lime and evaporating it to dryness is added to the sodium bicarbonate mixture used in foam fire extinguishers in order to stabilise the foam. T. S. Wheeler.

Separating materials of different specific gravities. T. M. Chance (U.S.P. 1,559,937–8, 3.11.25. Appl., [A] 24.1.21, [B] 7.7.22).—(A) A mixture of a liquid and insoluble comminuted solids is maintained by agitation at a density between the densities of the materials to be separated, the heavier constituent being allowed to sink out of the mixture through a rising current of the liquid beneath and not divided from the agitated mixture. (B) A mixture as above is maintained in a fluid condition by rotation of the container, *e.g.*, a drum, and by the introduction of liquid under pressure. A partition in the fluid mixture guides the floating constituent to the outlet, and means are provided for introducing the raw material and for removing the heavier constituent. B. M. Venables.

Method for producing fluid mediums of high density. T. M. Chance (U.S.P. 1,561,909, 17.11.25. Appl., 29.12.24).—A mixture of liquid and comminuted insoluble solids of greater density than the liquid is prevented from separating by supplying liquid under pressure to the lower part of the mixture, the smaller and lighter particles being thereby continually carried up through the mixture. The upper layer thus formed is continuously removed from the containing vessel and returned to it at a level considerably below the top.

B. M. Venables.

Apparatus for transmission of heat from one medium to another. E. S. Lynger (U.S.P. 1,560,271, 3.11.25. Appl., 12.6.24).—An apparatus suitable for preheating air for combustion by means of hot flue gases comprises a centrifugal blower with an axial inlet. The inlet chamber and the blower chamber are each divided into two compartments, one for gas and one for air. In one half of a revolution the vanes of the blower propel the flue gas and are heated. In the other half they propel air and give up their heat to it.

T. S. Wheeler.

Apparatus for concentrating liquids. F. L. Antisell (U.S.P. 1,561,898, 17.11.25. Appl., 17.2.23). —A combustion chamber is situated above a chamber containing the liquid to be evaporated, the two being separated by a horizontal partition through which vertical heat-conducting elements extend in both directions and dip into the liquid.

B. M. Venables.

Measurement of relative humidity [in technical drying processes]. A.-G. für Anilin-Fabr., Assees. of R. Fuchs and H. Wolff (G.P. 416,563, 3.7.24).—Relative humidity is measured by comparison of the physical constants of the outflowing air and a comparison gas. The latter is saturated with water vapour at the temperature of the outflowing air by bringing the measuring apparatus or the parts of it containing water into the stream of outflowing air, or by bringing them to the temperature of the latter by suitable heating arrangements. The end of the drying is indicated by a constant maximum difference in the property measured between the dry outflowing air and the saturated comparison air. B. Fullman.

Centrifugal separator. H. P. Hoyle (U.S.P. 1,563,491, 1.12.25. Appl., 12.7.23).—See E.P. 206,585; B., 1924, 40.

Rotary drying apparatus. S. S. Gettings and W. L. Bodman, Assrs. to J. M. T. Johnston (U.S.P. 1,564,058, 1.12.25. Appl., 27.9.24).—See E.P. 223,042; B., 1924, 999.

[Means for sealing evacuated] furnaces. Brit. Thomson-Houston Co., Ltd., Assees. of W. F. Massey (E.P. 235,565, 9.6.25. Conv., 12.6.24).

Grates for shaft furnaces. E. Cornet (E.P. 243,050, 16.8.24).

[Laboratory] ovens. H. S. Sharma and G. D. Desai (E.P. 243,223, 14.4.25).

Cooling and moistening of air. S. Yamamoto (E.P. 243,061, 20.8.24).

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

Colloid chemistry of humic acid and peat. Wo. Ostwald and A. Steiner (Koll. Chem. Beihefte, 1925, 21, 97—170).—Humic acid preparations have been made from peat and purified by dialysis, and their diffusion, ultrafiltration, electrophoresis, surface tension (cf. A., 1925, ii, 771), and especially viscosity studied. Humic acid sols are negatively charged, moderately hydrated systems which in many respects, especially in regard to flocculation, behave like negatively charged hydroxide sols, such as molybdenum dioxide and vanadium pentoxide; for instance, with salts they, and also peat suspensions, give flocculation values in approximately the same order. The flocculation of both humic acid sols and peat suspensions by a variety of electrolytes has been studied, and is found to result in an increase in viscosity and in the velocity of filtration. This behaviour is due to the formation of larger "secondary particles," which can again unite to form aggregates of higher orders, as is shown by the great influence of previous mechanical treatment on the viscosity of the flocculated sols and suspensions. By the addition of small quantities of alkali all the flocculated humic acid preparations studied are peptised. After flocculation with salts of iron or other heavy metals, organic bases, *e.g.*, pyridine, must be used as peptising agents. Free chlorine, in the form of chlorine water, is an especially active flocculating agent. In drying peat the presence of flocculating agents, especially chlorine, results in essentially harder and denser residues, although the drying process itself may be retarded on account of shrinkage of the evaporating surface.

N. H. Hartshorne.

Binders for briquetting, with special reference to "pulp binders." C. J. Goodwin and G. N. White (Proc. S. Wales Inst. Eng., 1925, 41, 443—461).—Waste vegetable matter (grass, beet sugar residues, banana leaves, etc.) is stacked and watered from time to time with a culture solution for bacteria. After the lapse of a variable period fermentation produces a pulpy matrix of humus substances intercalated with residual fibres. This may be treated in a suitable mill, if necessary with a small quantity of weak alkali. The hardening and agglomerating properties are developed by heating the briquettes to 100° or, if additional waterproofness is required, to 200°, when the material approaches pitch in waterproofing properties. Tests on strength and resistance to weathering of briquettes made with this binder gave favourable results. Combustion trials in open stoves and grates with strong draught have been completely successful. Cost and space requirements for production are discussed. The substance is applicable where coal is friable or where washery slurries and semi-coke breeze are produced.

R. A. A. Taylor.

Calorimetric bomb. P. Landrieu (Bull. Soc. chim., 1925, [iv], 37, 1340—1359; cf. Moureu, B., 1925, 301).—The chief errors in the ordinary Berthelot calorimetric bomb are due to loss of heat by evaporation of the water, gain of heat from the effect of the stirrer, and to differences of heat exchange in different experiments. A new bomb is described in which the water container is hermetically sealed, and the heat exchange regulated by always starting at the same temperature. The heating effect of the stirrer is proportional to the cube of the velocity and its effect can be determined. W. Hume-Rothery.

Bergius process of converting coal into oils. F. Bergius (Z. Ver. Deuts. Ing., Oct. 17 and 24, 1925 ; Engineering, 1925, **120**, 675).—A continuous plant at Rheinau, near Mannheim, for the hydrogenation of coal has been in operation for more than a year, and deals with 5 tons daily at an initial pressure of 120 atm., which is to be raised to 150 atm. A paste of coal ground to 1 mm. size, with 40% of tar (freed of its highly volatile constituents) is forced into the iron reaction chamber, which is heated indirectly by compressed, preheated inert gas in the jacket surrounding the chamber ; external heat is provided by means of a lead bath. One ton of coal yields 445 kg. of oil (rich in cresols and phenols), 210 kg. of gas, 5 kg. of ammonia, and 350 kg. of residual carbon. A. C. Monkhouse.

Distillation of cellulose, wood, and similar materials in the presence of hydrogen under pressure and catalysts. H. E. Fierz-David and M. Hannig (Helv. Chim. Acta, 1925, **8**, 900—923).—The dry distillation of cellulose, wood, starch, or lignite appears not to be affected by the presence of hydrogen at 300 atm. pressure. With nickel oxide and hydrogen together (yielding finely-divided nickel), however, under high pressures, complete decomposition of these substances to liquid and gaseous products is effected. Copper is much less effective and iron ineffective owing to the fact that reduction is not complete until the materials are largely decomposed. Gas-coals yielded unfavourable results. The most important products which have been isolated are aromatic phenols (homologues of xylenols, guaiacol), liquid organic acids from formic to valeric acids, numerous diketones, few ketones, numerous alcohols including methyl alcohol, a cyclic glycol, several homologues of furane, and carbon monoxide, carbon dioxide, and water. Details are given concerning the gas compressor, preparation of materials, and the analysis of the liquid and gaseous products. R. A. Morton.

Thermal decomposition of cellulose under hydrogenation conditions. A. R. Bowen, H. G. Shatwell, and A. W. Nash (J. S. C. I., 1925, **44**, 507—511 t).—The decomposition of cellulose at temperatures up to 440° in the presence of hydrogen at pressures of 120 atm. resulted in the formation of gas, aqueous liquor, a small quantity of tar, and solid residue, no appreciable amount of hydrogen being absorbed. However, in the presence of 1% of nickel oxide under similar conditions, 3—4% of hydrogen was absorbed and the products consisted of gas, aqueous liquor, tar, and only a trace of solid carbonaceous matter. The tar (22·4% of the weight of cellulose used) contained about 13% of a brown powder insoluble in ether, no carboxylic acids, 2·3% of phenols, and 77% of neutral oil. Vanadium salts have but slight catalytic influence in this reaction.

Direct hydration of aliphatic carbon, and the assimilation of carbon dioxide by plants. F. J. Nellensteyn (Chem. Weekblad, 1925, 22, 565—571).—Wood-charcoal and carbon black are readily oxidised by permanganate, with formation of carbon dioxide and of acidic substances. The latter may be isolated by means of their barium and lead salts, and are hygroscopic, syrupy substances with caramel-like odour, soluble in alcohol and water, but not in ether etc. Analyses of the salts and the free acids indicate that the latter are dicarboxylic hydroxy-acids of the sugar acid group. Norit on similar treatment is less vigorously attacked, but the acids obtained contain mellitic acid and yield benzene on dry distillation with sodium hydroxide ; this charcoal is therefore a mixed aromatic-aliphatic carbon, whereas wood-charcoal and carbon black are aliphatic carbons. The nature of the products obtained from these latter indicate that hydration of the carbon atoms has occurred simultaneously with the oxidation, since the products are similar to those obtained by the oxidation of carbohydrates (sugars and polyhydric alcohols). The reactivity of finely-divided carbon, and the formation of carbohydrates by hydration of this material, afford an explanation of the assimilation of carbon dioxide by plants, if it be assumed that reduction of carbon dioxide in the plant tissue gives rise to aliphatic carbon, which then immediately becomes hydrated. S. I. Levy.

Identification of “ norit ” and other wood charcoals. H. G. Tanner (Ind. Eng. Chem., 1925, 17, 1191—1193).—Microscopical and macroscopical examination of “ norit ” decolorising carbon indicates that it is made from birch-wood (*Betula occidentalis*), probably by carbonisation of the sawdust of the wood in the presence of a limited amount of air, followed by acid extraction, washing, and drying. It is possible to identify a considerable number of wood charcoals microscopically by means of the character of the perforations in the particles. J. P. Ogilvie.

[Gas] purification. T. R. Cook (Gas J., 1925, **172**, 432—437).—In the purification of gas at Southport the inadequacy of the ordinary scrubber system (a Livesey washer, a P. and A. tar extractor, a Holmes and a Clapham washer-scrubber) threw an overload on the oxide purifiers. The American system of washing the gas with 3% soda ash solution was resorted to. A scrubber with a spray and wooden grids was inserted before the oxide boxes. The resulting liquor was revivified by passing it through a second similar scrubber up which air was blown. During gas scrubbing hydrogen sulphide, hydrogen cyanide, and carbon disulphide are removed with the formation of sodium hydrogen sulphide, and sodium cyanide and thiocarbonate. During revivification these are oxidised to sodium polysulphide and thiocyanate and sodium salts of oxy-acids of sulphur. The revivified liquor is spent when its sodium thiocyanate content reaches 10%. The air used in revivification is passed through an open purifier as it is fouled with regenerated hydrogen sulphide. This washing process, besides reducing the overload on the oxide purifiers, increases their efficiency by reducing the amount of tar fog which fouls them. It reduces incidentally the naphthalene content of the gas. The cost is 0·4d. per 1000 cub. ft., and the quantities of materials required per 1000 cub. ft. of gas purified are 0·08 lb. of soda ash, 65 gals. of solution, and 66 cub. ft. of air for revivification. The hydrogen sulphide in the gas between the Clapham washer-scrubber and the oxide boxes was reduced by nearly 50%. R. A. A. Taylor.

Purification of coal gas by the wet process. C. Berthelot (Chim. et Ind., 1925, 14, 663—678). —The development of the utilisation of coke-oven gas as town gas in France raises the question of the purification of the gas before transport. The American process in which the impurities are absorbed in a solution of sodium carbonate, containing iron oxide in suspension, which is revivified by a current of air, is the most economical and suitable method available. A full account of American practice is given, and a design for a complete purifier plant is suggested. A. B. Manning.

Gas analysis. P. Lebeau (Chaleur et Ind., 1925, 6, 236—245; Chem. Zentr., 1925, 96, II., 2071—2072; cf. Lebeau and Bedel, B., 1924, 772).—Acetylene is absorbed in an alkaline solution of potassium mercuric iodide prepared by dissolving 25 g. of mercuric iodide and 30 g. of potassium iodide in 100 c.c. of water. Potassium hydroxide is added at the time of use of the solution in the absorption apparatus. 1 c.c. of the solution absorbs 20 c.c. of acetylene. The absorption of ethylene by concentrated sulphuric acid is accelerated by the addition of about 1% of the acid anhydride of vanadium, tungsten, molybdenum, or uranium, which after reduction by electrolysis or by contact with mercury, aluminium, or zinc exerts a catalytic effect, so that ethylene is absorbed after shaking for less than 1 minute. Homologues of ethylene are similarly absorbed: members of the CH_4 series are not absorbed. By appropriate cooling with liquid air, carbon dioxide snow, or acetone etc. over mercury it is possible to separate the higher hydrocarbons of the series C_nH_{2n+2}, C_nH_{2n}, and C_nH_{2n-2}, as well as carbon dioxide, hydrogen sulphide, ammonia, etc., from the hydrogen, methane, carbon monoxide, oxygen, and nitrogen, which remain gaseous at low temperatures. In this manner the fractionated hydrocarbon content of a gaseous mixture is further fractionated at appropriate temperatures into portions containing not more than two homologues, the proportions of which may be determined eudiometrically. The fractionation of a mixture containing ethane, propane, and butane at temperatures between −135° and 14° is detailed. J. S. G. Thomas.

Determination of water in hydrocarbon oils, shales, and lignites. C. E. Wood and A. E. T. Neale (J. Inst. Petrol. Tech., 1925, 11, 471—474). —A sufficient quantity of oil to give less than 0·5 c.c. of water is distilled with toluene or xylene in a flask of 150 c.c. capacity provided with a bent tube leading to a measuring tube immersed in a freezing mixture, till 20 c.c. of distillate are collected. Aniline is added to the distillate until critical solution is obtained at 20°. The amount of aniline used corresponds to the amount of water in the distillate, and this may be read off from graphs prepared for various solvents. The results with benzene as a solvent were not satisfactory. The method may be applied to the determination of water in solids. In each case the results were somewhat higher than those obtained by drying in a vacuum. A special method of determination is necessary in the case of kerosene or petrol, as lower boiling fractions distil over with toluene or xylene, and results are obtained by comparing the aniline required with that required for dried oil to which a given quantity of water has been added. H. Moore.

Toxic gases from Mexican and other high-sulphur petroleums and products. R. R. Sayers, N. A. C. Smith, A. C. Fieldner, C. W. Mitchell, G. W. Jones, W. P. Yant, D. D. Stark, S. H. Katz, J. J. Bloomfield, and W. A. Jacobs (U.S. Bureau Mines Bull. 231, 1925, 108 pp.).—Hydrogen sulphide is the only toxic gas, apart from petroleum vapour, evolved from Mexican and other petroleums with a high sulphur content. Acute hydrogen sulphide poisoning, resulting in respiratory paralysis followed by heart failure, can be produced by concentrations of the gas above about 0·06—0·08%, and sub-acute poisoning in the form of irritation of the eyes, nose, pharynx, and bronchial passages, can be produced by prolonged exposure to concentrations as low as 0·005%. During the distillation of light Mexican crude oil containing about 4% S the greater part of the sulphur collects in the gases, and in the heavier fractions and the residuum. A large percentage of the sulphur is combined in the form of a black, brittle asphalt, which is insoluble in acetone, but soluble in benzene, but even after removal of the asphalt, the residual oil has the characteristics of a high-sulphur crude. Heavy Mexican crudes do not give off such large quantities of hydrogen sulphide as the light crudes. Evolution of hydrogen sulphide is almost continuous during the handling and working up of high-sulphur crudes, and in general the concentration of hydrogen sulphide in the gases evolved is successively lower in the crude stills, in the pressure stills, and in tankers and other containers for the crude oil. Gases in containers for finished products are free from hydrogen sulphide. An account is given of the general methods of producing, transporting, and refining light Mexican crude oils, and of methods adopted for safeguarding employees at places where they are liable to be overcome by the gas. L. A. Coles.

Paraffin wax and its properties; methods of testing wax, and of analysing oil-wax mixtures. L. D. Wyant and L. G. Marsh (U.S. Bur. Mines, Tech. Paper 368, 1925, 26 pp.).—The methods of production of lubricating oils and the separation of paraffin wax from petroleum are described. The press method of determining the oil content of wax is unsatisfactory for wax-oil mixtures containing more than 10% of oil. The A.S.T.M. method for melting point was found to be very accurate: the Petrolatum melting point method of the A.S.T.M. was used in the experiments. For the separation and determination of wax, acetone was used as a solvent, 5 g. or 10 g. of the sample being dissolved by heating under a reflux condenser in enough acetone to make 100 c.c. of solution. The solubility of wax fractions in acetone does not vary greatly between 10° and 21°, the solubility being more affected by the melting point of the wax than by differences of temperature between these limits. Wax recrystallised from acetone is more nearly free from oil than ordinary commercial wax. The accuracy of the method increases with the percentage of wax in the sample and its melting point. H. Moore.

Recovery of sodium plumbite in the oil industry. A. Kinsel (Chem. Met. Eng., 1925, 32, 873—874; cf. U.S.P. 1,525,301, B., 1925, 276).—The lead sulphide and spent caustic soda from the "doctor" treatment are run off to a settling tank heated with a steam coil. From this the caustic solution is drawn off to storage and the lead sulphide has its water content reduced to 30% in a continuous filter. The sulphide is then treated with sludge acid diluted to 35—40° B. (*d* 1·32—1·38) and converted into lead sulphate. This, mixed with caustic soda solution, generates fresh "doctor" solution (sodium plumbite). 99% of the lead is thus recovered, and 75—80% of the caustic soda, and the sludge acid is partially utilised. The gasoline drawn off with the lead sulphide is recovered. The lead sulphate is more easily soluble than litharge, and danger of lead poisoning is avoided. A plant to recover 500 lb. of litharge per day costs $6000, and operating and fixed charges are about $5.00 per day. H. Moore.

Studies on naphthenic acids. VI. Naphthenic acids derived from Nishiyama petroleum. Y. Tanaka and S. Nagai (J. Fac. Eng. Tokyo, 1925, **16**, 171—181).—Crude naphthenic acids from a kerosene distillate, *d* 0·817, obtained in refining Nishiyama petroleum, closely resemble, and contain the same constituent acids as those derived from a neutral oil distillate from the same source (cf. B., 1925, 870). L. A. Coles.

Spreading of lubricants on metallic and solid surfaces. P. Woog (Compt. rend., 1925, **181**, 772—774).—The behaviour of oils on a surface of liquid mercury resembles that on water (Woog, Compt. rend., 1922, **174**, 162). On clean surfaces of steel, brass, and agate, drops of vaseline oil, containing only saturated molecules, rapidly cover the whole surface, whereas drops of olive oil remain as globules owing to the attraction between the surface and the oriented active unsaturated molecules. Machinery oil containing a mixture of saturated and unsaturated molecules shows an intermediate effect. The spreading effect of inactive saturated mineral oils can be neutralised by adding small quantities of active substances such as cetyl alcohol or oleic acid; by coating the metallic parts concerned with a thin film of active substance, clocks can be lubricated with pure mineral oil, which is unsatisfactory under ordinary conditions owing to the spreading effect. W. Hume-Rothery.

Transformer oils. Musatti and Pichetto.—See XI.

Determining sulphur in mineral oils. Wagner.—See XX.

Sewage for gas production. Sierp.—See XXIII.

Patents.

Method and apparatus for complete combustion. E. Gates (U.S.P. 1,560,076, 3.11.25. Appl., 8.4.22).—Finely-divided solid or liquid fuel or a mixture of the two is passed with just sufficient air for complete combustion through a helical passage of resistant material which is thermally insulated. The walls of the passage beome incandescent, and promote the combustion of unburnt particles which strike against them. This will occur frequently as the unburnt particles are heavier than the gaseous products of combustion. T. S. Wheeler.

Manufacture of fuel briquettes. L. A. Wood, and Minerals Separation, Ltd. (E.P. 242,352, 6.8.24).—The production of smoke on burning moist briquettes is eliminated by heating the briquettes in superheated steam at 100—300°, whereby the smoke-producing materials are removed. The briquettes are made by flocculating a suspension of the fuel in water with a carbonaceous binder, such as pitch or tar, and compressing the product. R. A. A. Taylor.

Manufacturing smokeless briquetted fuel from small coal. Midland Coal Products, Ltd., and C. Ingman (E.P. 242,783, 7.11.24).—In a modification of the process described in E.P. 198,503 (J., 1923, 701 A), suitable mixtures of finely divided non-caking and caking coals are compressed into briquettes of spheroid or ovoid shape, using pitch as a binder, and carbonised in a continuous vertical retort. Carbonisation is effected by the combustion of a portion of the briquettes by admitting air or steam at the base of the retort. A. C. Monkhouse.

Carbonising ovoid briquettes in a vertical retort. E. Gevers-Orban (E.P. 242,869, 6.4.25).—Ovoid coal briquettes are carbonised in a continuous vertical retort with heating flues arranged to give the maximum heat at the top of the retort, thus hardening rapidly the outer surface of the briquettes. The gases resulting from the distillation are used for heating the combustion chambers and also for the recovery of heat from the briquettes by passing a portion of the gases through the charge.

A. C. Monkhouse.

Distilling bituminous substances at a low temperature. Kohlenscheidungs Ges. (E.P. 225,172, 6.8.24. Conv., 24.11.23).—Bituminous substances are subjected to low-temperature distillation in two stages. The material is first heated in a rotary retort to a temperature which does not rise considerably above the softening point of the material, *e.g.*, for most coals not above 400°. It then passes directly into a vertical retort, where the carbonisation is completed. The material is conveyed along the rotary retort to avoid caking, but when in the vertical retort is moved as little as possible. The production of dust is thus reduced to a minimum.

A. B. Manning.

Method and means for stimulating distillation. J. J. Deschamps (E.P. 234,840, 29.5.25. Conv., 30.5.24).—The reactions of the distillation products in the presence of the solid material in coke ovens, gas retorts, etc., are stimulated by imparting pulsations to the vapours. This is effected by inserting in the pipe leading to the tar main an apparatus which works intermittently on the principle of an ordinary laboratory filter pump and alternately relieves the pressure and allows it to accumulate. The device is operated by the purified distillation gases, or by an auxiliary gas.

R. A. A. Taylor.

Coke ovens. E. Coppée et Cie. (E.P. 235,546, 22.5.25. Conv., 12.6.24).—A series of apertures, which can be opened or closed by means of hinged bricks, is provided above the walls dividing the heating circuits in a coke oven, so that when closed the wall flues are grouped into a number of independent circuits, each consisting of one or more ascending flues and one or more descending flues. This forms the normal working arrangement of the oven. The apertures are opened to allow intercommunication between the heating circuits for the distribution of the drying smoke during the period of preheating.

A. B. Manning.

Coking retort ovens. P. C. Rushen. From Koppers Co. (E.P. 241,991, 30.7.24).—A coking oven is provided with a large number of ports in the bottom wall of the chamber, between the longitudinal centre line and the sides, through which steam is injected during the later part of the coking period. The number and position of the ports are such that the steam effectively penetrates the coked portion of the charge. The steam channels are so disposed relatively to the passages conveying hot gases to the regenerators that the steam is superheated before admission to the oven.

A. B. Manning.

Distillation of fuel. A. J. A. Héreng (E.P. 242,411, 11.10.24).—The gaseous products of distillation are burned in a combustion chamber so that nitrogen and one of the oxides of carbon, but no free oxygen result. These gases are passed into the retort to effect distillation. The gas leaving one retort passes on to other retorts to preheat fresh charges.

R. A. A. Taylor.

Distillation of coal. J. Neath and W. Chaney (E.P. 242,435, 8.11.24).—A setting of retorts for low-temperature distillation is built with a regenerator and gas producer so that the blow-gas from the producer passes through the regenerator in which secondary air ports admit air to burn it ; it then passes on to heat the retorts externally. The water-gas made then passes through the regenerator with the air ports closed, and is used for heating the retorts internally.

R. A. A. Taylor.

Production of combustible gases. H. A. Humphrey, and Synthetic Ammonia and Nitrates, Ltd. (E.P. 242,741, 24.9.24).—Combustible gases are produced from powdered fuel by causing the latter to react with highly preheated steam and air. The combustion zone is maintained at about 1300°, and the preheated gases enter the combustion chamber at about 1000°. A gas consisting only of carbon monoxide, hydrogen, and nitrogen is produced, the formation of carbon dioxide or hydrocarbons being precluded by the temperatures used. The high degree of preheating is attained by the use of special regenerators of large dimensions. A working unit consists of two combustion chambers and two regenerators. While one combustion chamber is in operation, the hot gases therefrom pass through the other and thence through the corresponding regenerator. It is preferable to use sufficient steam to ensure complete gasification of the fuel with the minimum quantity of air. If a gas rich in hydrogen is required, the carbon monoxide in the product is caused to react with steam : $CO+H_2O=CO_2+H_2$, and the heat from this exothermic reaction may be made to contribute to the maintenance of the high furnace temperature.

A. B. Manning.

Process for splitting coal, oils and other hydrocarbons, by heating these initial materials with hydrogen under high pressure. E. C. R. Marks. From Internat. Bergin-Comp. voor Olie en Kolen-Chemie (E.P. 242,876, 27.4.25).—In the hydrogenation of oils, coal, etc., at pressures of 100—150 atm., and temperatures of 300—500°, where it is desired to feed the material continuously into the reaction chamber in the form of a paste, it is first compressed by means of a worm conveyor up to a few atmospheres pressure, and then forced by a hydraulic press into the reaction vessel. A definite liquid level is maintained in the reaction vessel by drawing off the reaction products through a pipe that dips down to the required normal level.

A. B. Manning.

Retort resembling a converter, for distilling material containing hydrocarbons. M. Devaux (G.P. 414,489, 14.2.24. Conv., 4.2.24).—A cylindrical or prismatic retort of great length in proportion to its cross-section, rotates about its transverse axis.

The heating gases enter the retort through one of the trunnions, which are hollow, and are distributed throughout the charge by means of perforated tubes extending to the retort walls The distillation products and the spent heating gases pass together into a chamber extending the whole length of the retort, and pass out of the retort through the other trunnion. L. A. Coles.

Production of low-temperature tar. E. Weiss (G.P. 417,688, 21.1.21. Can. P. 234,825, 24.1.22).—Semi-coke, gas, and low-temperature tar, are obtained by heating solid fuel in a rotating retort, with a counter-current of the combustion gases obtained by burning waste coal, the gases being reduced to a temperature suitable for the production of low-temperature tar, by admixture with non-combustible gas, before entering the retort. L. A. Coles.

Producing oil-gas in externally heated retorts. J. Rude (E.P. 242,029, 15.9.24).—Water-gas or other gas produced in externally heated vertical retorts is enriched by oil-gas produced within the retort. The oil is injected into the retort, and provision is made to remove the oil-gas directly it is formed. The oil-gas residue forms a valuable addition to the coke. The process can be worked in conjunction with that described in E.P. 235,007. A. B. Manning.

Gas producers. F. H. Waite and G. W. Davey (E.P. 242,473, 29.12.24).—The lining of a producer is provided with horizontal and vertical passages and a manifold for conducting air, steam, or water through these passages, whence it passes to the interior of the producer. An auxiliary conduit permits the water or steam to be conducted to the passages at different levels. The lining is thereby cooled and its life prolonged. Clinker formation on the sides of the producer is avoided and radiation loss reduced. A. B. Manning.

Eliminating hydrogen sulphide and other noxious impurities from fuel gases, and from air. W. J. Mellersh-Jackson. From Koppers Co. (E.P. 240,891, 5.6.24).—Hydrogen sulphide and other impurities in fuel gases are removed by absorption in an alkaline liquid, *e.g.*, a solution of sodium carbonate, which can be regenerated by aeration, the impurities being transferred to the stream of air by which aeration is effected (*cf.* U.S.P., 1,389,980 and 1,390,037; J., 1921, 762 A). The volume of air used is greater than that of the gas from which the hydrogen sulphide is extracted. The hydrogen sulphide is then removed from the air stream by washing in a dilute alkaline solution, *e.g.*, 0·5—1% sodium carbonate, containing 2—3% of iron oxide in suspension. The sulphur formed in this wash liquid is recovered. A. B. Manning.

Rotary scrubbers and washers for gas. Gas Light and Coke Co., and E. W. Eve (E.P. 242,404, 7.10.24).—A rotary gas scrubber has bundles of wetted elements arranged to fill practically the entire space between the central shaft and the inner periphery of the casing. The gas passes parallel to the axis of the machine, The outer elements of the bundles form pockets with the solid outer plates, so as to pick up the liquid, carry it up, and distribute it over the bundles. A. B. Manning.

Gaseous–liquid contact apparatus. [Centrifugal gas washer.] P. M. Kuehn, Assr. to Bartlett-Hayward Co. (U.S.P. 1,561,000, 10.11.24. Appl., 10.1.24). Liquid is thrown outwards from a pan over a baffle extending inwards from the casing wall, and a portion of the liquid is returned direct to the pan without passing over the baffle. The gas is introduced into the casing. S. Binning.

Distillation of [benzol] wash oil. F. Goldschmidt (G.P. 417,340, 31.7.24).—Benzene and toluene are recovered from crude light oil separated from wash oil, by heating the oil by means of wash-oil flowing out of the washing apparatus, and xylene and solvent naphtha are recovered by treating it with steam in the same or in another extraction apparatus. The residual oil is returned to the supply of wash-oil, to prevent it from thickening. L. A. Coles.

