

# BRITISH CHEMICAL ABSTRACTS

## B.—APPLIED CHEMISTRY

FEBRUARY 19, 1926.

### I.—GENERAL; PLANT; MACHINERY.

**Laboratory pump for the circulation of gases.** W. FRANCIS (*Fuel*, 1926, 5, 39—40).—The glass piston (see figure) is moved up and down by a solenoid acting on a tube of soft iron enclosed within the piston. The solenoid is operated by a battery in series with a clockwork pendulum make and break. When the piston rises air is drawn through the lower glass valve, which closes while the piston falls, and the upper valve in the central tube of the piston opens and the gas flows through. A pump of the dimensions shown will give any rate of circulation up to 80 c.c. per min. A. B. MANNING.



**New methods of washing gases.** V. Investigations with the aid of absorption curves. G. WEISSENBARGER, R. HENKE, and E. SPERLING (*Z. angew. Chem.*, 1925, 38, 1161—1164; cf. B., 1924, 773; 1925, 388, 697).—Absorption curves are obtained by plotting the degree of absorption (g. absorbed per 100 g. of absorbent) against the concentration of the gas phase (g. of vapour per cub. m. of air), the working temperature throughout being 20°. Decalin is slightly inferior to tetralin for absorbing benzene and alcohol, and much inferior for acetone and ethyl acetate. "Hydroterpin," a mixture of hydrogenated terpene hydrocarbons and tetralin, is practically non-absorbent for methyl alcohol, but absorbs ethyl alcohol, though less efficiently than tetralin, and accompanied by frothing; it is less efficient than tetralin for acetone and benzene, but is equal to tetralin, and better than turpentine or lignite tar oil, for absorbing lignite benzene, and has the advantage of imparting to the latter a pleasant odour. Absorption curves can be applied to the solution of a variety of problems, e.g., determining the composition of a solvent without analysis (by comparison with absorption curves of known compounds), and the examination of the protective action of substances in admixture with solvents, e.g., addition of tetralin to cresol for the absorption of the vapours produced in wood carbonisation,

in which 60% of tetralin practically prevents thickening of the absorbent, whilst the efficiency of the latter only begins to be materially impaired with a content of upwards of 70% of tetralin.

W. T. K. BRAUNHOLTZ.

**Measuring dust in air and industrial gases.** W. ALLNER (*Z. angew. Chem.*, 1925, 38, 1170—1171).—Air or gas is drawn from the main through a sampling tube and passed through a cylindrical dust catcher which can be electrically heated and contains filter-cloth or the like, thence through an ice-cooled condenser and a calcium chloride tower (for water vapour), and finally through a gas meter. It is important that the gas pressure in the mouth of the sampling tube should be the same as that in the main, and this is regulated by means of a pump and a manometer, the limbs of which end respectively in the mouth of the sampling tube and in the main alongside. W. T. K. BRAUNHOLTZ.

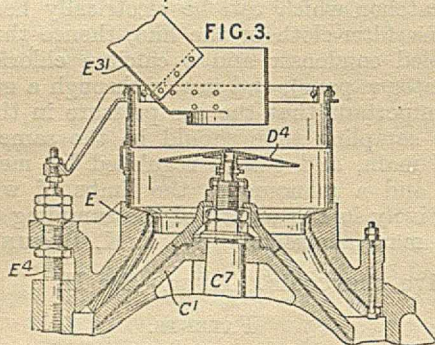
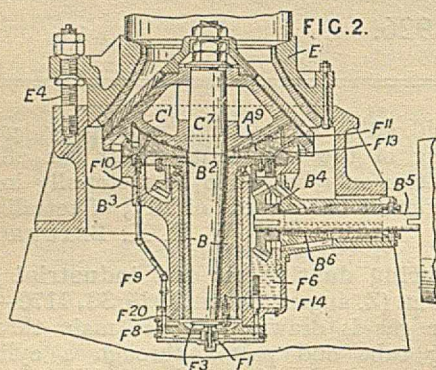
**Active charcoals.** RUFF.—See II.

### PATENTS.

**Apparatus for crushing ferruginous and agglutinative substances.** A. ELENBAAS (E.P. 236,578, 3.7.25. Conv., 4.7.24).—An apparatus for crushing material such as spent oxide from gas works comprises a hopper the bottom of which is formed by a roller having broaches on its surface. The opposite sides of the hopper have openings through which the broaches pass. S. BINNING.

**Gyratory [fine] crushing process and apparatus.** E. SYMONS (E.P. 243,926, 2.2.25).\*—The material to be crushed is fed between a pair of vertical conical crushing elements, both cones being inclined the same way, i.e., the outer fixed cone or concave, envelopes the inner gyrating cone. The gyrating cone, C<sup>1</sup>, is supported on a spherical bearing, A<sup>9</sup>, the centre of which substantially coincides with the geometrical apex of the cone, so that the extent of the gyrating motion or crushing stroke is greatest at the skirt or lower edge of the cone and small near the top where the material enters, and the motion of any point on the cone is combined lateral and vertical. The gyratory motion is produced by the rapid rotation of an eccentric sleeve, B, around a shaft, C<sup>7</sup>, extending downwards from the cone. The sequence of actions on any particle is as follows: first a drop by gravity from the feeding device, D<sup>4</sup> (Fig. 3), on to the gyratory cone at the top, where the crushing space is widest; an approach of the inner cone towards the concave, E, the motion being so rapid that the particle slides down the inner cone until it is nipped and crushed at the end of the approach stroke; the recession of the inner cone is then so

rapid that the crushed particles hang freely for a moment and drop vertically on to the inner cone at a point lower down than before, and on the re-approach



of the cone the particles continue their motion downwards by sliding until they are again nipped, and so on until they reach the skirt of the cone and are discharged. In order to effect fine crushing, to, say,  $\frac{1}{4}$  in., with a large stroke at the skirt, say  $2\frac{1}{2}$  in. or certainly more than twice the size of the largest particles discharged, the surface of the concave or outer cone is not truly conical but is flared, so that at the upper part the crushing surfaces are convergent but in the lower part they are parallel for such a length that no particle has time to slide right through the parallel part without being nipped at least once, and hence the maximum size of the discharged particles will depend on the minimum gap between the crushing surfaces. For the correct functioning of this crusher it is essential that the material be not crowded, which requirement necessitates an automatic feed. This can be effected by means of a plate (conical, flat, or dished according to the angle of repose of the material to be crushed),  $D^4$ , attached to the top of the gyrating cone and working in conjunction with a fixed feeding hopper or guide which delivers the material to the centre of the plate. The adjustment of the size of the crushed product is effected by raising or lowering the outer concave by means of adjusting screws,  $E^4$ . Means are provided for forced lubrication and for preventing creep of the stationary concave. B. M. VENABLES.

**Means of pulverising, and separating, all kinds of cereals, minerals, and the like.** J. C. CARLINE (E.P. 244,146, 9.8.24).—The apparatus

comprises two disintegrators and a spiral wire-brush conveyor through which the material passes in series, the conveyor delivering finished material while insufficiently crushed material is allowed to drop out of the circuit (before reaching the conveyor) and to return to the first disintegrator. The stationary grinding surface of the disintegrator is provided with adjustable spring-mounted or rigid blocks with which hinged extremities of the rigid arms of the rotor come in contact.

B. M. VENABLES.

**Apparatus for separation of solid materials by means of liquid currents.** H. REMY (E.P. 236,947, 8.7.25. Conv., 8.7.24).—The apparatus comprises a number of units in each of which a rising current of water separates and carries off the lighter constituents of a mixture of solids that is dropped into it, and the residual solid constituents forming the underflow are treated in a subsequent unit with a faster current of water. A transfer device is provided between the units which permits the residual solid matter to drop from one unit to the next without allowing any substantial intermingling of the currents of water in successive units, *i.e.*, it acts as a water-lock. The transfer device may consist of a cellular drum, an Archimedean screw, or of a number of flaps arranged in series and opened in succession. B. M. VENABLES.

**Process and apparatus for precipitating and filtering.** L. D. MILLS and T. B. CROWE (E.P. 242,383, 3.9.24).—A filtering apparatus, for example of the vacuum leaf type, suitable for the precipitation and collection of gold and silver from cyanide solutions, is arranged so that there is a brisk circulation of liquid or pulp over the surfaces of the filter medium, the filtrate being withdrawn comparatively slowly, but quickly enough to produce cakes which are uniform in texture and form an excellent final precipitating means because the coarse particles of sludge are not permitted to settle out. The circulation is preferably maintained by a propeller within a vertical shaft, placed centrally in the filter tank, the pulp passing up the shaft and being deflected downwards along the surfaces of the filter-leaves. B. M. VENABLES.

**Filtering apparatus.** W. HOEHN (U.S.P. 1,564,351, 8.12.25. Appl., 4.4.21).—In a filtering apparatus consisting of a number of filter-leaves in a tank, each of the filter-leaves with its respective holder is independently connected to a manifold, so that a filter-leaf with its holder can be removed from the tank without interrupting operation of the apparatus. S. BINNING.

**Filter.** F. B. LOMAX (U.S.P. 1,565,661, 15.12.25. Appl., 29.9.24).—A container has a horizontal filtering partition near the bottom and is provided with means for agitating the material above the filter and for withdrawing the filtrate. The whole is supported on a stand and the means for securing the apparatus to the stand includes the filtrate outlet. B. M. VENABLES.

**Preventing adhesion of scale in boilers, heaters, evaporators, and the like.** K. SCHNETZER (E.P. 243,415, 31.7.24. Addn. to 208,115; B., 1925, 231).—The method described in the original patent is modified by varying the direction of flow of the current at intervals, for example, by changing the points on the metallic surface to which the current is supplied.  
S. BINNING.

**Separating oil from water contaminated with oil.** E. W. GREEN, H. OGDEN, and G. R. UNTHANK (E.P. 243,501, 29.10.24).—Water contaminated with oil in a very finely dispersed condition is distributed over a large wetted area exposed to air, e.g., a bed of coke. The oil is retained as a film, and gradually accumulates and is transformed into drops, which are removed by the flowing water and are recovered in a trap.  
S. BINNING.

**Method of treating substances centrifugally and machines therefor.** A. E. WHITE. From SHARPLES SPECIALTY CO. (E.P. 243,946, 24.2.25).—A centrifugal machine for separating two substances, at least one of which is liquid, by means of a third or carrier liquid, e.g., paraffin wax from chilled oil with the aid of brine, is described. The 23 claims refer mainly to the various arrangements of the "weirs" or devices to regulate the separation and withdrawal of the products.  
B. M. VENABLES.

**Means for emptying a revolving open-top centrifugal separator.** E. VAN DER MOLEN (U.S.P. 1,565,604, 15.12.25. Appl., 26.9.24).—A scraping blade is drawn gradually into the collected material, which then passes along an inclined runway starting from near the blade and sloping gradually upwards over the opposite wall of the centrifugal drum. (Cf. E.P. 238,460; B., 1925, 790.)  
B. M. VENABLES.

**Evaporating solutions *in vacuo*.** N. V. NEDERLANDSCHE INSTALLATIE MAATSCHAPPIJ THERMA, and A. O. H. PETERSEN (E.P. 243,982, 1.5.25).—The vapours from a hot solution which has been evaporated *in vacuo* are condensed in a condenser by just sufficient cooling liquid to produce condensation, and the condensate is removed by an ejector pump actuated by the cooling liquid used in the condenser. The method is particularly suitable for the recovery of Epsom salts, Glauber salts, and potassium salts from their solutions.  
S. BINNING.

**Vacuum drying [evaporating] apparatus.** H. D. MILES, ASSR. to BUFFALO FOUNDRY AND MACHINE CO. (U.S.P. 1,560,598, 10.11.25. Appl., 31.12.24).—An internally heated drum is rotated inside a chamber maintained under reduced pressure by a suction device. The liquid under treatment is delivered to the bottom of the closed chamber and is rapidly evaporated in the form of a film on the surface of the drum. The dried solid deposited is removed by a scraper from the surface of the drum before it again enters the liquid. The vapours exhausted from the chamber are drawn through the liquid to be evaporated so that any solid entrained

in them is recovered. The apparatus is particularly useful in the preparation of milk powder.

T. S. WHEELER.

**Apparatus for separating moisture from gases in vacuum drying plants.** GEN. ENGINEERING CO. (RADCLIFFE), LTD., and S. TAYLOR (E.P. 244,233, 1.11.24).—A condenser for condensing and rendering visible the moisture in the gases leaving a vacuum drying oven is constructed of a number of groups of water-cooled tubes giving alternate upward and downward flow of the gases. The total cross-sectional area of the tubes increases in successive groups so that as the gases cool they pass through the tubes at a lower velocity. The condensed water is collected where the gases change direction at the bottom of one set of tubes in order to pass up the next, and arrangements are made for drawing off the condensed water without breaking the vacuum.  
B. M. VENABLES.