Gas and vapour indicating device. S. Ruben (U.S.P. 1,559,461, 27.10.25. Appl., 28.5.21).—An electric current is passed under a fixed voltage through a layer of palladium black or platinum sponge mounted on an insulator. If the material is in equilibrium in an atmosphere and this changes in any manner, the composition of the adsorbed gas will alter, with a consequent change in the resistance of the adsorbing layer and in the current passing through it. T. S. Wheeler.

Gas analysing method and apparatus. J. R. Cain (U.S.P. 1,560,660, 10.11.25. Appl., 3.6.19. Renewed 1.4.25).—The quantity of a substance in a mixture is determined by measuring the change in resistance produced in an electrolyte before and after adding the mixture to it, the electrolyte being one which will react with the substance in question to produce a precipitate. For example carbon dioxide is absorbed in barium hydroxide solution (cf. Cain and Maxwell, J., 1919, 773A). M. E. Nottage.

Apparatus for continuously measuring the combustible constituents of waste gases. M. Moeller, Assr. to Siemens u. Halske A.-G. (U.S.P. 1,562,243, 17.11.25. Appl., 22.11.24).—The waste gases pass through a compartment in which the combustible constituents are burnt by contact with a wire made of an alloy of platinum or other metal of that group. The electrical resistance of the wire is compared with that of a similar wire in a second compartment filled with a comparison gas. A. B. Manning.

Extraction of oil-shale, oil-sand, and similar material. G. Baume, and Soc. Recherches et Perfectionnements Ind. (F.P. [A] 589,710, 16.1.24, and [B] Addn. thereto 29,373, 11.6.24).—(A) The material is extracted with aqueous solutions containing small quantities of emulsifying agents, such as soaps, alkali resinates, or similar substances, which affect the surface tension of the solution, preferably with the addition of substances capable of dissolving petroleum, such as trichloroethylene, or of causing agglomeration of the oil particles, such as powdered charcoal. (B) The solutions described in (A) may be acid or alkaline, and are maintained at as low a temperature as is practicable. The material is macerated with a similar solution before it is charged into the extraction bath. The residues are suitable for use in road making.

L. A. COLES.

Storing explosive gases in containers. NORDDEUTSCHE ACETYLEN U. SAUERSTOFFWERKE A.-G., and J. POMMÉE (E.P. 241,468, 27.4.25).—A mineral having absorptive properties is heated until fritting takes place and then granulated. Pieces between 2 and 3·5 mm. in size are then packed into a container prior to the introduction of a solvent fluid for the gas. The spaces between the pieces may be packed with a powdered substance such as pumice.

H. HOLLINGS.

Oil cracking stills. SINCLAIR REFINING CO., Assees. of J. E. BELL (E.P. 231,840, 21.2.25. Conv., 1.4.24).—To avoid overheating of the oil in tubular cracking stills, and consequent overheating of the tubes with risk of rupture, the incandescent fuel in the fire-box is shielded to prevent direct radiation on to the tubes. Air preheated by the hot waste gases is introduced into a throat leading from the fire-box to the heating chamber containing the tubes for the purpose of moderating the heat of the fire-gases; the efficiency of heating is thereby little diminished, or may even be increased. The oil in the tubes flows in counter-current to the gases in the heating chamber, from which the gases pass downwards into an arrangement for preheating the air supply. The preheated air is not used for purposes of combustion.

H. MOORE.

Obtaining petrolatum oils, petrolatum, and paraffin. F. LAVIROTTE (E.P. 240,803, 25.8.25. Conv., 4.10.24. Not yet accepted).—Petroleum residues and heavy oils are purified by treatment with strong sulphuric acid at an elevated temperature. Preferably the material is first treated below 100° and then at not over 200°, *e.g.*, 160—170°. Sulphur trioxide may be added to the acid, and a hydrocarbon that is liquid at the temperature used and not acted upon by the acid may be mixed with the crude material. The product is neutralised by treatment with calcium carbonate and filtration through porous clay. Oil that has been treated once with acid as above may be freed from sulphonated compounds by extraction with alcohols, light naphtha, or other solvent of the pure oil, or by further treatment with 20% oleum. For example, black cylinder oil is mixed with an equal weight of petroleum jelly that has already been treated with acid, and agitated with 1·5 pts. by weight of 20% oleum at 120°—160° for 24 hrs. The liquid is drawn off, neutralised by agitation at 120° for 3—4 hrs. with 10% of porous clay and 1·5% of calcium carbonate, and filtered hot through porous clay. The carbonaceous residue in the acid-treatment vessel is broken up and treated with naphtha, benzol, tetrachloroethylene, or other solvent of the purified oil. The solution is withdrawn, the solvent distilled off, and the oil neutralised and filtered. Alternatively, the solution is chilled and the precipitated oil or jelly allowed to settle out. The carbonaceous residue is afterwards heated to about 400° to remove volatile impurities, ground in a ball-mill, and maintained red hot in contact with air until about half is consumed. A highly adsorbent carbon is thus obtained. Sulphur dioxide evolved during the operations is absorbed in sodium carbonate solution.

Avoiding shock chill in precipitating substances [wax] from liquids [petroleum]. L. D. JONES, Assr. to SHARPLES SPECIALTY CO. (U.S.P. 1,558,619, 27.10.25. Appl., 5.2.21).—Brine is circulated through coils in a tank containing petroleum, and a portion of the brine is also circulated through a refrigerating system, so that the temperature of the brine is maintained about 5° below that of the petroleum. The wax precipitated from the slowly cooled petroleum is crystalline and local supercooling of the petroleum is avoided.

T. S. WHEELER.

Distilling oil. L. E. HIRT (U.S.P. 1,559,701, 3,11.25. Appl., 2.3.20).—Distillation takes place in a series of tubes through which the oil flows in thin films. A gaseous medium other than the hydrocarbon being distilled is forced through the tubes to remove mechanically the vaporised constituents of the oil.

H. MOORE.

Apparatus for distilling oil. G. W. WALLACE (U.S.P. 1,561,758, 17.11.25. Appl., 20.5.22).—A still for cracking oil consists of banks of tubes with transverse headers, arranged in a passageway. The products of combustion circulate longitudinally to the tubes, in which endless chains are arranged, travelling around sheaves in the headers, for the removal of carbon. The collected carbon is discharged through an opening in a chamber at the bottom side of one header.

H. MOORE.

Extracting waxes from crude petroleum. E. PETTY, Assr. to DE LAVAL SEPARATOR CO. (U.S.P. 1,559,981, 3.11.25. Appl., 15.9.21).—Wax is extracted in amorphous or crystalline form from paraffin-base crude oils by subjecting them to refrigeration and centrifugal treatment. The wax obtained is distilled to drive off crystalline wax, leaving amorphous wax as a residue.

H. MOORE.

Producing wax-free products from crude petroleum. E. PETTY, Assr. to DE LAVAL SEPARATOR CO. (U.S.P. 1,559,982, 3.11.25. Appl., 11.7.23).—To obtain a wax-free low-pour, bright stock, paraffin-base, crude oil from which the wax distillate has not been removed is subjected to refrigeration and centrifugal treatment. The wax-free oil is distilled, and the residue diluted with a low-boiling petroleum distillate. The blended stock thus formed is subjected to successive treatments with acid and alkali, and the diluent distilled off.

H. MOORE.

Recovery of gasoline etc. H. B. Bernard, Assr. to Sinclair Oil and Gas Co. (U.S.P. 1,560,137, 3.11.25. Appl., 8.5.24).—Absorbed gasoline is separated from a liquid absorbing medium by distillation. The heated liquid residuum from distillation is passed through heat exchangers in counter-current with the distilled vapours under a lower pressure than that of the distillation treatment.
H. Moore.

Gasoline recovery. H. B. Bernard, Assr. to Sinclair Oil and Gas Co. (U.S.P. 1,560,138, 3.11.25. Appl., 27.5.24).—Natural gas, casinghead gas, etc. are treated with a liquid absorbing medium, which is then distilled, and the hot distillate passed through heat exchangers in counter-current with the vapours from the distillation treatment. H. Moore.

Cracking still for mineral oils. W. L. Bagwill (U.S.P. 1,560,891, 10.11.25. Appl., 27.12.23).—A number of superposed pipes for combustion gases extend through the still lengthwise from end to end, the uppermost passage being of largest diameter and the others progressively diminishing in diameter. The still is ovate in cross-section, with flat sides and the apex at the bottom, and the heating pipes are so mounted that the distance between the lateral wall of the still and the heating pipes is the same throughout.

Hydrocarbon distillation. H. G. W. Kittredge, Assr. to C. A. Kittredge (U.S.P. 1,561,169, 10.11.25. Appl., 13.8.19).—The still comprises two reservoirs, the first having an arched top exposed to the heat from the furnace. The lower portion of this reservoir, intended to receive any deposit, is insulated from direct heating by means of brickwork. After passing over the first reservoir the furnace gases pass by means of a fire-tube through a second reservoir surmounted by a column and attached condenser. The liquid level maintained in the second reservoir is such that the fire-tube is completely immersed. Oil is passed through the first reservoir to the second.
T. A. Smith.

Apparatus for distillation [of oils]. W. M. Fraser (U.S.P. 1,561,428, 10.11.25. Appl., 11.6.23).—A still is provided with an agitator consisting of a continuous band, fitted with scraper plates, and driven by a fluid-motor operated by the pressure of the ingoing oil. T. A. Smith.

Cracking petroleum. G. Egloff, Assr. to Universal Oil Products Co. (U.S.P. 1,561,779, 17.11.25. Appl., 19.10.23).—The oil passes through a coil in which it is subjected to cracking conditions of heat and pressure. Thence a portion of the oil passes to a primary expansion chamber, and from this to a secondary chamber. The remainder of the oil from the coil is introduced into the oil in the secondary chamber to increase conversion therein. H. Moore.

Treating oils. P. W. Prutzman, Assr. to Gen. Petroleum Corp. (U.S.P. 1,561,999, 17.11.25. Appl., 2.9.22).—To purify and partly decolorise oil, a portion of it is mixed with a powdered porous adsorbent material, and the mixture allowed to rest till the air is displaced from the pores of the adsorbent. The remainder of the oil is heated above 176° and added to the mixture. The spent adsorbent is separated mechanically from the decolorised oil. H. Moore.

Treating [decolorising] oil. P. W. Prutzman and C. J. von Bibra, Assrs. to Gen. Petroleum Corp. (U.S.P. 1,562,001, 17.11.25. Appl., 2.9.22).—A pulverulent solid decolorising material is prepared in the form of an aqueous mud, air being thus excluded from the pores of the material. The mud is mixed with the oil, and heat applied to drive off water, the solid decolorising agent being thus brought into intimate contact with the oil.
H. Moore.

Removing acids from oils. P. W. Prutzman and P. D. Barton, Assrs. to Gen. Petroleum Corp. (U.S.P. 1,562,000, 17.11.25. Appl., 2.9.22).—Acid tar is removed from acid-treated petroleum oil by agitating it with a powdered adsorbent which has expended its adsorptive value in removing impurities from tar-free oil and is charged with such oil. H. Moore.

Purifying mineral oils. J. F. Faber, H. C. Hanna, and M. L. Chappell, Assrs. to Standard Oil Co. (U.S.P. 1,562,156, 17.11.75. Appl., 26.1.22).—Petroleum is treated with sulphuric acid, separated from the acid sludge, and neutralised. To prevent the formation of a persistent emulsion on neutralising the treated oil, salts of petroleum carboxylic acids, obtained by extracting the carboxylic acids from crude petroleum oil by means of an aqueous solution of a metal base, are added.

Calorimeter. G. E. Scholes (U.S.P. 1,563,662, 1.12.25. Appl., 23.3.25).—See E.P. 236,980; B., 1925, 788.

Treatment of finely-divided coal and production of briquettes. E. Edser and W. H. Beasley, Assrs. to Minerals Separation North American Corp. (U.S.P. 1,562,876, 24.11.25. Appl., 29.7.22).—See E.P. 189,220; J., 1923, 86a.

Manufacturing decolorising carbon. J. N. A. Sauer (U.S.P. 1,563,295, 24.11.25. Appl., 27.2.20).—See E.P. 189,148; B., 1924, 364.

Purifying mineral oil products and the like. F. Schwarz (E.P. 242,317, 9.5.24).—See G.P. 403,135; B., 1925, 64. (Reference is directed in pursuance of Sect. 7 (4), of the Patents and Designs Acts, 1907 and 1919, to E.P. 26,198 of 1904, 16,134 of 1901, and 9179 of 1894).

Apparatus for fractionation of petroleum. H. P. Straus (U.S.P. 1,562,009, 17.11.25. Appl., 19.6.20).—See E.P. 189,239; J., 1923, 136 a.

Purifying hydrocarbons. A. Greenspan (U.S.P. 1,562,425, 17.11.25. Appl., 10.11.22).—See E.P. 203,098; J., 1923, 1061 a.

Process of distillation [of oils]. D. Pyzel, Assr. to Simplex Refining Co. (U.S.P. 1,562,723, 24.11.25. Appl., 3.11.19. Renewed 11.5.25).—See E.P. 173,907 ; J., 1922, 168 A.

Lubricating compound. A. G. Marshall (U.S.P. 1,561,261, 10.11.25. Appl., 17.7.23).—See E.P. 211,978 ; B., 1924, 366.

System of combustion. T. J. J. Wasley and F. G. Sibilla (E.P. 242,333, 31.7.24).

Machines for charging and discharging gas retorts and the like. T. F. Canning and R. G. Clark (E.P. 242,369, 16.8 and 22.9.24).

Manufacture of briquettes from coke smalls or the smalls of other lean fuels. L. Weber (E.P. 243,129, 13.10.24).

Safety device for gas and air mixing plants and other industrial gas plants. Selas A.-G. (E.P. 235,164, 5.5.25. Conv., 4.6.24).

Production of air-gas mixtures for combustion. H. Salau, and Bader und Salau (E.P. 243,222, 14.4.25).

Transmitting heat from one medium to another. (U.S.P. 1,560,271).—See I.

Lead tetra-alkyl. (U.S.P. 1,559,405).—See XX.

III.—TAR AND TAR PRODUCTS.

Blue oil of lignite tar. J. Herzenberg and S. Ruhemann (Ber., 1925, **58**, 2249—2262).—The neutral oil of lignite tar contains a dark blue component which can be concentrated by treatment of the oil with aqueous hydroferrocyanic acid followed by decomposition of the pale yellow ferrocyanide with dilute sodium hydroxide and fractional distillation of the liberated oil, but the fractions are highly complex mixtures from which the blue component cannot be isolated. Its sensitiveness towards air and mild oxidising agents and also towards reducing agents is remarkable. Further examination of it is greatly facilitated by the spectroscopic proof of its identity with the blue hydrocarbon azulene, derived from many essential oils and isolated by Sherndal (J., 1915, 150, 730) as picrate. Azulene is readily prepared by the catalytic dehydrogenation of gurjunene at 400—410° by nickel supported on aluminium oxide ; the distillate is either fractionated and the fractions of highest b.p. treated with picric acid or the total distillate is treated with hydroferrocyanic acid and the oil recovered from the ferrocyanide is transformed into the picrate. Azulene probably owes its presence in lignite tar oil to the dehydrogenation of sesquiterpenes of the gurjunene type formed by pyrogenic decomposition of the resinous components of bitumen. In confirmation, it is found that a nearly colourless, neutral fraction, b.p. 126—133°/13 mm. gives an intensely blue distillate when dehydrogenated over a nickel catalyst at 340—350°, whereas fractions of higher b.p. appear to contain only traces of sesquiterpenes capable of forming azulene. The possibility that finely-divided carbon is the catalyst during the production of the tar is suggested by the observation that a fraction of gurjun balsam oil, b.p. 127·3—128°/13 mm., loses hydrogen and affords a dark blue distillate when passed over activated charcoal at 410—420°. The production of blue oils by the action of sulphuric acid and acetic anhydride on bicyclic sesquiterpenes, such as cadinene, and terpenes has frequently been reported. Highly purified samples of *d*-sylvestrene, cadinene, and caryophyllene, however, give colourless or almost colourless distillates when subjected to catalytic decomposition. The latter process, therefore, affords a very sensitive method of testing the freedom of terpenes and sesquiterpenes from azulene-forming terpenes of the gurjunene type. H. Wren.

Process for working up tar-oil fractions with a high creosote content. E. Kárpáti (Chem. Runds. Mitteleuropa u. Balkan, 1925, **2**, 229—230 ; Chem. Zentr., 1925, **96**, II., 2036).—Tar oils are worked up to neutral oils, by converting the phenolic constituents into non-volatile condensation products by treatment with concentrated sulphuric acid or formaldehyde. In using concentrated sulphuric acid, the oil is subsequently separated by distillation *in vacuo*, and the residues are used for tanning. Formaldehyde yields condensation products resembling bakelite, from which the neutral oil is separated by distillation in a current of superheated steam.

L. A. Coles.

Patents.

Removing phenol and/or its homologues from liquids such as waste waters or the like. P. Preiss (E.P. 241,682, 19.9.24).—The liquid from which it is desired to extract phenols is rendered neutral or slightly acid, and is sprayed down a tower in which it meets an ascending current of vapour of benzol, benzine, or trichloroethylene. The last-named is most suitable. The two liquids are separated at the bottom of the tower and the trichloroethylene with the extracted phenols is returned to a still. The phenols will gradually accumulate, and are removed from time to time. C. Irwin.

Separating phenols from crude oils. V. L. Oil Processes, Ltd., O. D. Lucas, and E. L. Lomax (E.P. 242,092, 24.11.24).—Sodium phenoxide solution, obtained by treating oil containing phenols with sodium hydroxide solution of at least 20% strength, is used for extracting phenols from further quantities of the oil, yielding a solution containing sodium phenoxide and free phenols. The phenols are precipitated by dilution with water, and are removed, and the residual solution, after concentration to suitable strength, is used again. If the sodium hydroxide solution is at or above 30% strength, part of the neutral oil dissolves together with the phenols, but can be removed by steam distillation.

L. A. Coles.

Distillation of benzol wash-oil (G.P. 417,340).—See II.

IV.—DYESTUFFS AND INTERMEDIATES.

Proposed system of tests for the fastness of dyestuffs on wool. H. R. Hirst (J. Soc. Dyers and Col., 1925, 41, 347—354).—The methods given are based on actual experience of the use of the dyestuffs in the cloth manufacturing and dyeing trades and are published with the view of establishing standard methods for testing, depending on both manufacturers' and wearers' requirements. The results of the tests are estimated by comparison with dyed patterns retained as standards and the changes are judged by inspection, the results so obtained being considered of more value than those obtained with scientific instruments. The usual five degrees of fastness have been adopted and the standards are those recommended by the "German Commission on Fastness of Dyes," 1914. Fastness to light.—Dyes for outside purposes should be directly exposed to sunlight and weather, whilst those for indoor use should be exposed under glass. As standards for light tests, the following dyes (in ascending order of fastness) have been selected: 0.—4% Indigo Carmine X (B.D.C.). I.—1·5% Ponceau R.G. (B.D.C.). II.—2·75% Azo-Rubine (Sand.). III.—4·5% Kiton Red S. (C.A.C.). IV.—2·5% Chlorazol Fast Red F.G. (B.D.C.). V.—Indigo (full shade) or Naphthol Green B. (C.). Special light exposures should be made where the patterns are exposed to sea-spray or to the air in industrial areas. Fastness to washing.—In this as in most of the subsequent tests the dyed worsted yarn is plaited with white wool, cotton, mercerised cotton, and silk. The test consists in giving a mild scour at 40° and then a strong scour at 80° (each for 15 mins.) with a solution containing 1% of soap and 0·5% of soda ash. Fastness to cold water is determined by placing the dyed yarn in distilled water at 20° for 12 hrs. (there is a distinct difference in results when using tap water). Fastness to rubbing is tested after the dyed material has been well washed without further cleansing. If the dye is for loose material (wool, tops or yarn) the test may be made after scouring and milling. White cotton cloth is rubbed vigorously ten times backwards and forwards over a 10 cm. length with the dyed pattern and the effect noted both for dry and moist fabrics. Fastness to hot ironing.—The pattern (as dyed, if for piece dyeing, or scoured if for loose wool) is pressed for 10 secs. with a hot iron of such a temperature that it does not scorch white flannel. Fastness to stoving.—The dyed yarn is soaped with a 0·2% solution, hydro-extracted, and then left for 12 hrs. under a bell jar in which sulphur is burned, a standard dye being placed alongside. Fastness to perspiration.—The wetted-out pattern is placed in a 10% solution of salt containing 5 c.c. of a 30% solution of ammonium acetate, and incubated for 24 hrs. at 40°. Dyes for saddle cloth materials should be fast to alkali. Fastness to alkali (street-dust fastness) is determined by spotting the dyed material with a mixture of 10 g. of quicklime and 6 c.c. of ammonia (*d* 0·880) in 1000 c.c. of water. After drying the cloth is brushed and classed according to its appearance. Fastness to acid.—The dyed yarn is treated with a 0·25% solution of sodium bisulphate (70 times the weight of the cloth) for 1½ hrs. at 90—92°. Fastness to peroxide bleaching.—The testing bath consists of 100 pts. of distilled water, 20 pts. of hydrogen peroxide (10—12% volume), made just alkaline and maintained alkaline with ammonia. The material is entered at 45°—50° and left for 12 hrs. Fastness to milling.—The knitted yarn is treated (i) with 40 times its weight of a 2% soap solution, well worked, and kept in the liquor for 2 hrs. at 30°, (ii) in the same liquor with 0·5% of soda ash added, at 50°. The tests should be confirmed by actual milling. Fastness to carbonising.—The sample is steeped in dilute sulphuric acid (*d* 1·035) for ½ hr., squeezed so as to leave 100% of the solution, and heated for 1 hr. at 80° when the cotton should be carbonised. Fastness to potting.—Patterns previously milled are heated with 6 times their weight of water at 90° for 2 hrs. Decatising.—The test should be made in a practical manner on some approved machine. Fastness to sea-water.—The dyed yarn is kept for 24 hrs. in 40 times its weight of sea-water and dried without washing. Methods of dyeing the type samples on wool, and a list of the standard dyestuffs required are given. It is emphasised that where dyed silk and cotton are blended with wool for effect purposes they have to stand all the requirements for finishing and hence the tests for fastness should be identical in all the industries concerned. A. Coulthard.

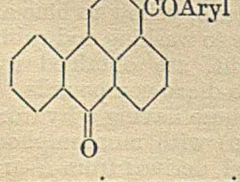
Benzidine derivatives of thiocarbamide [and azo dyestuffs therefrom]. L. Pinto (Compt. rend., 1925, 181, 788—790).—Monoacetylbenzidine when warmed with carbon disulphide in alcoholic solution yields diacetyldibenzidinethiocarbamide, m.p. above 360°, which is hydrolysed by heating with 10% hydrochloric acid at 125—130°, giving dibenzidinethiocarbamide. The latter when diazotised couples with azo components to give direct cotton dyestuffs, *e.g.*, with aminonaphtholdisulphonic acid (H acid) to a blue, with sulphophenylmethylpyrazalone to a yellow, and with β-naphthol to a red dye. L. F. Hewitt.

Patents.

Manufacture of new [azo] dyestuffs. Soc. of Chem. Ind. in Basle (E.P. 220,303, 1.8.24. Conv., 11.8.23).—*Dyestuffs* giving on cellulose acetate, in an acetic acid bath, yellow to blue and brown shades, of good fastness to washing and rubbing and excellent fastness to light, are obtained by coupling unsulphonated nitro-diazo-compounds of the benzene series (except those having a hydroxy-group ortho to the diazo-group) with monosulphonic acids capable of being coupled, derived from *N*-aryl-, *N*-alkylaryl-, *N*-aralkyl-, and *N*-alkylaralkyl-derivatives of aniline or its homologues or substitution products (other than the *N*-alkylaralkyl-derivatives of metanilic and *m*-toluidinesulphonic acids), or by coupling monosulphonic acids of the same nitro-diazo-compounds (other than the *m*-nitroanilinesulphonic acid of E.P. 20,313 of 1895; cf. J., 1896, 708) with the above amines non-sulphonated. For example, 183 pts. of 2 : 4-dinitroaniline are diazotised with the calculated quantity of nitrosyl sulphate in concentrated sulphuric acid and the mixture is poured on ice. The product is added, while stirring, to a solution of 313 pts. of sodium ethylbenzylanilinesulphonate. The dyestuff (which separates rapidly), after being filtered off and dried, is a bronze powder, giving fast bluish-red shades. A table showing thirteen examples is given. A. Coulthard.

Production of azo dyestuffs insoluble in water. G. Kalischer and K. Keller, Assrs. to L. Casella u. Co (U.S.P. 1,558,890, 27.10.25. Appl., 24.3.25).—A diazo-compound is combined with a derivative of an arylide of 2:3-hydroxynaphthoic acid with the general formula $C_{10}H_6(OH)\cdot CO\cdot NH\cdot R\cdot X\cdot R\cdot NH\cdot CO\cdot C_{10}H_6\cdot OH$; R is an aryl residue and X an azo- or azoxy-group. Coupling occurs in both the 1-positions to give *dyestuffs* which yield fast red, claret, blue, and black shades on cotton. These shades are best produced in the fibre by soaking cotton in an alkaline solution of the arylide and then immersing in a bath of the diazo-compound. The azo- or azoxy-arylides are prepared by condensing the chloride of 2:3-hydroxynaphthoic acid or its *O*-acyl derivatives with aromatic diamino-azoxy- or -azo-compounds and saponifying when using an *O*-acyl derivative. Alternatively the nitro-arylides of 2:3-hydroxynaphthoic acid are reduced in alkaline solution. For example the *m*-nitro-*o*-toluidide of 2:3-hydroxynaphthoic acid is reduced in alkaline solution to the corresponding azoxy-compound, which is dissolved in alkali to give a bath in which cotton is soaked. On immersing the soaked cotton in a bath of diazotised *m*-nitro-*p*-toluidine a fast bluish Turkey-red shade is obtained. The azoxy reduction product of the *m*-nitroanilide of 2:3-hydroxynaphthoic acid coupled with diazotised *m*-nitraniline gives yellow-orange shades, with diazotised *p*-nitro-*o*-toluidide blue-red, with diazotised aminoazotoluene claret, and with tetrazotised *o*.*o*′-dianisidine blue shades. T. S. Wheeler.

Manufacture of condensation products [dyestuffs] of the anthraquinone series. Farbw. vorm. Meister, Lucius, u. Brüning (E.P. 220,304, 1.8.24. Conv., 8.8.23. Addn. to 205,502).—1-Acylbenzanthrones having the general formula,



obtained by the successive conversion of the nitro-group in 1-nitrobenzanthrone or its substitution products, into the amino-group, the cyano-group, the carboxyl group, the carboxylic acid chloride group, and finally, by treatment with an aromatic hydrocarbon in the presence of aluminium chloride, into the acyl group, are converted into products identical with those described in the chief patent (cf. B., 1924, 627) by treatment with aluminium chloride at high temperatures. For example, 1-cyanobenzanthrone, m.p. 335—341°, is hydrolysed with a mixture of 3 pts. by vol. of concentrated sulphuric acid and 2 pts. of water, yielding benzanthrone-1-carboxylic acid, m.p. 350—355°. After conversion to the acid chloride, the product is stirred at the ordinary temperature and then heated on the water bath with excess of benzene and aluminium chloride, yielding 1-benzoylbenzanthrone, m.p. 194—195°, which on heating with 15 pts. of aluminium chloride at 180° for 2 days, yields a dyestuff of m.p. 385°, identical with that obtained as described in example 1 of the chief patent. L. A. Coles.

Manufacture of vat [anthraquinone] colouring matters. J. Y. Johnson. From Badische Anilin- u. Soda-Fabr. (E.P. 242,837, 18.2.25. Addn. to 204,249).—1-Halogen-2-aminoanthraquinones or their derivatives are treated with aromatic compounds containing at least two substituents with reactive carbon atoms, such as carbonyl chloride groups, or di- or tri-halogenmethyl groups, or, alternatively, they may be treated with oxalyl chloride or adipyl chloride, or with other aliphatic dicarboxylic acid chlorides, and the products are treated in the presence or absence of condensing agents, with sulphides, polysulphides, xanthates, or other compounds capable of yielding sulphur. For example a mixture of 10 pts. of the product obtained by the action of 1 mol. of terephthaloyl chloride on 2 mols. of 1-chloro-2-aminoanthraquinone, 40 pts. of crystalline sodium sulphide, 10 pts. of sulphur, 100 pts. of water, and 100 pts. of 96% alcohol, is stirred for 3 hrs. at 180—200° under pressure. After distilling off the alcohol and diluting the residue with water, the dyestuff is filtered off, washed, and purified if necessary by treatment with sodium hypochlorite solution. The product is identical with that obtained from 1-mercapto-2-aminoanthraquinone and terephthaloyl chloride by the process described in the chief patent (*cf.* U.S.P. 1,459,536; J., 1923, 881a).

L. A. Coles.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Polysaccharides XXXIII. Enzymic cleavage of artificial silk and natural cellulose. P. Karrer, P. Schubert, and W. Wehrli (Helv. chim. Acta, 1925, 8, 797—810; cf. B., 1925, 441, 585).—The way in which cellulose is precipitated exerts a profound influence on the rate of enzymic hydrolysis; *e.g.*, viscose cellulose suffers 57·5% decomposition in the same time as cuprammonium cellulose undergoes 7·8% hydrolysis. The differences in resistance to the action of cellulase are ascribed to differing micellar structures. When the dilution of the enzyme solution is increased in a geometrical ratio the amount of decomposition decreases in an arithmetical ratio. Hence it is necessary for practical application of the enzymic cleavage to maintain the concentration of enzyme as high as possible. The hydrolysis is at first approximately unimolecular. The effect of doubling the enzyme content is to increase about 1½ times the amount of sugar-formation. Different brands of commercial viscose artificial silk show marked differences in their behaviour towards cellulase. Further, the defective parts known as "milky" spots which are sometimes found in viscose silk tissues are hydrolysed by the enzyme much more readily than the undamaged portion. The enzymic hydrolysis of natural cellulose by snail cellulase proceeds only very slowly (20% in 32 days in one example). The efficiency of the enzyme falls from 17·2% at 35° to 15% at 50° and 3·2% at 60°. R. A. Morton.