**Method of drying and oxidising materials in suspended condition. Drying materials.** G. D. HARRIS, ASSR. to INDUSTRIAL DRYER CORP. (U.S.P. 1,564,565-6, 8.12.25. Appl., [A] 23.10.20, [B] 18.2.24).—(A) Suspended material is moved within a chamber from which a definite volume of the drying atmosphere is removed in a damp condition and divided into a number of streams, each of which is separately conditioned by mixing with fresh air and by reheating, and then again circulated within the drying chamber. (B) In a drying apparatus where the atmosphere is reheated while circulating and some of the atmosphere is withdrawn, conditioned by exchange with fresh air, and again circulated, the periods of reheating are controlled by the changes of temperature of the atmosphere and the periods of conditioning by the moisture content of the atmosphere.  
B. M. VENABLES.

**Method and apparatus for drying. Method and apparatus for drying, including solvent recovery.** G. D. HARRIS, ASSR. to INDUSTRIAL DRYER CORP. (U.S.P. 1,564,782-3, 8.12.25. Appl., 6.5.21).—(A) An atmosphere circulating within a drying chamber is expanded by heat and the excess permitted to escape, thus producing a rarefied drying atmosphere, which is then alternately cooled and heated to set up a circulation while excluding external air. (B) A drying chamber with an attenuated circulating atmosphere is provided with a number of internal flues, leading from the top of the chamber to the bottom, through which the circulating atmosphere moves downwards in separate paths. Condensers are provided in each flue near the top and heating means near where the flues open into the main chamber (at the bottom) and "boosters" in the chamber at points between the bottom and top.  
B. M. VENABLES.

**Heating system for kilns.** J. B. AGNEW and A. A. OEFFNER (U.S.P. 1,562,135, 17.11.25. Appl., 12.3.25).—Air or oxygen under pressure is introduced into the top of a down-draught kiln and meets the hot gases rising from the fire-boxes,  
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producing a whirling motion of the products of combustion which ensures thorough heating of the material in the kiln.

T. S. WHEELER.

**Furnace.** N. I. IVANOVSKY (U.S.P. 1,565,370, 15.12.25. Appl., 27.12.24).—A furnace comprises a combustion chamber, a regenerator, and a gas producer, the last being adjacent to, and provided with apertures communicating with, the other two. A number of brick-walled passages in the regenerator and also the walls of the gas producer are heated by the exhaust gases, and the air for combustion is admitted partly through the regenerator and partly through the gas producer. B. M. VENABLES.

**Digestion and filtration apparatus.** L. C. DANIELS, Assr. to NAT. ANILINE AND CHEMICAL Co. (U.S.P. 1,562,870, 24.11.25. Appl., 9.1.20).—A combined extraction and filtration apparatus consists of a steam-jacketed vessel connected with a reflux condenser and having an outlet pipe which passes to the bottom of the apparatus and is fitted with a filter head. The material under treatment is heated with the solvent and when extraction is complete it is blown out through the filter head by means of compressed air.

T. S. WHEELER.

**Apparatus for refrigeration.** B. B. HOLMES (U.S.P. 1,564,242, 8.12.25. Appl., 13.2.22).—A refrigerating machine consists of a boiler and condenser with an intermediate ejector connected with an evaporator. Boiler, condenser, and evaporator contain a volatile liquid the vapour of which is drawn regularly from the evaporator and discharged into the condenser. Means are provided for periodically stopping the action of the ejector, and for supplying the liquid to the discharge end of the ejector when the jet is not acting, for return to the evaporator.

A. COUSEN.

**Dephlegmator.** J. W. HANCOCK (U.S.P. 1,564,564, 8.12.25. Appl., 16.2.23).—A tower is provided with a central vertical flue, the surfaces of both the flue and the tower being air-cooled. In the annular space within the tower are a number of annular collecting chambers or deep trays, the walls of which are spaced from the central flue and from the walls of the tower.

B. M. VENABLES.

**Apparatus for absorption of gases in liquids.** H. HOWARD, Assr. to GRASSELLI CHEMICAL Co. (U.S.P. 1,565,366, 15.12.25. Appl., 6.12.22).—A closed chamber contains the liquid which is to be impregnated with gas and is provided with a horizontal plate with many small perforations, to the underside of which the gas is supplied. The plate has a central large aperture in which is situated a device, such as a propeller, for circulating the liquid and causing it to pass radially over the plate. For use in the manufacture of sulphuric acid the plate may be of cast iron and divided into separately detachable sections.

B. M. VENABLES.

**Production of membranes of parchment paper for osmotic purposes.** SIEMENS U. HALSKE A.-G. (G.P. 418,210, 19.9.22).—Membranes for the

dialysis of soap solutions etc. are produced by treating parchment paper with caustic soda or potash.

D. F. TWISS.

**Rotary drying apparatus.** P. SCRIVE (U.S.P. 1,567,335, 29.12.25. Appl., 12.1.24).—See E.P. 224,111; B., 1925, 56.

**Absorption refrigerating machines.** A. S. GRAY (E.P. 230,079, 26.2.25. Conv., 29.2.24).

**Refrigerating apparatus.** A. GREEN (E.P. 244,532, 22.9.24).

**Rabbling apparatus.** EBERHARD HOESCH UND SÖHNE (E.P. 237,251, 13.7.25. Conv., 21.7.24).

**Hydrometer.** F. C. and H. S. JEWELL (E.P. 244,669, 20.7.25).

**Optical pyrometers.** SIEMENS U. HALSKE A.-G. (E.P. 244,691, 16.10.25. Conv., 29.5.25.)

**Rotary drum apparatus for drying, heating, and mixing granular and other [road-making] materials.** J. M. T. JOHNSTON and J. E. DAVIES (E.P. 244,975, 1.4.25).

**Apparatus for draining water from steam-heated rotary cylinders and the like.** J. M. ARNOT (E.P. 245,031, 30.7.25. Addn. to 239,087).

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

**Limits of inflammability of firedamp and air.** M. J. BURGESS and R. V. WHEELER (Safety in Mines Res. Bd., Paper No. 15, 1925. 21 pp.).—The effect of varying experimental conditions on the limits of inflammability of mixtures of methane and air has been studied. The dimensions and material of the containing vessel have no appreciable effect on the limits of inflammability when determined in tubes of diameter greater than 5 cm. The values for the horizontal propagation of flame in wider tubes, open at one end, are 5.4% CH<sub>4</sub> and 14.3% CH<sub>4</sub>. For tubes of less than 5 cm. in diameter, the lower limit increases and the upper limit decreases with decreasing diameter until a minimum diameter is reached (4.5 mm. for glass tubes); in narrower tubes no mixture of methane and air is capable of continued propagation of flame. The limits for upward, horizontal, and downward flame propagation are 5.4 and 14.8%, 5.4 and 14.3%, and 6.0 and 13.4% respectively. For horizontal propagation of flame there is little difference in the limits when the mixture is totally confined and when it is free to expand. For upward propagation, however, the lower limit is least when the mixture is free to expand and the upper limit is greatest when the mixture is totally enclosed. The limits widen with rise of temperature, and with increasing pressure from 120 mm. to about 760 mm., when the lower limit passes through a minimum. This variation with pressure is observed with other gases of the paraffin series, but the position of the lower limit

minimum varies, being, for example, about 4 atm. for pentane. Such variations in temperature and pressure as ordinarily occur in coal mines do not appreciably affect the limits of inflammability. A mixture of methane and air containing about 5% CH<sub>4</sub> can propagate flame (a) under certain limiting conditions of turbulence of the mixture, or (b) when the mixture is travelling as a slow current. The presence of water vapour in the atmosphere does not appreciably affect the lower limit of inflammability. The reduction of the oxygen content of the air narrows the limits, the upper limit being affected more than the lower, until, when the air contains 13% O<sub>2</sub>, they coincide and only one mixture, containing about 6% CH<sub>4</sub>, can propagate flame. If the reduction of the oxygen content is brought about by the addition of carbon dioxide, the limits are narrowed more rapidly, owing to the specific heat of carbon dioxide being higher than that of nitrogen. The effect of the presence of another combustible gas is dependent on the nature of that gas and can be calculated from the known values of its limits of inflammability with air alone.

A. B. MANNING.

**Determination of carbon in coal.** J. G. KING and D. MACDOUGALL (Fuel, 1926, 5, 33—35).—The carbon in a strongly caking bituminous coal, high in volatile matter (Wearmouth gas coal), was determined by the "combustion" method in an electrically-heated furnace of standard pattern (cf. Fuel Research Board Interim Report on Methods of Analysis of Coal). The temperature of the copper oxide was varied in stages from 800° down to 350°, and the amount of carbon escaping combustion was determined by measurement and analysis of the gases passing through the absorption vessels. The standard method of combustion of the Sampling and Analysis of Coal Committee (*loc. cit.*) has been shown to give satisfactory results. The time taken to burn the coal should not be less than 30 min., and the total time of one determination need not exceed 120 min. The temperature at the centre of the layer of copper oxide should not be lower than 800°, and at this temperature, even with rapid heating, there is no likelihood of the loss of carbon exceeding 0.15%. At temperatures lower than 800° the amounts of carbon escaping combustion increase. At 700° and at 650° results to within 0.3% can be obtained by careful manipulation, but variations of over 1% tend to occur.

A. B. MANNING.

**Fusibility of coal ash.** A. C. FIELDNER and W. A. SELVIG (Fuel, 1926, 5, 24—33; cf. Bull. 209, U.S. Bureau of Mines, 1922; B., 1922, 738 A).—The requirements of a standard method for the determination of the fusibility of coal ash have been studied. In particular, the ash should be heated in an atmosphere which reduces the iron component to the ferrous state, in which it exerts its maximum fluxing action. The reducing atmosphere of a gas-fired furnace fulfils this requirement. The standard method of the U.S. Bureau of Mines is described

in detail, and the results of determinations on a large number of American coals are summarised.

A. B. MANNING.

**Bergius process for the liquefaction of coal.** F. SCHUSTER (Sparwirtsch., 1925, 3, 157).—The apparatus, procedure, and the products obtained by the Bergius process (G.P. 301,231 and 303,893; cf. E.P. 18,232 of 1914 and 5021 of 1915; B., 1916, 167, 732) are briefly described. The process is illustrated by the following results of a large-scale experiment: 1 ton of dry coal, with an ash content of 4%, yielded 210 kg. of gas, 455 kg. of oil, 75 kg. of water, and 5 kg. of ammonia. The residue was carbonised, and gave further 25 kg. of gas, 80 kg. of oil, and 240 kg. of coke. In all, 535 kg. of oil were obtained, which on fractionation yielded 150 kg. of refined benzine, 200 kg. of Diesel oil, and 60 kg. of lubricating oil; the residue served as fuel oil. The Bergius plant at Mannheim-Rheinau has a reaction cylinder of 4 m.<sup>3</sup> capacity, and can deal with 18,000 tons of raw material per annum.

A. B. MANNING.

**Active charcoals and their adsorptive power.** O. RUFF (Z. angew. Chem., 1925, 38, 1164—1169; cf. B., 1924, 362; 1925, 117).—Activated and non-activated charcoals may be distinguished by their percentage adsorptive power for phenol, *i.e.*, one hundred times the quantity of phenol adsorbed by 1 g. of charcoal from 100 c.c. of a 1% phenol solution at 25°. The differences in adsorptive power towards gases and dissolved substances suggest two different types of attraction. Elementary analysis affords no clue as to activity, but active charcoals are always denser than inactive charcoals. For charcoal to be capable of activation it must be amorphous, activation being effected by any means (*e.g.*, heating in air, steam, carbon dioxide) that causes the amorphous surface to be etched or partially broken up. The loss of carbon in the process need not be great (*e.g.*, 6½%). Carbonisation of various organic substances out of contact with air and in the presence of certain inorganic compounds (*e.g.*, alkalis) leads direct to active charcoals. Heating to too high a temperature (*e.g.*, 1100° and above) destroys the activity and capacity for activation of amorphous carbon. Active amorphous carbon probably contains irregular groups of carbon atoms with valencies incompletely satisfied, and where these lie on or near the surface or the pores of the charcoal they act as centres of adsorptive attraction. In inactive charcoals the amorphous substratum is covered with a dense skin of saturated carbon atoms, and the object of activation is to remove or break through this skin.

W. T. K. BRAUNHOLZ.

**Analysis of organic substances of high ash content, in particular of Esthonian shale.** E. VON PEZOLD (Brennstoff-Chem., 1925, 6, 381—385).—The chemical composition of the inorganic constituents present in the material should be determined before deciding upon the best method of determining the ash content. Direct incineration, as usually practised,

will give erroneous results if the inorganic matter comprises oxides (which will take up sulphur dioxide from gas), hydrates (which will give up water at elevated temperatures), and carbonates. In such cases, the dried and weighed material should be first treated with 10% hydrochloric acid, the residue filtered off, dried, and weighed, and finally incinerated in the usual manner. The loss in weight on incineration of the residue from the acid extraction gives the content of organic matter, and from this the ash content of the original sample is calculated. This method must, however, be used with caution for coals and other easily oxidisable substances, owing to the possibility of oxidation occurring in the drying oven and thus leading to unduly high values being obtained for the organic matter.

W. T. K. BRAUNHOLTZ.

**Development of a standard Canadian laboratory distillation method for examination of oil shale.** R. E. GILMORE and A. A. SWINNERTON (Canad. Chem. Met., 1925, 9, 215—217, 235—239).—

A standard shale sample with an oil content of about 30 gals. per short ton was retorted by various current methods. These comprised a cross retort of 3500 g. capacity immersed in a lead bath electrically heated, 3000 g. of shale being used and the temperature raised to 550°; the small field assay retort of the U.S. Bur. of Mines, charged with about 350 g. of shale and heated in an electric furnace; a large field assay retort, charged with 1000 g. of shale, heated by a gas burner or in an electric furnace; a horizontal iron tube, 2½ in. inside diam. and 26 in. long, heated in a gas furnace and charged with 450 g. of shale, and the Scotch (Pumphreston) tube method with an iron tube, 2 in. in diam. and 6 ft. long, closed at one end and open at the other, which is charged with 450 g. of shale and heated in an inclined position, so that the distillate runs out of the open end. Distillations of the crude oil were made in an Engler flask on 100 c.c. and in a Hempel flask on 300 c.c. The lead bath retort was found inconvenient. The assay retorts gave the most accurate results, the larger one being preferred. The Scotch tube method gave only 29 gals. of oil per ton, as against 32 gals. by the small assay retort and about 31 gals. by the large assay retort. The yield of gas without use of steam was 1095—1635 cub. ft. per ton, and with the use of steam up to 4020 cub. ft. per ton. The crude oil from the large assay retort had  $d$  0.881, and on distillation yielded 8% up to 150°, 31% from 150 to 300°, 46% from 300° to end point, and 15% of pitch and loss.

H. MOORE.

**Thermal expansion of California petroleum oils.** E. H. ZEIFFUCHS (Ind. Eng. Chem., 1925, 17, 1280—1283).—Various Californian petroleum products were tested to ascertain their coefficients of expansion from 50° up to 400°. Glass pycnometers were used up to 200°, and steel pycnometers for higher temperatures. These were heated in vapour from baths of liquids of suitable boiling points or in baths of melted solder. A single formula could not be found to cover the expansion over the

whole range. The coefficient increased rapidly at higher temperatures, and was greater for high temperatures than with oils of other fields. A graph indicates the error introduced by using the National Standard Petroleum Tables for computing the gravities of these products; this error is 7% for 50° A.P.I. gravity.

H. MOORE.

**Sulphur compounds removed from a Persian petroleum by means of sulphuric acid.** I. E. H. THIERRY (J.C.S., 1925, 127, 2756—2759).—The oil obtained on dilution of a sulphuric acid sludge, from the refining of Persian petroleum, has been separated into 29 fractions boiling below 120°/125 mm., together with a residue. Fraction (4), b.p. 68—70°/760 mm., contained methyl ethyl sulphide, which was characterised by preparation of its mercuri-iodide, the methylsulphonium iodide mercuri-iodide, and methyl ethyl sulphide mercuri-chloride, m.p. 101—102°. Fraction (7), b.p. 89—92°/760 mm., contained a compound C<sub>4</sub>H<sub>10</sub>S, of which the mercuri-iodide, unmelted below 100°, methylsulphonium iodide mercuri-iodide, m.p. 54°, and mercurichloride, m.p. 68°, are described; this compound is not ethyl sulphide. Fraction (11) contained a liquid, b.p. 64—65°/125 mm., 120—121°/760 mm., which was recognised as tetramethylene sulphide; the methiodide, decomp. 185—190°, mercurichloride, m.p. 126°, tetramethylene sulphide mercuri-iodide, m.p. 58°, and tetramethylene methylsulphonium iodide mercuri-iodide, m.p. 111°, are described. Fraction (17) contained pentamethylene sulphide, b.p. 83—84°/125 mm., 138.5°/742 mm., which was oxidised to pentamethylene sulphone, m.p. 98°; the sulphonium chloride, decomp. on heating, was prepared from the sulphonium iodide through the sulphonium base; pentamethylene sulphide mercuri-iodide, m.p. 72—74°, the mercurichloride, m.p. 135—136°, the chloroplatinate, and pentamethylemethylsulphonium iodide mercuri-iodide, m.p. 78°, are described.

F. M. HAMER.

**Sulphuric acid absorption and iodine values of various petroleum products and cracked distillates.** J. C. MORRELL and G. EGLOFF (Ind. Eng. Chem., 1925, 17, 1259—1261).—The amounts of various oils dissolved by sulphuric acid,  $d$  1.84, are disproportionate to their content of unsaturated substances, 100% of some crude oils being absorbed. For determining iodine values the method of Hanus was used on a solution of oil in chloroform containing 0.01 g. per c.c. 25 c.c. of Hanus solution were used and an absorption period of 30 min. in the dark. When the proportion of reagent to oil solution was increased the iodine value greatly increased. There was considerable change in the addition iodine value with changed proportions of the reactants, and a still greater change in the substitution value.

H. MOORE.

**Theory of anti-detonators.** H. MURAOUR (Chim. et Ind., 1925, 14, 851).—The author suggests that the action of anti-detonators, such as lead tetraethyl in internal-combustion engines, is due to the formation of a cloud of solid particles, which

fix a proportion of the ions in the gas, and thus moderate the rate of explosion. The fact that benzene-air mixtures can be strongly compressed without detonation is ascribed to initial combustion of the hydrogen, whereby a cloud of carbon particles is formed and acts as an anti-detonator.

L. A. COLES.

**Catalytic formation of petroleum hydrocarbons from fats.** J. MARCUSSEN and W. BAUERSCHÄFER (Chem.-Ztg., 1925, 49, 1045).—Conversion of fats into petroleum hydrocarbons takes place at lower temperatures than those used by Mailhe (cf. B., 1921, 650 A, 803 A), the low-boiling hydrocarbons obtained by Mailhe being secondary decomposition products of heavier oils, which are the primary products of the transformation. Mixtures of oils or fats with one-fifth of their weight of uncalcined kieselguhr or sodium chloride were boiled for 20 hrs. under a reflux condenser, the temperature being kept below 300°. After removing saponifiable constituents by treatment with alkalis, the products from linseed oil and tallow were a moderately viscous brown liquid with green fluorescence and a brown liquid of low viscosity, having  $d_{20}^{20}$  0.9219 and 0.8762, iodine value 52 and 29.3, acetyl value 13.6 and 16.6, and acetyl value after hydrogenation 31.8 and 61.3, respectively. In each case the product consisted mainly of saturated and unsaturated hydrocarbons, and contained alcohols and ketones in addition. The product from tallow, on fractional distillation yielded 18% of b.p. 150—300°, and a viscous residue,  $d$  0.91. L. A. COLES.

**Methods of testing transformer oils.** H. C. STAEGER (Ind. Eng. Chem., 1925, 17, 1272—1275; cf. B., 1924, 898; 1925, 531).—The author reviews the composition and qualities of transformer oils and methods of test as given by different authorities. Graphs illustrate the oxidation and sludging of oils over prolonged periods in the presence of various metals. The temperature of the Michie test (150°) is considered too high, and the best agreement with the results of actual service is obtained with the B.B.C. test, in which the oil is heated to 112° in a copper beaker for 300 hrs., and the sludge determined gravimetrically. H. MOORE.

**Methods of washing gases.** WEISSENBERGER, HENKE, and SPERLING.—See I.

#### PATENTS.

**Fuel dryer.** H. KREISINGER, Assr. to COMBUSTION ENGINEERING CORP. (U.S.P. 1,564,361, 8.12.25. Appl., 3.10.24).—Within a casing is a heated conduit through which the fuel is passed. The conduit divides the casing into two chambers, one of which is provided with a gas inlet, and the other with a gas outlet, so that a current of gas can be passed through the fuel as it is being dried. A. B. MANNING.

**Pulverising, feeding, and burning fuel.** RAYMOND BROS. IMPACT PULVERIZER CO., Asscs. of J. CRIES (E.P. 230,405, 29.5.24. Conv., 8.3.24).—In a system for pulverising fuel and feeding it to a furnace in a current of air, the fineness of pulverisation

being controlled by an adjustable device (cf. E.P. 101,962 or 103,963) situated between the pulverising chamber and the fan chamber, a controlled volume of air is admitted to the pulverising chamber, and an independently controlled volume of additional air is admitted to the fan chamber. When so using the adjustable device referred to, it is possible to carry the pulverised fuel from the fan chamber to the furnace in a current of air at a high pressure, notwithstanding that the pressure of the air carrying the material through the pulverising chamber is maintained relatively low. A. B. MANNING.

**Burning pulverised fuel.** L. H. BERGMAN (E.P. 232,268, 14.4.25. Conv., 14.4.24).—Pulverised fuel is conveyed from the pulverising mill to a storage bin in a current of hot gases circulating through the apparatus, and passes from the bin to the furnace before it has had time to cool. The hot gases may be flue gases derived from the furnace. Provision is made for adding fresh hot gases as required from the furnace to the circulating system, and at the same time withdrawing a portion in order to prevent undue accumulation of moisture in the gas stream. The fuel is partially dried by this treatment, and clogging of the feeding mechanism due to condensation of moisture in the storage bin is prevented.

A. B. MANNING.

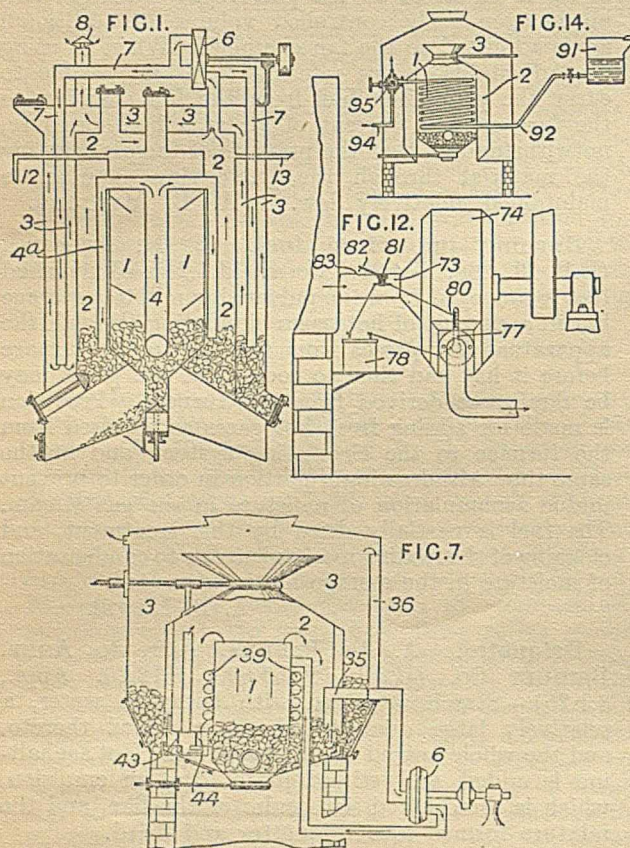
**Briquette.** A. D. PARKER, Assr. to AMER. BRIQUET Co. (U.S.P. 1,564,890, 8.12.25. Appl., 8.1.25).—Starch is mixed with borax in water, a relatively large quantity of water added thereto, and the whole heated to boiling point. Hot asphaltum is added and stirred in to form an emulsion, which is then mixed with culm or the like, and the mixture formed into briquettes and dried.

A. B. MANNING.

**Coking coal.** P. C. RUSHEN. From KOPPERS Co. (E.P. 243,414, 30.7.24).—The oven tapers from top to bottom, and steam inlets are provided in the floor of the carbonising chamber. The lower portion of the charge receives the first impact of the coking heat, and when this portion is completely coked, steam is admitted to produce blue water-gas, the steaming being continued until the remaining thicker portion of the charge is completely coked. The vertical flues of the heating walls on opposite sides of the coking chamber may be connected by cross-over ducts. A. R. MYHILL.