Production of cellulose with the aid of chlorine. W. Schacht (Papier-Fabr., 1925, 23, 759—762).—Sodium hydroxide and chlorine are used for the production of cellulose from vegetable materials, such as grasses, which contain but little lignin. The use of chlorine has the disadvantage that hydrochloric acid is formed, which may damage the cellulose. When gaseous chlorine is used the dissolution of the hydrochloric acid causes a rise of temperature, and the process is less under control than with aqueous chlorine. It is preferable to remove most of the lignin by treatment with hypochlorite ; only a minimum quantity of free chlorine is then necessary. A vigorous chlorine treatment also leads to a considerable loss in weight. Paper made from esparto cellulose produced by a severe chlorination has the properties of an ordinary chemical pulp paper, rather than those of a good esparto paper. The use of sodium hydroxide and chlorine is economical if these can be obtained by the electrolysis of sodium chloride, using cheap water power. A. Geake.

Particle size of wood cellulose. D. Krüger (Papier-Fabr., 1925, 23, 767—768).—The particle size of cellulose can be measured by nitrating carefully, dissolving the nitrate in acetone, and measuring the rate of diffusion. The particles of a sulphate-cellulose had a diameter of $1·4\times10^{-6}$ cm., those of two samples of sulphite-cellulose 2·2 and $2·4\times10^{-6}$ cm., and of cotton $3·4\times10^{-6}$ cm. Cotton has thus appreciably larger particles than the other celluloses, accounting for the lesser solubility and greater viscosity of its esters. The ripening of alkali-cellulose in viscose manufacture results in a reduction of the particle size, as do also the bleaching of sulphite-cellulose with hypochlorite, and the beating of hemp-cellulose. The viscosity of nitrocellulose solutions falls with diminishing particle size, and it may, therefore, be possible to determine the particle size and ripeness of celluloses by measuring the viscosity of the nitrate, prepared under standard conditions. A. Geake.

Cellulose esters of higher fatty acids. G. Kita, T. Mazume, I. Sakurada, and S. Nakajima (Cellulose Ind., Tokyo, 1925, 1, 227—232).—Only a slight degree of esterification is obtained by heating cellulose with palmitic anhydride in the presence of pyridine and chloroform. On the other hand, when cellulose is heated with palmityl chloride and pyridine, preferably diluted with benzene, progressive formation of esters takes place, with the ultimate production of cellulose tripalmitate soluble in benzene or ether. The esters are purified by washing the product with alcohol and then extracting with ether or benzene. The monopalmitate is still fibrous and only slightly swollen ; the higher palmitates while retaining a fibrous structure are very much swollen and completely deformed. The tripalmitate from hydrocellulose is completely soluble in ether, that from normal cellulose only partly soluble. The dipalmitate from hydrocellulose is soluble in benzene, but that from normal cellulose only partly. The monopalmitate is insoluble in benzene but becomes transparent in that liquid. The solutions from ether or benzene deposit elastic films. The melting points, ranging from 180° to 220°, are lower in the esters from hydrocellulose than in those from normal cellulose. In the analysis by saponification, the addition of benzene to the alcoholic potassium hydroxide promotes the reaction.
J. F. Briggs.

Properties of viscose. G. Kita, R. Tomihisa, and H. Ichikawa (Cellulose Ind., Tokyo, 1925, 1, 193—200).—The quantity of sodium combined as xanthate increases with the concentration of the alkali used for dissolving the viscose ; it reaches a maximum after the viscose has attained a certain degree of ripening. The viscosity of viscose dissolved in strong alkali decreases during ripening and that of viscose dissolved in weak alkali rises at first and decreases only at a later stage. High alkalinity of the viscose favours the disappearance of the fibrous structure, whilst viscose dissolved in water only always shows fibres. Viscose dissolved in strong alkali gives stronger films ; the strength of the film tends to increase with the percentage of combined sodium. In these circumstances the strength of the film tends to increase to a maximum, despite the fact that the viscosity gradually falls. The strength of the film from viscose dissolved in water only is poor, although the viscosity is high. Reduction of viscosity by long ripening of the alkali-cellulose or by mercerising with concentrated sodium hydroxide does not necessarily decrease the strength of the film. Xanthates prepared with small proportions of carbon disulphide always give low values. J. F. Briggs.

Composition of viscose. G. Kita, R. Tomihasa, and S. Iwasaki (Cellulose Ind., Tokyo, 1925, 1, 129—134).—The usual methods for the determination of combined sodium and combined sulphur in viscose are considered to be defective. According to the preferred procedure, 2 g. of a 6% viscose solution are acidified with 5 c.c. of 0·5- or $0·25N$-acetic acid, and the xanthate is salted out and washed with a neutral saturated solution of sodium chloride. The xanthate is decomposed with 15 c.c. of $0·02N$-hydrochloric acid, allowed to stand for 4 hrs., the precipitate is filtered off and washed, and the excess of acid in the filtrate is titrated. The combined sulphur is determined by Carius' method in the xanthate similarly purified as above. The combined alkali found by this method never exceeds 0·34 mol. per mol. of

$C_6H_{10}O_5$. It is lower, the higher the concentration of the caustic soda used for mercerising, the longer the ripening of the alkali-cellulose, and the smaller the quantity of carbon disulphide used. When the viscose is matured for a week the proportion of combined sodium does not change very much but increases to a maximum and then decreases again. The combined sulphur corresponds with the combined sodium, but is always about 10% higher than the equivalent quantity of sodium. The viscosity of the viscose is lower, the lower the proportion of combined sodium and sulphur. J. F. Briggs.

Cellulose fibre and tissue paper as materials for celluloid. K. Atsuki (Cellulose Ind., Tokyo, 1925, 1, 3—13).—Normal cotton cellulose, well purified, is the only acceptable raw material for celluloid ; it may be in the form of cotton wool or tissue paper. Other celluloses, such as those from wood, straw, or bast fibres, either contain too much non-resistant cellulose or are chemically modified by the processes of digestion. Old cotton rags are similarly unsuitable for the manufacture of tissue papers for celluloid. Loose cotton wool prepared from spinning wastes gives nitrocellulose of the highest viscosity, but unless the solvent and mechanical means for dispersion are exceptionally well adapted the celluloid is apt to be brittle. Such celluloid is best suited for the manufacture of heavy, rigid articles. Tissue paper made from sound cotton material has the advantage over cotton wool of greater cleanliness, and the properties of the celluloid may be controlled to a great extent by the treatment of the pulp. Wet beating lowers the viscosity of the nitrocellulose and gives a celluloid which is soft and plastic. The correct beating should be sharp and free, to afford uniform nitration, with a slight amount of developed hydration according to the plasticity desired. The best thickness is between 0·04 and 0·07 mm. ; thick papers are not uniformly nitrated. The structure of the sheet should be as open as possible provided it is uniform. The ratio of substance in g. per sq. m. to thickness in mm. should be less than 600. The chemical purification of the raw material must be carefully controlled. The use of coloured rags for a bleached paper is condemned. Colour due to traces of iron is not very harmful, as it is removed by the acids ; colour due to organic matters must be eliminated by careful bleaching. A standard colour for celluloid tissue paper may be taken as 0·05 by the Lovibond tintometer.

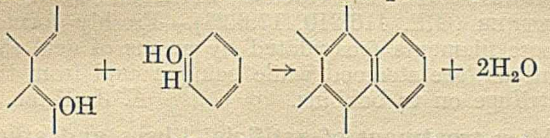
J. F. Briggs.

Stability of nitrocelluloses. J. Duclaux (Rev. gén. Colloid., 1925, 3, 257—263).—The stability of nitrocellulose is determined not only by the chemical character of the nitrocellulose, but also, though in a less marked degree, by its physical constitution or ultramicroscopic structure ; physical structure varies in the case of films and the like with the method of production, as evidenced by differences in optical properties, mechanical properties, and apparent density of films of the same thickness made from the same sample of nitrocellulose but with the aid of different dispersion media. For instance, the higher-boiling solvents such as *iso*butyl formate or mesityl oxide give with the same sample of nitrocellulose films of higher stability than do the low-boiling solvents or solvent mixtures such as acetone, ether–alcohol, or the like. Moreover with high-boiling solvents slight variations in the conditions obtaining during the formation of the film have no appreciable effect on the stability, whereas with low-boiling solvents concordant results are difficult to obtain. Quite small quantities of high-boiling solvents in admixture with low-boiling solvents are effective in giving films of constant physical structure and hence constant stability, provided that, immediately prior to solidification, only the high-boiling solvent remains in association with the nitrocellulose. There appears to be no definite relationship between stability and apparent density. It is conceivable that the stabilising action of amyl alcohol and diphenylamine is due in part to a modification of the physical structure of the nitrocellulose.

D. J. Norman.

Effect of chemicals on paper-making properties of cellulose. R. Sieber (Papier-Fabr., 1925, 23, 765—767).—By treatment of a sulphate-cellulose with 1% sulphuric acid for 3 hrs. at 50° the strength of the paper made from it was reduced 13%, but the beating properties were not affected ; treatment for 2 days with 2% lactic acid at 30° or for 1 day with 5% sodium hydroxide at the ordinary temperature produced no effect. Boiling calcium or barium hydroxide injured both the strength and the beating properties, but the latter were partially restored by subsequent acid treatment. Beating was less efficient when 10% of sodium sulphate was added to the water and when the material was previously dried for 14 days at 100°. A. Geake.

Solubility of lignin in phenols. A. Hillmer (Cellulosechem., 1925, 6, 169—187 ; cf. G.P. 412,235, B., 1925, 707).—The solubility of lignin in a large number of organic compounds has been examined qualitatively, 1 g. of lignin being taken to 50 g. of solvent. In many cases hydrochloric acid lignin (residue from hydrolysis of wood with cold 42% hydrochloric acid) was used, it being found that its solubility was similar to that of lignin itself. Among phenolic compounds the best solvents are those containing at least two hydroxyl groups, or a carboxyl group or a nitro-halogen, or aldehyde group in the *m*- or *p*-position to a hydroxyl group. Dissolution is greatly assisted by catalysts ; chlorine and bromine are as effective in this respect as the strong mineral acids and have the advantage of not hydrolysing cellulose. Other good solvents for lignin are the stronger organic acids, such as halogen-acetic acids, succinic acid, maleic acid, *o*-nitrophenylacetic acid, mandelic acid, halogen- and nitro-benzoic acids, and benzenesulphonic acid ; *p*-nitroaniline and *p*-toluenesulphonyl chloride are also good solvents. Quantitative experiments were made with *p*-chlorophenol. The amount of lignin dissolved depends greatly on the temperature and the duration of the digestion ; the dissolution of accompanying cellulose is hindered by the addition of bases, *e.g.*, 5% of pyridine. In the presence of catalysts good separation of lignin and cellulose is obtained without the addition of bases; for this purpose iodine was used, this being a less active catalyst than chlorine or bromine. By treatment for 30 min. at 80° with creosote and 0·2% of iodine, 98% of an acid lignin is dissolved, whereas cotton wool remains unattacked. The dissolution of lignin in phenols is not a simple process of solution, but chemical combination takes place; it is suggested that lignin contains a reactive carbonyl group, which condenses in the enolic form with phenols,



Combination with the various other solvents mentioned can be represented similarly. Phenol–lignins are obtained from the phenolic solutions by concentrating in a vacuum to a syrup and pouring into ether. The substance thus precipitated contains the particular phenol used as a solvent, as is proved by the presence of nitrogen and chlorine, respectively, in the phenol–lignins from *o*-nitrophenol and *p*-chlorophenol. The course of the reaction cannot be deduced from the composition of the primary phenol–lignins, prepared from natural lignin, as the composition of this latter is unknown. From an acid lignin having the composition $C_{37\cdot5}H_{33\cdot1}O_{9\cdot4}(OMe)_4$ a secondary phenol–lignin was prepared, the analysis of which corresponded to the addition of 1 mol. of phenol and the loss of 2 mols. of water and 1 of methyl alcohol. The phenol–lignins are amorphous substances readily soluble in acetic acid, alcohols, ethyl acetate, acetone, pyridine, quinoline, aniline, phenols, and dilute alkali hydroxides; they are insoluble in water, ether, chloroform, carbon tetrachloride, carbon disulphide, petroleum, trichloroethylene, benzene, toluene, turpentine oil, aqueous ammonia, sodium carbonate solution, and dilute mineral acids. A. Geake.

Resin sizing of paper. R. Lorenz (Ver. Zellstoff- u. Papier-Chem., Hauptversamml., 1924, 78—86; cf. B., 1925, 586, 799).—For the prevention of premature coagulation of the resin size when mixed with hard water in the beater, it is not advantageous to work with highly concentrated emulsions and to restrict the quantity of water in the pulp. The tendency to spontaneous coagulation of a colloidal solution increases with its concentration. Flocculation under the influence of hard water is not governed by the quantity of the hard water but by the concentration of the hardening constituents. The system is most stable at high dilutions, and the colloidal flocculation of the resin by the hydroxide of the earthy constituents of the water is avoided by increasing the dilution of the hydroxyl ions to a point where these earthy hydroxides are not precipitated. The most effective means for preventing flocculation of the resin size emulsions by hard water is the addition of a protective colloid, provided it is not so powerful as to prevent flocculation at a later stage when the alum is mixed with the pulp. When the requisite quantity of concentrated aluminium sulphate is added to the sized pulp in the beater, three different flocculating influences may come into play. The mixture of pulp and size being definitely alkaline, slight chemical precipitation of aluminium hydroxide and some resin takes place in the first stage. The colloidal combination between aluminium hydroxide and resin in virtue of their opposite electrical charges only induces flocculation when the ratio of aluminium hydroxide to resin is about 1 : 25. Thus, in the second stage, as the aluminium sulphate becomes mixed and diluted, a colloidal flocculation of this order spreads like a wave through the stuff only where the two reagents aluminium hydroxide and resin are in contact in the correct proportions; this kind of coagulation does not occur when the resin is much diluted. The major influence of flocculation is undoubtedly that of the very powerful tervalent aluminium ion which acts steadily throughout without restrictions of conditions. Experiments with the Plauson colloid mill have indicated that effective sizing could be produced by mechanical means alone, by grinding the resin with the pulp to a sufficiently fine state of subdivision. J. F. Briggs.

Methods of distinguishing sulphite- and soda-celluloses in paper. Korn (Papier-Fabr., 1925, 23, 781).—Lofton and Merritt's method for determining the proportions of sulphite- and soda-celluloses in mixtures (J., 1921, 343 A) gives too high results for the former when this is present in small amounts. Correct results are obtained by Wisbar's modification (J., 1923, 711 A). The method of Alexander (cf. Cameron, Paper, 1924, 33, 138) gives a clear distinction in the majority of cases, but soda-celluloses from many coniferous woods give the same red colour as is given by sulphite-celluloses; the test is, therefore, valuable only when the blue colour, yielded by most soda-celluloses, is obtained. A. Geake.

Stiffness of paper. H. Schulz and W. Ewald (Papier-Fabr., 1925, 23, 768—770).—The stiffness of paper is determined by clamping horizontally a strip 20 mm. wide with a free length of 80 mm.; a weight is rested on the paper and moved along until the strip bends at the clamp. The distance of the weight from the clamp is a measure of the stiffness of the paper. A. Geake.

Patents.

Protecting furs, wool, and similar materials from attack by moth. E. Naefe (G.P. 416,706, 9.9.24).—The articles are impregnated with benzene containing in solution antimony soaps, prepared, *e.g.*, by heating antimony pentoxide with concentrated potassium hydroxide solution and adding an excess of oleic acid or other saponifiable fat. L. A. Coles.

Manufacture of cellulose compounds [thiourethane derivatives]. L. Lilienfeld (E.P.

241,149, 20.11.24. Conv., 11.10.24; *cf.* B., 1925, 955,985).—An ester of an inorganic acid is caused to act upon a thiourethane or *N*-substituted aryl- or alkyl-thiourethane of cellulose (E.P. 231,801; B., 1925, 955) in the presence of an alkali. For example, 100 pts. of a phenyl- or tolyl-thiourethane of cellulose are dissolved in 4900 pts. of 10% sodium hydroxide solution and mixed with 600—1000 pts. of ethyl sulphate, the mixture being agitated. The precipitated product after keeping in the presence of the liquor for several days is separated and washed until free from alkali, then treated with dilute sulphuric acid, thoroughly washed, and dried. The reaction may be performed by the action of ethyl chloride at a low temperature in an autoclave on the cellulose arylthiourethane in the presence of sodium hydroxide, part of which is in the solid state. The products may be regarded as ethyl esters of aryliminothiocarboxylic esters of partially etherified cellulose. They are soluble in most volatile organic solvents including a mixture of alcohol and benzene and in many high-boiling plastifiers. J. F. Briggs.

Production of cellulose compounds [ether-esters]. Courtaulds, Ltd., W. H. Glover, and E. van Weyenbergh (E.P. 241,679, 15.9.24).—A cellulose ether, containing, say, 26·3% C_2H_5, soluble in cold water and insoluble in 8% sodium hydroxide solution, is heated at 70—90° for 5 hrs. with glacial acetic acid. The product gives a clear solution and when separated by precipitation, it is no longer affected by cold water and is readily soluble in benzene, alcohol, and other organic solvents. Analogous products may be obtained by heating a cellulose ether with formic or propionic acid. The esterification may alternatively be performed at a lower temperature by the action of a lower fatty acid in the presence of a catalyst, *e.g.*, sulphuric acid. J. F. Briggs.

Cellulose acetate composition. S. J. Carroll, Assr. to Eastman Kodak Co. (U.S.P. 1,560,542, 10.11.25. Appl., 28.7.24).—The composition is a solution of colloidised cellulose acetate, soluble in acetone, and cresyl *p*-toluenesulphonate. A. Geake.

Treating cellulose acetate reaction mixtures. E. S. Farrow, jun., Assr. to Eastman Kodak Co. (U.S.P. 1,560,554, 10.11.25. Appl., 4.8.24).—Cellulose acetate is precipitated from viscous reaction mixtures in a highly divided form by agitating with blades and adding water. A. Geake.

Manufacturing cellulose acetate. A. F. Sulzer, Assr. to Eastman Kodak Co. (U.S.P. 1,560,620, 10.11.25. Appl., 28.1.25).—By heating in a vacuum, acetic acid is removed from the reaction mixture at a temperature below that at which cellulose acetate is degraded. A. Geake.

Spinning artificial silk etc. H. P. Bassett and T. F. Banigan, Assrs. to Meigs, Bassett and Slaughter, Inc. (U.S.P. 1,560,965, 10.11.25. Appl., 17.5.23).—A solution of cellulose acetonitrate in acetone, issuing from a spinneret, is passed through a shallow body of acetone and water, and the thread thus formed is passed through an appreciable depth of air. A. Geake.

Manufacture of artificial silk from nitrocellulose. E. Bindschedler, Assr. to Tubize Artificial Silk Co. (U.S.P. 1,562,076, 17.11.25. Appl., 31.5.24).—A solution of nitrocellulose hydrate in alcohol and ether is forced through orifices into a mixture of glycerin and an aliphatic monohydric alcohol, and is drawn through this mixture at a greater speed than through the orifices. A. Geake.

Manufacture of viscose artificial silk. F. Küttner (G.P. 416,210, 17.6.23).—Freshly formed viscose filaments (coagulated by means of acid salt solutions) are steamed while being wound from the centrifuge on to bobbins. A. J. Hall.

After-treatment of artificial fibres and other products prepared from viscose or other cellulose compounds. H. Voss (G.P. 416,557, 7.11.22).—After-treatment is effected by means of solutions containing sulphite-cellulose waste lye and a mineral acid, such as sulphuric acid. A. J. Hall.

Pulp process. Preparation of wood for pulp manufacture. Wood-pulp material. J. H. Wallace, Assr. to Pine Waste Products, Inc. (U.S.P. 1,560,446—8, 3.11.25. Appl., 25.8.20).—(a) Resinous wood is extracted by means of a volatile solvent so long as the extraction proceeds rapidly, and the extracted wood is then converted into a pulp by treatment with hot alkaline lyes, the residual non-volatile and solid resinous matters in the spent alkaline lyes being recovered subsequently. (b) Porous long-fibred wood chips suitable for the manufacture of wood pulp and containing less than the normal amount of resinous substances (uniformly distributed) are prepared by converting resinous coniferous wood into chips and subjecting these to solvent extraction only so long as the extraction proceeds rapidly, so that the resulting chips contain a substantial amount of substances capable of extraction by the solvent. (c) Claim is made for wood chips prepared by the process described in (b). A. J. Hall.

Process for making paper pulp. B. T. McBain, J. E. Alexander, and G. Genberg, Assrs. to Nekoosa-Edwards Paper Co. (U.S.P. 1,560,591, 10.11.25. Appl., 2.9.22).—Resinous wood is treated by the usual sulphate process, and the pulp thus obtained is treated with an acid sulphite liquor. A. Geake.

Quick-cook sulphite process. P. C. Ulmen, H. H. Becker, and R. T. Mann (U.S.P. 1,560,881, 10.11.25. Appl., 14.4.24).—When the digestion process is complete, cold water is injected while the spent liquor is being drained off, in order to lower quickly the temperature and pressure within the digester, and the pulp is then washed out.

Control of bisulphite-pulp cooking. J. E. Fleury (U.S.P. 1,562,217, 17.11.25. Appl., 14.5.24).—Samples of liquor from a digester are treated with an alkali hydroxide and an alcohol, filtered, and compared in a colorimeter with standards.

A. Geake.

Recovering sodium acid sulphite from waste liquors of sodium acid sulphite pulp process. J. Beveridge, Assr. to J. B. Beveridge (U.S.P. 1,560,649, 10.11.25. Appl., 12.12.24).—Waste liquor from the sodium acid sulphite wood pulp process is drained from the pulp, and a portion is neutralised with alkali and concentrated. Further unneutralised waste liquor is then added, the mixture carbonised, and the residue extracted; the extract is suitably treated to recover the sodium hydrogen sulphite.

A. Geake.

Treating waste sodium monosulphite liquors. V. Drewsen, Assr. to West Virginia Pulp and Paper Co. (U.S.P. 1,560,900, 10.11.25. Appl., 18.10.23. Renewed 4.4.25).—Waste sodium sulphite liquor from the digestion of vegetable fibrous material is concentrated to a water content of 50%, incorporated with nitre-cake and 10—30% of hydrated lime to minimise loss of organically combined sulphur, incinerated, and melted. The product contains sodium carbonate and calcium sulphide. After removing the sodium salts by leaching, the residue is treated to produce sulphur dioxide, which is converted into sodium sulphite for use in preparing further quantities of cooking liquor.

Production of organic acids from soda-cellulose waste liquor. P. Deriveau, E. de Fersen, F. Fieschi, E. Lancesseur, A. Potel, and P. Watel (F.P. 563,747, 21.6.22).—The waste liquor, after removal of cellulose, is heated in closed vessels with oxygen or gases containing it, in the presence or absence of catalysts. The oxygen preferably contains a sufficient quantity of steam to prevent the liquor from drying. Suitable catalysts include platinum and similar metals; chromium, copper, cobalt, manganese, aluminium, and nickel; oxides of these metals or of iron; aluminium, zinc, and phosphorus carbides; metal chlorides and bromides; and cerium, manganese, and lead salts. The catalysts may be used in their usual form or in colloidal solution, or may be deposited upon non-reacting material, such as kieselguhr, asbestos, pumice stone, and coke. The products include sodium formate, acetate, and oxalate.

L. A. Coles.

Sizing cellulose fibres. Paper-sizing process. J. A. De Cew, Assr. to Process Engineers, Inc. (U.S.P. 1,558,845–6, 27.10.25. Appl., [A] 7.6.24, [B] 14.7.25).—(A) Precipitation of the resin is delayed until the end of the beating operation. (B) Resin emulsions are added to the paper pulp and coagulated with colloidal aluminium hydroxide. When coagulation is complete, aluminium sulphate is added.

D. J. Norman.

Protecting wool, furs, and other materials against moths. W. Lommel and H. Münzel, Assrs. to Farbenfabr. vorm. F. Bayer und Co. (U.S.P. 1,562,510, 24.11.25. Appl., 10.5.24).—See G.P. 402,341; B., 1925, 202.

Preliminary treatment of cellulose prior to esterification. Soc. Chim. des Usines du Rhône (E.P. 237,567, 5.6.25. Conv., 28.7.24).—See U.S.P. 1,543,310; B., 1925, 667.

Utilising sulphite-cellulose [waste] lye. C. G. Schwalbe (U.S.P. 1,564,142, 1.12.25. Appl., 17.10.24).—See E.P. 224,509; B., 1925, 587.

Binding material for cement etc. (G.P. 399,020).—See IX.

Mixed glycerides. (U.S.P. 1,558,299).—See XII.

Acid and salts strongly absorbing ultra-violet rays. (E.P. 242,721).—See XX.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Dyeing of cellulose acetate silk. V. Kartaschov (Helv. Chim. Acta, 1925, 8, 928—942).—Cellulose acetate silk is not very permeable to water, it is far from porous, and exhibits no crystalline structure. It may be regarded as a solid colloid possessing a negative electrostatic charge. The electric charge does not, however, enter into the mechanism of dyeing. The silk may be dyed merely by immersion in a suspension of basic anthraquinone dyestuffs in water, suggesting that the mechanism is that of simple dissolution of dye by the colloidal fibre. This view has been tested by placing dry fibre and solid dry dyestuff in contact at 60° for several days. The fact that permanent dyeing ensues proves that the dyeing of cellulose acetate is a simple solution effect in which water may play a useful but not an indispensable part.

R. A. Morton.

Urine as a mordant in the dyeing of glove skins, and its replacement. E. Simoncini (Boll. Uff. Staz. Sperim. Ind. Pelli, 1925, 3, 269—276).—The putrefied urine commonly used as a mordant in the dyeing of glove leathers may be replaced with advantage by a solution containing about 0·3% of sodium ammonium phosphate and 2% of ammonium carbonate.

T. H. Pope.

Application of dyeing phenomena in the revelation of bleached written characters. R. Mellet and M. A. Bischoff (Compt. rend., 1925, 181, 868—869).—Ink texts bleached with oxidising agents may be revealed by staining the paper in a fluorescent dye solution (*e.g.*, eosin) and examining in filtered ultra-violet rays, *e.g.*, the light from a Wood lamp. The characters then appear plainly in a dark colour on a luminous coloured ground.

S. K. Tweedy.

Methods for obtaining white and multicolour effects on fabrics dyed with sulphur dyestuffs. A. Scheunert and J. Frossard (Sealed Notes [A] 1775, 18.10.07, [B] 1794, 16.12.07, [C] 2.1.08, and [D] 1813, 10.3.08. Bull. Soc. Ind. Mulhouse, 1925, 91, 551—557. Report by C. Zundel and X. Vogt, *ibid.*, 557—558).—(A) Resists under sulphur dyestuffs are obtained by means of printing pastes containing manganese chloride and zinc oxide. White resist effects are produced by printing white mercerised cotton fabrics with a paste (*a*) containing 400 g. of manganese chloride, 500 g. of gum water, and 100 g. of zinc oxide, then drying, and dyeing in the usual manner for 5—30 secs. at a temperature not exceeding 70° with a dye liquor prepared with sulphur dyestuffs and sodium sulphide or sodium hyposulphite. Black and white effects are obtained by printing fabric with reserve paste *a* and a suitable Aniline-Black printing paste, the fabric being passed through a Mather–Platt before dyeing. Coloured effects obtained by means of ice colours are produced by printing the fabric, after preparation with β-naphthol, with a paste prepared by adding diazo-compounds or preferably their double salts with zinc chloride or aluminium sulphate to reserve paste *a*, drying, and developing the shade rapidly by passing the fabric during ¾ to 1 min. through a Mather–Platt, the fabric being subsequently dyed with sulphur dyestuffs. Satisfactory printing pastes for obtaining coloured effects by means of Para Red or Grenat N (Naphthylamine Claret) contain 100 g. of a double salt of diazotised *p*-nitroaniline and zinc chloride, 450 g. of reserve paste *a* and 450 g. of reserve paste *b*, or 150 g. of a double salt of diazotised α-naphthylamine and zinc chloride, 425 g. of reserve paste *a* and 425 of reserve paste *b* respectively. Reserve paste *b* contains 500 g. of zinc chloride and 500 g. of gum water. (B) Coloured resist effects are obtained under sulphur dyestuffs and also under vat dyestuffs such as Indanthrene Blue, Flavanthrene, Algol Blue, Algol Rose, Thioindigo Red, and Thioindigo Scarlet, by the method described in (A) by means of mordant (*e.g.*, Alizarine Blue and Alizarine Viridine) and basic (*e.g.*, Prune pure and Setocyanine) dyestuffs which are not immediately precipitated by zinc or/and manganese chloride or of which precipitation may be prevented by addition of suitable substances (*e.g.*, glacial acetic acid and phenol or resorcinol) but which are fixed on fabric by treatment for 1—2 min. in a Mather–Platt. Satisfactory printing pastes for blue and violet effects contain 30 g. of Setocyanine, 50 g. of glacial acetic acid, 100 g. of phenol, 700 g. of reserve paste *b*, 100 g. of a 50% solution of tannic acid in acetic acid of 6° B. (*d* 1·05), and 20 g. of Turkey-red oil, or 30 g. of Prune pure, 50 g. of glacial acetic acid, 100 g. of phenol, 700 g. of reserve paste *b*, 100 g. of chromium bisulphite, and 20 g. of Turkey-red oil respectively. (C) Especially bright red resist effects are obtained under Indanthrene Blue by means of the resist paste *a* described in (A), whereas inferior effects are obtained similarly under Indigo or blue sulphur dyestuffs. For example, cotton fabric is printed with the Para Red paste described in (A), then dried, dyed at 55—60° for 20—40 sec. in a dye-liquor containing Indanthrene Blue, and afterwards washed, acidified, washed, and soaped. These resist effects are quite satisfactory should several weeks elapse between printing and dyeing. (D) Coloured resist effects under sulphur dyestuffs are obtained simultaneously by means of ice colours and basic dyestuffs by the method described in (A), sodium tungstate being added to the β-naphthol used in the preparation of the fabric. Basic dyestuffs are maintained in solution in the reserve printing paste (containing zinc chloride) by addition of a mixture of lactic and glacial acetic acids or phenol. After printing, the fabric is dried, steamed twice in a Mather–Platt, dyed in a dye-bath containing sulphur dyestuffs and sodium sulphide, then washed, acidified, washed, and soaped. Zundel and Vogt report favourably on the processes, although they find that the presence of zinc chloride in the reserve paste described in (C) retards fixation of basic dyestuffs.

A. J. HALL.

Fastness of dyestuffs on wool. HIRST.—See IV.

PATENTS.

Dyeing, printing, or stencilling acetylcellulose. BRITISH CELANESE, LTD., G. H. ELLIS, and W. O. GOLDTHORPE (E.P. 242,711, 14.8.24 ; cf. E.P. 219,349, 224,681, 227,183 and 237,943 ; B., 1924, 906 ; 1925, 39, 204, 801).—The dyeing of cellulose acetate with insoluble dyes and fatty substances, such as sodium sulphoricinoleate, is aided by the presence of secondary solvents ; these may be alkyl halides, such as tetrachloroethane and trichloroethylene, aromatic compounds, such as cresols, alkylanilines, toluidines, chlorophenols, and chlorobenzenes, and hydrogenated aromatic substances, such as hexahydrophenol, hexahydrocresols, hexahydrobenzene, decahydronaphthalene, and tetrahydronaphthalene. The presence of such solvents results in improved depth of shade, penetration, and levelness, and consequently in economy in dyes. The mixture of dye, oil, and solvent may be made in any order, much or little water may be used, and the mixture may be subsequently concentrated or dried before addition to the dye bath or printing paste. Insoluble diazotisable substances may be applied in this way for development on the fibre, and the process may be used for the production of varied effects on mixed goods. (Reference is directed, in pursuance of Sect. 8 (2), of the Patents and Designs Acts, 1907 and 1919, to E.P. 224,925.)

A. GEAKE.

Treating textile fibres. J. C. McDOWELL (U.S.P. 1,558,104, 20.10.25. Appl., 8.5.22).—Cotton or linen goods dyed in part with vat colours are boiled under pressure at 120° with a solution of sodium silicate and sodium carbonate. The undyed portions of the fabric can then be bleached by one of the usual methods without the coloured part being affected.

T. S. WHEELER.

Kiers. P. F. HADDOCK (E.P. 243,262, 15.6.25).

Azo-dyestuffs (U.S.P. 1,558,890). See IV.

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

Catalytic oxidation of ammonia under works conditions. W. J. MALIAREVSKI and N. A. MALIAREVSKAJA (Z. angew. Chem., 1925, 38, 1113—1118).—The catalytic oxidation of ammonia gas with a set of platinum gauzes was investigated for the determination of the relation between : (1) ammonia concentration and temperature, and (2) nitric oxide yield and temperature, each with varying gas velocities. The results which are tabulated in detail and also exhibited as curves, are in agreement with those of other investigators. The optimum temperature for nitric oxide yield, as measured in the gas leaving the gauze with a Le Chatelier pyrometer, was found to be 620°. This optimum rises and falls with the gas velocity. At temperatures above the optimum the yield falls off rapidly with low gas velocities. The ammonia concentration representing optimum conditions in the authors' apparatus was 9·2% by vol. and the time of contact 0·00031—0·00044 sec. C. Irwin.

Action of silica on barium and magnesium sulphates. G. Marchal (Compt. rend., 1925, **181**, 784—786 ; cf. B., 1924, 92).—When heated alone barium sulphate begins to decompose at 1510°, but when mixed with the theoretical amount of silica, the decomposition begins at 1025° according to the reaction, $BaSO_4+SiO_2\rightleftharpoons BaO,SiO_2+SO_2+\frac{1}{2}O_2$. For magnesium sulphate the corresponding temperatures are 880° and 680° respectively. The equilibrium pressures have been determined from 1100° to 1270° for barium sulphate, and from 700° to 1030° for magnesium sulphate. The heats of formation of barium and magnesium silicates, from the oxide and silica, are calculated as 14·7 and 8·5 cal. respectively. W. Hume-Rothery.

Apparatus for the determination of helium in natural gas mixtures and minerals. W. Chlopin and A. Lukasuk (Ber., 1925, **58**, 2392—2396).—The method depends on the absorption of gases other than helium by coconut charcoal. The apparatus consists of two parts separated by a glass tap. One portion comprises the absorption vessel filled with coconut charcoal, a manometer, and a small Plücker tube for spectroscopic examination of the unabsorbed gas, and the other is a somewhat modified form of the McLeod vacuometer and contains the measuring tube. The process requires only 100—200 c.c. of gas. Test analyses give results in agreement with the data obtained by the method of Moureu and Lepape (J., 1914, 1118). H. Wren.

Foreign elements in scheelite and tungstic acid. Agte, Becker-Rose, and Heyne.—See X.

Precipitation of calcium sulphite. Farnell.—See XVII.

Patents.

Manufacture of hydrocyanic acid. Deutsche Gold- u. Silber-Scheideanstalt vorm. Roessler, and O. Liebknecht (E.P. 242,685, 14.6.24. Addn. to 207,830 ; B., 1925, 447).—The efficiency of an activated carbon catalyst in promoting the interaction of ammonia and carbon monoxide to yield hydrogen cyanide is increased by the presence of alkali. A mixture of coal powder and sawdust may be treated with concentrated caustic soda solution, dried, and ignited at 800° in contact with the mixture of reacting gases. After carbonisation the temperature is lowered to 550—600° and the reaction proceeds. Other alkalis may be used. (Reference is directed in pursuance of Sect. 7 (4), of the Patents and Designs Acts, 1907 and 1919, to E.P. 207,830.) C. Irwin.

Oxidation of ammonia. C. Ellis, Assr. to Ellis Foster Co. (U.S.P. 1,558,598, 27.10.25. Appl., 26.4.18. Renewed 13.1.25).—Air with 5% of ammonia is passed over a catalyst composed of cobalt vanadate mounted on a carrier maintained at a temperature of about 600°. A good yield of nitrogen oxides is obtained. The catalyst is prepared by mixing cobalt chloride with ammonium vanadate and heating to volatilise ammonium chloride. The vanadates of nickel, chromium, and manganese may also be used. T. S. Wheeler.

Apparatus for synthetic production of ammonia from its elements. A. Woosnam. From Norsk Hydro-Elektrisk Kvaelstofaktieselskab (E.P. 222,461, 2.9.24).—A catalyst chamber suitable for use with very active catalysts at somewhat low temperatures consists of an outer pressure-resisting shell and an inner chamber containing the catalyst and having walls pervious to gas. This may be built up of rings bolted together or consist of two perforated tubes with the space between them packed with loose material. Both inner and outer chambers are fitted with gas connexions, and the temperature of the catalyst is controlled by regulating the proportion of the gas mixture which passes through the porous wall of the inner chamber into the outer space. A heating element may be arranged in this outer space or in a central tube in the inner chamber, or the apparatus may be started by admitting the gas into the inner chamber and burning it with air in the outer. C. Irwin.

Treatment of natural alkaline salts. G. M. Clark. From Cosmic Arts, Inc. (E.P. 217,598, 12.6.24).—Trona or other natural salts containing a substantial proportion of sodium carbonate are dissolved in water, and the solution is concentrated, or similar natural alkaline waters are concentrated, and then treated with ammonia and carbon dioxide at 33°. The whole of the sodium carbonate present, about two-thirds of the sodium chloride, and some of the sodium sulphate are converted into sodium hydrogen carbonate, which is precipitated and is filtered off and washed at the same temperature. C. Irwin.

Production of practically iron-free alumina. Chem. Fabr. Griesheim-Elektron (E.P. 241,184, 30.9.25. Conv., 13.10.24. Not yet accepted).—Clay or the like is treated with hydrochloric acid or with sulphuric acid followed by sodium chloride, so as to obtain a crude solution of aluminium chloride. The iron is reduced, for instance, by hydrogen sulphide, and the solution is then evaporated and the residue calcined to decompose the aluminium chloride while excluding oxygen so that the ferrous chloride is not decomposed. The solution may be sprayed into a tower or rotary tube furnace where it comes in contact with hot gases having a reducing character, obtained for instance by flameless combustion. The residue is leached with water containing hydrochloric acid, which dissolves the ferrous chloride, leaving alumina practically free from iron. The alumina may be further purified by heating in a current of air containing chlorine or hydrochloric acid to remove the remaining iron.

Process for making hydrated alumina and by-products. G. L. WILLIAMS (U.S.P. 1,559,489, 27.10.25. Appl., 29.12.23).—Potassium aluminate solution is treated with boiler furnace gases, whereby hydrated alumina is precipitated in a granular form.
H. ROYAL-DAWSON.

Synthetic manufacture of liquid ammonia. G. PATART (E.P. 240,871, 5.10.25. Conv., 6.10.24. Not yet accepted).—The cold produced by the evaporation of the liquid product of the catalytic synthesis of ammonia is used for cooling the gases withdrawn by the compressor used for producing the pressure necessary for the ammonia synthesis, thereby increasing the output of the compressor ; or for cooling the gaseous components or a mixture of the components for purification purposes ; or for effecting a preliminary cooling of the nitrogen and hydrogen before their separation by liquefaction and rectification from complex gas mixtures containing them. The liquid ammonia may further be utilised as washing liquid for the final purification of the compressed gases, whereby carbon moxoxide, water vapour, hydrogen sulphide, etc. are removed. When the cold produced by the evaporation of the liquid ammonia is used for purifying the gases, an absorbent is chosen the efficiency of which increases with a reduction of temperature; *e.g.*, gaseous hydrocarbons are absorbed by coal oils or activated carbon, carbon dioxide by water under pressure or alkali carbonates, and carbon monoxide by cuprammoniacal and like solutions.

Treatment of leucite and other similar complex silicates containing potassium. W. R. ORMANDY and A. M. PEAKE (E.P. 242,336, 2.8.24 and 29.4.25).—Leucite is allowed to react with one or more alkaline-earth salts of phosphoric acid or a natural phosphate rock, calcium carbonate, and dilute sulphuric acid or an acid sulphate, in the presence of water, the ingredients being finely ground and intimately mixed. The reaction is exothermic, and the degree of heat developed must be controlled. Practically the whole of the potassium present can be recovered in the form of neutral salts substantially free from iron and aluminium, and the insoluble phosphate is converted into a form in which it is soluble either in water or in weak citric acid or ammonium citrate solutions. By varying the quantities of the reacting substances, and controlling the temperature of the reaction, the composition of the product as regards solubility of the potash and phosphate values in water or in weak citric acid solution, can be varied at will. The quantity of sulphuric acid required for the reaction is not more than twice the amount theoretically required for the potash present. Before, during, or after the reaction, substances having value as fertilisers may be added.
M. E. NOTTAGE.

Stabilising bleaching powder. A. LAMBLE, and UNITED ALKALI CO., LTD. (E.P. 242,805, 15.12.24). —Bleaching powder is dried, for instance by controlled heating on trays exposed to the atmosphere, or by the action of dry air free from carbon dioxide, and a small quantity of powdered quicklime added. The bleaching powder is thus stabilised without appreciable reduction of its available chlorine content.
C. IRWIN.

Combination apparatus for the slaking and mixing of lime, particularly for use in sulphate of ammonia plant. R. AND J. DEMPSTER, LTD., and A. L. HOLTON (E.P. 242,865, 26.3.25).—An open basket with perforated bottom is mounted on, and revolves with, a central vertical shaft. On this basket lump lime is slaked and the cream falls into a tank wherein it is agitated by paddles carried by the downward extension of the shaft. In the case of lime intended for ammonia distillation the slaking will be by means of spent liquor, and the contents of the tank are further agitated by steam.
C. IRWIN.

Production of zinc sulphate from iron ores containing zinc sulphide. GEWERKSCHAFT SACHTLEBEN, and H. PÜTZER (G.P. 416,104, 5.2.24). —The residual roasted ore containing zinc sulphide is treated with vaporised sulphuric acid or a mixture of sulphur trioxide and steam at a temperature above that of the formation of iron sulphate and below the decomposition temperature of zinc sulphate-preferably at about 600° ; if desired the counteri current principle may be used in the process. Alkali sulphates, bisulphates, or pyrosulphates, or other alkali salts which when heated with sulphur trioxide or sulphuric acid decompose with the formation of sulphates, bisulphates, or pyrosulphates, may be added to the roasted ore. The formation of zinc, silicate or zinc ferrite, which diminishes the yield of zinc sulphate, is prevented.
J. S. G. THOMAS.

Treatment of alkaline-earth sulphides. RHENANIA VEREIN CHEM. FABR. A.-G. MARWEDEL, and W. SCHOLZ (G.P. 417,410, 2.2.24).—Alkaline-earth (*e.g.*, barium) sulphide solutions are treated with ferric or ferrous hydroxide, or with material containing them, in such a manner that double alkaline-earth–iron compounds soluble in water are formed, and these are subsequently treated with hydrochloric or other acid in such quantities that solutions free from iron are obtained, or, alternatively, an excess of the acid is used, and the solution is subsequently freed from iron by the addition of barium silicate.
L. A. COLES.

Production of barium salts. RHENANIA VEREIN CHEM. FABR. A.-G. ZWEIGNIEDERLASSUNG MANNHEIM, Assees. of F. RÜSBERG and A. KLÜG (G.P. 417,441, 28.9.23).—Suspensions of solid barium sulphide in salt solutions, *e.g.*, natural brine, are treated with hydrogen sulphide, preferably with heating. L. A. Coles.

Simultaneous production of barium chloride and sulphur chloride. Chem. Fabr. Griesheim-Elektron, Assees. of K. L. Gonder (G.P. 417,853, 17.12.22).—The compounds are produced by passing chlorine over strongly heated mixtures of barium sulphate with coal, coke, or hydrocarbons with a high carbon content. L. A. Coles.

Production of hydrides. E. Tiede (G.P. 417,508, 23.1.25).—The compounds are prepared by heating alkali, alkaline-earth, or rare-earth azides in a stream of activated hydrogen. L. A. Coles.

Production of sodium thiosulphate. P. Kircheisen (G.P. 417,602, 31.7.24).—Sodium hydrosulphide solution, produced from barium sulphide solution by treatment with sodium bisulphate or sodium bicarbonate, or with equimolecular proportions of the free acids and the normal salts, is oxidised to sodium thiosulphate. L. A. Coles.

Production of barium salts. J. Ephraim (G.P. 418,097, 23.4.22).—Hydrogen sulphide is passed into a heated suspension of solid barium sulphide in a concentrated solution of barium sulphide, and the resulting solution caused to react with solid alkali salts. J. S. G. Thomas.

Stabilising solutions containing loosely-combined oxygen [hydrogen peroxide]. Stabiliser for solutions containing loosely-combined oxygen. V. Wintsch, jun., Assr. to R. H. Comey Co. (U.S.P. 1,559,599–600, 3.11.25. Appl., 25.6.24).—(a) 1% of sodium pyrophosphate salicylate (see b) acts as a stabiliser when added to solutions containing loosely-combined oxygen, *e.g.*, a solution of hydrogen peroxide. (b) Sodium pyrophosphate is mixed with salicylic acid moistened with water, and the mixture dried on the water bath. Sodium pyrophosphate salicylate, for which the formula $(NaO \cdot CO \cdot C_6H_4)_4P_2O_7$, is suggested, is thus obtained. T. S. Wheeler.

Method of producing an allotropic form of sulphur. H. H. Wilkinson, Assr. to Union Sulphur Co. (U.S.P. 1,560,926, 10.11.25. Appl., 20.12.23).—Sulphur is heated under vacuum in a still until it melts and vaporises. The vapour, still under vacuum, is drawn into a vacuum receiver with the aid of a current of a non-oxidising gas inert to sulphur, and there condensed. The finished product consists of finely divided, deep yellow, highly purified, light-weight sulphur composed of particles of approximately equal size, and free from sulphur dioxide. M. E. Nottage.

Preparing adsorptive silicious material. F. X. Govers (E.P. 243,123, 25.9.24).—See U.S.P. 1,504,549 and 1,506,118 ; B., 1924, 829, 870. Iron, silver, platinum, or other catalysts in colloidal form may be added to the colloidal silicic acid.

Purification of phosphoric acid containing arsenic. O. Wolfes and H. Maeder (U.S.P. 1,562,818, 24.11.25. Appl., 5.5.25).—See E.P. 234,122 ; B., 1925, 630.

Separating potassium and sodium hydroxides. T. Sutter, Assr. to Soc. of Chem. Ind. in Basle (U.S.P. 1,562,805, 24.11.25. Appl., 8.5.25).—See E.P. 234,072 ; B., 1925, 630.

Production of potassium carbonate. H. Klopstock and W. Neumann (U.S.P. 1,562,891, 24.11.25. Appl., 21.7.24).—See E.P. 234,585 ; B., 1925, 590.

Combustion reactions. (E.P. 242,681).—See I.

Colloidal suspensions. (E.P. 242,689).—See I.

Gas analysing method. (U.S.P. 1,560,660).—See II.

Cyanide solutions. (U.S.P. 1,562,295).—See X.

VIII.—GLASS; CERAMICS.

Colouring glass with phosphates. K. Fuwa (J. Jap. Ceram. Assoc., 1924, 32, 431—440).—In the glasses $R_2O,RO,3SiO_2$ variation in the kind of alkali has no effect on the opalescence produced by bone ash. Lead-glasses give the best effect, followed by barium-glasses and then by zinc-glasses. Boric acid favours the action of bone ash. RO has a remarkable influence on the coloration of the borosilicate glasses $R_2O,RO,0{\cdot}5B_2O_3,3SiO_2$; ZnO favours the action of bone ash most, followed by BaO and PbO, MgO-glasses showing the least effect. Experiments with the glasses $1{\cdot}3$—$1{\cdot}7R_2O,RO,6SiO_2$ and $R_2O,B_2O_3,6SiO_2$ showed that the borosilicates require the leas- amount of bone ash for opalescence, followed by lead. and barium-glasses ; calcium glasses are least effective in this respect. Disodium phosphate acts similarly to bone ash, but in the glasses $R_2O,RO,0{\cdot}5B_2O_3,3SiO_2$ the boric anhydride has an unfavourable effect. With tricalcium phosphate, in glasses of the type $R_2O,RO,3SiO_2$, PbO favours the opalescence most, followed by BaO ; B_2O_3 favours it. In the glasses $R_2O,RO,0{\cdot}5B_2O_3,3SiO_2$, PbO and BaO favour the action of the phosphate, ZnO being less active in this respect. The action of disodium phosphate is weaker than that of bone ash and tricalcium phosphate in the glasses $R_2O,RO,0{\cdot}5B_2O_3,3SiO_2$, whereas no notable difference is observable in the glasses $R_2O,RO,3SiO_2$. The opalescence is probably due to suspended phosphorus trioxide. Potassium nitrate and arsenious oxide seem to favour slightly the action of the phosphates. S. Kondo.

Colouring glass with arsenious acid. K. Fuwa (J. Jap. Ceram. Assoc., 1924, 32, 469—470).—Experiments with glasses of the types $1{\cdot}3R_2O,RO,6SiO_2$ and $R_2O,B_2O_3,6SiO_2$, using amounts of arsenious acid varying from 5 to 25%, showed that a large quantity of arsenious acid, *e.g.*, 15%, produces an opalescence on melting the batches or on reheating the glasses. The quantity of the acid required to produce this effect varies according to the composition of the glass. The effect is due probably to the presence of suspended arsenious oxide. Glasses containing arsenious acid are coloured brown on the surface when heated in a flame, the effect being more marked in potash-glasses than in soda-glasses.

S. KONDO.

Colour imparted to glass by carbon and its compounds. K. FUWA (J. Jap. Ceram. Assoc., 1924, 32, 471—490).—Experiments with glasses of the types R_2O,RO,3SiO_2, R_2O,RO,0·5B_2O_3,3SiO_2, 1·3—1·7R_2O,RO,6SiO_2, and R_2O,B_2O_3,6SiO_2 showed that retort carbon and organic compounds (sucrose, tartaric and oxalic acids) produce a colour which varies from light yellow or brown to dark red. Carbon in excess floats on the surface of the glass or remains suspended in it, imparting a dark colour. A dark colour is produced in calcium-, magnesium-, and barium-glasses, whereas zinc- or lead-glasses remain colourless or acquire only a lighter colour. Soda glasses give a lighter colour than potash-glasses, but the content of alkali has no material influence provided that the constituents of the glasses remain unchanged. The colouring power of organic compounds increases with their content of carbon and decreases with their content of oxygen and hydroxyl. In soda-glasses, the coloration is destroyed by addition of potassium nitrate in quantities about 10—20 times as much as the carbon, but potassium nitrate only weakens the coloration in potash-glasses. The coloration in some soda-glasses is destroyed by arsenious acid in quantity about 3–5 times as much as the carbon, but most potash-glasses retain the colour though it may be weakened to some extent.

S. KONDO.

Ray-transmission of glass. I. Transparency to ultra-violet rays of alkali-lime glasses, and manufacture of glasses which transmit ultra-violet rays. J. SUGIE (Osaka Ind. Lab. Bull., 1924, 5, [11], 26 pp.).—Tests were made with 51 glasses of the type 0·7–1·6Na_2O, 0·9–1·5CaO, 6SiO_2, 9 glasses obtained by replacing the whole or a part of soda by potash, and 17 glasses made by adding MgO, Al_2O_3, B_2O_3, As_2O_3, MnO_2, P_2O_5, Sb_2O_3, WO_3, Fe_2O_3, ZnO, BaO, SnO, CdO, TiO_2, or ZrO_2. The glass 1·0Na_2O,1·4CaO,6SiO_2 was most transparent to ultra-violet rays, the minimum wave length of the transmitted rays being 237 $\mu\mu$ for a plate 1·50 mm. thick. The glass 1·0Na_2O,1·5CaO,6SiO_2 was the least transparent, the corresponding minimum wave-length being 279$\mu\mu$. The increase of the transparency with diminution of thickness is smaller in the less transparent glasses than in the more transparent kinds. The effect on the transparency of replacing soda entirely or partially by potash is negligible. Phosphorus pentoxide does not injure the transparency of the alkali–lime glasses, TiO_2, Sb_2O_3, and Fe_2O_3 have a marked effect on the transparency, and MgO and Al_2O_3 have also some effect. S. KONDO.

[Ceramic bodies for] ignition-plugs. M. WATAYA (Osaka Ind. Lab. Bull., 1924, 5, [8] ; 30 pp.).—Analysis of an ignition plug of German manufacture (Bosch) gave loss on ignition 0·11, SiO_2 66·43, Fe_2O_3 2·01, Al_2O_3 3·72, CaO trace, MgO 27·78, K_2O 0·02, Na_2O 0·02%, and TiO_2 trace. It was coated with a slip containing rutile and with a colourless glaze. On the basis of this analysis 27 bodies were prepared. Thick tubes were pressed semi-dry, dried and biscuit-fired at 900–1000°. They were coated with slips, prepared from the same bodies to which 1·5% of rutile had been added, and were glost-fired at 1350—1520°. A glaze, (0·33Na_2O, 0·33CaO, 0·33PbO), 0·13Al_2O_3, (1·73SiO_2, 0·53B_2O_3), maturing at 1100°, was then applied on the tubes. The finished plugs were tested for resistance to sudden cooling and heating, electrical resistance at high temperatures, and puncture voltage, and the microstructure was examined. The results indicate that limestone is not a suitable flux for the body. Clay acts as a strong flux in magnesian bodies. Porcelains made from bodies containing Shugan-stone (loss on ignition 5·16, SiO_2 44·60, Al_2O_3 0·57, Fe_2O_3 0·91, CaO 0·25, MgO 47·82) have strong electrical resistance at high temperatures, but do not resist sudden changes in temperature. Bodies made of 80 pts. of calcined talc and 10—15 pts. of clay substance are best for talc plugs. Kaolin is better than a plastic clay with respect to resistance to sudden changes in temperature. S. KONDO.

Iron aventurine glaze. S. KONDO (Tokyo Higher Tech. School, Bull. 3, 1925, 1—12).—In fritted glazes of the composition (0·5Na_2O, 0·25BaO, 0·25 CaO)(0·05 Al_2O_3, 0·5—0·1 Fe_2O_3) (2·00—2·80 SiO_2, 1·00—0·20 B_2O_3), silica retards the production of the aventurine, and boric oxide favours it, though excess makes the crystals coarse ; the best proportions for cone 05a—1a are 2·00 SiO_2 : 0·20 B_2O_3. At least 0·30Fe_2O_3 is required. In fritted glazes of the composition (0·5 Na_2O, 0·25BaO, 0·25 CaO)(0·05—0·25 Al_2O_3, 0·50—0·10 Fe_2O_3), (2·50 SiO_2, 0·50 B_2O_3), alumina retards the crystallisation, but keeps the crystals fine and widens the permissible range of ferric oxide. In fritted glazes of the composition (0·50 Na_2O, 0·25 BaO, 0·25 CaO) (0·05 Al_2O_3, 0·50 Fe_2O_3) (2·00 SiO_2, 0·50 B_2O_3) metallic iron is the most effective source of iron, but the crystals are not well defined and are contaminated with amorphous material. Ferrous carbonate is next in order of effectiveness and produces good crystals. Ferrous oxide is less effective, and ferric oxide least. In a series in which R_2O, RO, and Fe_2O_3 were varied, the best glazes were obtained with (0·25 K_2O, 0·25 Na_2O, 0·50 CaO) (0·05 Al_2O_3, 0·45—0·50 Fe_2O_3)(2·00 SiO_2, 0·20 B_2O_3), fired to cone 03a and cooled quickly. Ferruginous bodies favour the crystallisation and the glazes appear finer than when applied on porcelain bodies. Excess of the colouring oxides (CaO, CuO, and UO_3) makes the crystals too minute and injures the lustre. Fine glazes were obtained with UO_3. In a series with varying Al_2O_3 the best result was obtained with (0·25 K_2O, 0·25 Na_2O, 0·50 CaO) (0·05 Al_2O_3, 0·45 Fe_2O_3) (2·00 SiO_2, 0·20 B_2O_3).

S. KONDO.

Mechanical analysis of sediments. COUTTS and CROWTHER.—See I.

Size distribution of particles. WERNER.—See I.

Electrical conductivity of magnesia refractories at high temperatures. Burt-Gerrans and Kerr.—See XI.

Patents.

Glasses. Jenaer Glaswerk Schott u. Gen., O. Schott, and H. Thiene (E.P. 242,568, 4.8.25).—A glass having a relatively high softening temperature and insensitive to abrupt temperature changes contains at least 45% of silica, 2—15% of boron trioxide, and 4—30% of lime and magnesia together. The alkali oxides usually present as a flux are largely replaced by alumina, which is present to the extent of 20—30%, against 4—8% of alkali oxides. Lead oxide and antimony oxide together may be added up to 6%. B. W. Clarke.

[Glass] melting furnace. W. A. Yung (U.S.P. 1,561,393, 10.11.25. Appl., 15.4.25).—A rectangular furnace for glass melting is divided into two chambers by a longitudinal wall reaching from the bottom to the roof. Openings through the wall adjacent to one end of the furnace allow glass and the products of combustion to pass between the chambers. The lower portion of the dividing wall is thickened to form relatively narrower spaces for the flow of the molten glass than for the products of combustion. The outer walls of the furnace are offset outwards between their upper and lower edges and the dividing wall is provided with a cooling system.
B. W. Clarke.

Silvering glass or other surfaces of non-conconducting material. Deutsche Gasglühlicht-Auer-Ges.m.b.H. (G.P. 417,787, 19.3.22).—The surface to be silvered is first cleaned with a dilute solution of formaldehyde and subsequently treated with the usual silvering solution.—A. R. Powell.

Purifying [quartz] fusions. E. Thomson, Assr. to Gen. Electric Co. (U.S.P. 1,559,203, 27.10.25. Appl., 1.6.25).—Fused quartz is centrifuged in a heated crucible so that it forms a hollow cylinder to the inner surface of which the air bubbles present gravitate. When the rotation is stopped, the portion containing the air bubbles rises to the surface of the fused mass and is removed when cold. Clear quartz is thus obtained.
T. S. Wheeler.

Treating ceramic mixtures. H. Spurrier (U.S.P. 1,559,652, 3.11.25. Appl., 24.1.24).—The porosity of plastic clay is reduced by placing the clay in a container which is evacuated and to which air is then suddenly admitted. T. S. Wheeler.

Purifying clays and improving their colour. W. Feldenheimer (E.P. 242,357–8, 7.8.24).—(a) Clay suspended in water is treated with a water-soluble reducing acid, *e.g.*, oxalic acid, and a soluble salt of a reducing acid, such as sodium sulphide or sodium thiosulphate, a permanent bleaching effect being produced. The clay may be purified by deflocculation if the sodium sulphide solution is added to the clay slip before the oxalic acid. (b) Clay suspended in water is brought into contact with an acid salt of sulphurous acid, such as sodium hydrogen sulphite or sodium metabisulphite, and a metal, such as zinc, which reduces sulphurous acid and does not form coloured oxidised salts. The reaction is accelerated by adding a trace of a mineral acid, *e.g.*, hydrochloric acid, which gives the less readily oxidised iron salts.
B. W. Clarke.

Recovering diatomaceous earth from waste material [from sugar refining]. R. C. Williams (U.S.P. 1,561,042, 10.11.25. Appl., 15.7.25).—Waste decolorising earth from sugar refineries is mixed with an antiseptic such as phenol, to prevent fermentation and is then used to make moulded articles. Alternatively the earth is mixed with water and allowed to ferment. When fermentation is complete any gas in the material is removed and the earth used as above. T. S. Wheeler.

Preparation of porous bodies of magnesia. Deutsche Ton- u. Steinzeug-Werke A.-G. (G.P. 416,901, 2.7.21).—Magnesium silicate is mixed with magnesium carbonate or hydroxide or with other magnesium compounds which yield the oxide on heating. The products are plastic and when fired are porous and resistant. The mixture is suitable for making diaphragms. A. R. Powell.

IX.—BUILDING MATERIALS.

Patents.

Paste for admixture with cement and other materials for strengthening and/or waterproofing them. S. McM. Kirkpatrick (E.P. 242,345, 6.8.24).—A paste consisting of crude or vulcanised rubber latex, mixed with hexamethylenetetramine or other preservative agents, sodium silicate, potash soap, and water, is added in the proportion of 3½ lb. per 100 lb. of cement, and acts as a strengthening and waterproofing agent. Bricks, blocks, tiles, etc. may be waterproofed by dipping in a fluid suspension of the paste in water.
B. W. Clarke.

Production of finely-crushed diabases, granites and allied stones. E. B. Hack and E. J. Burt (E.P. 242,487, 6.2.25).—The crushed material is passed successively through two tubular containers with their axes inclined to the horizontal and to one another, and provided with means for raising and dropping the material during its passage. The material is dried in a current of hot air or gas in the upper container, and is delivered to the lower container, where it meets a stream of cool air which separates out the finely-crushed material. The product is for use in road-making and in cement and concrete mixtures. B. W. Clarke.

Preparation of a binding material for cement, mortar, and the like. H. Silbermann (G.P. 399,020, 8.1.21).—A strong binding material for cement and the like is made by treating waste cellulose liquors, either alone or mixed with sodium silicate, alumina, sodium carbonate, or resin soap, with oxidising agents, such as bleaching powder or peroxides. The products are resistant to weathering. A. R. Powell.