**Carbonising fuels.** F. KRAUSS (E.P. 243,534, 8.12.24).—An apparatus for carbonising or gasifying fuel, particularly moist fuel, e.g., peat, lignite, etc., comprises an inner chamber, 1, to which either hot furnace gases are supplied through a tube, 4, or in which the fuel is burned in an air supply, surrounded by an annular carbonising chamber, 2, which in turn is surrounded by a fuel drying chamber, 3. Hot gases from the chamber pass through branches, 4a, from the pipe, 4, into contact with the fuel in chamber 2, the gases from which are circulated by a fan, 6, and tubes, 7, through the fuel in the drying chamber, 3. The

cooled gases escape through the tube, 8. Combustible gases are led off through the tubes, 12, 13, for use in the chamber, 1, or elsewhere. Fuel is charged into,

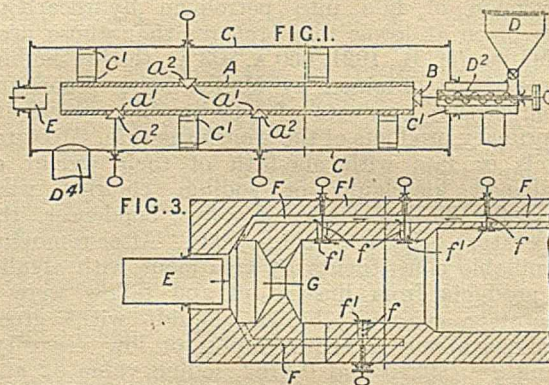


and coke discharged from each chamber separately. In a modification shown in Fig. 7, the hot gases are withdrawn by tubes, 35, 36, and fan, 6, and are heated in a coiled pipe, 39, leading, according to the position of a valve, 43, to chamber, 2 or 3, or when a valve, 44, is open, to chamber, 1. The fan, 74 (Fig. 12), withdrawing the gases may be controlled automatically by the heat of these gases, by providing in the outlet pipe, 73, a valve, 82, operated by a solenoid, 81, the circuit of which and a battery, 78, is closed when the contact element, 80, in a thermometer, 77, is reached, the valve being opened and air admitted through an opening, 83, thus reducing the suction effect of the fan and cooling the outgoing gases. Liquid such as water or hydrocarbons from a tank, 91 (Fig. 14), may be vaporised in a coil, 92, in chamber, 1, and steam or oil vapour supplied through a valve, 95, either to the carbonising or drying chamber, or to a pipe, 94, leading to a motor.

A. R. MYHILL.

**Distillation of carbonaceous materials.** B. LAING and H. NIELSEN (E.P. 243,857, 10.10.24).\*—In the destructive distillation of carbonaceous material at low or medium temperatures means are provided for admitting the heating gas to,

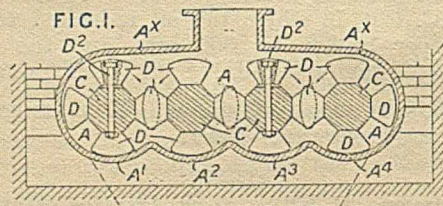
and for allowing it to escape from, certain predetermined zones of the retort. For example, the hot gases enter the retort, C (Fig. 1), through the inlet,  $A^2$ , and a portion enters the concentric tube, A, and flows through openings,  $a$ , controlled by valves,  $a^2$ , into contact with the material, which is fed in through a conduit,  $D^2$ , and discharged through an opening,  $D^4$ . The mixed heating gases and distillates leave by a conduit,  $C^1$ . The tube, A, is movable longitudinally in the retort. In a modification



(Fig. 3) ducts, F, are formed in the retort lining,  $F^1$ , and the heating gases, throttled by a constriction, G, are forced along the ducts and through the openings,  $f$ , controlled by valves,  $f^1$ . The retort may be inclined or vertical, or may be rotary, and when treating strongly caking coals these may be passed through a heating and a cooling zone before being further heated, thereby avoiding clogging of the retort.

A. R. MYHILL.

**Retorts for destructive distillation or heat treatment of solid materials.** A. L. J. QUENEAU (E.P. 243,942, 23.2.25).\*—Apparatus for the distillation or heat treatment of solid material comprises three or more horizontal retort units, A, in parallel



juxtaposition and in open communication with one another along their length. A separate conveyor, C, carrying blades or knives, D, runs through each retort. The blades revolve in such a manner as to intersect with and pass between those of the adjacent retort or retorts, without touching. Each conveyor shaft revolves in the opposite direction to the adjacent one. The bottom of the apparatus comprises a set of curved channels,  $A^1$  to  $A^4$ , extending from end to end of the retorts. The material is charged at the top at one end of the retort and discharged at the bottom at the other end.

A. R. MYHILL.



**Producing coke, gas, and tar from solid fuel.** J. RUDE (E.P. 244,337, 11.5.25; cf. E.P. 204,718 and 228,763; B., 1924, 663; 1925, 275).—Solid fuel is carbonised in a two-stage process, passing first through an internally heated preheater in which its temperature is raised by a hot gaseous medium to a point below that at which the plastic stage commences. This medium may be air or fuel gas (or, in some instances, fuel gas diluted with flue gases), and is afterwards utilised, together with the volatile matter obtained from the preheating stage, in the combustion chambers of an externally heated retort, in which the carbonisation is completed. The gaseous medium used for preheating is itself heated by the retort flue gases in a heat interchanger, or, in a second modification, by the sensible heat of the produced coke. The process is applicable to both low-temperature and high-temperature carbonisation plants. A. B. MANNING.

**Activated carbon for medicinal purposes.** J. N. A. SAUER (E.P. 243,801, 4.9.24. Addn. to 174,702; cf. B., 1922, 232 A).—Activated carbon of high adsorptive power is prepared from vegetable material by carbonising the latter (*e.g.*, up to 800°), certain gases (*e.g.*, hydrogen, producer gas, steam) being preferably passed through the material during carbonisation. The product is activated in a state of suspension or movement by means of a gas (*e.g.*, air, superheated steam, chlorine) at an elevated temperature (*e.g.*, 400—1200°). It is finally purified by treatment with acid and alkaline solutions, as specified in the parent patent. W. T. K. BRAUNHOLTZ.

**Removing chemicals from solids and semi-solids. [Distilling wood.]** A. F. FRAME (U.S.P. 1,562,880, 24.11.25. Appl., 14.11.21).—An apparatus for distilling wood consists of an externally heated inclined cylinder. The wood under treatment is fed into the upper end of the cylinder and is carried through it by a screw conveyor. Means are provided for feeding the wood to the cylinder without admitting air or allowing distillation products to escape. T. S. WHEELER.

**Oil-gas apparatus.** L. BLANCHET, Assr. to SOC. DE CHIMIE ET DE LA CATALYSE IND. SIEGE SOCIAL (U.S.P. 1,565,409, 15.12.25. Appl., 1.8.21).—An oil-gas retort comprises an upper vaporising compartment, which communicates directly with a lower catalysing compartment. Means are provided for supplying a liquid hydrocarbon to the upper compartment, the vapour then passing over catalysts disposed in rows upon the floor of the lower compartment. A. B. MANNING.

**Gaseous fuel.** J. HARRIS (U.S.P. 1,565,933-5, 15.12.25. Appl., [A, B], 6.12.23, [C] 16.2.24).—A cutting gas is prepared by mixing (A) natural gas and ether vapour, the latter constituting not less than 2½% by vol. of the mixture, (B) carbon monoxide and ether vapour, the latter constituting not less than 2½% by vol. of the mixture, or (C) casing-head

gas and ether vapour, the latter constituting approximately 5% by vol. of the mixture. A. B. MANNING.

**Porous mass [for absorbing acetylene].** A. B. RAY, Assr. to CARBIDE AND CARBON CHEMICALS CORP. (U.S.P. 1,565,328, 15.12.25. Appl., 28.10.21).—A porous filling material for acetylene storage tanks is prepared by bonding fragmentary activated carbon with a bonding agent not substantially impairing its absorptive capacity. A. B. MANNING.

**Distilling oil shale, bituminous coal, and the like to obtain light hydrocarbons.** A. L. MOND. From AMERICAN SHALE REDUCTION CO. (E.P. 244,275, 22.12.24).—Carbonaceous material is heated in a rotary retort comprising two chambers, a preheating chamber in which it is raised to a temperature at which the volatile matter is about to be driven off, and a second chamber in which it is subjected, in thinner layers, to a higher temperature. Means are provided, *e.g.*, a bath of molten metal, for applying heat evenly to the second chamber. The volatile matter is released quickly, and is withdrawn by suction. No steam is introduced into the retort, but hydrogenation of the unsaturated volatiles produced by cracking is brought about by the hydrogen liberated by the decomposition of the moisture originally in the material. This reaction is catalysed by causing the vapours to pass through a cascade of hot spent shale in the second chamber. The vapours are condensed in stages, the first condenser removing the heavy paraffin wax fraction, the second the lubricating oil fraction, and the third the gasoline fraction. The first condenser is maintained at a temperature at which some of the heavy condensates are cracked, and the second at a temperature at which some of the remaining condensates are cracked, the temperatures being maintained by hot flue gases from suitably heated zones of the combustion chamber. A. B. MANNING.

**Oil shale retort.** S. H. CORFIELD (U.S.P. 1,562,541, 24.11.25. Appl., 10.5.22. Renewed 26.8.25).—The shale is passed through a casing closed at the top and bottom. The casing contains a number of superimposed tables, and baffle-plates direct heat around the tables. Scrapers above each table are carried by a frame, and blades cut in them are staggered in relation to the uncut portions. The rotation of the scrapers moves shale from one table to the one below through openings in the tables offset from each other. H. MOORE.

**Recovering oil from shale.** C. S. FOGH, Assr. to ORE ROASTING DEVELOPMENT Co. (U.S.P. 1,563,271, 24.11.25. Appl., 26.11.20).—The volatile constituents of oil shales and oil sands are vaporised in a continuous process by heating the material during its passage through a gas-tight, mechanically-rabbed furnace by heated non-oxidising gases. The gases are continuously removed from the furnace

and their volatile constituents condensed. The fixed gases are reheated and again passed into the furnace.

H. MOORE.

**Oil cracking stills.** W. J. MELLERSH-JACKSON, From SINCLAIR REFINING Co. (E.P. 240,355, 16.2.25).—In oil cracking stills, to avoid excessive heating of the parts containing the oil, and at the same time to maintain a high temperature in the furnace and promote economic combustion of the fuel, preheated air is introduced into the furnace, and the furnace gases before they come into contact with the parts containing the oil are cooled to the desired extent by addition of flue gases withdrawn from near the outlet of the heating chamber. The flue gases may be mixed with the products of combustion in the fire-box, or between the fire-box and the heating chamber. Gases issuing from the heating chamber are used to preheat air in a vertical tubular preheater, and this air is introduced into the fire-box. The amount of flue-gases returned may be regulated by a steam jet, and the gases may be introduced around the walls of the fire-box, so as to protect parts of the furnace from the heat of combustion. The pressure employed in cracking various products may vary from 90 to 700 lb./in.<sup>2</sup>, and the charging stock may pass once or more than once through the tubes. The oil in the tubes passes in counter-current to the heating gases.

H. MOORE.

**Process of making motor spirits and refining petroleum products.** B. T. BROOKS, Assr. to CARBIDE AND CARBON CHEMICALS CORP. (U.S.P. 1,563,012, 24.11.25. Appl., 1.5.18).—A petroleum product is cracked under conditions giving a product rich in olefines. This product is subjected to the action of sulphuric acid of less than 66° B. (*d* 1.84). The oil is then separated from immiscible substances, treated with alkali, and distilled.

H. MOORE.

**Oil-cracking and carbon-removing method and apparatus.** L. D. WYANT (U.S.P. 1,563,818, 1.12.25. Appl., 20.3.22).—Oil is heated to cracking temperature and agitated to maintain the liberated carbon in suspension. Portions of oil containing charges of carbon are ejected from the body of heated oil by the gases evolved from the oil. These charges are separated from the oil while within the still, and discharged. The still is provided with a collector above the level of the oil, and with conductors dipping into the oil to collect evolved gases and convey oil and carbon carried by the gases into the collector, where means are provided for separating the carbon from the oil and discharging it.

H. MOORE.

**Recovery of gasoline from natural gas.** H. A. MOSSOR, Assr. to SOUTH PENN OIL Co. (U.S.P. 1,565,749, 15.12.25. Appl., 12.12.22).—Gasoline is recovered from natural gas by successively cooling the gas under compression, and compressing it in the presence of a solvent for the residual gasoline, the increase in density of the solvent, due to the absorption of constituents of the gas, not being allowed to exceed 1° B. After removing the residual gas, the pressure on the solvent is reduced so as to

vaporise the dissolved gasoline, and the vapour is added to further supplies of the gas. L. A. COLES.