Preserving wood. J. H. James, Assr. to C. P. Byrnes (U.S.P. 1,561,164, 10.11.25. Appl., 19.12.21).—Wood is impregnated with a liquid preservative containing alcohols, aldehydes, and aldehyde-fatty acids obtained by the partial oxidation of petroleum hydrocarbons (cf. E.P. 138,113 and 209,128; J., 1921, 636 A; B., 1924, 210). B. W. Clarke.

Composition of matter. [Artificial stone.] H. S. Lukens, Assr. to Solidifier Corp. (U.S.P. 1,561,473, 17.11.25. Appl., 24.1.25).—An aggregate, other than metallic ores, is mixed with a binder consisting substantially of magnesia and water, and the wet mixture is carbonated to convert the magnesia. B. W. Clarke.

Making cement. A. G. Croll, Assr. to Atlas Portland Cement Co. (U.S.P. 1,562,207, 17.11.25. Appl., 3.3.24).—The raw materials are burnt at a clinkering temperature, and the clinker is quenched at a white heat. The Portland cement produced on grinding has a higher strength than the normal product. B. W. Clarke.

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

Use of a blast enriched in oxygen in the Thomas process. J. Haag (Stahl u. Eisen, 1925, **45**, 1873—1878).—Large-scale experiments have been carried out on the plant of the Thomaswerk der Gutehoffnungshütte in Oberhausen on the practicability of adding oxygen to the blast, both from the metallurgical and economic standpoints. A regulated measured supply of oxygen was sent into the furnace at about 4 atm. pressure. The waste gases were sampled at half-minute intervals and analysed. Temperatures of the pig iron, the steel, and the converter linings were measured by the Holborn–Kurlbaum pyrometer. The charges (kept as uniform as possible), the limestone used, and the slags were accurately weighed. During each operation a similar set of conditions (with regard to temperature etc.) was maintained. The use of oxygen in the blast was characterised by a dazzling white flame. Changes in this showed the transition to the de-phosphorisation stage. The product showed no deterioration in quality and could be poured and worked up by the usual methods. In order to avoid increased ferrous oxide in the crude steel, only air was used in the later stages of blowing. With 21·0% of oxygen in the blast the blowing period is 13·25 mins.; with 50% this becomes 5·56 mins. The product of the time of blowing in mins. and the percentage of oxygen in the blast is a constant. The higher temperature of the molten charge due to the diminution of the nitrogen ballast allows larger amounts of scrap to be used. Thus for a charge of 23,900 kg. with 21% of oxygen in the blast the amount of scrap was 600 kg., with 26% 2200 kg., with 35·1% of oxygen 3700 kg. The oxidation losses do not differ much from those with normal blast. Figures are given, showing the economies attained owing to the use of larger amounts of scrap and to the shortening of the blowing period. A shortening of 5·55 min. results when the oxygen content is raised from 21% to 35·1%. The slag is poorer in phosphorus than ordinarily, owing to the decrease in the amount of pig iron in the charge. For a charge of 23,900 kg. and a blast containing 35·1% of oxygen, the volume of oxygen required is 625 cub. m., the cost of which should not be higher than 4·36 pfennige per cub. m. From the thermal point of view the same results are obtained by using pig iron with 0·5% of phosphorus and adding 600 kg. of scrap iron, or with 1·85% of phosphorus and adding 3500 kg. of scrap iron. The use of an oxygen-enriched blast allows pig iron of lower quality, or poor in phosphorus to be used, and the ores used for the pig iron itself may show wide variation in their phosphorus content. A. Coulthard.

Production of press-matrix iron in the converter. A. Jung (Stahl u. Eisen, 1925, **45**, 1915—1917).—Press-matrix iron should have a tensile strength of 44—52 kg./mm.^{2} and should be neither too hard nor too tough. It is subjected to hammering and expanding tests to ensure freedom from brittleness. So as to be capable of being threaded it has a relatively high phosphorus content, which varies, however, with the thickness of the casting. The crystalline structure is not important so long as the properties are correct. The material is produced by stopping the blow during the dephosphorisation period. The manganese content must be sufficient to prevent red-shortness. The iron should not be overheated and should be poured at a relatively low temperature. The permissible range of phosphorus is 0·28—0·50% and the manganese content 0·30—0·70%. If the manganese content of the mixer iron is less than 1·50% there is a danger of red-shortness. The lime additions are less than when making ingot iron. Press-matrix iron should be blown without ferromanganese additions. The time from taking the test sample to emptying the charge should be as short as possible, but the tendency to re-phosphorisation is small. T. H. Burnham.

Corrosion of cast irons in sulphuric acid of varying concentration. G. Delbart (Compt. rend., 1925, **181**, 786—788; cf. B., 1925, 592).—The loss in weight of different kinds of cast iron in sulphuric acid has been determined, the concentration varying from 1·6 to 92·6% total SO_3. Phosphoric or impure cast irons are more rapidly attacked than pure or malleable cast irons, the difference being greatest for dilute acids. Cast irons are more rapidly attacked than cold-drawn steel in dilute acid, but in concentrated oleum the results are comparable, and some cast irons may even be the better. W. Hume-Rothery.

Chemical and physical processes in rusting and corrosion. O. Bauer (Gas- u. Wasserf., 1925, **68**, 683—687, 704—707).—A review of the subject, with special reference to the work of the author and colleagues (cf. Heyn and Bauer, J., 1908, 569; 1910, 568; Bauer and Wetzel, 1916, 1112; Bauer and Vogel, 1919, 1444A; Bauer, B., 1925, 674). A. Coulthard.

Origin of pitting corrosion phenomena [in iron water pipes]. E. Liebreich (Korrosion u. Metallschutz, 1925, 1, 67—69; Chem. Zentr., 1925, 96, II., 2024).—The formation of corrosion pits in iron water pipes cannot be due to differences in the concentration of salts in the main water stream and in the pit, as the corrosion products have an alkaline reaction. A probable reason for the formation of the pits is the perforation of the protective coating of rust inside the tube owing to the presence of chlorides or other impurities, followed by occlusion in the rust of the hydrogen set free by the action of the exposed metal on the water and the setting up of an electrolytic cell, hydrogen–electrolyte–iron, which causes rapid corrosion of the iron locally. A. R. Powell.

Flow in a low-carbon steel at various temperatures. H. J. French and W. A. Tucker (U.S. Bur. Standards Tech. Papers, 1925, 19, [296], 619—640).—Upon the application of a fixed load at constant temperature steel elongates for an appreciable time and if the load is not too great this "initial flow" ceases, or is materially reduced, indicating a strain hardening of the material. A "secondary flow" of much less rapidity than the "initial flow" continues under a constant load of suitable magnitude and this in turn is followed by a final rapid flow immediately preceding the fracture of the metal. The relation of the life of the steel to the initial flow appears to be hyperbolic, but though the initial and final stages of flow play an important part in the failure of the metal, the greatest part of the total elongation is produced during the second interval. The importance of the determination of the loads resulting in a zero flow rate during the second stage is emphasised, as not only must the metal be able to resist fracture for a stated time (usually an infinitely long period), but it must not deform appreciably during that period. Comparison of the average flow rate in the second period with the stress–strain relations in short-time tension tests on 0·24% C steel at 295° and 430° showed that the load-carrying ability is well above the proportional limit of the short-time test at 295° and is practically equal to the latter at 430°. The principal factor governing the maximum allowable stress varies with temperature and the type of service, and generally the maximum allowable load closely approximates to the proportional limit of short-time tests at corresponding temperatures. C. A. King.

Comparative cold-rolling tests of open-hearth steel strip [deep drawing stock] and electrolytic iron strip. J. R. Freeman, jun., and R. D. France (U.S. Bur. Standards Tech. Papers, 1925, 19, [288], 297—313).—Mechanical tests on cold-rolled electrolytic iron and open-hearth steel suitable for cold drawing showed that electrolytic iron was slightly superior to the steel. Electrolytic iron did not harden so readily and did not increase in tensile strength so rapidly with cold rolling as open-hearth steel. The hardness of both materials increased to a maximum value and then decreased on further rolling. C. A. King.

Comparative slow bend and impact notched-bar tests on some metals. S. N. Petrenko (U.S. Bur. Standards Tech. Papers, 1925, 19, [289], 315—346).—Tests made on steels and non-ferrous alloys in an Izod pendulum-type impact machine and a Humfrey slow-bend machine show that the slow-bend test gives values which are related to the tensile yield point and strength of the materials, but the test itself is less convenient in routine practice than the impact test. The notched-bar test is very sensitive in revealing directional differences in the properties of rolled metals, and variations in the individual values in many cases may be accounted for by the structural condition of the metal. The "sharp," "standard," and "round" notches place materials in the same relative order for their resistance to impact or to slow bend, and for brittle metals the sharp and standard notches are preferred. The "deep" notch is considered to be unsatisfactory. C. A. King.

Permanent magnets. F. Stäblein (Physikal. Z., 1925, 26, 700—707).—The cobalt steels, Koerzit I. (10% Co), Koerzit II. (20% Co), Koerzit III. (30% Co), and a cobalt–molybdenum steel, Koerzit A (15% Co), all manufactured by Krupp, possess a much greater coercive force than, and practically the same remanence as the chromium and tungsten steels previously used for permanent magnets. For Koerzit I., II., and III., the coercive forces are 100, 160, and 220 gauss respectively. A modification of the Koepsel–Kath permeameter, using a shorter (10 cm.) test-piece, is described. Steel for permanent magnets is, in general, sufficiently characterised by the three quantities, remanence, coercive force, and the maximum value of the product B×H in the left upper quadrant of the hysteresis curve. In considering choice of steel for magnets of different shape, the hysteresis curve needs correction for the self-demagnetisation effect. Where the demagnetisation is small, *e.g.*, in the field magnets of a galvanometer, a high remanence is desirable, and a chromium or tungsten steel is chosen, but for short, straight magnets, *e.g.*, compass needles, or for apparatus subjected to considerable vibration, *e.g.*, magnetos, high coercive force is necessary and here the cobalt steels are to be recommended. A. B. Manning.

Modern developments in steels resistant to corrosion. W. H. Hatfield (Engineering, 1925, 120, 657—660).—The resistance of nickel to the action of 10% sulphuric acid and of chromium to nitric acid is reflected in the behaviour of steels containing these elements as constituents, and for a given chromium content, nickel increases the resistance of a steel to hydrochloric and sulphuric acids. Steels containing 12—14% Cr are used in making stainless cutlery, turbine blading, etc., but do not lend themselves readily to cold working. A steel known as "staybrite," containing 18% Cr and 8% Ni, proved resistant to corrosion by a large number of reagents which attacked steel containing 14% Cr, and possessed greater ductility than the plain, low-carbon, chromium steels. When heated and quenched staybrite does not become hardened but is rendered more ductile. The mechanical properties of this steel in a softened condition were : yield point 15·1 tons/in.^{2}, maximum stress 48·6, elongation 62·8%, reduction in area 45%, hardness (Brinell) 160. The coefficient of expansion (0·000017) was notably greater than that of "stainless" steels and the alloy was non-magnetic. The results of a large number of corrosion tests on iron alloys are tabulated. C. A. King.

Comparison of a new ferro-nickel [permax] of remarkable magnetic properties with permalloy. H. Tscherning (J. Phys. Radium, 1925, **11**, 300—304 ; cf. Yensen, B., 1925, 320 ; Deloraine, 1925, 593).—Permax (an alloy of French manufacture) has little hysteresis in high fields, and considerable hysteresis in small fields. The permeability is high for fields of 1 or 2 gauss, and only moderate in high fields. The alloy has a marked magnetic viscosity in weak fields. Although it lacks the remarkable properties of permalloy it is less susceptible to loss of its characteristic properties. R. A. Morton.

Relations between artificial ferronickel and a meteoric iron containing nickel. M. Peschard (Compt. rend., 1925, **181**, 854—855).—Thermal and magnetic experiments are described which indicate that meteorites are in physico-chemical equilibrium, whereas artificial ferronickels are in a metastable state. S. K. Tweedy.

Special nickel brasses. O. Smalley (Trans. Amer. Inst. Min. Met. Eng., Oct., 1925. Advance copy. 35 pp.).—The addition of nickel in amounts exceeding 1% results in a general improvement in the mechanical properties of brass (59% Cu) in the cast state. Increasing the nickel to 4%—the copper remaining constant—reduces both strength and ductility. The hardness diminishes with increasing nickel content. In amounts up to 4% nickel does not affect the hot-working qualities of $\alpha\beta$-brasses and has a beneficial influence on the shock-resisting properties. The grain size is rendered finer and the quantity of β-constituent is reduced owing to the copper-replacing value of nickel, which is 1·30. Aluminium increases the yield point and ultimate strength of 59 : 41 brass, the limit of rapid hardening being about 1·35%, although it is not until 3% of aluminium has been added that the maximum strength is reached. When this amount is exceeded the strength falls and the alloy loses its ductility owing to the presence of the γ-constituent. The range of heat fragility in β-brass of the copper–aluminium–zinc series is approximately from 226° to 558°. Tin up to 0·5% increases the yield point and ultimate strength without affecting the elongation, reduction of area, or alternating impact strength. Increasing this element to 1·0% hardens without strengthening and impairs the ductility. Iron up to 1% improves the tensile and shock-resisting properties of cast 59 : 41 brass, further additions reducing the latter without increasing the strength. Iron up to 2·52% results in an all-round improvement after hot working, and even in small quantities has a marked refining effect on the structure. Contrary to the findings of Guillet, iron does not act as a zinc-replacing element. The substitution of 3% Ni for 3% Zn in a 1·5% Al 59% Cu brass resulted in general improvement, but reducing the copper to 56% yielded properties which could be equalled by an ordinary aluminimum β-brass. When the copper is increased to 60% and aluminium to 3% the nickel brings about a reduction of strength without affecting the ductility. When forged this alloy gives a higher yield point, ductility, and impact strength. 1% of iron improves the general properties of 59% Cu brass containing 3% Al, but in greater amounts causes a reduction in ductility and impact strength. Iron up to 1% improves slightly the general mechanical properties of brasses containing 1·5% Al with 3% Ni and 3% Al with 3% Ni. Small amounts of tin have a deleterious influence on the properties of a 59% Cu brass containing 3% Ni and 3% Al in the cast condition. Forging breaks down the thin boundaries of the α-constituent around the crystals and produces a closer-grained structure which notably improves the properties of this alloy. The casting temperature of these brasses ranges between 930° and 1030°, depending on composition, and 10% superheat is considered a satisfactory casting temperature ; for heavy ingots this may be reduced to 7%. M. Cook.

Boron in aluminium and its alloys. P. Haenni (Compt. rend., 1925, **181**, 864—866).—Aluminium–boron alloys containing up to 18% B were prepared by heating molten aluminium for periods up to 4 hrs. at 1400° in a crucible lined with boron ; the alloys were cast in heated metal moulds. In the equilibrium diagram for alloys of low boron content the liquidus curve falls continuously down to 620°, corresponding with 8·5% B ; a eutectic line appears at 565° between 1·7% and 8·5% B. The breaking stress and hardness of aluminium are increased by the addition of boron and the elongation under strain is decreased. Addition of boron to aluminium–silicon alloys has a refining effect similar to that produced by sodium and alkali fluorides.
S. K. Tweedy.

Aluminium–silicon alloys. A. Petit (Compt. rend., 1925, **181**, 718—719).—The influence of various metals and alloys on the physical properties of aluminium–silicon alloys is recorded. Refining of the alloy is best carried out by squirting in sodium (0·5%) at 775° and casting at 675°. The influence of sodium up to 1% on the properties decreases with increasing rate of cooling after casting. The presence of iron must always be avoided. Copper, magnesium, and alloys of the latter with copper and zinc, present to the extent of 2 to 5%, have the greatest influence. In such cases annealing for an hour at 400° reduces the hardness equivalent to quenching at 500°, and ageing at ordinary temperatures produces a hardening owing to the separation of Mg_2Si or

Al_2Cu, maximum hardness being attained after 70 hrs. ; this time is shortened if the temperature is raised to 100°, but above 125—150° a softening occurs. S. K. TWEEDY.

Amorphous cement and the formation of ferrite in the light of *X*-ray evidence. F. B. FOLEY (Trans. Amer. Inst. Min. Met. Eng., Oct., 1925. Advance copy, 8 pp.).—In the freezing of a metal the formation of crystals takes place atom by atom and not cube by cube. This conception is developed to show that at the grain boundaries no amorphous cement exists. The intercrystalline nature of fracture at elevated temperatures is due to the weakness in the structure at the boundaries. Atoms at the boundaries of adjacent grains are only loosely held, having become detached from the lattice of the crystal being consumed in the process of crystal growth and not having finally settled into the lattice of the growing crystal. Slip interference is considered a satisfactory explanation of the raising of the elastic limit by cold working. In the separation of ferrite from austenite it is maintained that the ferrite is not formed within the crystals and rejected to the boundaries, but forms at the exterior of the austenite crystals. Atoms at the crystal boundaries are freer to assume new orientations and possess energy in excess of that necessary for maintaining their positions in the lattice and thus the formation of the α-modification is facilitated at the boundaries. As the γ-lattice progressively breaks down through the addition of atoms to the α-nuclei the carbon atoms are driven towards the centre of the crystal. In the Widmanstättan structure ferrite is found in what were the 111 planes of the austenite. This is partly explained by the predominance of iron atoms at the nuclei of recrystallisation. Since the carbon atom occupies a position between corner atoms along the cube edge any plane parallel to the cube face (001) contains carbon atoms, but none will be found in the octahedral plane. M. COOK.

Elastic properties of alloys : variation with composition. P. CHEVENARD and A. PORTEVIN (Compt. rend., 1925, **181**, 780—782).—Curves are given for the elastic properties of annealed carbon steels and gold–silver alloys. The modulus of elasticity (μ) varies almost linearly with composition, both in alloys of two structural constituents and also in solid solutions, this being confirmed for alloys of copper with zinc, aluminium, or nickel. On the other hand the elastic contraction is always much less than that of the pure metals, the contraction (δ)–composition curves sinking rapidly from the pure metals to a very flat minimum. The curves for the thermo-elastic coefficient $1/\mu.(d\mu/d\theta)$ pass smoothly but not linearly from one component to the other. W. HUME-ROTHERY.

Influence of cold-working and quenching on the elastic properties of various metals and alloys.—A. PORTEVIN and P. CHEVENARD (Compt. rend., 1925, **181**, 716—718).—The influence of thermal and mechanical treatment on the elastic properties of pure metals and alloys was investigated by the method previously described (cf. J., 1918, 91 A). In the case of cold-drawn gold wires the relative torsion modulus diminishes with rising temperature ; its value at 15° passes through a maximum at an annealing temperature of about 225°. The thermoelastic coefficient varies similarly with rising annealing temperature ; the change in internal friction attains a minimum with an annealing temperature of 250°, and rises only slightly for higher annealing temperatures. Slightly different absolute values are obtained, depending on the time elapsing between annealing and the experimental observations. Qualitatively similar results are obtained with normal solid solutions (*e.g.*, silver–gold alloys) ; in the case of " anomalous " solutions which have been hardened by quenching or cold-working, such as reversible ferro-nickel alloys, the above effects are observed superposed by the effects of the reversible anomaly modified by cold-working. Such treatment lowers the Curie point and modifies the range of the thermoelastic anomaly. The minimum annealing temperature of ferro-nickels is about 550°. In the case of carbon steel, quenching diminishes the torsion modulus, and increases the thermoelastic coefficient and the change in internal friction, the latter more especially near the eutectic point. The temperature curves of the latter property show a singularity at about 200°, which is independent of the magnetic transformation of cementite and cannot be due to a new polymorphic transformation of iron. S. K. TWEEDY.

Leaching mixed copper ores with ferric sulphate. G. D. VAN ARSDALE (Trans. Amer. Inst. Min. Met. Eng., Feb., 1926. Advance copy. 17 pp.).—The ore treated contains chalcocite and chrysocolla as principal sulphide and non-sulphide constituents respectively, averages 1·25% Cu, and when ready for leaching the limits are approximately 0·1 and 0·9% of copper as sulphide and 0·25 and 1·1% as oxide. After coarse crushing to 1½ in. the ore is further crushed to pass 3-mesh and conveyed to the leaching tanks, where it is in contact with acid ferric sulphate leach liquor for nine days. The liquid is applied on the counter-current principle. Washing consists of the application of six washes in succession and occupies three days. The strongest wash solution is directed into the copper solution. The limits of constituents in the solution for electrolysis are, copper as sulphate 2·5 to 3·5%, total iron 1·5 to 2·5%, ferric iron up to 1·0% or somewhat higher, and free acid from 3·5 to a maximum of 7·5%. The success of the method turns upon the facts that active and efficient ferric sulphate solvent can be regenerated in a non-diaphragm cell by electrolysis with a reasonable yield of copper and that this solvent under proper leaching conditions will give a satisfactory sulphide extraction. Both lead and graphite anodes have been used. Graphite gave a low voltage, a high anode efficiency of conversion of ferrous into ferric iron, and durability in the presence of sufficient ferrous iron, whilst lead yielded higher voltages, a lower anode efficiency corresponding with less ferric iron at the anode per unit of copper deposited, and was durable under the test conditions. A current density of about 15 amp./

sq. ft. is sufficient to counteract the solvent action at the cathode by the ferric iron produced. The average total extraction over a test period of ten months was 77·90%. The tank-house data for the same period averaged 15·00 amp./sq. ft. current density, 62·1% cathode efficiency, 53·9% anode efficiency, and 0·695 lb. of copper per kw.-hr. The copper produced is sufficiently pure to meet standard specifications.

M. Cook.

Determination of small quantities of foreign elements in [scheelite, tungstic acid, and metallic] tungsten. K. Agte, H. Becker-Rose, and G. Heyne (Z. angew. Chem., 1925, 38, 1121—1129).—For the determination of the minor constituents of scheelite, 25 g. are fused with 175 g. of sodium potassium carbonate and the insoluble residue is dissolved in hydrochloric acid with a small amount of tartaric acid to retain any tungstic acid in solution. The solution is treated with hydrogen sulphide to remove the heavy metals, the filtrate boiled with excess of hydrochloric acid to remove tungstic acid, and evaporated to dryness, the residue treated to destroy tartaric acid and extracted with water, and the remainder of the analysis conducted in the usual way. For the detection and determination of the rare earths, silica, alumina, magnesia, lime, and the alkalis in tungstic acid or tungsten powder the sample is first roasted in the air, then heated to 400° for 5—20 hrs. in a current of chlorine and sulphur chloride, whereby the tungsten is completely volatilised as an oxychloride leaving the other metals in the residue, which may be analysed in the usual way. Iron is determined by dissolving tungstic acid in ammonia or metallic tungsten in nitric and hydrofluoric acids followed by addition of ammonia and precipitation by hydrogen sulphide ; the iron is then determined iodometrically. Zinc is separated from tungsten by means of hydrogen sulphide in dilute acetic acid solution and, after purification, the zinc sulphide is converted into pyrophosphate for weighing. Phosphorus and arsenic are determined together as the magnesium pyro-salts after precipitation with magnesia mixture from the ammoniacal tungstate solution ; arsenic is then separated from the phosphorus by distillation with methyl alcohol, hydrochloric acid, and pyrogallol and subsequently determined colorimetrically as sulphide. For the determination of tin the alkaline solution containing tungsten and tin is treated with 5 g. of sodium sulphide and 1 g. of sodium hydrogen sulphate for every 1 g. of tungstic acid present and electrolysed for 4 hrs. at 60° with 1·2 amp. at 4 volts ; the precipitated tin is dissolved and determined iodometrically. Bismuth, copper, and lead are separated from tungsten by means of hydrogen sulphide in a chloride solution containing tartaric acid, manganese, nickel, and cobalt by means of hydrogen sulphide in ammoniacal solution, and nickel alone by dimethylglyoxime in the usual way. Molybdenum is best determined colorimetrically in the alkaline tungstate-molybdate solution by addition of xanthate, and vanadium by addition of hydrogen peroxide to the solution after boiling with sulphuric acid to remove the tungsten. Carbon is determined in tungsten metal by combustion in oxygen at 1000—1100°, and oxygen by heating in hydrogen at 1200° for 1—2 hrs. Nitrogen may be determined gasometrically in tungsten metal by dissolving the metal in alkaline ferricyanide solution and measuring the nitrogen evolved. Sulphur is determined by heating the metal in oxygen at 1100°, passing the gases through hydrogen peroxide solution, and precipitating the sulphuric acid so formed with barium chloride, or by titration with thiosulphate of the iodine liberated when a mixture of iodide and iodate is added.

A. R. Powell.

Determination of the grain-size of tungsten powder. K. Agte, H. Schönborn, and K. Schröter (Z. tech. Phys., 1925, 6, 293—296 ; Chem. Zentr., 1925, 96, II, 2013)—Rough values for the grain size of tungsten powder may be obtained by measuring the volume and determining the apparent sp. gr., and more exact values by measuring its adsorptive power for dyestuffs (which is proportional to its surface) by determining the rate of solution in chemical reagents, by calculating its rate of fall in water, or by actual measurement of the grains after embedding a portion of the powder in a soft metal, such as copper. Constant values could not be obtained by measuring the adsorption of methylene-blue from water owing to slight oxidation of the powder. As a measure of the rate of solution of the powder it may be shaken with aqueous ammonia and oxygen, and the oxygen consumption measured. In the fall method it is assumed that the particles are fine enough to fall through water at a constant rate and are almost spherical in shape.

A. R. Powell.

Agglomeration of ores. A. Cousin (Rev. Mét., 1925, 22, 697—702).—Sintering a mixture of a finely-divided mineral and a combustible substance by means of a flame impinging on the surface of a layer of the mixture is not a satisfactory method of agglomerating mineral particles owing to the large proportion which remains in fine form. Briquettes made with the aid of bonding material are not strong enough to withstand after-treatment and have the disadvantage of a reduced mineral content. Whilst the sintering of fine minerals in a rotary furnace results in a granular product of sufficient hardness, the low porosity of the grains renders the subsequent reduction of the mineral difficult. The most satisfactory method of treatment is to briquette the mineral without the addition of any bond and to pass the briquettes on cars through a tunnel kiln. Such a kiln at Seraing is 70 m. in length and 2 m. in width, and will treat 140 metric tons of roasted pyrites daily, with a consumption of 60 kg. of carbon per ton of briquettes. The material may be sintered to a sufficient degree to bear the blast-furnace load in subsequent treatment while still retaining the necessary porosity (30—40%) for efficient reduction. It is necessary to study the best briquetting conditions for each type of mineral.

C. A. King.

Agglomeration of finely-divided ores by the Dwight and Lloyd method. Schneider et Cie. (Rev. Mét., 1925, 22, 703—710).—The method of agglomerating ores in powder form by heating briquettes of the ore, bonded with clay, in a tunnel furnace has been replaced by the Dwight and Lloyd process of sintering a layer of the ore. A mixture of 56% of ore, 6·5% of pulverised coke, and 37·5% of material which has passed through the process previously is caused to travel on a continuous trough conveyor under the flames from a battery of 10 Méker burners fed with coke-oven gas. The normal thickness of the ore layer is 20 cm. After sintering, the material passes over a screen and grains less than 20 mm. diam., amounting to about 40% of the total, are returned to a further charge. The consumption of fuel is 8 cub. m. of coke-oven gas or in the case of oil firing, 4—5 kg. of oil per metric ton of agglomerated fines. The process is considered to possess advantages in that the product is homogeneous in size and porosity, preliminary drying of the material is not necessary, and desulphurising is satisfactory. C. A. King.

Metallurgy of quicksilver [mercury]. L. H. Duschak and C. N. Schuette (U.S. Bur. Mines, Bull. 222, 1925, 173 pp.).—The metallurgy of mercury has not changed in its main principles since mediæval times, direct furnace treatment of even very low-grade ore being still the most economical process of recovering the metal. Preliminary concentration of cinnabar by flotation or table treatment or a combination of both gives a recovery of 5—20% less mercury than direct furnace treatment and the cost is not appreciably less; hydrometallurgical processes have the same disadvantages. Recent advances in the metallurgy of mercury have therefore been confined to improvements in the drying and preliminary treatment and improvements in furnace design and in the efficiency of the condensers. Preliminary drying of ore, especially where waste heat is available, is advantageous in that the thermal efficiency of the furnace and condensers is improved and difficulties due to the collection of large amounts of water in the condensers are eliminated. A detailed description with diagrams, illustrations, and cost data is given of the Scott and Spirek furnaces and of several mechanical roasting furnaces. Whatever furnace is used it is essential that complete combustion of the fuel is effected, and that there is always a reasonable excess of oxygen in the furnace atmosphere in order to reduce to a minimum the quantity of mercurial soot, due chiefly to the presence of unroasted mercuric sulphide in the flue gases. Although stoneware pipes are employed as condensers in Europe, American mines used wooden chambers lined with white glazed tiles or simply a series of brick chambers in which the flue gases are cooled progressively from 300° to 40°. The disadvantage of brick chambers is that a certain amount of mercury penetrates the brick floor and a further quantity is absorbed by the walls. Various condenser systems are discussed in detail, and a brief account of the effect of mercury on the health of the workers is given. A. R. Powell.

Patents.

Heat treatment of manganese steel. E. C. R. Marks. From Amer. Manganese Steel Co. (E.P. 242,322, 3.7.24).—Manganese steel castings of the kind described in E.P. 206,183 (cf. B., 1924, 20) are introduced into a furnace immediately after the removal of a previous charge. The furnace temperature will be about 705° at this time, and is allowed to fall to about 580°, from which temperature the furnace is reheated to an upper limit of 1025° until the requisite heat treatment has been effected. C. A. King.

Heat treatment of high-speed steel for the manufacture of permanent magnets. E. C. R. Marks. From Glockenstahlwerke A.-G. vorm. R. Lindenberg (E.P. 242,421, 23.10.24).—High-speed steels to be used for permanent magnets are heated to a temperature above that to which certain kinds of steel have to be heated in order to lower the Ar1 point on cooling the steel, and are then hardened in oil, petroleum, or other mild hardening medium. The steel may or may not contain cobalt. A suitable composition is C 0·6—0·8%, Mn 0·5%, Si 0·25%, Cr 4—5%, Mo 7—8%, Co 1—2%, V 0·5%. C. A. King.

Magnetic structures and method of manufacture thereof. Western Electric Co., Ltd. From Western Electric Co., Inc. (E.P. 242,384, 4.9.24. Addn. to 188,688).—Magnetic structures, *e.g.*, cores, of an alloy containing Ni 78·5% and Fe 21·5% are built up from strips of small cross-section, spaced apart by a phenol condensation product. Such a structure may be assembled with a combustible material as the spacing agent, which is destroyed during the heat treatment to develop high permeability. The structure is then impregnated with a phenol condensation product, and may be heated to a temperature below 200° to form a hard, infusible mass in which the nickel–iron alloy is embedded, and which can be subjected to ordinary usage without impairing the permeability of embedded alloy due to strain. C. A. King.

Refining steel. J. N. Kilby and A. H. Spalton (E.P. 242,475, 6.5.24 and 3.2.25).—Molten steel from a furnace is poured into a container lined with a basic or neutral refining medium, and a cover of the same or similar material is applied so that the molten steel in the container is completely enveloped. The basic lining may consist of a mixture of magnesite 75%, dolomite 25%. An additional refining medium added in small quantity during the pouring of the steel may contain fluorspar 2 pts., lime 2 pts., silica 1 pt., borax glass 1 pt. C. A. King.

Purifying molten metal [steel]. R. Mattice (U.S.P. 1,559,342, 27.10.25. Appl., 21.8.25).—A cylindrical container is filled at one end with a mixture of lime and borax, and at the other with a block of aluminium, and is immersed in molten steel. The fusible plug at the end containing the borax and lime melts, as also does the aluminium block, and the steel is slowly purified without the explosive reaction which occurs if powdered aluminium is added directly to it. T. S. Wheeler.

Apparatus for the production of electrolytic iron. Siemens u. Halske A.-G., Assees. of E. Duhme (G.P. 416,082, 23.6.23).—An electrolytic apparatus for the production of pure iron is provided with magnets below the bath or immersed in the electrolyte, and so arranged that the strength of the field decreases towards the cathode. In this way particles that fall from the anode are prevented from becoming attached to the cathode and thus causing the formation of nodules. A. R. Powell.

Desulphurising agent for iron and other metals. C. Ehrenberg, H. Wiederhold, C. Krug, M. G. Holsboer, K. Fischer, and Studien-Ges. für Ausbau der Industrie m. b. H. (G.P. 417,448, 28.9.23).—A desulphurising agent for iron consists of the alkali or alkaline-earth salts of humic acids. The salts may be carbonised before use, and are preferably added during the smelting of the ore. A. R. Powell.

Roasting iron ores. A. Apold and H. Fleissner (F.P. 589,472, 21.11.24. Conv., 22.10.24).—Iron ores mixed with a carbonaceous fuel are roasted with an insufficiency of air, and the carbon monoxide so produced is burnt to obtain the heat required for roasting further quantities of ore. A. R. Powell.

Treatment of iron ores. H. Fleissner (F.P. 589,473, 24.11.24. Conv., 28.7.24).—Iron ores, *e.g.*, spathic iron ore, are roasted in a current of an inert, oxidising, or reducing gas. In this way decomposition is effected at a lower temperature, and by suitable adjustment of the composition of the gas or by alternate treatments with oxidising and reducing gases a product may be obtained which is amenable to magnetic separation. A. R. Powell.

Bearing metal alloys. J. Neurath (E.P. 238,895, 21.8.25. Conv., 23.8.24).—By the addition of 0·7—2·5% of arsenic to alloys of lead 65—77%, tin 3—14%, and antimony 10—27%, the bearing qualities are made equal to those of bearing metals of the same ternary system containing a high proportion of tin. The increased hardness and compressibility are ascribed to the formation of a ternary lead–antimony–arsenic eutectic, and of a tin–arsenic compound, probably Sn_3As_2. L. M. Clark.

Bearing metal alloys of high lead content. T. Goldschmidt A.-G. (G.P. 417,166, 21.4.20).—Small quantities of phosphorus and iron are added to bearing metal alloys, of which lead is the chief constituent. Phosphorus increases the hardness and resistance to wear, whilst iron reduces the brittleness and makes the alloy tougher. A. R. Powell.

Bearing metal alloys of high lead content. T. Goldschmidt (G.P. 417,337, 18.6.21. Addn. to 408,229; cf. E.P. 169,703; J., 1922, 942 a).—Arsenic or a mixture of arsenic and phosphorus is added together with the copper specified in the chief patent. A. R. Powell.

[Foundry] mould composition. A. Pacz (E.P. 240,808, 8.9.25. Conv., 2.10.24. Not yet accepted).—A material suitable for moulds for casting aluminium–silicon alloys or other metals comprises a mixture of a silicon-containing substance of high conductivity in divided form and a binding material, *e.g.*, 10% of clay. The conductive material may comprise one or more silicides of iron, aluminium, calcium, or other metal, *e.g.*, ferrosilicon with 50—90% Si. Other materials such as sand, carbon, coke, carborundum, graphite, or powdered aluminium or other metal may be added to alter the specific gravity or conductivity or both.

Cerium alloys for igniting purposes. A. Kratky (E.P. 242,361, 9.8.24).—To cerium alloys containing silicon and boron used for igniting purposes, a quantity of potassium, sodium, zinc, calcium, aluminium, lead, or the like is added whereby the particles removed when the mass is scraped are transformed into molten drops of a glass having pronounced pyrophoric properties. An alloy specified has the approximate composition by weight cerium 80%, potassium 4%, calcium 4%, boron 2%, silicon 10%. Those alloys are particularly effective which have such a composition that the glass formed on scraping is composed of cerium oxide 75—90% and lead silicate 10—25%. (Reference is directed in pursuance of Sect. 7 (4), of the Patents and Designs Acts, 1907 and 1919, to E.P. 16,210 of 1909.) L. M. Clark.

Pickling process for metal plates. W. Thomas and M. Hawes (E.P. 242,506, 13.3.25).—A solution, non-injurious to the throat, lungs, skin, or clothes of the user, has the composition by weight, water 1 pt., commercial sulphuric acid (*d* 1·69) 0·58 pt., sodium chloride 0·25 pt., and zinc 0·20 pt. The sodium chloride and zinc are added to the mixture of water and sulphuric acid; after 4 days the solution is ready for use. Steel plates are immersed in the mixture for ½ hr. at 40° before tinning. L. M. Clark.

Treatment of lead minerals. L. F. Clark (U.S.P. 1,548,351, 4.8.25. Appl., 23.4.24).—Ores are treated with alkali dichromate dissolved in copper sulphate solution or with a solution of copper dichromate so as to form a superficial film of lead chromate on the particles of lead minerals present. The ore is then treated with an organic substance (aniline or an aniline acid salt, linseed oil, turpentine, pine oil, etc.), which is oxidised by the lead chromate, and the coated lead mineral is thus made amenable to flotation. Alternatively, a coating of copper cyanide or carbonate may be produced on the particles of lead minerals and the coating treated with acetylene to form copper acetylide therein. C. A. King.

Metal stock [for use as deoxidising agent]. A. M. Hunt, Assr. to Amer. Magnesium Corp. (U.S.P. 1,555,978, 6.10.25. Appl., 26.8.20).—Powdered magnesium (10—20 pts.) is mixed with ferrosilicon or ferromanganese (90—80 pts.) and the mixture highly compressed to form a stable briquette, which is applied to the deoxidation and purification of molten iron or steel. A similar nickel–magnesium briquette is used to purify molten nickel. T. S. Wheeler.

[Alloy for] resisting oxidation at high temperatures. R. F. Flintermann (U.S.P. 1,556,776, 13.10.25. Appl., 14.2.21).—The alloy contains 20—60% of nickel or cobalt, 3—9% of silicon, and the remainder principally iron. T. H. Burnham.

Nickel–chromium alloy. W. F. Cochrane, Assr. to U.S. Industrial Alcohol Co. (U.S.P. 1,557,025, 13.10.25. Appl., 17.7.24).—The alloy contains 1—5% of chromium, 20—40% of nickel, and the balance principally copper. T. H. Burnham.

Nickel–copper alloy. W. F. Graham, Assr. to U.S. Industrial Alcohol Co. (U.S.P. 1,557,044, 13.10.25. Appl., 28.8.23).—The alloy consists of 30—35% of nickel, 3—7% of iron, and the remainder copper, and contains no lead or zinc. T. H. Burnham.

Gold alloy. V. D. Davignon (U.S.P. 1,557,431, 13.10.25. Appl., 4.9.25).—A malleable and ductile gold–copper alloy contains not less than 25% of gold and at least 1% of aluminium. T. H. Burnham.

Alloy. F. W. Karitzky, Assr. to H. B. Newhall (U.S.P. 1,559,620, 3.11.25. Appl., 31.12.24).—The alloy contains Zn 85%, Al 10%, and Sn 5%. C. A. King.

Apparatus for treating ores or the like. G. H. Clevenger, Assr. to Research Corp. (U.S.P. 1,558,965, 27.10.25. Appl., 27.12.20).—The furnace, which is horizontal, consists of a reaction unit, a preheating unit at a somewhat higher level, and a material-transfer connexion between the two units. The charge is passed successively through the preheating and reaction units while a combustible gas is passed in the opposite direction and progressively burned in the reaction unit. The combustion of unburnt gases is effected in a combustion chamber connecting the two units. M. Cook.

Extraction of copper from matte. A. H. Henderson (U.S.P. 1,560,574, 10.11.25. Appl., 9.5.21. Renewed 21.4.25).—Copper matte is decomposed by heating it with an alkali carbonate, a fluxing agent, and an alkali hypochlorite. A. R. Powell.

[Aluminium] alloy. M. E. Page (U.S.P. 1,560,845, 10.11.25. Appl., 22.4.25).—An alloy comprising 93·20% Al, 4·55% Au, and 2·25% Cu is claimed. A. R. Powell.

Preparation of aluminium alloys. A. Negui (F.P. 589,223–4, 26.1.24).—The constituent of the alloy of highest m.p. is heated to redness without melting and a portion of the aluminium is added; this reduces the surface oxide and causes the mixture to melt owing to the large amount of heat evolved. Further oxidation is prevented by the oxide layer formed. The remainder of the aluminium is then added, followed by any other constituent. Copper–nickel–aluminium and copper–vanadium–aluminium alloys containing magnesium are readily produced by this method from cupro-nickel and cupro-vanadium. A. R. Powell.

Electrolytic cell [for production of aluminium]. W. Hoopes, Assr. to Aluminum Co. of America (U.S.P. 1,562,090, 17.11.25. Appl., 8.11.23).—The carbon bottom-lining of an electrolytic cell is provided with a depression forming a receptacle for molten metal (aluminium) together with a tapping-well extending below the surface on which the molten metal rests and a tap-hole leading horizontally from the bottom of the well. On tapping the cell, liquid floating on the molten metal is prevented from reaching the tap-hole before the receptacle is drained of metal. J. S. G. Thomas.

Coating aluminium with a strongly-adherent film of copper. G. Götz (G.P. 416,422, 16.5.24).—Aluminium articles may be provided with a strongly adhering copper coating by immersing them for a short time in a boiling solution of copper nitrate and then dipping them into a boiling concentrated solution of copper sulphate. A. R. Powell.

Nickel-plated article. F. M. Becket, Assr. to Electro Metallurgical Co. (U.S.P. 1,561,900, 17.11.25. Appl., 20.3.24).—A nickel-plated article consisting of an iron alloy containing sufficient chromium to render it rustless under atmospheric conditions is claimed. A. R. Powell.

Separating molybdenum from ores. W. H. Rideout (U.S.P. 1,562,125, 17.11.25. Appl., 13.3.24).—Ores containing molybdenum are pulped and agitated with a flotation agent in the proportion of pulp 1 pt., flotation agent 2 pts. The latter consists of a mixture of water 90 gals., paraffin 10 gals., soda 4 oz., lye 1 lb. C. A. King.

Compound metal and method of making it. C. P. Byrnes (U.S.P. 1,562,145, 17.11.25. Appl., 1.3.21).—Loose granules of a metal are introduced into a molten metal of lower melting point than the granules and are allowed to settle under the action of gravity during the cooling of the molten metal. C. A. King.

Producing molybdenum and vanadium alloys. J. J. Boericke (U.S.P. 1,562,201, 17.11.25. Appl., 26.5.20. Renewed 25.9.25).—Molybdenum and vanadium alloys are made by reducing a mixture of a molybdenum or vanadium compound with aluminium in the presence of the alloying metal and a large quantity of indifferent flux. A. R. Powell.

Tempering light alloys. G. L. Williams (U.S.P. 1,562,269, 17.11.25. Appl., 8.5.22).—The

alloy is made the cathode in a hot solution of a salt of a heavy metal and electrolysis is continued until the surface is coated with the heavy metal; the alloy is then quenched in cold water.
A. R. POWELL.

Production of cyanide solutions [from crude cyanide]. K. F. COOPER, Assr. to AMER. CYANAMID Co. (U.S.P. 1,562,295, 17.11.25. Appl., 21.2.23).—Cyanide solutions suitable for the extraction of precious metals from their ores may be obtained by dissolving a crude cyanide containing carbide in water, adding a sulphide to remove the carbide, and aerating the solution with a gas containing oxygen to convert the excess of sulphide into thiocyanate.
A. R. POWELL.

Refining of precious metal residues. F. LAU (G.P. 415,720, 24.2.24).—Precious metal residues are melted with borax, sodium nitrate, and a large amount of ammonium chloride to obtain a regulus from which the valuable metals may readily be recovered.
A. R. POWELL.

Ennoblement of metallic surfaces. W. GUERTLER (G.P. 416,852, 26.4.22).—The metallic surface is covered with a paste containing molybdenum or tungsten and heated first in an oxidising atmosphere to remove any carbon or sulphur in the paste, then to a high temperature in a reducing atmosphere to reduce the tungsten or molybdenum compounds to metal and cause the latter to alloy with the surface layers of the article. In this way nickel, copper, and iron and their alloys may be rendered resistant to chemical attack.
A. R. POWELL.

Smelting tin ores. T. GOLDSCHMIDT A.-G., Assees. of L. SCHERTEL (G.P. 417,741, 3.5.23).—Tin ores containing valuable constituents, such as silver, are heated under reducing conditions to a temperature below that at which the gangue sinters, and the reduced tin is leached out with hydrochloric acid, with or without chlorine, ferric chloride, or stannic chloride. The insoluble material is then smelted with materials which yield products that will collect the silver, *e.g.*, lead or copper ores.
A. R. POWELL.

Alloy for electrical contacts. BELL TELEPHONE MANUF. Co. (Swiss P. 109,929, 20.6.24).—An alloy for electrical contacts is composed of phosphor-bronze and lead, containing, *e.g.*, 4—5·5% Sn, 1—4% Pb, 0·05—0·25% P, and 90·25—94·95% Cu. Contacts made of this alloy are considerably more durable than those made of lead-free bronze.
J. S. G. THOMAS.

Treatment, especially melting, of metals. WESTFÄLISCHE STAHLGES. OSSENBERG U. Co. (Swiss P. 110,000, 25.10.23. Conv., 31.10.22).—The metal is melted under a layer of flux having a low melting point and a high boiling point. The flux may consist of eutectic mixtures of the halides, carbonates, or oxides of the alkali, alkaline-earth, or light metals, and may contain, in addition, a reducing agent. The operation is carried out in an electric resistance furnace, the walls of which are rendered conducting by treating them at a high temperature in a reducing atmosphere in contact with aluminium powder. The metal to be treated may act as an electrode, in which case it is insulated from the walls of the furnace.
A. R. POWELL.

Softening aluminium-plated iron articles. F. JORDAN (E.P. 243,042, 20.6.24).—See U.S.P. 1,552,744; B., 1925, 885.

Treatment of alloys containing copper and iron. H. PEDERSEN, Assr. to ORKLA GRUBEAKTIEBOLAG (U.S.P. 1,562,472, 24.11.25. Appl., 16.4.24).—See E.P. 239,768; B., 1925, 885.

Method of producing alloys. A. PACZ (U.S.P. 1,562,654, 24.11.25. Appl., 18.3.20).—See E.P. 160,426; J., 1922, 637 A.

Alloy. C. A. FONTANE, Assr. to E. CONTI (U.S.P. 1,563,079, 24.11.25. Appl., 2.2.24).—See E.P. 211,456; B., 1925, 508.

Applying metallic coatings to porous [non-metallic] bases. K. RIPPER, Assr. to F. POLLAK (U.S.P. 1,563,793, 1.12.25. Appl., 21.8.23).—See E.P. 201,567; B., 1924, 985.

Tilting [smelting] furnaces. D. F. CAMPBELL and W. S. GIFFORD, Assees. of HIRSCH, KUPFER- U. MESSINGWERKE A.-G. (E.P. 227,124, 2.1.25. Conv., 3.1.24).

Zinc sulphate from iron ores containing zinc sulphide (G.P. 416,104).—See VII.

Electric-arc furnace (U.S.P. 1,561,731).—See XI.

XI.—ELECTROTECHNICS.

High-frequency-induction electric furnace for very high temperatures. G. RIBAUD (J. Phys. Radium, 1925, **11**, 295—299; cf. B., 1925, 554).—A detailed account of the author's graphite-porous carbon furnaces. 10 kilowatts gave a maximum temperature of 3000° for 100 c.c. with one furnace, 2500° for 500 c.c., 1800° for 3 litres volume. With 18 kilowatts and 5 litres volume, the maximum temperature was 2000°.
R. A. MORTON.

Electrical conductivity of magnesia refractories at high temperatures. J. T. BURT-GERRANS and R. S. KERR (Trans. Roy. Soc. Canada, 1925, **19**, III., 27).—The specific conductivity of new magnesia bricks increases from 2×10^{-5} mho/c.c. at 870° to 5×10^{-5} mho/c.c. at 1020°, falls to 2×10^{-5} mho/c.c. at 1080°, and then steadily increases to 0·27 mho/c.c. at 1550°. Bricks that have been heated above 1400° and then cooled show a decrease in conductivity between 1200° and 1300°, but reach the same value as for new bricks at higher temperatures.
J. S. CARTER.

Chemical method of reducing the diameter of tungsten wire [filaments]. W. Samter and K. Schröter (Z. techn. Phys., 1925, 6, 305—306; Chem. Zentr., 1925, 96, II., 2078).—It was found possible to reduce the diameter of the finest tungsten filaments obtained by drawing (0·011 mm.) still further by 35—50% by etching for about ¾ min. in a bath composed of a molten mixture of sodium nitrite and nitrate. By slower etching a rougher surface is obtained. By the use of filaments of diameter 0·007 mm. so prepared, it is possible to manufacture lamps taking less current than has hitherto been found possible, *e.g.*, lamps which at 2030° take only about 0·040 amp. while burning over a period of 50 hrs. J. S. G. Thomas.

Transformer oils and methods of testing them. I. Musatti and A. Pichetto (Annali Chim. Appl., 1925, 15, 238—265).—Of the various tests which have been devised in order to obtain a measure of the tendency of a transformer oil to form a deposit, the Brown–Boveri test approaches most nearly the conditions in which such oil functions in practice. Neither air nor oxygen is blown through the oil, oxidation occurring by simple contact of the surface of the oil with the air; further, the temperature used is not excessive in relation to the temperatures encountered when the oil is in actual use. This test, however, takes too much time for practical purposes, it requires a considerable quantity of oil, and the surfaces of contact between the air and the copper catalyst used, and between the copper and the oil, are arbitrary. Modifications are suggested to overcome these disadvantages. The results furnished by a number of oils indicate that no relationship exists between the bromine, iodine, and formolite numbers and the tendency to undergo oxidation, but reveal a certain parallelism between the proportions of unsaturated products soluble in liquid sulphur dioxide and of sludge formed during the oxidation test. The formation of sludge is apparently accelerated by the presence of unsaturated aromatic hydrocarbons in appreciable amount. T. H. Pope.

Coated filaments for thermionic discharge tubes. Gen. Electric Co., and C. J. Smithells (E.P. 242,438, 11.11.24).—The metal core consists of an alloy of platinum or a metal of the platinum group with either 3% of iron or 5% of chromium and is made by melting the constituent metals and then rolling, hammering, and wire-drawing. Alloys containing iron or chromium are harder and stronger than the pure metal and have a higher electrical resistivity. The electron emission per unit area of filaments coated on alloys of platinum and iron is greater than that of filaments coated on alloys previously used. M. E. Nottage.

Electric incandescence lamps. A. S. Cachemaille (E.P. 242,787, 12.11.24).—In the manufacture of gas-filled electric incandescence lamps a mixture of a hydrocarbon "getter," *e.g.*, diphenylamine, *p*-dibromobenzene, or naphthalene, and a gas, *e.g.*, argon or hydrogen, is introduced into the lamp envelope. If desired the envelope may be flushed out with hydrogen prior to filling. J. S. G. Thomas.

Mercury vapour device. J. Force, Assr. to Gen. Electric Co. (U.S.P. 1,560,936, 10.11.25. Appl., 11.7.22).—Finely-divided tungsten or silica is sealed in the bulb of a mercury vapour lamp of any usual type. When the lamp is run, a thin, transparent layer is produced on the inner surface of the bulb and prevents the deposition of mercury. T. S. Wheeler.

Coating electrodes [for electric discharge tubes]. J. E. Harris, Assr. to Western Electric Co. (U.S.P. 1,562,164, 17.11.25. Appl., 4.3.20).—A metal electrode, which combines with alkaline-earth compounds to form compounds not reducible to alkaline-earth oxide upon heating in a vacuum, is coated electrolytically with a deposit of an alkaline-earth metal which is convertible, at least in part, to alkaline-earth metal oxide on exposure to air. J. S. G. Thomas.

Deoxygenation of enclosed atmosphere [in transformers]. C. J. Rodman, Assr. to Westinghouse Electric and Manuf. Co. (U.S.P. 1,557,092, 13.10.25. Appl., 23.12.22).—The space above the surface of the oil in an enclosed transformer is connected by two tubes to a reaction vessel containing a finely divided alloy of magnesium and lead mounted on asbestos. Initially the alloy is electrically heated, and when the air in the enclosed space circulates over the alloy the oxygen is rapidly absorbed. The reaction chamber is connected with the air by a mercury seal and any oxygen which may enter as the transformer "breathes" is slowly absorbed at the ordinary temperature, provided water vapour is present. Sludging of the oil is thus prevented. T. S. Wheeler.

Electric-arc furnace. F. Kostka, Assr. to Rheinische Metallwaaren- u. Maschinenfabrik (U.S.P. 1,561,731, 17.11.25. Appl., 30.12.24).—The part of the electrode lying in the wall of an electric-arc furnace for melting metals is surrounded by a tube contained within a sleeve of non-conducting material. One end of the sleeve is embedded in the fireproof furnace wall, whilst the other end holds the metallic part of the packing for the electrode at such a distance from the wall of the furnace that short-circuiting is prevented. J. S. G. Thomas.

Electric furnace. J. Sechowski (U.S.P. 1,562,261, 17.11.25. Appl., 17.8.23).—The casing of an electric furnace is divided internally into separate compartments communicating at the bottom below the vertical dividing partition. The top of the casing is provided, above one of the compartments, with an opening whereby air may be driven through this compartment into the other compartment. Horizontal baffles disposed in staggered relation are arranged in the latter compartment, being mounted alternately on the vertical partition and on one of the walls of the compartment. The width of the baffles is equal to that of the compartment, whilst their length is less than that of the compartment. Electric heating elements are arranged in transversely spaced rows beneath the baffles.

J. S. G. Thomas.

Electric furnace with electrodes arranged in the region of the furnace hearth. W. Kunze (G.P. 416,736, 22.7.21).—In an electric furnace, auxiliary electrodes equal in number to or many times the number of the principal electrodes are arranged along the circumference or on the floor of the hearth. Current is supplied to the auxiliary electrodes exclusively from a supplementary transformer controlled by the consumption of current in the arc electrodes. A short circuit is arranged in parallel with the primary of this transformer, so that the latter may be thrown out of circuit, leaving the arc heating alone in operation.

J. S. G. Thomas.

Electrical resistors. J. L. Capelle (Swiss P. 109,991, 27.6.23).—Electrical resistors are composed of an electrically-conducting material, *e.g.*, a mixture of carbon and a powdered metal, together with a non-conducting material, *e.g.*, alumina, cement, lime, etc., or mixtures of these substances. The raw materials mixed with water and, if desired, with a binder, are moulded and dried at a temperature not exceeding 500°. The metal–carbon mixture may be arranged either outside the non-conducting material, or between layers of the latter. By the use of mixtures of carbon and metal a resistance which is constant between certain limits of temperature is obtained. J. S. G. Thomas.

Electrolyte for galvanic elements. R. Pörscke (U.S.P. 1,562,517, 24.11.25. Appl., 29.8.21).—See E.P. 190,226; J., 1923, 149 a.

Impermeabilising substances for absorbing gas [for use in electric batteries]. E. A. G. Street, Assr. to Soc. Anon. le Carbone (U.S.P. 1,563,673, 1.12.25. Appl., 30.6.22).—See E.P. 198,656; B., 1924, 986.

Electric discharge devices and means for operating them. Brit. Thomson-Houston Co., Ltd., Assees. of C. G. Found and I. Langmuir (E.P. 240,149, 4.9.25. Conv., 18.9.24).

Magnetic structures (E.P. 242,384).—See X.

Electrolytic cell (U.S.P. 1,562,090).—See X.

Alloy for electrical contacts (Swiss P. 109,929).—See X.

Melting metals (Swiss P. 110,000).—See X.

XII.—FATS; OILS; WAXES.

Oil content of the seeds of the opium poppy. H. E. Annett and M. N. Bose (Mem. Dep. Agric. India, Chem. Series, 1925, 8, 39—43).—The oil content of the seed of the opium poppy grown in the United Provinces is about 50% on the dry matter of the seed, and variations in the contents of the seeds of nine pure races tested are insignificantly small. Variations in content due to season, climate, manures, the use of terminal or lateral capsules, and lancing the capsule for opium are also negligible.

C. O. Harvey.

Tests for rancidity in fats. J. Bulir (Chem. Listy, 1925, 19, 357—362).—Rancid fats contain products which give peroxide reactions, and in testing for these *p*-diaminodiphenylamine sulphate is a good reagent. A surer method is as follows: shake 1 c.c. of the fat dissolved in 1 c.c. of light petroleum with 2 c.c. of 20% alcoholic potassium iodide solution, add 15 c.c. of water, shake, and test the aqueous layer with starch paste. A blue colour indicates that the fat is rancid. B. W. Anderson.

Cacao beans and cacao products. Fincke.—See XIX.

Patents.

Purifying oils and fats under a high vacuum by means of steam or the like. Metallbank u. Metallurgische Ges., and W. Gensecke (E.P. 242,739, 17.9.24).—Steam led into the oil or fat contained in a vacuum vessel, is withdrawn from the vessel by a special injector (cf. E.P. 237,309) and may then be passed through a second vacuum vessel before being condensed. The injector is provided, in front of the convergent guide conduit, with an additional nozzle which increases the velocity of the steam and decreases its pressure. The vacuum obtained is higher and the steam consumption lower than in the ordinary vacuum condenser plant.

G. T. Peard.

Mixed esters [glycerides] of lower and higher fatty acids. G. L. Schwartz, Assr. to E. I. du Pont de Nemours and Co. (U.S.P. 1,558,299, 20.10.25. Appl., 11.4.22).—Glycerin is heated with acetic acid and the acids from coconut oil in presence of a small quantity of sulphuric acid, and any water formed is removed by passing a current of nitrogen through the mixture. A product which is for the most part the diacetylmonoglyceride of the coconut oil acids is obtained. It has a low freezing point, is non-volatile, and rapidly colloids pyroxylin. A similar product is obtained by using coconut oil, acetic acid, and glycerin. T. S. Wheeler.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Detection of rosin [in linseed oil]. H. Wolff (Farben-Ztg., 1925, 31, 515).—The apparently positive reaction given by linseed oils containing no rosin in the Liebermann–Storch test differs from the genuine reaction in that the coloration develops but gradually through stages of brown and red, to blue-violet. The greatest intensity of violet colour attained is, furthermore, only reached after an interval of time corresponding to the change of violet to brown or green in the case of the true rosin reaction. In the presence of rosin the violet coloration invariably develops immediately. The distinction between the two cases is more marked if the oil under test be previously dissolved in a few drops of light petroleum previous to solution in acetic anhydride. It is recommended that tests be made simultaneously against a control of linseed oil containing 0·5—1·0% of rosin, no violet coloration whatever or development to a maximum intensity of violet with simultaneous fading or disappearance of violet in the control test indicating absence of rosin. A. de Waele.

Catalytic effect of lead and manganese on the drying of China wood [tung] oil. G. E. Ludwig (Ind. Eng. Chem., 1925, 17, 1160—1161).—Varying amounts of litharge or manganese borate were added to mixtures of tung oil and rosin which had been heated to 288° for 12 min., then cooled to 218° (litharge) or 200° (manganese borate); the temperature was maintained for 10 min., after which the oil was cooled to 177°, and mixed with the thinner. Drying tests were made with the product on glass plates, and curves (% metal plotted against time taken to "dry to touch") drawn for the two driers. The lead curve was even and regular, whereas the manganese curve, after the initial fall to a well-marked minimum drying time, shows a rise and then a somewhat irregular flat portion. The use of more than 0·26% of lead does not improve the drying properties very much, and there is no advantage at all in using more than 0·50%. With manganese the most efficient amount was found to be 0·03%, and the drying time increased with further increase in the proportion of metal. The litharge-in-oil samples gave a slight gradation of colour and amount of sedimentation on keeping. Above 0·5% of lead the amount of sediment was excessive. The sedimentation was more marked with manganese. D. Woodroffe.

"Two-type" lacquer solvents. D. B. Keyes (Ind. Eng. Chem., 1925, 17, 1120—1122).—"Two-type" solvents, *i.e.*, ester-alcohols, ether-alcohols, keto-alcohols, keto-esters, keto-ethers, or ester-ethers, are generally better than "single-type" solvents, *i.e.*, simple esters, alcohols, ethers, or ketones, for use in the manufacture of nitrocellulose and resin lacquers. The methods of preparation and properties of a number of these "two-type" solvents are given, viz.: — Ester-alcohols, ethyl glycollate (b.p. 160°), ethyl lactate (b.p. 152°), ethyl β-hydroxypropionate (b.p. 187°), ethyl citrate (b.p. 261—263°/300 mm.), ethyl malate (b.p. 248—252° decomp.), ethyl tartrate (b.p. 280°), ethyl glycerate (b.p. 230—240°), ethyl salicylate (b.p. 232°), ethylene glycol monoacetate (b.p. 182°). Ether-alcohols; ethylene glycol monoethyl ether (b.p. 134°), trimethylene glycol monoethyl ether (b.p. 160—161°), glycerol diethyl ether (b.p. 191°), glycide (b.p. 161—163°), diethylene glycol (b.p. 250°). Ketone-alcohols: pyruvyl alcohol (acetol) (b.p. 145°), diacetone-alcohol (b.p. 164°), dihydroxyacetone (m.p. 68—75°), acetonyl-methyl alcohol. Ketone-esters: ethyl pyruvate (b.p. 160°), ethyl acetoacetate (b.p. 181°). Ketone-ethers: ethoxyacetone (b.p. 128°), ethoxyethyl methyl ether. Ester-ethers: ethyl glycollate ethyl ether (b.p. 152°), ethyl α-ethoxypropionate (b.p. 155°). L. A. Coles.