**Manufacturing lubricating oils.** R. W. HANNA, O. E. CUSHMAN, and T. W. DOELL, Assrs. to STANDARD OIL Co. (U.S.P. 1,566,000, 15.12.25. Appl., 28.4.24).—Lubricating oil having a green fluorescence is obtained by mixing lubricating oil from the residue of a cracking process operated under such conditions of temperature and pressure as to produce a polymerised and stabilised viscous oil stock, with lubricating oil obtained from petroleum by processes carried out below the stabilising conditions of temperature and pressure. L. A. COLES.

**Treating crude oil or petroleum. Treating petroleum.** C. G. HINRICHES (U.S.P. 1,566,008–9, 15.12.25. Appl., [A] 23.11.18, [B] 3.11.23).—(A) Natural petroleum emulsions are mixed with a chlorine additive product of a liquid fatty acid in quantity sufficient to effect separation of the oil from brine and other impurities. (B) Water-soluble thiocyanates are added to aqueous emulsions of hydrocarbon oils.

L. A. COLES.

**Revivifying fuller's earth [used for refining mineral oils].** F. W. HALL, Assr. to TEXAS Co. (U.S.P. 1,562,550, 24.11.25. Appl., 28.7.23).—Spent absorbent used in refining mineral oils is subjected to the distilling action of a carrier gas and then heated in presence of air.

H. MOORE.

**Treating [spent] decolorising and clarifying hydrous magnesium silicate.** M. L. CHAPPELL, Assr. to STANDARD OIL Co. (U.S.P. 1,562,868, 24.11.25. Appl., 15.10.24).—Spent hydrous magnesium silicate which has been used for treating mineral oils can be revived by treating it with a mixture of acetone, alcohol, and petroleum containing a small quantity of sulphuric acid. T. S. WHEELER.

**Bituminous emulsions.** G. S. HAY (E.P. 243,398, 31.5.24 and 28.2.25).—Bitumen is heated to 100–110° and mixed with up to 10% of an emulsifying agent comprising starch or other farinaceous material or dextrin, and after agitating, with a dilute solution of alkali. A portion of the starch may be replaced by a fatty acid, or added to a fatty acid in the form of an alkali gel.

B. W. CLARKE.

**Gasifying and carbonising coal and like substances.** H. MACAUX, Assr. to SOC. LYONNAISE DES EAUX ET DE L'ECLAIRAGE (U.S.P. 1,567,967, 29.12.25. Appl., 3.10.22).—See E.P. 186,927; B., 1923, 1164 A.

¶ **Process of making motor fuel.** L. DE FLOREZ, Assr. to TEXAS Co. (Re-issue 16,239, 29.12.25, of U.S.P. 1,437,045, 28.11.22. Appl., 10.10.24).—See B., 1923, 86 A.

**Materials for refining hydrocarbon oils.** R. CROSS (E.P. 227,084, 27.10.24. Conv., 31.12.23).—See U.S.P. 1,515,733; B., 1925, 64.

**Apparatus for treating hydrocarbons.** F. G. NIECE, Ass. to INTERNAT. HOLDING CO. (U.S.P. 1,566,341 and 1,566,416, 22.12.25. Appl., 1.7.22 and 17.7.22).—See E.P. 185,632 and 230,339; B., 1922, 850 A; 1925, 436.

**Classification of furnace ash, gas retort ash, household refuse, etc.** G. H. HADFIELD (E.P. 244,579, 9.12.24).

**Crushing ferruginous substances** (E.P. 236,578).—See I.

**Treating substances centrifugally** (E.P. 243,946).—See I.

**Obtaining vanadium from petroleum ash** (U.S.P. 1,563,061).—See X.

### III.—TAR AND TAR PRODUCTS.

**Insulating material from sapropel tar.** N. ZELINSKI and B. MAXOROV (Nefljanoe i slancevoe Chozjajstvo, 1925, 8, 945—949; Chem. Zentr., 1925, II., 2301).—The best conditions for the production of material suitable for the insulation of metal cables, from sapropel tar of  $d_{50}^{50}$  0.9554, viscosity (Engler) 3.20 at 50°, iodine value 98.9, dropping point 30.8°, and containing 2.5—18% of water, are rapid distillation until 40—60% of the tar has distilled over. The residue is a plastic material having  $d_{50}^{50}$  0.996—1.000, dropping point 43—103°, softening point (Kremer-Sarnow) 38—70°; it is completely liquid at 120°, adheres to sheet metal, and does not crack on bending; it contains H about 9.5%, C about 85%, O, and traces of N and S, and is free from mineral acids; and in a layer 2.3 mm. thick it has a dielectric resistance of 33.6 kilovolts in a test extending over 35 secs. L. A. COLES.

### IV.—DYESTUFFS AND INTERMEDIATES.

**Synthetic indigo.** R. LEPETIT (Chim. et Ind., 1925, 14, 852).—A process for the production of synthetic indigo, described by the author in a sealed note deposited with the Soc. Ind. de Mulhouse in 1900, and stated to be used by Du Pont de Nemours and Co., consists in treating aniline with formaldehyde and sodium bisulphite. The following reaction takes place:  $\text{Ph}\cdot\text{NH}_2 + \text{NaHSO}_3 + \text{CH}_2\text{O} = [\text{H}_2\text{O} + \text{NHPh}\cdot\text{CH}_2\cdot\text{SO}_3\text{Na}$ , and the product is treated with sodium cyanide to form phenylglycine nitrile,  $\text{NHPh}\cdot\text{CH}_2\cdot\text{CN}$ , which is subsequently fused with alkali hydroxide. L. A. COLES.

**Perylene and its derivatives.** ZINKE, SPRINGER, and SCHMID.—See A., 1926, 71.

**Dimethylisoidigotins.** WAHL and FAIVRET.—See A., 1926, 79.

**Volumetric determination of nitrobenzene.** KOLTHOFF.—See A., 1926, 84.

#### PATENTS.

**Manufacture of sulphide dyes and intermediate products.** W. CARPMAEL. From FARBENFABR.

VORM. F. BAYER U. Co. (E.P. 243,557, 12.1.25).—Intermediates having the general formula,

$$\begin{array}{c} \text{NH} \\ \diagup \quad \diagdown \\ \text{C}_6\text{H}_4 \text{---} \text{C}_6\text{H}_3 \cdot \text{CO} \cdot \text{NXY} \end{array}$$

(X=hydrogen, alkyl, or aryl, Y=alkyl or aryl), which readily condense with nitrosophenols forming indophenols suitable for the production of sulphur dyestuffs, are obtained by condensing carbazolecarboxylic acids with primary or secondary aliphatic or aromatic amines, in the presence of condensing agents. For example, 10.5 pts. of phosphorus trichloride are added to a mixture of 42 pts. of carbazole-2-carboxylic acid, 22 pts. of *p*-toluidine, and 900 pts. of toluene at 70°. After boiling for several hours, toluene is removed by distillation in a current of steam, and 2-carbazoloic acid *p*-toluidide, m.p. 294°, is filtered off and dried. A solution of the product in 3200 pts. of 90% sulphuric acid at 0° is mixed with a solution of 27.5 pts. of *p*-nitrosophenol in 450 pts. of 90% sulphuric acid, and, when condensation is complete, the solution is poured on to ice, and 2-carbazoloic acid *p*-toluidide indophenol is separated by filtration. The indophenol is sulphurised, e.g., by boiling with alcohol, sodium sulphide, and sulphur under a reflux condenser for several hours, yielding a dyestuff which dissolves in sodium hyposulphite solution giving a yellow vat which yields on cotton fast, bluish-black shades on subsequent oxidation. The preparation of 2-carbazoloic acid dimethylamide, thick needles, m.p. 198° (decomp.), 1-carbazoloic acid 2-carbazolamide, and 3-carbazoloic acid *p*-toluidide, and of the indophenols therefrom is also described.

L. A. COLES.

**Production of [anthraquinone] dyestuff intermediates.** J. THOMAS, and SCOTTISH DYES, LTD. (E.P. 243,505, 2.7.24).—Nitroanthraquinone derivatives substituted in the  $\beta$ -position are produced by condensing benzoylbenzoic acids substituted in the *para*-position in the presence of strong sulphuric acid or weak oleum, and nitrating the anthraquinone derivatives formed by the condensation, without separating them from the solution. The products are subsequently converted into the corresponding amino-compounds and simultaneously purified by treatment with alkaline reducing agents followed by washing with water. For example, a solution of 11.1 pts. by wt. of *p*-chlorobenzoylbenzoic acid, which is prepared by condensing chlorobenzene with phthalic anhydride in the presence of aluminium chloride, in 55.5 pts. of 6% oleum, is maintained at 140° for 2 hrs., and then cooled below 18°, when 3.5 pts. of sodium nitrate are added during  $\frac{1}{2}$  hr. with stirring. After keeping for 16 hrs., the melt is boiled with 600 pts. of water, and filtered after further dilution with water. A quantity of the moist product containing 10 pts. of crude nitro-2-chloroanthraquinone is boiled for 1 hr. with a solution of 25 pts. of crystalline sodium sulphide in 450 pts. of water, and the product is filtered off and washed, yielding 9 pts. of amino-2-chloroanthraquinone, m.p.

176—180°. Nitro- and amino-2-methylantraquinone are prepared in a similar manner from *p*-toluoylbenzoic acid.  
L. A. COLES.

**Production and isolation of alkali salts of aromatic sulphonic acids.** H. W. HILLYER, Assr. to NAT. ANILINE and CHEMICAL Co. (U.S.P. 1,564,239, 8.12.25. Appl., 3.1.20).—Sodium salts of aromatic sulphonic acids are obtained by treating a solution of the corresponding calcium salt with sodium chloride, whereby the sodium salt is formed and precipitated.  
A. COUSEN.

**Indigoid dyestuff of the anthraquinone series and intermediate products.** SOC. OF CHEM. IND. IN BASLE, Asses. of B. MAYER and W. MOSER (U.S.P. 1,567,158, 29.12.25. Appl., 18.11.24).—See E.P. 225,554; B., 1925, 953.

**Aromatic derivative of cyanuric chloride.** SOC. OF CHEM. IND. IN BASLE, Asses. of H. FRITZSCHE and P. SCHÄDELI (U.S.P. 1,566,742, 22.12.25. Appl., 26.3.25).—See E.P. 240,371; B., 1925, 954.

## V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

**Oxidation of drying oils: effect of anti-oxidising agents.** TARADOIRE.—See XII.

### PATENTS.

**Treating flax, hemp, or like textile materials to obtain their fibres in a silky and supple form.** C. DUBOIS (E.P. 232,935, 25.3.25. Conv., 26.4.24).—Fibres of flax, hemp, or the like, after retting, are treated with a hot alkaline lye at the ordinary pressure, washed with water, then with hot soapy soft water, and rinsed with water. This process is repeated until all resinous substances have been removed, and the fibres are thus rendered supple and silky. The silky lustre and feel may be further improved by impregnating with a suitable oil or varnish.  
A. GEAKE.

**Washing or otherwise treating wool, silk, soiled fabrics, or other fibrous materials.** E. C. DUHAMEL, and COMP. GÉN. DES IND. TEXTILES (E.P. 243,360, 8.9.24. Conv., 7.9.23; cf. E.P. 221,521, B., 1925, 985).—In order to reduce the loss of soap in cleaning operations, due to absorption by fats, dirt, etc., the soap solution and the material to be treated are passed in opposite directions through a series of vats. After the first hour the liquor squeezed from the material leaving the first vat is run to waste, and replaced by water from the last vat; the consequent dilution of the soap solution causes a part of the absorbed soap to be liberated.  
A. GEAKE.

**Preparing viscose solutions.** E. S. HUMBOLDT, Assr. to PACIFIC LUMBER Co. (U.S.P. 1,562,885, 24.11.25. Appl., 26.11.23).—Raw viscose is suspended or dissolved in water at 50° and heated until a sample coagulates immediately when treated with saturated sodium hydrogen carbonate solution. The whole is then coagulated by treatment with a solution of sodium chloride and sodium hydrogen carbonate,

and the precipitate washed and dissolved in dilute caustic soda for spinning.  
T. S. WHEELER.

**Reducing viscosity of nitrocellulose.** N. S. KOCHER and V. E. KIMMEL, Assrs. to EASTMAN KODAK Co. (U.S.P. 1,564,689, 8.12.25. Appl., 25.2.25).—Nitrocellulose is treated with a solution of a mineral acid and an alkali chlorate, the action being stopped before denitration of the nitrocellulose reduces its nitrogen content below 9.5%.