Working-up tar oils. Kárpáti.—See III.

Patents.

Manufacture of artificial shellac. Soc. of Chem. Ind. in Basle (E.P. 221,205, 21.8.24. Conv., 30.8.23).—Artificial resin obtained by sulphuration of a phenolic compound is subjected to the action of a base, such as *cyclo*hexylamine or ammonia, in the presence of water if necessary. The original artificial resin, if desired, may first be treated with formaldehyde and with agents imparting elasticity. D. F. Twiss.

Composition for lubricating, dissolving and preventing rust and the like. A. Dokter (E.P. 241,678, 13.9.24).—The composition consists of a mixture containing 7·5 pts. by weight of chemically pure zinc-white, 4·5 of lampblack, 33·0 of American graphite, 7·5 of consistent grease, 7·5 of technically pure horse-fat, and 18·0 pts. of purified seal oil. It forms a non-drying acid-free paste capable of withstanding the action of the strongest acids and not becoming separated at temperatures as high as 255°. It remains elastic at high and at low temperatures. M. Cook.

Production of thermoplastic compositions for use in the manufacture of moulded articles. T. Hough (E.P. 241,807, 20.4.25).—By mixing two or more copals, gums, or resins with shellac, *e.g.*, kauri copal 40, dammar 20, hardened rosin 25, and shellac 15 pts., and heating under pressure to 200—350° for 30—60 min., a product is obtained which can be mixed with more shellac, suitable fillers, and colouring matter to produce a material capable of being softened by heat and moulded to shape under pressure. D. F. Twiss.

Priming composition [for varnishes and lacquers containing drying oils]. G. Roth A.-G., and R. Weithöner (E.P. 242,379, 28.8.24). —Sufficient aluminium hydroxide to combine with the resin is added to a mixture of a resin and a drying oil or a varnish or lacquer containing a drying oil, and the whole is then warmed, triturated, and thinned with a solvent, with or without addition of a drier. Alternatively a basic aluminium salt of a resin or fatty acid may be added direct. Suitable proportions are 2 pts. of aluminium hydroxide, 30 of boiled linseed oil, 35 of oil of turpentine, and 5 of lead–manganese drier. S. Binning.

Manufacture of linoleum covering material. G. Schicht and A. Eisenstein (E.P. 242,832, 3.2.25).—The solid raw materials are mixed with the fluid ingredients so as to form a pulverulent mass, which is exposed to atmospheric oxidation at a temperature above 70°. The constituents still lacking are introduced during or after the oxidation process, the addition in the former case providing a means of preventing any excessive rise in temperature. The method is rapid and safe.

D. F. TWISS.

Synthetic resin coating composition. C. ELLIS (U.S.P. 1,557,519, 13.10.25. Appl., 7.2.21. Renewed 9.1.24).—A mixture of *m*- and *p*-cresol is heated with sulphur chloride and the plastic product is blown with steam at 120° to deodorise it and then baked in thin layers for 6·5 hrs. The product when mixed with an equal weight of boiled linseed oil and thinned with turpentine and amyl acetate gives a varnish which dries to a clear film resistant to acids and alkalis. T. S. WHEELER.

***cyclo*Hexanol–aldehyde resin.** C. ELLIS, Assr. to ELLIS-FOSTER Co. (U.S.P. 1,557,521, 13.10.25. Appl., 30.3.23).—*cyclo*Hexanol is heated with 30% of its weight of formaldehyde in presence of 50% of its weight of 50% aqueous caustic potash. A fusible resin is obtained which becomes infusible on heating, especially if hexamethylenetetramine is added. T. S. WHEELER.

Keto-alcohol resin. C. ELLIS (U.S.P. 1,557,571, 20.10.25. Appl., 27.2.22).—Ketobutyl alcohol heated with 1% of its weight of alkali rapidly sets to an infusible resin. T. S. WHEELER.

Decolorising and refining gums and resinous products of coniferous pine trees. A. R. AUTREY (U.S.P. 1,559,399. 27.10.25. Appl., 13.8.24).—Solid gum turpentine is melted in a closed vessel, filtered hot, and stirred with fuller's earth. The decolorised material is then distilled with steam at ordinary or reduced pressure at a temperature not above 160°. The residue in the still is filtered hot and yields a resin of high quality. The distillate is treated with decolorising charcoal and is fractionated to give turpentine oil. T. S. WHEELER.

Composition for preventing rust. (E.P. 241,678).—See XIII.

Acid and salts strongly absorbing ultra-violet rays. (E.P. 242,721).—See XX.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Coagulation [of rubber latex] with sodium silicofluoride in conjunction with *p*-nitrophenol. H. P. STEVENS (Bull. Rubber Growers' Assoc., 1925, 7, 657—658).—Coagulation of standard rubber latex (3000 c.c.) by the addition of a mixture of sodium silicofluoride (2 g.) and *p*-nitrophenol (0·5 g.) gives a product similar to that of coagulation with acetic acid in appearance and rate of vulcanisation, but free from bubbles and tendency to mouldiness. D. F. TWISS.

Calender- and creep-effect in unvulcanised rubber. W. DE VISSER (Diss., Delft, 1925; Gummi-Ztg., 1925, 40, 457—458, 511—513).—When stressed in the direction of calender grain rubber shows a steady increase in load with increase in stretch; across the grain or in rubber without grain the load remains approximately constant over a considerable increase in extension. Previous heating or prolonged mechanical working reduces the extent of development of grain; subsequent heating also causes the effect to disappear. Rubber sheet with calender grain is doubly refractive and dichroic, and exhibits a distinct Debye–Scherrer diagram; its specific gravity is higher than normal, and it tends to become hard and brittle. The degree of creep shows no simple relation to the extent of calender grain; the former is probably explained by Lunn's views (Ann. Repts., 1924, 385), whereas the latter is probably associated with the development of a definite orientation of the rubber particles with perhaps partial crystallisation. Gutta and balata can exhibit marked calender grain; *Castilloa* rubber and *Hevea* rubber are comparable in behaviour but with *Ficus elastica* rubber the effect is only weak. D. F. TWISS.

United States Government master specification No. 59a for rubber goods. (Methods of physical tests and chemical analyses.) (U.S. Bur. Standards Circ. No. 232, 1925, 42 pp.).—Details are given as to the methods of taking samples, of measuring tensile strength, extensibility, permanent set, adhesion, and hardness, and of applying tests as to behaviour when subjected to steam under 75 lb. pressure, to hydrostatic pressure (for hose), and to accelerated ageing at 70°. The chemical tests include determination of specific gravity, acetone extract (with further determination of unsaponifiable and hydrocarbon content), chloroform extract, alcoholic potash extract, free sulphur, total sulphur, ash, barium sulphate, antimony, free carbon, glue (from nitrogen content), and cellulose. Rubber is calculated by difference either by means of the preceding results, or with the aid of an additional determination of the proportion insoluble in mineral oil at 150—155°.

D. F. TWISS.

PATENTS.

Vulcanisation of rubber. S. J. PEACHEY and A. SKIPSEY (E.P. 242,464, 9.12.24).—Rubber solutions treated with insufficient phosphorus sulphide to effect gelling under normal conditions, may be caused to gel at once by the addition of ammonia. Rubber vulcanised by phosphorus sulphide (*cf.* E.P. 230,637; B., 1925, 368), if subjected to an after-treatment with ammonia, is improved in its mechanical characteristics. D. F. TWISS.

Treating rubber and similar materials. T. WHITTELSEY and C. E. BRADLEY, Assrs. to NAUGATUCK CHEMICAL Co. (U.S.P. 1,559,393, 27.10.25. Appl., 19.2.20).—Three mols. of aniline are dissolved in benzene and treated with 1 mol. of sulphur chloride. Aniline hydrochloride is precipitated, and on evaporation phenyliminothiosulphurous acid, $NPh:S:S$, is obtained. This substance has the property of rapidly vulcanising rubber, and may be used alone or mixed with other vulcanisers and accelerators. Other amines give similar products; for example, ammonia and sulphur chloride yield a substance with the formula, $S:S(:N\cdot S:N)_2$, having similar properties. T. S. WHEELER.

Treating rubber. E. B. Spear, Assr. to Goodyear Tire and Rubber Co. (U.S.P. 1,560,488, 3.11.25. Appl., 6.1.23).—Unactivated carbon saturated with ammonia and a second batch saturated with hydrogen sulphide, formaldehyde, or carbon dioxide are mixed with rubber. The substances with which the carbon is saturated interact and the products act on the rubber in the usual manner. Any gas used to treat rubber may be added to it in this manner in order to obtain more intimate contact. T. S. Wheeler.

Accelerator for vulcanisation of rubber. A. Cambron, Assr. to Roessler and Hasslacher Chemical Co. (U.S.P. 1,562,146, 17.11.25. Appl., 27.6.25).—Rubber is vulcanised with the aid of the steam-blown reaction product of an aldehyde and an aromatic amine. D. F. Twiss.

Waterproofing cement etc. (E.P. 242,345).—See IX.

Photographic papers (E.P. 241,769).—See XXI.

XV.—LEATHER; GLUE.

Action of ultra-violet light on hide protein. A. W. Thomas and S. B. Foster (J. Amer. Leather Chem. Assoc., 1925, **20**, 490—494).—Portions of dry hide powder were submitted to the rays from a 1000-candle-power Cooper-Hewitt mercury arc quartz lamp for several weeks. The powder became coloured a bright canary-yellow even when the air was replaced by nitrogen. When the treated powder was treated with an equal weight of water at the ordinary temperature 27·8% dissolved. Portions of treated and untreated powders were shaken with solutions of hemlock extract and quinone respectively at different p_H values. The results showed that the capacity of the hide powder to combine with hemlock tannin at p_H 3·8 was greatly reduced by exposure to ultra-violet rays. No difference was noted with the quinone tannage. This shows a marked difference in the nature of vegetable and quinone tannages. If the simple electron emission theory of effect of irradiation were correct, the irradiated collagen should show greater affinity for the vegetable tannin. D. Woodroffe.

Suggested tests on shoe upper leather. A. Rogers (J. Amer. Leather Chem. Assoc., 1925, **20**, 495—497).—A method of determining resistance to tearing at stitch holes is described. Leathers about which complaints of cracking were received, were invariably undertanned and did not withstand the boiling test. D. Woodroffe.

Tests with various hide powders using a buffer solution of p_H 4·6. J. G. Parker and J. T. Terrell (J. Soc. Leather Trades Chem., 1925, **9**, 479—480).—Samples of solid chestnut extract, oakwood, and sulphited quebracho extracts were respectively analysed with untreated B. 12 hide powder and batches 9, 11, 12, and 13 treated according to the method of the committee of the Society of Leather Trades Chemists for hide powder (cf. J. Soc. Leather Trades Chem., 1925, **9**, 405). Hide powders which gave bad results before treatment were completely altered by treatment and then gave uniform and satisfactory results. The use of a buffer solution of p_H 4·6 for treating hide powders before use in tannin analysis brings them all to the same standard. The differences in the non-tannin results in the above experiments varied from 0·3% to 0·8% with 6 different powders. D. Woodroffe.

Deliming heavy hides. G. Baggini and L. Chiesa (Bull. Uff. Staz. Sperim. Ind. Pelli, 1925, **3**, 285—288).—Deliming by means of either sodium bisulphite or ammonium chloride or by bating preparations accelerates the subsequent tanning but tends to lessen the tensile strength, and if great strength is required the best results are obtained by the use of hydrochloric acid. The action of ammonium chloride is analogous to that of the bran drench. T. H. Pope.

Determination of acidity in synthetic tannins. G. A. Bravo (Boll. Uff. Staz. Sperim. Ind. Pelli, 1925, **3**, 296—298).—The method proposed by the American Leather Chemists Association (J. Amer. Leather Chem. Assoc., 1922, **17**, 627; J., 1923, 152A) gives (1) for a tannin extract containing 3% of synthetic tannin, acidity as sulphuric acid 1·02% and as benzenesulphonic acid 2·20%; the ordinary method gave 2·15% of sulphuric acid; (2) for a synthetic tannin, acidity as sulphuric acid 15·6%, and as benzenesulphonic acid 8·2%; the ordinary method gave 12·67% of total acidity as acetic acid. The above American method may be accelerated by mixing the liquid containing the gelatin with kaolin and filtering through an alundum crucible. The method serves well with synthetic tannins, but is not nearly so suitable for tanning extracts containing synthetic tannins. T. H. Pope.

Control of chrome liquors in the one-bath chrome tanning process. [Report of committee of the British section of the Society of Leather Trades Chemists.] D. Woodroffe (J. Soc. Leather Trades Chem., 1925, **9**, 480—485).—The basicity of various one-bath chrome tanning liquors has been determined by the Procter–McCandlish method and also by a modified method (cf. J., 1921, 669A). The modified method using sodium chloride showed an apparent increase in the acidity of the liquor. Of two commercial one-bath chrome tanning extracts of different basicities, the more acid product tanned more quickly than the basic product. The basicity of the latter was adjusted to that of the former, but their tanning properties were not made identical. A comparison of the precipitation figures and basicities of a series of one-bath chrome liquors showed that the precipitation figure was affected by the method of manufacture of the liquor. Liquors with the same precipitation figure, but made by different methods, did not tan equally well. The p_H value of these different chrome liquors was determined and it was shown that the more acid commercial extract had a higher $p_{\rm H}$ value than the other commercial extract. The $p_{\rm H}$ value is suggested as a better method of controlling the tanning properties of liquors of the same chromium content than the basicity figure, especially in the case of chrome liquors manufactured by different methods. D. WOODROFFE.

Determination of fat and water-soluble [matter] in leather. A. COLIN-RUSS (J. Soc. Leather Trades Chem., 1925, 9, 455—478).—Experiments have shown that when a leather is immersed in a fat solvent, an equilibrium is attained, and at this point the ratio of the concentration of fat retained by the leather to the concentration of fat in the external solvent is a constant, which is characteristic of the system. The fat content of a leather can be determined without its complete removal if the constant is known. To determine the constant, a known weight (40 g.) of leather is placed in a calibrated vessel, covered with a solvent, the vessel gently shaken to remove air bubbles, and the mixture made up to 100 c.c. with solvent. The vessel is closed, allowed to remain for 24 hrs. at room temperature, the liquid decanted and thoroughly drained off into a measuring vessel, the leather covered with a fresh lot of solvent, and the sequence of operations repeated. The equilibrium constant, K, is given by $E_2.V/(E_1-E_2)m$, where E_1 and E_2 are the amounts of fat removed in the first and second decantations respectively, V is the volume of liquid decanted, and m is the weight of the leather minus the total fat. The total fat content is given by $F=E_1^2/(E_1-E_2)$. The fat content of samples of different chrome- and vegetable-tanned leathers determined by the above method was often in close agreement with that obtained by the usual Soxhlet extraction, but not always. The method is applicable to all tannages and is independent of the state of division. The iodine value of different extracts was determined in one case and successive extracts had higher iodine values. The above method has also been applied to the determination of water-soluble matter in vegetable-tanned leathers by first degreasing weighed strips of the leather and using distilled water as the solvent. The results obtained for a number of different leathers were about 0·7 of the water-soluble matter as determined by the official method. Successive extractions were made on several vegetable-tanned leathers and the logarithm of the total amount extracted from the leather plotted against the number of extractions, and it was shown that the first few points were on a straight line, after which the amount of extract increased unduly. This is attributed to the hydrolysis of the collagen tannate and thus the above new method is only applicable to the determination of water-soluble matter provided the first two extractions are obtained under conditions that exclude hydrolysis. The water-soluble matter as determined by the official method includes solid matter arising from hydrolysis of the collagen tannate and is therefore too high. D. WOODROFFE.

Working-up tar oils. KÁRPÁTI.—See III.

Mordant for dyeing glove skins. SIMONCINI.—See VI.

XVI.—AGRICULTURE.

Physiological importance of extractable nutrients, a contribution to the determination of the manurial requirement of soils by chemical means.—E. BLANCK and F. ALTEN (J. Landw., 1925, 73, 219—230).—The amount of phosphoric acid extracted from a soil by a variety of acid solvents was determined, the weaker acids being used both with and without making allowance for the carbonates present in the soil. Oats were then grown on sand cultures receiving phosphoric acid (in the form of dicalcium phosphate) equivalent to the varying amounts extracted by the different solvents, each pot having the same application of other essential nutrients. It is concluded that only dilute acids are suitable solvents for determination of assimilable phosphoric acid in soil. Of those tried, 1% nitric acid, 1% acetic acid, and 0·5% citric acid gave satisfactory results, if the amount used was adjusted to allow for neutralisation by the carbonates present. Water saturated with carbon dioxide was, however, quite unsuitable. C. T. GIMINGHAM.

Determination of manurial requirements of soils by Mitscherlich's method. E. A. MITSCHERLICH (Z. Pflanz. Düng., 1925, B4, 473—478).—A reply to the criticisms of Gerlach (*cf.* B., 1925, 220, 731). C. T. GIMINGHAM.

Acetone method of extracting sulphur from soil. R. H. SIMON and C. J. SCHOLLENBERGER (Soil Sci., 1925, 20, 393—396).—Details are given of a method for the determination of elementary sulphur in soils by extraction with acetone and subsequent oxidation to sulphate. Sulphates present in the soil are not removed by the solvent and in studies of the rate of oxidation of sulphur in soil errors from this source are eliminated and a positive measure is obtained. C. T. GIMINGHAM.

Nitrification in soils. H. N. BATHAM (Soil Sci., 1925, 20, 337—351).—Laboratory studies on the nitrification of some decomposition products of proteins which may occur in the soil are recorded. The most readily nitrifiable of the compounds tested was tryptophane, followed by phenylalanine, α-alanine, leucine, tyrosine, and cystine in the order named, but the differences noted are small and doubtfully significant. All are apparently less readily nitrified than ammonium sulphate. C. T. GIMINGHAM.

Action of zeotokol [powdered dolerite] on plant growth. E. BLANCK and F. ALTEN (J. Landw., 1925, 73, 213—218; *cf.* B., 1925, 80).—A further series of pot experiments, with oats, on three types of soil, in which zeotokol was applied mixed with the whole of the soil, or with the top layer only, or on the surface, confirms the view that this material has no significant effect on plant growth. C. T. GIMINGHAM.

Development and composition of potato plants under the influence of different manuring. W. Huxdorff (J. Landw., 1925, 73, 177—212).—Whole plant samples were taken from each of eight differently manured plots of potatoes at six dates during the growing period. The treatments of the plots included manuring with potassium, nitrogen, and phosphorus singly and in all combinations. The yields and percentages of potassium, nitrogen, and phosphorus were determined, the haulm and the tubers being dealt with separately. Numbers of tubers per plant and measurements of leaves and stems were also recorded; and, in addition, sections of leaves and stems were cut and observations made on the effect of the treatments on the structure and size of the cells of various tissues at different stages of growth. On the whole, the results tend to confirm the generally accepted views as to the characteristic effects of the three primary nutrients on plant growth; but, contrary to the conclusions of some previous workers, it was found that, with both nitrogen and potassium, the potato will take up an abnormal amount of whichever of these nutrients is in excess—an amount which may be greater than the actual requirements at the stage of growth reached. The analyses and botanical observations are discussed in detail.

C. T. Gimingham.

Bacterial oxidation of sulphur in pond deposits and its practical importance. H. Fischer (Zentr. Bakt. u. Parasitenk., Abt. II., 1925, 65, 35—42; Chem. Zentr., 1925, 96, II., 1687).—The autotrophic organisms responsible for the oxidation of sulphur to sulphates in pond deposits are favoured by alkalinity of the medium and inhibited by acidity and the presence of organic matter. Their behaviour is similar to that of nitrifying organisms. Phosphoric acid, which is important for the production of fish, is brought into solution by the action of the sulphate ion on the phosphates in the deposit.

C. T. Gimingham.

Investigations on "tuba" [derris]. B. A. R. Gater (Malay Agric. J., 1925, 8, 313—329).—As an insecticide, *Derris*, to which the name "tuba" is usually applied, is comparable with nicotine. The Malay word "tuba" is not confined to species of *Derris*, but eleven "tuba" plants not *Derris* species were found to have no practical value as insecticides. The *Derris* species, and also varieties of the same species, vary in toxicity. The best plant for insecticidal purposes appears to be the "*Tuba rimba*" variety of *Derris elliptica*. An account of various pests of *Derris* species, and of means of combating them is given.

C. O. Harvey.

Mechanical analysis of sediments. Coutts and Crowther.—See I.

Size distribution of particles. Werner.—See I.

Assimilation of carbon dioxide by plants. Nellensteyn.—See II.

Influence of manures on yield and morphine content of latex of opium poppy. Annett and Singh.—See XX.

Patents.

Manufacture of manures. Rhenania Verein Chem. Fabr. A.-G., and H. Brenek (E.P. 242,512, 20.3.25).—Mineral phosphates are heated to about 1200° with silica or silicates and an alkali salt, preferably the carbonate or sulphate. The proportions in the mixture are so adjusted that one-third of the lime combined with phosphoric acid in the mineral is converted into calcium silicate and is replaced in the phosphate complex by alkali. Sufficient silica must be added (taking into account that present in the mineral) to convert the whole of the lime not combined with phosphoric acid into calcium silicate. The silica required may be added in the form of mineral phosphate rich in silica. The product contains the phosphate in a readily available condition.

C. T. Gimingham.

Fertiliser. O. Reitmair (Austr. P. 99,793, 31.5.21; Swed. P. 57,113, 20.5.22).—Crude phosphates containing carbonate are powdered and treated with sufficient of an inorganic acid or solution of an acid salt to convert the carbonate into hydrogen carbonate. If an acid other than sulphuric acid, or an acid salt other than a bisulphate be used to effect the transformation, a soluble sulphate is also added in order that a dry product may be obtained.

J. S. G. Thomas.

Making sulphur products [fungicides]. W. C. Piver (U.S.P. 1,559,984, 3.11.25. Appl., 28.1.25).—Casein (2 pts.) is dissolved in water (97·5 pts.) containing sodium hydroxide (1·5 pts.), and the solution is mixed with finely-divided sulphur (200 pts.), the mixture being maintained alkaline throughout. Colloidal dispersion of the sulphur takes place and a product of value as a fungicide is obtained.

T. S. Wheeler.

Preparation of a product for spraying plants. M. Buchner and W. Bachmann (G.P. 416,800, 4.5.20).—Copper–arsenic compounds, in the presence of ammonia, react with the precipitate given by acids with soda-cellulose waste liquor, yielding copper–arsenic derivatives of lignic acid. If necessary, glacial acetic acid is added, in which case the precipitate is separated by decantation after 20 hrs. The product is soluble in water containing a small quantity of sodium carbonate, the solution being very adhesive. For example, a solution of copper sulphate in dilute ammonia is mixed with a suspension of the precipitate produced on acidifying soda-cellulose waste liquor, and ammonium chloride and a solution of arsenious acid in ammonia, and water are added. The precipitate is dissolved in aqueous sodium carbonate solution.

B. Fullman.

Treatment of leucite etc. (E.P. 242,336).—See VII.

XVII.—SUGARS; STARCHES; GUMS.

Precipitation of calcium sulphite under various conditions, with special reference to sugar factories. R. G. W. Farnell (J.S.C.I., 1925, 44, 530—532 T, 533—538 T).—Investigation of the precipitation of calcium sulphite from its pure aqueous solutions and solutions of sucrose, diluted cane syrup (15° Brix), and molasses (1%), showed that complete neutralisation of sulphurous acid, long time and high temperature, high initial concentration of sulphurous acid and lime, and absence of colloids were favourable to precipitation. The presence of sucrose had no retarding effect on the precipitation, but greatly diminished the size of the characteristic clusters of crossed needles of $CaSO_3,2H_2O$. The presence of colloids retarded the precipitation and altered the form of the precipitate to spherical granules, the size of which increased with rise of temperature, and with time, p_H, and initial concentration of sulphurous acid. Graphs are given, showing the neutralisation curve H_2SO_3—$Ca(OH)_2$ under different conditions, and the extent of precipitation of $CaSO_3$ at various p_H values. 0·023*N*-calcium hydrogen sulphite has p_H 4·8, and 0·005*N*-calcium sulphite has p_H 9·2. There is little indication of the formation of calcium sulphite and free sulphur dioxide on heating a dilute calcium hydrogen sulphite solution to 100°. The higher a cane juice is sulphured the more complete is the precipitation of calcium sulphite on liming back to a given p_H value. It is suggested that the p_H of the hot juice be increased from 6·8 to 7·6—7·8 in order to obtain more complete precipitation.

Physical examination of sugar juices. K. R. Lindfors (Ind. Eng. Chem., 1925, 17, 1155—1156; cf. B., 1924, 802).—To obtain indications of the relative efficiency of methods for the treatment of syrups previous to filtration, it is proposed to determine the surface tension (using du Noüy's apparatus), the viscosity (rate of flow from a 100-c.c. pipette), the visible turbidity by means of the Jackson turbidimeter, and the colloidal turbidity by means of Horne's apparatus (*cf.* B., 1924, 694). Such determinations carried out before and after treatment can be of especial value in examining the relative efficacy of various clarification methods and filter-aids.

J. P. Ogilvie.

Temperature and analytical changes in sugar liquor during boneblack filtration. H. I. Knowles (Ind. Eng. Chem., 1925, 17, 1151—1152).—When boneblack was filled into a cistern through a funnel set in its mouth, and levelled by hand every hour during the 10—12 hrs. taken to fill, the distribution was irregular throughout, there generally being a much greater proportion of fine material (passing a 50-mesh sieve) in the central portion of the filter. On running liquor at 71° upon char at 66° the temperature in the centre of the filter remained constant for the first 8 hrs., after which it rose rapidly, until after 12 hrs. it had reached about 93°, at which it remained for 8 hrs., then gradually fell. In the outer layers of char the temperature remained more nearly constant during the whole period of 20 hrs., presumably due to the heat absorbed by the walls of the cistern. Liquor in contact with char near the walls was much less decolorised, due probably to the coarser granulation. Decolorisation was comparatively small at the top of the filter; it was greater half-way down, but greatest at the bottom at a point midway between the centre and the walls. It has been found advisable to lime the washed liquor so that it will come off the filter with a p_H of 6·8—7·0, but second liquor may have a p_H as low as 6·5 without apparent loss by inversion.

J. P. Ogilvie.

Purifying molasses by addition of hydrochloric acid. G. Dorfmüller and F. Tödt (Z. Ver. deuts. Zucker-Ind., 1925, 903—913).—The addition of hydrochloric acid to molasses to neutralise the bases present, and obtain a more readily worked product, is not new, having been described by G. F. Meyer in 1876. Experiments are described showing that this addition effects no actual increase in the purity value. If the solution of molasses is dialysed after the hydrochloric acid addition, as in Cutler's method (U.S.P. 1,493,967 and 1,494,218; B., 1924, 609), the economy of the process becomes extremely doubtful.

J. P. Ogilvie.

Patents.

Centrifugal apparatus for treatment of sugar liquors and the like. J. J. Ragg (E.P. 233,337, 27.4.25. Conv., 30.4.24).—Syrup or other solution of sugar is introduced into a perforated basket of a centrifugal machine rotating at a high speed within an outer casing, the inner walls of the basket being covered with a layer of filter-cloth, over which is placed a second cloth. Between the two cloths, a sheet of blotting paper, felt, or asbestos, or a thin layer of magnesium carbonate, calcium phosphate, fine coral sand, carbon, kieselguhr, etc., may be interposed.

J. P. Ogilvie.

Separating syrup from residual molasses. C. G. Leonis (U.S.P. 1,558,554, 27.10.25. Appl., 29.12.24).—Residual molasses is dried and treated with concentrated acetic acid, the sugar thus precipitated being separated and washed with alcohol.

J. P. Ogilvie.

Vacuum pan [for graining sugar]. C. White (U.S.P. 1,558,957, 27.10.25. Appl., 18.3.25).—A vacuum pan for graining sugar is provided with the floor sloping downwards towards the centre, the heating element within the casing being adjacent, but spaced from, the floor. A central open space extends upwards through the heating element, this constituting a well having an upper and a lower opening with a closed side-wall. A core projects upwards from the casing floor through the well, forming a displacement member whereby the volume of liquid within the well is reduced.

J. P. Ogilvie.

Dextrose hydrate. W. B. Newkirk, Assr. to Internat. Patents Development Co. (U.S.P.

1,559,176, 27.10.25. Appl., 16.4.24). — Normal dextrose hydrate is heated so that some of the water of crystallisation is driven off, without impairing the form of the crystals. When exposed to a damp atmosphere partially dehydrated crystals absorb water until fully hydrated without becoming moist, and on this account are suitable for storage.

T. S. WHEELER.

Recovering diatomaceous earth. (U.S.P. 1,561,042).—See VIII.

XVIII.—FERMENTATION INDUSTRIES.

Steam-boiling of brewery worts. E. WILLEMART (Chim. et Ind., 1925, 14, 686—690).—Unsatisfactory results with steam are frequently due to technical faults in the plant. To obtain maximum utilisation of the heat, a tubular heater should be used with short tubes of small diameter arranged as nearly horizontal as practicable. Open coils are more satisfactory than closed coils, the latter having a much lower coefficient of heat-transmission, and in addition the circulation of steam is imperfect. The steam-jacketed copper is the least satisfactory; the wort is not properly circulated and the " break " is incomplete, though cold storage of low-fermentation beers helps to correct this. Agitation allows of a more vigorous boil without risk of the contents boiling over; 10% more evaporation can be obtained, and the deposit from an agitated wort is greater than from one boiled without agitation, the wort is clearer, and the resulting beer brighter and more resistant to infection. The use of high pressures of steam (70—130 lb./in.^{2}) is beneficial. Boiling under pressure is attended with good results, but if the pressure exceeds 21 lb./in.^{2}, the flavour of the beer is impaired owing to the denaturation of the bouquet substances in the hop. This trouble can sometimes be prevented by addition of sulphuric acid to the wort. The acidity of wort is frequently insufficient to promote the optimum " break " upon boiling. The addition to wort of 0·03% of phosphoric or 0·005% of sulphuric acid more than doubled the bulk of the precipitate upon boiling and the clarity of the boiled wort was improved; sulphuric acid was slightly superior to phosphoric acid in both respects. An economy of steam and time may be effected by commencing to heat the wort vigorously as soon as the first portion is run into the copper, as with modern mashing plant it is unnecessary to allow diastatic action to take place in the copper when the weak worts are run in. G. T. PEARD.