A. GEAKE.

**Removing pyridine from nitrocellulose.** L. W. EBERLIN, Assr. to EASTMAN KODAK Co. (U.S.P. 1,564,765, 8.12.25. Appl., 11.2.25).—Solid colloidal nitrocellulose, containing pyridine, is treated with a chlorinating agent in the presence of water and a substance facilitating penetration. When the pyridine is decomposed the nitrocellulose is removed and treated with an anti-chlor.

A. GEAKE.

**Manufacture of artificial silk and the like from cellulose derivatives.** H. DREYFUS (U.S.P. 1,566,384, 22.12.25. Appl., 10.3.22).—See E.P. 182,166; B., 1922, 627 A.

**Recovering lye from disintegrated celluloses.** G. MOSEBACH (U.S.P. 1,567,668, 29.12.25. Appl., 5.5.25).—See G.P. 398,041; B., 1925, 986.

**Chlorination of sulphite-[cellulose waste] liquor.** A. SCHMIDT (U.S.P. 1,567,395, 29.12.25. Appl., 30.3.22).—See E.P. 178,104; B., 1923, 765 A.

**Impregnating textile fabrics, ropes and the like.** V. LANGE (E.P. 230,859, 16.3.25. Conv., 14.3.24.)

**Process of making artificial sponges [from cellulose esters].** L. MOSTNY (E.P. 245,049, 3.11.25. Conv., 25.2.25).

**Manufacturing paper.** C. BÜCKING (E.P. 237,598, 16.7.25. Conv., 25.7.24).

**Membranes of parchment paper (G.P. 418,210).**—See I.

## VI.—BLEACHING; DYEING; PRINTING; FINISHING.

**Process for dyeing woollen piece goods evenly. Process for printing woollen piece goods by means of direct dyestuffs without steaming.** C. FAVRE (Sealed Notes [A] 1897, 2.4.09, and [B] 2120, 20.9.11. Bull. Soc. Ind. Mulhouse, 1925, 91, 618 and 619—620. Report by H. WAGNER. *Ibid*, 620—621).—[A] Uneven dyeing of woollen piece goods in a winch machine is avoided by retarding the rate of absorption of dyestuff by the following method. The pieces are entered into a cold dye-liquor containing sodium carbonate; the temperature of the dye-liquor is then raised to 30° and sufficient sulphuric acid to reduce the alkalinity to one-half, is added, the pieces at this stage being merely tinted. At 35° the dye-liquor is made slightly acid by addition of a further quantity of

sulphuric acid, whereupon dyeing proceeds rapidly. Subsequently dyeing is continued at boiling temperature, the dyed pieces being afterwards washed and dried. For the dyeing of 9 pieces (each 45 yds. in length) of woollen delaine a dye-bath containing 122 g. of Tartrazine, 125 g. of Lanafuch-sine SB, 68 g. of Cyanine B, and 8 kg. of sodium carbonate is used, two successive additions, each of 4 kg. of sulphuric acid of 65° B. (*d* 1.82), being made. [B] Woollen pieces are padded with a thickened dye-liquor containing a direct dyestuff and a small quantity of sodium chloride, then dried, and successively passed through two acid baths, the first containing a cold and the second a hot (80°) 0.5% solution of sulphuric acid, and afterwards washed and dried; the duration of immersion in each acid bath is  $\frac{1}{2}$  min. The resulting shades are particularly even. Suitable padding liquors contain 80 litres of water, 20 litres of dextrin thickening, 1 kg. of salt, and 130 g. of Diamine Fast Blue FFB (C), 8 g. of Benzo Fast Red 8DL (By), and 52 g. of Diamine Yellow CP (C), or 350 g. of Diamine Fast Blue FFB, 80 g. of Brilliant Fast Blue 4G (By), and 8 g. of Diamine Yellow CP. Wagner confirms the advantages claimed for these processes. A. J. HALL.

**Crêpe effects on delaines.** C. FAVRE (Sealed Notes [A] 2236, 31.3.13, and [B] 2266, 28.7.13. Bull. Soc. Ind. Mulhouse, 1925, 91, 615—616. Report by A. WOLF. *Ibid.*, 616—617).—[A] In carrying out the crêping process previously described (cf. B., 1921, 467 A) the unbleached delaine should be passed directly into the crêping bath, which must be kept vigorously boiling, the previous process of wetting-out in cold water being unnecessary; subsequent bleaching should be effected by steeping the woollen pieces for several hours in a bath containing sodium peroxide, since bleaching by means of a bisulphite has a deleterious action on the crêped fabrics. Other acids, particularly sulphuric acid, may be used instead of thiocyanic acid for the production of crêpe effects. For example, pleasing minutely crêped delaines are obtained by treating the woollen pieces for  $\frac{1}{4}$  hr. in a boiling liquor containing 1% of sulphuric acid. Delaine fabric usually shrinks during scouring and bleaching processes  $1\frac{1}{2}$ % in length and 6% in width, whereas the corresponding shrinkage produced by crêping by means of thiocyanic acid and sulphuric acid is  $5\frac{1}{4}$ % and 11%, and  $3\frac{1}{2}$ % and 11% respectively. [B] The formation of undesirable creases in delaine fabric during crêping is avoided by the use of a crêping bath containing 1000 litres of water and 25 kg. of sulphuric acid maintained at 87.5°; the pieces (10 of 80 m. each) are successively entered in open width into this bath through a mouthpiece, liquor from the bath being sprayed into the mouth-piece during the entry of the fabric by means of a pump. The pieces are well agitated for 1 hr. in the crêping bath and are then washed and bleached. Prolongation of the duration of crêping increases the minuteness of the crêpe effects. Wolf reports favourably on the processes, but points out that they are expensive in respect of labour and control. A. J. HALL.

**Rendering gelatin [in textile fabrics] insoluble at a moderate temperature by means of formaldehyde in the presence of Turkey-red oil.** A. BRYLINSKI (Sealed Note 2054, 9.12.10. Bull. Soc. Ind. Mulhouse, 1925, 91, 611—612. Report by P. BRANDT. *Ibid.*, 613—614).—A solution containing 10% of gelatin, 3% of 40% formaldehyde, and 2—4% of Turkey-red oil (ammonium sulphoricinoleate) remains liquid for  $1\frac{1}{2}$  hrs. in the cold, but for a few minutes only at a temperature of 40—50°, the coagulated product being completely insoluble in boiling water. Fabrics are prepared with insoluble gelatin by successive treatment with a solution of gelatin and a solution containing Turkey-red oil and formaldehyde, and afterwards drying, but more lustrous effects are obtained when the order of treatment is reversed. Brandt reports favourably on the process and finds that the formation of a small quantity of hexamethylenetetramine by interaction of ammonia and formaldehyde has no retarding or deleterious effect on the coagulation of the gelatin. Turkey-red oil accelerates the coagulation of gelatin by formaldehyde by reason of its dispersing action, and it may be replaced by similar dispersing agents such as sodium sulphoricinoleate, starch, gum Senegal, Protectol (By), and albumin. A. J. HALL.

**Clouding point of soap solutions.** BRAUN.—See XII.

#### PATENTS.

**Laundering of textile material after bleaching.** H. KOHNSTAMM AND CO. (E.P. 243,877, 30.10.24; cf. U.S.P. 1,514,067; B., 1925, 38).—A solution of an acid and a chloride or other metal salt, having a reducing action due to the metallic constituent, is a good sour and anti-chlor after bleaching. Stannous and titanous chlorides are specially suitable. Sodium silicofluoride or bisulphate or acetic, sulphuric, or phosphoric acid may be used as acid constituent; the use of oxalic, citric, hydrochloric, and benzoic acids is disclaimed. A. GEAKE.

**Weighting silks.** A. PEPPER (U.S.P. 1,565,390, 15.12.25. Appl., 14.8.25).—Silk is treated with a solution of stannic chloride, then washed, treated with a solution of sodium phosphate, washed, treated with dilute acetic acid, washed with cold water, treated with a solution of lead acetate, washed, and afterwards treated with a cold solution of sodium phosphate. A. J. HALL.

**Treatment [improving the durability] of [weighted] silk.** A. G. BLOXAM. From FÄRBEREI-U. APPRETTURGES. (VORM. A. CLAVEL UND F. LINDENMEYER) (E.P. 244,282, 6.1.25).—Weighted silk containing free acid deteriorates during storage more rapidly than silk which is neutral or feebly alkaline. Deterioration is prevented by treating silk, after weighting, with an alkaline substance, such as ammonia, trisodium phosphate, a borate, or an organic base. For example, weighted and dyed silk is treated with a 0.5% aqueous solution of soap and ammonia, or trisodium phosphate, or an alkaline solution containing gum tragacanth and  $\beta$ -naphthylamine. The tensile strength of treated and untreated

silk decreased during storage for 4 months in a tropical climate (but protected from direct sunlight) from 19.6 to 19.1 kg. and 20.7 to 10.4 kg. respectively.

A. J. HALL.

**Washable black silk piece goods and process for dyeing them.** J. SEYER, Assr. to STANDARD SILK DYEING Co. (U.S.P. 1,565,515, 15.12.25. Appl., 24.2.23).—Black silk piece goods fast to washing in lukewarm soap solutions, and to bleeding in cold water, are obtained by immersing the silk in a boiling liquor containing logwood and fustic extracts, then in a boiling bath containing hæmatin extract and soap, subsequently treating successively with hot solutions containing tannic acid and tartar emetic, and removing loose colour by soaping.

A. J. HALL.

**Dyeing silk.** J. SEYER, Assr. to STANDARD SILK DYEING Co. (U.S.P. 1,565,516, 15.12.25. Appl., 15.3.23).—Tin-weighted silk is dyed in a solution of disodium phosphate containing a direct dyestuff.

A. J. HALL.

**Dyeing cellulose acetate.** BRITISH DYESTUFFS CORP., LTD., W. H. PERKIN, and C. HOLLINS (E.P. 244,267, 16.12.24).—Dyestuffs suitable for application, without the use of dispersing agents, to cellulose acetate are prepared by acetylation and nitration, with or without subsequent hydrolysis or reduction, of non-sulphonated amino-, diamino-, or poly-amino-anthraquinones or their substituted derivatives. Acetylation may not be replaced by benzoylation since the products have no affinity for cellulose acetate. A brown dyestuff is prepared by the mono-nitration of 20 kg. of diacetyl-1:8-diamino-anthraquinone dissolved in 100 kg. of sulphuric acid for 1 hr. at 5–10° by means of 48 litres of a mixed acid containing 200 g. of nitric acid per litre; the crude dyestuff is precipitated by pouring the product into water, and recrystallised from chlorobenzene. A crimson dyestuff is prepared by reduction of mononitrodiaacetyl-1:8-diaminoanthraquinone by means of stannous chloride. The dinitro-compounds of 1:5- and 1:8-diacetyldiaminoanthraquinones have no affinity for cellulose acetate but the products obtained from them by hydrolysis or reduction have a useful affinity. Dinitro- $\beta$ -acetamidoanthraquinone is a useful brown dyestuff. 2-Nitro- and 4-nitro-anthraquinonylurethanes, the corresponding nitro-amines obtained by hydrolysis, and the amino-urethanes obtained by reduction also have an affinity for cellulose acetate.

A. J. HALL.

**Dyeing, printing, or stencilling cellulose acetate.** BRITISH CELANESE, LTD., and G. H. ELLIS (E.P. 243,841, 23.9.24).—The fastness to light of colours dyed, printed, or stencilled on cellulose acetate is improved by treating the material with a simple or substituted organic amino-compound. The improvement is specially marked when the initial fastness is poor, and with azo dyes. The most suitable compounds are aniline, substituted anilines, alkylanilines, and alkylphenylenediamines; the efficiency increases with the degree of alkylation.

Amines, such as diphenylamine, which darken when exposed to air and light are less suitable. The amines may be applied in aqueous solution, as a soluble salt, or solubilised or dispersed. They are readily absorbed by cellulose acetate and only a relatively small quantity is, therefore, required.

A. GEAKE.

**Printing or stencilling of products of or containing acetyl cellulose [cellulose acetate].** BRITISH CELANESE, LTD., G. H. ELLIS, and E. GREENHALGH (E.P. 244,143, 28.7.24).—Printed coloured effects fast to rubbing are obtained on cellulose acetate by means of printing pastes containing specially solubilised dyes (cf. E.P. 219,349; B., 1924, 906) or other dyestuffs and a substance capable of exerting a swelling or solvent action on cellulose acetate. Suitable swelling agents include the salts of sulphonic acids of benzene, naphthalene, and anthracene and substituted derivatives such as phenol, naphthol, aminonaphtholsulphonic acids, and particularly a thiocyanate of ammonium or an alkali metal (for alkaline or neutral printing pastes) and zinc nitrate or chloride (for acidic printing pastes). For example, woven or knitted cellulose acetate silk is printed with bluish-red effects by means of a printing paste containing 40 g. of a colour paste (prepared by heating 4 g. of 2:4-dinitrobenzene-1-azodimethylaniline, 12 c.c. of water, and 24 g. of 70% sodium ricinoleate until dispersion of the dyestuff is complete), 5 g. of soda ash, 20 g. of ammonium thiocyanate, 40 g. of water, and 295 g. of a thickening (prepared by boiling for 10 min. a mixture containing 600 g. of dark British gum, 600 g. of a 50% aqueous solution of gum arabic, and 800 g. of water); after printing, the fabric is dried (preferably by means of hot air), steamed for 15 to 20 min. in dry steam, soaped lightly at 60°, washed, and dried. (Reference is directed, in pursuance of Sect. 8 (2), of the Patents and Designs Acts, 1907 and 1919, to E.P. 224,925.)