PATENTS.

Producing lactic acid and/or nitrogen-containing lactic acid compounds from sugar-containing raw materials by means of micro-organisms. A. POLLAK (E.P. 222,514, 29.9.24. Conv., 29.9.23).—In the production of lactic acid for utilisation in the manufacture of yeast, wort made from sugar-containing raw materials is mixed with a relatively large amount of a lactic acid bacteria "starter" and run through a series of vats, to one or more of which basic nitrogenous substances are added to neutralise the acid and form the source of nitrogen for the yeast. The process is continuous. The acidified wort may be sterilised by boiling, or it may be directly pitched with yeast, the acid being neutralised with basic substances as it is formed.

G. T. PEARD.

Stock food (U.S.P. 1,561,158).—See XIXA.

XIX.—FOODS.

Chemistry of bread. New Zealand wheat flours and fermentation. W. L. M. DEARSLEY (N.Z. J. Sci. Tech., 1925, 8, 34—38).—Chemical and baking analyses of fine typical strains of New Zealand wheat, which are quoted, resulted in the following conclusions:—The order of acidities (calculated as acetic acid) of the flours is that of their p_H values; the hydration of the gluten is greater the nearer the p_H is to 5·0. The water-absorption value of the flours depends upon both quantity and quality (*i.e.*, hydration) of gluten, and one flour may be more satisfactory than another containing a greater total amount of gluten. A dough of lower initial p_H ferments faster than one of higher p_H, and the bread will have a better texture and colour, though the latter is to some extent dependent upon the fat present; in all cases the p_H approaches 5·0 after fermentation. The volume of the loaf is connected with the water absorption capacity of the flour; the losses of weight in baking and upon keeping, due to loss of water, are less the greater the hydration of the gluten. The question of "strong" and "weak" flours may perhaps be explained by a consideration of hydrogen-ion concentrations. It is probable that the best flour is one which has a high content of gluten and which will yield a dough having p_H as near 5 as possible. Bread having p_H greater than 5·1 is liable to attack by *B. mesentericus* (a "ropy" organism). G. T. PEARD.

Influence of feeding coconut oil-cake [to cows] on the Polenske value [of the butter]. PARASCHTSCHUK (Milchwirts. Zentr., 1925, 54, 161—163).—Feeding experiments with individual cows show that the increase in the Polenske value of the butter which follows addition of coconut oil-cake to the ration is much less when the cows are in poor condition than when they are in normal condition. C. T. GIMINGHAM.

Cacao beans and cacao products. III. H. FINCKE (Z. Unters. Nahr. Genussm., 1925, 50, 205—220; cf. B., 1924, 489; 1925, 50).—Cacao beans, smaller than the average size in a number of samples, were found to have a lower percentage of fat and larger amount of husk and germ. The fat content of cocoa pastes, calculated on a dry-matter basis, was slightly increased by roasting the beans. The fat content of the husks was 2—3% and differed from the fat of the kernels in having a higher iodine value, refractive index, and acidity. The last-named was particularly pronounced. The

fat of the cacao germ was similar in its properties, but had an unusually low saponification value and a setting point which was ill-defined. It was unpleasant in taste and smell and of a dark brownish colour. The presence of fat from the husk and germ in cacao butter is best indicated by the increased acidity and, to some extent, by the taste and smell. Adulteration of cocoa powders by husk and germ can be detected to some extent by examination of the residue after sedimentation, and comparative figures are given. Increased fibre content and acidity of the fat are the most notable points.
A. G. POLLARD.

Acid- and base-forming elements in foods. G. W. CLARK (J. Biol. Chem., 1925, 65, 597—600).—Figures are given for the sodium, potassium, calcium, magnesium, chlorine, phosphorus, sulphur, and nitrogen content of the ash of numerous foods.
C. R. HARINGTON.

Is antirachitic factor [vitamin-D] of cod liver oil when mixed with grains, destroyed through storage? E. B. HART, H. STEENBOCK, and S. LEPKOVSKY (J. Biol. Chem., 1925, 65, 571—578).—Cod liver oil when mixed in the proportion of 0·5% with maize meal retained its antirachitic properties during storage at the ordinary temperature in unsealed vessels for six months. C. R. HARINGTON.

Development and composition of potato plants. HUXDORFF.—See XVI.

PATENTS.

Deodorising, cooling, and dehydrating fluid substances [milk etc.]. TE AROKA DAIRY CO., LTD. (E.P. 220,627, 11.8.24. Conv., 14.8.23).—The warm fluid is led from a pasteuriser or preheater into a vacuum vessel and the ebullition set up causes concentration, deodorisation, and cooling. The odour in milk and cream due to a diet of turnip and rape etc. is completely removed, and the acidity of milk is decreased. By making the process continuous, condensed milk can be produced. The spherical vacuum vessel is fitted with a central water condenser, having the shape of an inverted frustum of a cone, also with large blades or sweeps shaped to the container walls and baffle plates near the top, but below the mouth of the condenser. The plant is sterilised and the vacuum obtained by blowing in steam and condensing it. The fluid is given a circulatory and upward movement by the sweeps and then deflected downwards by the baffle plates over the outer wall of the condenser. Charging and discharging are carried out automatically without releasing the vacuum. G. T. PEARD.

Baking powder. R. E. JONES (U.S.P. 1,558,888, 27.10.25. Appl., 14.2.25).—A baking powder comprising acid calcium phosphate, sodium bicarbonate, maize starch, and taka-diastase is claimed. When mixed with flour the diastase transforms a portion of the starch into sugar, giving the bread a sweet taste. T. S. WHEELER.

Process of and composition for dough-making. B. LOWY (U.S.P. 1,559,330, 27.10.25. Appl., 18.5.25).—Condensed buttermilk (100 pts.) with a high content of lactic acid is mixed with calcium phosphate (1·25 pts.) at 40° to produce a calcium lactophosphate, ammonium tartrate (0·75 pt.) is added, and the mixture is dissolved with yeast, salt, and sugar in water. 100 pts. of flour are added for each part of the prepared mixture and the whole is formed into dough. During fermentation the carbon dioxide evolved in presence of ammonium tartrate, which acts as a catalyst, liberates lactic acid from the lactophosphate. This mellows the gluten cells and permits the entrance of carbon dioxide, so improving the quality of the loaf. T. S. WHEELER.

Semi-solid stock food. W. P. M. GRELCK (U.S.P. 1,561,158, 11.11.25. Appl., 27.9.23).—The starch in a ground cereal is gelatinised by heating with water and the product mashed with malt. The wort is fermented to lactic acid and mixed with grain to form the food, in which the lactic acid acts as a preservative. G. T. PEARD.

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

Influence of manures on the yield and morphine content of the latex of the opium poppy. H. E. ANNETT and H. D. SINGH (Mem. Dept. Agric. India, Chem. Series, 1925, 8, 27—37).—Organic manures such as oil-seed cakes and cattle manure increase the yield of opium and its morphine content, the increase being due to the phosphoric acid in the manure and not to the nitrogen or potash. Superphosphate caused an increase in the morphine content of the opium. C. O. HARVEY.

Ash constituents of Indian opium. H. E. ANNETT and M. N. BOSE (Mem. Dept. Agric. India, Chem. Series, 1925, 8, 45—51).—The amount of ash constituents of the latex of the opium poppy rises at each successive lancing up to the fourth, whereas there is a rapid fall in morphine content and, to a lesser extent, a fall in narcotine content. The codeine and papaverine contents remain more or less constant, as also does the composition of the ash. Little or no increase in ash occurs in later lancings, and its composition is not appreciably affected by manuring. Sulphate and phosphate in the original opium rapidly increase, the former up to the third and the latter up to the fifth successive lancing. Chlorides were not found in the latex.
C. O. HARVEY.

Electrometric titration of alkaloids and the reaction of alkaloid salts. I. M. KOLTHOFF (Pharm. Weekblad, 1925, 62, 1287—1293).—Recent methods are discussed, and a table of dissociation constants and p_H values for a great number of alkaloids and salts is given, from which suitable indicators can be chosen for particular titrations, where colourless aqueous solutions are available. Only when the solutions are coloured or a suitable indicator is not available do electrometric methods offer any advantage. S. I. Levy.

Sterilisation of tropacocaine hydrochloride and its solution. S. Matsunami (J. Pharm. Soc. Japan, 1925, [520], 6—7; Chem. Zentr., 1925, 96, II., 2069).—Heating for 1 hr. at 130° does not decompose tropacocaine hydrochloride; heating for 2 hrs. at 135—140° decomposes it very slightly. A 2% solution sterilised as usual yields (per 10 g. of hydrochloride) 0·0004—0·0005 g. of benzoic acid and 0·0006—0·0007 g. of ψ-tropine. The aqueous solution of the latter decomposes only on heating at 170—180° (tube), yielding a trace of tropidine. The alkali of the glass promotes the hydrolysis of tropacocaine hydrochloride solution. The hydrochloride and its solution are stable to sunlight and ultra-violet light. B. Fullman.

Comparative experiments on the narcotic and toxic effects of some halogen derivatives of hydrocarbons. J. Müller (Arch. exp. Path. Pharm., 1925, 109, 276—293).—White mice were subjected to the action of known concentrations of various halogen derivatives, chloroform in a concentration of 0·027 g./litre being used as a standard. The order of increasing narcotic activity of the substances examined was: propyl chloride, ethyl bromide, methylene chloride, ethylidene chloride, propyl bromide, dichloroethylene, carbon tetrachloride, ethylene chloride, chloroform, and tetrachloroethane. The order of increasing toxicity was: propyl chloride, dichloroethylene, ethylidene chloride, methylene chloride, propyl bromide, ethylene chloride, ethyl bromide, chloroform, carbon tetrachloride, and tetrachloroethane. Histological examinations were made in each case. S. I. Levy.

Identification of adaline. C. Genot (Chim. et Ind., 1925, 14, 679—685).—Adaline (bromodiethylacetylcarbamide), a white crystalline powder, m.p. 117—118°, is frequently adulterated with cheaper substances (veronal etc.). It is almost insoluble in water (0·05%) and in formic, perchloric, and hydrobromic acids. Its colour reactions and microcrystalline reactions and the refractive indices of its solutions in the usual solvents, are given in great detail, together with a table of melting points of mixtures of adaline with adulterants in various proportions. The microcrystalline forms are characteristic and divisible into four classes:—fine needles are deposited from water, ethyl and amyl alcohols, chloroform, ether, ethyl bromide, fuming nitric acid, and concentrated hydrobromic acid; short needles grouped like an ear of barley from dilute hydrochloric acid, xylene, and butyric acid; large prisms from benzene, acetyl chloride, acetic anhydride, methyl alcohol, light petroleum, aniline, and nitrobenzene; very short and fine needles, arborescent or in star-like clusters, from dilute ammonia, carbon disulphide, acetone, toluene, and acetic acid. Photomicrographs of many of these forms are reproduced. G. T. Peard.

Determination of small quantities of halogens [chlorine in benzaldehyde] and sulphur [in mineral oils]. O. Wagner (Z. angew. Chem., 1925, 38, 1068).—Chlorine in the proportion of about 0·2% in, *e.g.*, benzaldehyde may be accurately determined by treating the material with pure fuming sulphuric acid in a Carius bomb tube, and then determining the chloride as silver chloride by the micro-method of Pregl. This yields results accurate to within 0·02%. Sulphur is determined by treatment with pure fuming sulphuric acid and precipitation with barium chloride, the barium sulphate being collected in a quartz filter-tube with attached siphon and ignited in a micro-bomb furnace (*ibid.*, 1923, 36, 494). B. W. Clarke.

Testing *Spt. Aether Nit.* J. Rae (Pharm. J., 1925, 115, 633—634).—The nitrite content is determined colorimetrically by means of a dilute hydrochloric acid solution of sulphanilic acid, the coloration being developed by the final addition of a dilute solution of ammonia, and compared with a permanent potassium dichromate standard. C. O. Harvey.

Studies on camphor group. I. Formation of camphor from turpentine oil. Y. Murayama (J. Pharm. Soc. Japan, 1925, [524], 882—884; *cf.* B., 1924, 731).—Bornyl oxalate prepared by heating a mixture of anhydrous oxalic acid, turpentine oil, and ferric chloride in carbon tetrachloride solution gives either *d*- or *l*-borneol on saponifying with alcoholic potash according to the nature of the turpentine oil used. On oxidation with a mixture of sulphuric and nitric acids, *d*- or *l*-borneol gives *d*- or *l*-camphor, $[\alpha]_D^{17} + 15{\cdot}00°$ or $[\alpha]_D^{18} - 11{\cdot}30°$ respectively. Camphor is also formed from camphane-2-carboxylic acid by oxidation with permangante in alkaline solution. The product melts at 175° and its semicarbazone at 235°. K. Kashima.

Determination of menthol in alcoholic solutions. Donath and Sebor (Chem. Listy, 1925, 19, 363—364).—The percentage content of menthol in alcohol is given by the formula $p=0{\cdot}35a$ (where a is the polarimeter reading for 100 c.c. in a 200-mm. tube). The strength of the alcohol is determined by its specific gravity, making a correction of $+0{\cdot}0004$ for every gram of menthol present. B. W. Anderson.

Action of phosphoric acid on certain terpenes and related compounds. P. G. Carter, H. G. Smith, and J. Read (J.S.C.I., 1925, 44, 543—547 t).—By the action of syrupy phosphoric acid (d 1·75) diterpenes or diterpene mixtures have been obtained from *l*-α-phellandrene, *d*- and *l*-pinene, *d*-limonene, cineole, and the phellandrene fractions of the essential oils of *Eucalyptus dives*, *E. phellandra*, and *Melaleuca acuminata*. With the exception of the diterpene from *l*-α-phellandrene which has $[\alpha]_D^{20}$ up to $+ 21{\cdot}20°$, and the eucalyptus oil fractions, the diterpenes are almost optically inactive. It is suggested that the polymerisation occurs by hydration of the terpene, followed by dehydration from one or two molecules, giving in the first case α- and γ-terpinene, and in the second, the diterpene; terpin hydrate was isolated from the product of the incomplete reaction between cineole and phosphoric acid. The diterpenes are viscid, pale yellow oils, b.p. in the neighbourhood of 192—194°/24 mm., n_D^{20} 1·5157—1·5186, d_4^{20} 0·9236—0·9315 ; they are insoluble or only slightly soluble in hydroxylic solvents, but are readily miscible with chloroform, ether, ligroin, etc. No solid derivatives could be obtained by the action of bromine, hydrogen chloride, nitrous acid, nitrosyl chloride, and other reagents applied to olefinic compounds, with the exception of ill-defined, yellow nitro-products. The variation with temperature of the density and refractive index of the diterpene are given, and the physical constants of the diterpenes from the various sources are tabulated.

Examination of some Rhodesian eucalyptus oils. P. G. CARTER and J. READ (J.S.C.I., 1925, **44**, 525—526 T).—The physical constants of the oils of *E. Macarthuri*, *E. citriodora*, and *E. globulus* from seedlings two to three years old, grown in Northern Rhodesia, show appreciable differences from those of Australian oils of the corresponding species. The amounts of the chief components of commercial value in the oils from the two sources are almost identical, with the exception of the geranyl acetate content of Rhodesian oil of *E. Macarthuri*, which is markedly low ; the same oil contains a larger quantity of eudesmol than is usual. The yields of oil are much higher for the Rhodesian than for the Australian material.

Blue oil of lignite tar. HERZENBERG and RUHEMANN.—See III.

PATENTS.

Making crotonaldehyde. E. C. R. MARKS. From CARBIDE AND CARBON CHEMICALS CORP. (E.P. 242,521, 31.3.25).—Aldol prepared and stored in an atmosphere of nitrogen, acetylene, or other non-reacting gas, is heated, preferably under reduced pressure, to a temperature not much above 165°, and crotonaldehyde is removed as vapour as fast as it is formed, by passing a current of steam or a non-reacting gas through the liquid. The crotonaldehyde is condensed and stored with the exclusion of air, and acetaldehyde mixed with it is removed by fractional distillation in the presence of a non-reacting gas. The process may be worked continuously by passing a slow stream of aldol into a reaction vessel maintained at a suitable temperature.

L. A. COLES.

New acid and its salts strongly absorbing ultra-violet rays. T. SUZUKI and S. SAKURAI (E.P. 242,721, 18.8.24).—The sodium or potassium salt is prepared by condensing dextrose or inverted sugar with phenylhydrazine-*p*-sulphonic acid in presence of sodium or potassium acetate at 100°. The free acid is prepared by precipitation of the lead salt from aqueous solution and passing hydrogen sulphide through a suspension of the precipitate. The acid and its neutral, especially alkali, salts are readily soluble in water. A 2 cm. layer of 0·01% solution completely absorbs the ultra-violet, and passes most of the visible rays, absorbing, however, some of the rays from the G and H lines to the ultra-violet. Used in a gelatin filter, 2 g. per sq. m. completely absorb the ultra-violet. Compared with Filter Yellow K for equal visual absorption, the new substance is a more efficient absorber of the ultra-violet. Used in conjunction with Tartrazine in the amount of 2 g. of Tartrazine and 1 g. of the salt of the new acid per sq. m., filters far more efficient than those made with Tartrazine alone can be prepared. A red filter of Rose Bengale and Tartrazine cuts off all ultra-violet if some of the new salt is added, and improved blue filters are prepared using the new salt with Toluylene Blue etc. The insoluble basic lead salt of the acid provides an ultra-violet ray-proof paint, and fibres can be treated with the acid if lead is used as mordant.

W. CLARK.

Manufacture of benzoic acid from benzotrichloride. Manufacture of benzoyl chloride. A. GEORGE, Assr. to MATHIESON ALKALI WORKS (U.S.P. 1,557,153–4, 13.10.25. Appl., 22.7.24).—(A) Benzotrichloride containing zinc chloride in suspension is heated with agitation at 100—120°, and water is added at the rate at which it reacts. Benzoic acid is rapidly formed in almost theoretical yield. (B) By suitably reducing the quantity of water added in the above reaction the hydrolysis may be stopped when substantially pure benzoyl chloride is present. It is removed by distillation under reduced pressure and is obtained in 85% yield.

T. S. WHEELER.

Manufacture of diphenylaminechloroarsine. W. L. TANNER, Assr. to GRASSELLI CHEMICAL CO. (U.S.P. 1,557,384, 13.10.25. Appl., 17.8.22).—An equimolecular mixture of diphenylamine and arsenic trichloride heated to 210° gives diphenylaminechloroarsine in theoretical yield. T. S. WHEELER.

Manufacture of urea [carbamide] from ammonium carbamate. N. W. KRASE and V. L. GADDY, Assrs. to R. C. TOLMAN (U.S.P. 1,558,185, 20.10.25. Appl., 25.3.21).—In the production of carbamide by heating a mixture of ammonium carbonate and ammonium carbamate in an autoclave, the mixture is first briquetted, to facilitate charging and discharging of the autoclave.

T. S. WHEELER.

Irritant product from the *Rhus* plant. P. MASUCCI, Assr. to H. K. MULFORD CO. (U.S.P. 1,559,340, 27.10.25. Appl., 16.4.23).—The leaves of *Rhus toxicodendron* are extracted with benzine, and the extract is decolorised with fuller's earth and evaporated to dryness. The product is a wax containing the irritant principle of the plant, and is of therapeutic value. T. S. WHEELER.

Making lead tetra-alkyl. W. S. CALCOTT, Assr. to E. I DU PONT DE NEMOURS AND CO. (U.S.P. 1,559,405, 27.10.25. Appl., 5.10.22).—A finely-divided alloy of lead (131 pts.) and sodium (29 pts.) is mixed with ethyl bromide (135 pts.) and triethylamine (19·2 pts.) or other catalyst for the Grignard reaction, and water (4 pts.) is dropped in slowly during 16 hrs. at a temperature below 35°. A large excess of water is then added, and lead tetraethyl separated by distilling in steam. T. S. Wheeler.

Oxidising organic compounds [*e.g.*, toluene to benzaldehyde]. J. V. Meigs, Assr. to Ellis-Foster Co. (U.S.P. 1,560,297, 3.11.25. Appl., 4.4.19).—Ferric chromate and ammonium vanadate are mixed and heated to give an iron vanadochromate in granular form which is saturated with silver nitrate solution, dried, and treated with hydrogen so that metallic silver is formed. The product is placed in a chamber at 250° and toluene vapour mixed with steam and air is passed over it. The temperature and quantity of steam are regulated so that the quantity of carbon dioxide in the exit gases remains at about 3%. A good yield of benzaldehyde is obtained. T. S. Wheeler.

Preparation of bismuth oleate. F. Hoffmann-La Roche u. Co. (Swiss P. 106,664, 18.8.23).—Hydrated bismuth oleate is prepared as a soft soap by adding, at 15°, bismuth nitrate dissolved in 13% mannitol solution to oleic acid in 80% alcohol neutralised with the calculated quantity of aqueous sodium hydroxide (alkali oleates in general are also specified). The precipitate is washed free from nitric acid. The anhydrous oleate is obtained by evaporation of an ether solution of the oleate in a vacuum. It is insoluble in water but easily soluble in organic solvents. For therapeutical purposes it is used as an oily emulsion, prepared by mixing oil with the ether solution of the hydrated form, and distilling off the ether and water. B. Fullman.

Making alkyl chlorides. W. R. Webb, Assr. to Carbide and Carbon Chemicals Corp. (U.S.P. 1,560,625, 10.11.25. Appl., 18.7.24).—Hydrogen chloride rapidly reacts with an olefine when passed with it over aluminium chloride at about 150°, to give the corresponding alkyl chloride in satisfactory yield. T. S. Wheeler.

Production of cyanamide solutions. S. J. Gelhaar (Swed. P. 57,109, 23.12.21, 57,110, 16.2.22, and 57,111, 5.4.22).—Calcium cyanamide is finely ground with water or with a solution of cyanamide or carbamide, with, if necessary, sufficient sulphuric acid, carbon dioxide, or the like to neutralise the lime present. The calcium cyanamide may be mixed with acid and such a quantity of water that a solid product is obtained, and this extracted with water or a solution of cyanamide or carbamide. Alternatively the calcium cyanamide is treated with water at a temperature not above 125° so that water not present in the form of hydrate is vaporised. Thereby undesirable sulphur and phosphorus compounds are decomposed, calcium oxide is converted into the hydroxide, and calcium cyanamide is obtained in the form of a very fine powder, which is extracted in presence of carbon dioxide or gases containing carbon dioxide. J. S. G. Thomas.

Organic acids from soda-cellulose waste liquor (F.P. 563,747).—See V.

Stabiliser for solutions containing loosely-combined oxygen (U.S.P. 1,559,600).—See VII.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Treatment of felted materials, papers, and the like [for photographic purposes]. Kodak Ltd., and W. G. Bent (E.P. 241,769, 20.1.25).—Rubber latex is added to the coating mixture in the manufacture of coated papers and the like. A suitable mixture is made as follows: 400 lb. of blanc fixe or barytes in paste form (containing 25% of water) are mixed with 10 gal. of water and added to 50 lb. of gelatin dissolved in 30 gal. of water; 1500 c.c. of saturated alum solution are then run slowly in, followed by rubber latex (containing 35—40% of non-volatile constituent) in the proportion of 0·5 gal. of latex per 640 lb. of mixture. Colouring agents may be added if desired. Paper coated by this process is particularly suitable for photographic purposes, since the final sensitised paper is resistant to water and shows no tendency to crack. D. J. Norman.

Natural colour kinematography. K. Campbell (E.P. 242,727, 20.8.24).—Panchromatic film is coated on the emulsion surface with a multi-colour screen consisting of fine pollen or spores, the latter preferably of *L. clavatum*, stained in the three primary colours. The screen is prepared by bleaching the pollen or spores with hydrogen peroxide solution acidified with hydrochloric acid at 57—63°, drying at the same temperature, pulverising, and staining equal weights of the bleached substance with the alcoholic dye solutions necessary to give mono-spectrum yellow, mono-spectrum red, and mono-spectrum blue. The stained and dried powders are mixed in equal proportions in gelatin or celluloid and coated to give a closely-packed single layer of coloured grains on the emulsion surface of the film. Exposure is through the screen layer, and the exposed film may be developed to a negative and printed on a positive film carrying a similar multi-colour screen, or else be reversed to give a direct positive. In printing, the colour-screen layer of the positive is maintained in close contact with the back of the negative film. The multi-colour screen may similarly be applied to panchromatic plates. W. Clark.

Solution for sensitising paper, glass, fabric, etc. M. Michels (Swiss P. 109,722, 22.4.24).—A solution containing ferrous ammonium citrate, silver nitrate, and tartaric acid is heated at 50—60° for 6—8 hrs. and then separated from any small precipitate which forms. For special printing processes, copper sulphate, uranyl nitrate, or chloral hydrate may be added. W. Clark.

Acid and salts strongly absorbing ultraviolet rays (E.P. 242,721).—See XX.

XXII.—EXPLOSIVES; MATCHES.

Stability of nitrocelluloses. Duclaux.—See V.

Patents.

Explosive compound [trinitrophenoxyethyl nitrate]. H. A. Lewis, Assr. to E. I. du Pont de Nemours and Co. (U.S.P. 1,560,426, 3.11.25. Appl., 26.1.25).—2:4-Dinitrochlorobenzene (100 pts.) is dissolved in ethylene glycol (322 pts.) and an equal quantity of the glycol mixed with caustic soda (20 pts.) and water (12 pts.) is added. On heating the mixture on the water bath, dinitrophenoxyethyl alcohol is formed and separates on pouring into water. One part is dissolved in 10 pts. of 95% sulphuric acid and slowly added to 3 pts. of concentrated nitric acid at 30° and heated to 50° for 1 hr. On pouring into water *trinitrophenoxyehayl nitrate*, m.p. 105°, is obtained. It is a valuable high-explosive. T. S. Wheeler.

Explosive [trinitrophenylnitroaminoethyl nitrate]. R. C. Moran, Assr. to E. I. du Pont de Nemours and Co. (U.S.P. 1,560,427, 3.11.25. Appl., 26.1.25).—100 pts. of 2:4-dinitrochlorobenzene are dissolved in 510 pts. of 95% alcohol, 30 pts. of aminoethyl alcohol are added, and the mixture is heated to 70° and treated with 20 pts. of caustic soda in 30 pts. of water. On concentration dinitrophenylaminoethyl alcohol separates. When dissolved in 10 pts. of 95% sulphuric acid and added to 3 pts. of concentrated nitric acid at 30° and heated at 50° for 1 hr. *trinitrophenylnitroaminoethyl nitrate*, m.p. 125°, is obtained. It is a valuable high explosive. T. S. Wheeler.

XXIII.—SANITATION; WATER PURIFICATION.

Sterilisation of water by chlorine and some of its compounds. C. H. H. Harold (J. Roy. Army Med. Corps, 1925, 45, 190—207; Pub. Health Eng. Abstracts, Sept. 19. 1925. W 54; cf. B., 1924, 886).—Prior addition of 0·25—0·5 p.p.m. of ammonia increased the germicidal action of chlorine, reduced loss of chlorine by absorption, and produced a water with satisfactory taste. Good results were obtained only when the ratio of chlorine to ammonia was 4:1. The germicidal power of hypochlorous acid is lower than that of chlorine, and the former is more readily absorbed by water. Chloramine was found to possess the highest germicidal power of any chlorine-ammonia compound, and the rate of sterilisation though slower than with chlorine, was not reduced by a moderate content of colloidal matter. R. E. Thompson.

Endo's medium [for *B. coli*]. N. MacL. Harris (Canad. Pub. Health J., 1925, 16, 326).—In experiments made with a view to improve the stability of Endo's medium the best results were obtained with "Difco" bacteriological peptone and with a basic fuchsin consisting of approximately equal proportions of rosaniline and pararosaniline. Substitution of dipotassium phosphate (0·3—0·5%) for meat extract in the formula of the standard method of the Amer. Pub. Health Assoc. was found advisable.
R. E. Thompson.

Importance of differentiating colon-aerogenes group in examining water. J. J. Hinman, jun. (Amer. J. Pub. Health, 1925, 15, 614—619).—A discussion of the test for *B. coli* in water, with special reference to methods for differentiation of the colon-aerogenes group and the value of information derived therefrom. In the examinations of treated water from Iowa plants during the period 1914 to 1924 inclusive, of 18,847 culture tubes 31·5% gave positive presumptive tests, 9·4% of these being due to presence of *B. coli*, 9·8% to *B. aerogenes*, and 80·8% to other gas formers. R. E. Thompson.

Utilisation of sewage for gas production. Sierp (Gas u. Wasserfach, 1925, 68, 772—776).—A fuel gas can be produced from sewage sludge by suitably controlled bacterial action. Some aspects of the operation of the process at Essen are described. The crude gas contains 65—95% CH_4, 5—35% CO_2, 0—8% H_2, 0—5% N_2, and 0—0·25% H_2S. After purification the gas contains 90—98% CH_4. The hydrogen is relatively high during the initial period of fermentation, but later, under the influence of particular bacteria, it reacts with carbon dioxide to form methane. Too great a dilution of the sludge gives rise to acid fermentation and a higher percentage of hydrogen sulphide. The optimum temperature is about 25°, and in cold weather an increased yield may be obtained by heating the fermentation tanks. The sewage must be free from bacterial poisons, such as may occur in the waste from gas works, copper works, tanneries, etc. The collection of the gas gives rise to certain mechanical difficulties. These have been overcome by the use of deep fermentation tanks, the gas outlet of which is fitted with a device for allowing the passage of gas while preventing that of the scum. The gas collects in a hood covering the outlet, whence it is withdrawn as required. The gas is used as a constituent of town gas, as a fuel gas on the works, or is compressed into cylinders. Various Essen works produce gas in this way in amounts ranging from 250,000 to 600,000 $m.^3$ per annum.
A. B. Manning.

Pitting in iron water pipes. Liebreich.—See X.

Corrosion of water pipes. Cassel.—See X.

Natural water corrosion. Baylis.—See X.

Tuba (*Derris*). Gater.—See XVI.

Patents.

Water distilling apparatus utilising exhaust gases. C. Day (E.P. 242,328, 25.3.25).—In a distilling apparatus utilising exhaust gases from internal-combustion engines, furnaces, etc., a constant level of water is automatically maintained in the evaporating vessel, and the amount of cooling water is regulated by means of a thermostat device.
C. O. Harvey.

Sulphur fungicide (U.S.P. 1,559,984).—See XVI.