**Printing textile fabrics.** J. R. GEIGY A.-G. (E.P. 223,888, 22.9.24. Conv., 22.10.23).—Instead of ethylene thiodiglycol (cf. E.P. 147,102 and 150,303; B., 1923, 766 A), ethylene glycol and ethylene chlorohydrin are used as colour solvents in the preparation of printing pastes. For example, printing pastes suitable for application to weighted silk contain 4 g. of Chromazurol S conc., 26 g. of water, 8 g. of ethylene chlorohydrin, 54 g. of starch and gum tragacanth thickening, and 8 g. of chromium acetate of 20° B. (*d* 1.16), or 4 g. of Eriochrome Red B, 12 g. of water, 4 g. of 20% ammonia, 10 g. of ethylene glycol, and 70 g. of 50% aqueous gum thickening. Ethylene glycol and ethylene chlorohydrin have no deleterious action on textile materials and may also be used advantageously in discharge pastes.

A. J. HALL.

**Cotton fabric having a linen-like finish resistant to wear and washing.** E. R. CLARK, Assr. to M. S. ERLANGER (U.S.P. 1,564,943, 8.12.25. Appl., 1.3.23).—Cotton fabric is treated with a viscose solution of low alkalinity, the excess removed,

and the cellulose precipitated from the viscose with a precipitating bath. A. GEAKE.

Treating cotton textiles to impart a linen-like appearance thereto. R. M. L. G. HÉBERT, Assr. to A. VERGÉ (U.S.P. 1,567,264, 29.12.25. Appl. 7.4.25).—See E.P. 232,451; B., 1925, 497. The soured fabric is chlorinated before treatment with sulphuric acid.

Machine for mercerising skeins of thread. C., G., and F. BONNET (E.P. 244,806, 28.6.24).

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

Sulphatisation of burnt pyrites by the action of the gases obtained on roasting. A. E. MAKOVECKI and K. N. SCHABALIN (Russian J. Chem. Ind., 1925, 1, [3], 21—23).—The conversion of the copper in burnt pyrites into the sulphate by the action of mixtures of sulphur dioxide and air under various conditions has been investigated. The range of temperature most favourable to the formation of copper sulphate in this way is 600—640°, and the extent to which the action proceeds increases with the proportion of sulphur dioxide in the mixed gases. The dissociation pressures of ferrous and ferric sulphates are greater than that of copper sulphate, but the copper rendered water-soluble contains about 20% of water-soluble iron salts. On the industrial scale, the reaction may be carried out in a furnace of the Herreshoff type. T. H. POPE.

Hydrating lime for bleach [bleaching powder] manufacture. D. F. RICHARDSON, W. E. EMLEY, and J. M. PORTER (Chem. Met. Eng., 1925, 32, 936—937).—A sample of quicklime containing 92.3% CaO and showing 6.6% loss on ignition was slaked with varying proportions of water and then chlorinated. The bleaching powder made was tested for available chlorine at the time of preparation and after storage for 30 days in a stoppered bottle, and also for apparent density. The best results were obtained when little or no free water was present in the slaked lime, *i.e.*, by using 45—50 pts. of water to 100 pts. of quicklime. With these proportions the percentage of Ca(OH)<sub>2</sub> in the slaked lime was a maximum (93.6%). C. IRWIN.

Hydrolysis of aluminium sulphate—an application of the quinhydrone electrode. A. J. PELLING (J. Chem. Met. Soc. S. Afr., 1925, 26, 88—93).—The  $p_H$  values of solutions of the salt were determined at various dilutions, using both the Clark shaking hydrogen electrode, and the quinhydrone electrode. The latter was found to be very suitable, and the values obtained agreed well. New platinum must be used for the electrodes. The dissociation constants calculated indicate that at 15° the first stage of hydrolysis is represented by  $Al_2(SO_4)_3 + 2H_2O = 2Al(SO_4)(OH) + H_2SO_4$ .

S. I. LEVY.

Determination of coloured gases by means of the photo-electric cell, and its application to

nitrous vapours. H. and A. COPAUX (Compt. rend., 1925, 181, 1058—1060).—A method is described for the determination of coloured gases by measuring the intensity of light transmitted through a column of the mixture by means of a photo-electric cell in circuit with a sensitive galvanometer. In the case of nitrogen peroxide mixed with air, the galvanometer deflection was plotted against the percentage of the former gas as determined by chemical analysis. Under the best conditions, differences of 0.02% were detectable in mixtures containing 0.2—0.7% of nitrogen peroxide. The absorption-coefficient ( $K$ ) was obtained from the relation  $K = \log (J_0/J) \cdot 1/C$ , where  $J_0/J$  is the ratio of the intensities of incident and transmitted light as shown by the corresponding galvanometer deflections. As the concentration ( $C$ ) diminishes,  $K$  gradually increases, since the sensitivity of nitrogen peroxide to partial pressure changes causes an increase in the coloured form of the gas (NO<sub>2</sub>) according to the equilibrium  $N_2O_4 \rightleftharpoons 2NO_2$ . J. GRANT.

Absorption of oxygen by pyrogallol. KOVÁCS-ZORKÓCZY.—See A., 1926, 100.

Analysis of mixtures of metallic iron and iron oxides. INGBERG.—See X.

### PATENTS.

Electrode for use in the contact process of making sulphuric acid. F. VORLÄNDER and H. WEBER, Assrs. to A.-G. FÜR ANILIN-FABR. (U.S.P. 1,565,691, 15.12.25. Appl., 29.6.25).—The electrodes of an electrical precipitator for use in the manufacture of sulphuric acid are composed of frame elements carrying a coat of lead, the elements consisting of material which does not react with sulphuric acid with evolution of hydrogen. H. ROYAL-DAWSON.

Utilisation of the gases evolved in the concentration of sulphuric acid for the preparation of sulphuric acid. RHENANIA VEREIN CHEM. FABR. A.-G. (F.P. 592,561, 2.2.25. Conv., 22.2.24).—The gases evolved during the final concentration of sulphuric acid are returned to the lead chamber to be re-converted into acid. A. R. POWELL.

Manufacture of hydrocyanic acid or cyanides [from calcium cyanamide]. STICKSTOFFWERKE G.m.b.H., Asses. of H. FRANCK and H. HEIMANN (G.P. 417,018, 9.4.24).—Calcium cyanamide is treated at a low red-heat with a mixture of hydrogen and carbon monoxide (water-gas), and the hydrogen cyanide evolved is collected and converted into cyanides in the usual way. Alternatively the water-gas may be generated *in situ* by heating a mixture of calcium cyanamide and carbon in an atmosphere of steam. A. R. POWELL.

Oxidation of nitrogen compounds [nitric oxide]. VEREIN FÜR CHEM. U. MET. PRODUKTION (G.P. 418,322, 16.9.22).—Gases containing nitric oxide are brought into contact with highly activated charcoal and removed when the ratio of nitric oxide to nitrogen peroxide is about 1:1. A. R. POWELL.

**Producing soluble carbonates and hydrates [hydroxides].** A. F. MEYERHOFER (E.P. 243,990, 24.7.24. Addn. to 219,971; B., 1926, 12).—The calcium fluoride produced by interaction of sodium fluoride and calcium carbonate is converted into sodium titanofluoride or other similar double fluoride, instead of into sodium silicofluoride.

C. IRWIN.

**Method of hydrating lime.** J. P. RICH (U.S.P. 1,565,107, 8.12.25. Appl., 29.12.24).—To a known weight of unground lime the calculated quantity of water is added with agitation. A jet of air is then blown in while mechanical agitation is continued, and the hydrated lime withdrawn by suction. C. IRWIN.

**Production of alkali polysulphides containing sulphur in a colloidal form.** R. RUSSELL (E.P. 243,394, 23.5.24).—Sulphur, or material containing sulphur, is ground with a compound of sodium or potassium and with a compound of boron together with water. The resulting sludge is heated by steam to 130–140° and filtered. The proportions used may be 2 pts. of flowers of sulphur, 1 pt. of borax, 1 pt. of soda-ash, and 4 pts. of water. A polysulphide solution is thus obtained which contains up to 50% of sulphur by weight and is only slightly alkaline. It is suitable for the cold vulcanisation of rubber, and as a vehicle for sulphur for medicinal purposes. The process is also applicable to the extraction of sulphur from ores, the sulphur being precipitated from the solution by addition of acid.

C. IRWIN.

**Coating particles [of copper sulphate] with inert powder.** L. A. BUNDS, Assr. to SAN JOSE SPRAY MFG. Co. (U.S.P. 1,562,821, 24.11.25. Appl., 14.4.25).—Copper sulphate crystals are ground and mixed with talc powder and the mixture is passed in a current of hot air into a centrifugal separator. The crystals lose water on the surface and become coated with the powder and these heavier particles are separated from the unused talc in the separator. The material thus obtained can be stored without agglomerating and the copper sulphate dissolves readily in water, if required, for example, as an insecticide.

T. S. WHEELER.

**Apparatus for making anhydrous metal chlorides.** F. T. WOHLERS, Assr. to ANHYDROUS METALLIC CHLORIDES CORP. (U.S.P. 1,564,302, 8.12.25. Appl., 17.12.21).—A compound of the metal of which the chloride is required is fed into a rotary retort of fused silica along with a regulated supply of chlorine. The metal chloride is distilled off and condensed.

C. IRWIN.

**Gas-purifying composition [for removing ammonia from gases].** R. P. MASE, Assr. to MINE SAFETY APPLIANCES Co. (U.S.P. 1,564,433, 8.12.25. Appl., 2.6.22).—Ammonia is removed from gases by means of activated charcoal impregnated with an anhydrous copper salt.

**Reducing sulphates and the like.** A. H. WHITE, Assr. to J. E. ALEXANDER and E. G. GOODELL (U.S.P. 1,565,300, 15.12.25. Appl., 18.10.24).—

Sulphates or other reducible salts are reduced to sulphites by heating in the presence of carbonaceous material and a metal oxide capable of reacting with carbon dioxide at the reduction temperature to form a carbonate, with evolution of heat. The quantity of oxide used is sufficient to form a carbonate with the main part of the carbon dioxide evolved in the reduction, which is effected at a temperature above 300°, but below the temperature at which the carbonate formed is completely dissociated.

H. ROYAL-DAWSON.

**Manufacture of sodium sulphide.** B. ROOS v. Co. (G.P. 418,313, 16.9.24. Addn. to 404,410; B., 1925, 132).—Sodium sulphate is melted in a shaft or revolving furnace and the requisite coal or reducing gas is then introduced into the fused mass.

A. R. POWELL.

**Electrolytic production of copper carbonate.** H. HOWARD, Assr. to GRASSELLI CHEMICAL Co. (U.S.P. 1,565,367, 15.12.25. Appl., 29.8.24).—A solution containing an agent supplying carbon dioxide and an electrolyte is electrolysed with a copper anode, enclosed in a diaphragm; carbon dioxide is supplied to the solution during electrolysis, and the copper carbonate produced is removed from the solution by settling or filtering.

B. M. VENABLES.

**Synthetically made precious stone.** D. BERTOLINI, Assr. to SWISS JEWEL Co. (U.S.P. 1,565,777, 15.12.25. Appl., 20.1.25).—A stone having the hardness of natural sapphire and the colour and appearance of natural aquamarine is composed of alumina, and oxides of magnesium, cobalt, and vanadium in the approximate proportion of 86% of alumina, 14% of magnesium oxide, and traces of cobalt and vanadium oxides.

H. ROYAL-DAWSON.

**Manufacturing hydrogen sulphide.** E. BINDSCHEDLER and E. W. RUGELEY, Assrs. to TUBIZE ARTIFICIAL SILK Co. OF AMERICA (U.S.P. 1,565,894, 15.12.25. Appl., 15.4.24).—A mixture of hydrocarbon oils and sulphur is heated and the hydrogen sulphide evolved is purified by passing it through a material of high absorptive capacity.

H. ROYAL-DAWSON.

**Apparatus for producing zinc oxide.** M. P. KIRK, Assr. to KIRK SIMON SMELTING Co. (U.S.P. 1,566,103, 15.12.25. Appl., 28.3.21).—A zinc compound is mixed with carbonaceous material and fed into the upper end of an inclined rotary kiln, through which hot reducing gases travel in the same direction. The solid residue is discharged from the lower end of the kiln, and the evolved zinc fumes pass into a combustion chamber into which air is passed to form zinc oxide.

H. ROYAL-DAWSON.

**Manufacturing gypsum from anhydrite.** M. FARNSWORTH (U.S.P. 1,566,186, 15.12.25. Appl., 11.3.25).—Anhydrite is ground to a size between the limit in which the largest particles do not substantially exceed 135 microns, with an average size of 18 microns, and that in which the largest particles do not exceed



30 microns, with an average size of 7 microns, and the ground anhydrite is hydrated to form gypsum.

B. W. CLARKE.

**Manufacture of chromium compounds free from iron.** CHEM. FABR. KUNHEIM U. Co., Assees. of K. PULS (G.P. 418,050, 9.1.24).—Chromic hydroxide suitable for the production of chromium compounds free from iron, is precipitated by the addition of sludge containing ferrous hydroxide or ferrous carbonate to solutions obtained by treating ferrochromium with acids.

L. A. COLES.

**Manufacture of hydrogen peroxide.** RHENANIA VEREIN CHEM. FABR. A.-G., ZWEIFNIEDERLASSUNG MANNHEIM, and F. MARTIN (G.P. 418,321, 16.5.22. Addn. to 403,253; B., 1925, 71).—The crude solution of hydrogen peroxide obtained as described in the chief patent is purified by treatment with hydrofluoric acid or with a soluble phosphate or fluoride.

A. R. POWELL.

**Manufacture of sodium sulphate and ammonium chloride.** E. A. E. WACHÉ (F.P. 589,191, 21.1.24).—The equivalent weight of sodium chloride is added in small portions, with constant stirring, to a solution, at 90–95°, of ammonium sulphate in 1–1.5 times its weight of water. After removing the sodium sulphate which crystallises out, the solution is cooled to 30°. Ammonium chloride separates and is removed. The mother liquor is used for dissolving fresh quantities of ammonium sulphate and sodium chloride.

L. A. COLES.

**Method of producing chlorine.** E. M. PARTRIDGE and E. W. SCARRITT (U.S.P. 1,566,040, 15.12.25. Appl., 11.5.25).—A pyrosulphate, a chloride, and a permanganate are mixed together in the presence of moisture.

H. ROYAL-DAWSON.

**Making aluminium sulphate from aluminous materials.** R. MOLDENKE and W. SCHUMACHER (U.S.P. 1,567,610, 29.12.25. Appl., 10.1.23).—See G.P. 383,435; B., 1924, 294.

**Evaporating solutions** (E.P. 243,982).—See I.

**Absorption of gases in liquids** (U.S.P. 1,565,366).—See I.

**Electrolysis of alkali chlorides** (Austr.P. 100,562–3).—See XI.

**Ammonium chloride and sulphate** (G.P. 417,214).—See XVI.

## VIII.—GLASS; CERAMICS.

**Machine for transverse tests of clay and glass laboratory specimens.** A. C. HARRISON (J. Amer. Ceram. Soc., 1925, 8, 774–783).—A machine capable of giving accurate results for specimens varying widely in size and strength consists essentially of a beam and a lever, which constitute the active element, an adjustable counterpoise, valve mechanism for controlling the flow of shot, and straining mechanism. Results of tests made with the machine on vitreous china and glass are tabulated. F. SALT.

**Drying properties of clays.** D. C. LINDSAY and W. H. WADLEIGH (J. Amer. Ceram. Soc., 1925, 8, 677–693).—Other conditions being constant, the rate of evaporation of water from clay varies approximately in direct proportion to the surface exposed per unit weight of clay. It increases with a rise in temperature, decreases with a rise in the wet bulb temperature of the air, and decreases, after shrinkage water has been removed, with a decrease in the moisture content, due to decrease in the effective vapour pressure of moisture in the material. The most important factor in the drying of clay is the rate of evaporation from the surface in relation to the rate of diffusion of moisture from within to the surface. The causes of the more common drying injuries are explained. Important factors relating to the preparation of drying schedules are the determination of the rate of shrinkage and the point at which shrinkage ceases. A critical stage occurs at, and immediately preceding, the point where shrinkage ceases. Beyond this point, drying may safely be accelerated. Determinations of modulus of rupture on dried specimens of different clays and body mixtures indicated that the strength varied directly with the residual moisture content, the removal of the final 1% of moisture having a marked effect. In an Appendix, a description is given of the special drying cabinet and of the optical flexure balance used. The former is fitted with means for controlling humidity, temperature, and air velocity. Frequent observations of loss of moisture in the specimen are rendered possible by means of a simple weighing device having an extension link into the cabinet.

F. SALT.

**New type of oxy-acetylene fusion furnace, with notes on the behaviour of refractories at cone 40.** A. F. GORTON and W. H. GROVES (J. Amer. Ceram. Soc., 1925, 8, 768–773).—A small refractory cylinder, made of electrically fused magnesia, is supported on a stand of angle iron. The support, which holds the cone plaque and specimen, rests on square pins, which fit loosely into holes cut through the furnace lining and steel shell 120° apart. New features of the furnace are a slot cut through the front wall to afford a clear view of the cones, and the acetylene burner, which is applied vertically at the bottom of the furnace. The furnace is convenient and economical to operate, and is portable. In the course of a series of tests, it was observed that fireclay and alumina interact at cone 32, alumina and chrome above cone 36, and zircon and magnesia at about cones 37–38.

F. SALT.

**Articles of fused magnesite [magnesia].** J. BRONN (Chem.-Ztg., 1925, 49, 1053–1054).—The technical difficulties encountered in the manufacture of articles of fused magnesia are of two kinds; the first is due to the high melting point of magnesia (about 2800°), and the second to the non-plastic nature of the fused material. The addition of other substances (silica, alumina, lime, etc.), with the object of increasing the plasticity, is not practicable, owing to the formation in such mixtures of eutectics of

considerably lower melting point. In the fusion process, magnesite undergoes a certain degree of purification, the secondary ingredients being partially volatilised; for example from a raw material containing 88% of magnesia, the fused material contained 94–95.5%. If the fused product is cooled slowly, well-developed crystals several mm. in length (probably periclase) are formed. The sp. gr. of the fused material is 3.5–3.62; that of crucibles made therefrom, 3.56. Such crucibles are now being made in various sizes. They are much more sensitive to abrupt changes of temperature than quartz crucibles, and they also tend to contract slightly when heated. When in direct contact with magnesite or magnesia, carbon has a reducing and volatilising effect at about 2000°. For work at this and higher temperatures, therefore, it is necessary to place the magnesia crucible in a thin carbon or graphite crucible and to fill the space between the two with powdered magnesia. Magnesia crucibles also show great affinity for sulphur, traces of which are present in granulated carbon. F. SALT.

**Effect of heat on the strength of calcined kieselguhr-Portland cement mixtures.** S. J. McDOWELL and H. M. KRANER (*J. Amer. Ceram. Soc.*, 1925, 8, 784–788).—The mixture contained 55% by weight of Californian kieselguhr (calcined at 1200°) and 45% of Portland cement. To this dry mixture 65% by weight of water was added. Specimens were moulded from the damp mixture, allowed to age for 28 days, and heated at the rate of 100° per hr. The moduli of rupture were determined on specimens heated at intervals of 100° up to 1100°. A great decrease in strength was noted between room temperature and 100°, and a further decrease between 100° and 200°. Between 200° and 500° the strength was practically constant, but fell again sharply between 500° and 600°. Between 600° and 900° it was fairly constant, a slight increase occurring at the latter temperature. A rapid decrease again took place above 1000°. F. SALT.

**Comparison of methods used in estimating the maturing of terra cotta.** L. ANDERSON (*J. Amer. Ceram. Soc.*, 1925, 8, 762–767).—A comparative study was made of practical methods, with the object of developing more satisfactory means of determining the maturing point of terra cotta fired in a down-draught kiln. Colour trials (red body dipped in red slip), which were formerly used to indicate temperature by a change in colour, were found unsatisfactory, nor were shrinkage trials entirely satisfactory; shrinkage was found to continue during the "soaking" period after firing had ceased, and also on re-fired trials. The actual maturing temperature must be determined by the additional aid of cones. Shrinkage trials may, with advantage, be placed in different parts of the kiln, in order to provide useful data regarding variations of temperature within the kiln. F. SALT.

**Effects of composition on the properties of sheet steel enamels.** H. G. WOLFRAM and W. N. HARRISON (*J. Amer. Ceram. Soc.*, 1925, 8, 735–755).

—Three series of enamels were studied, in which the refractory portion was supplied by felspar alone, by a 7:5 mixture of felspar and flint, and by flint alone. The frits consisted of 60% of this refractory portion, 5% each of boric oxide and sodium oxide, and 30% of equal proportions of three of the following common constituents: the oxides of boron, sodium, and zinc, cryolite, fluorspar, and sodium antimonate; these were substituted systematically one for the other. The enamels were applied to 8-inch steel plates, and were tested for resistance to thermal shock, acid attack, and impact, and for relative opacity. The effect of substituting one constituent for another varied to some extent with the type of enamel; hence definite conclusions are impossible. Enamels most suitable for general use were found among those containing both felspar and flint; others having special properties occurred in the two series containing felspar only and flint only. Enamels of the former type (felspar only) were more resistant to impact-on-edge, less resistant to impact-on-centre, to quenching, and to acid attack, and less opaque. F. SALT.

**Formation of mullite from cyanite, andalusite, and sillimanite.** J. W. GREIG (*Amer. J. Sci.*, 1926, [v], 11, 1–26).—See B., 1925, 761.

#### PATENTS.

**Melting and fining glass.** A. L. HARRINGTON, Assr. to PITTSBURGH PLATE GLASS CO. (U.S.P. 1,564,235, 8.12.25. Appl., 5.12.23).—A preliminary fusion of the batch in a pot is followed by a transference of the pot to an electric furnace in which melting and fining are completed. A. COUSEN.

**Making sheet glass.** H. K. HITCHCOCK (U.S.P. 1,564,240, 8.12.25. Appl., 5.2.25).—Against an outlet slot from a tank furnace is a covered bath of molten metal, wider than the slot, and provided with means of regulated heating between cover and bath. Glass flowing from the slot passes over the metal and through a pair of rolls, at least one of which is driven, placed at the forward end of the bath. A. COUSEN.

**Preparing quartz rods or canes.** L. B. MILLER, Assr. to BRITISH THOMSON-HOUSTON CO., LTD. (E.P. 237,264, 15.7.25. Conv., 18.7.24).—Quartz in the plastic state hanging from a furnace in the form of a rope subject to gravity, is continuously cut into sections by mechanical means and allowed to cool while still hanging freely. B. W. CLARKE.

**[Fused silica] refractory material.** W. A. HARTY (U.S.P. 1,563,853, 1.12.25. Appl., 18.11.21).—Fused silica is produced by fusing sand in an electric furnace beneath an isolating layer of amorphous or crystalline silicon carbide. F. SALT.

**Treatment of clay.** T. W. PARKER (E.P. 243,929, 5.2.25).—Clay is purified by deflocculating it in aqueous suspension by means of sodium silicate, together with a non-soap-forming acid (*e.g.*, sulphuric or hydrochloric acid) in amount insufficient to neutralise the alkali content of the silicate, and, after separation, is flocculated by addition of further acid. A. COUSEN.

**Preparation of clay.** CHEM. LAB. FÜR TONIND. U. TONIND.-ZTG., H. SEGER U. E. CRAMER, and M. PLATZSCH (G.P. 417,361, 13.7.24).—Raw clay is stirred with a solution of the products obtained by treating organic substances, such as wood meal, peat meal, fruit waste, etc., with sulphur dioxide or with waste gases containing sulphur dioxide. The process is applicable to the treatment of non-plastic clays, and the preparation of the clay can be completed within a few weeks. A. R. POWELL.

**Melting furnace of the tilting type [for fusing basalt].** P. DHÉ (U.S.P. 1,558,250, 20.10.25. Appl., 1.3.24).—A tilting furnace for the fusion of basalt, providing for the direct casting of the molten material in moulds, is built of firebricks, and is provided with a tap-hole at the front and a loading aperture at the rear. The hearth is in three sections of approximately equal size; that at the rear is inclined toward the front, the other two being inclined toward the rear. A feeding hopper, which can be closed by means of a flap, is attached to the rear of the furnace. F. SALT.

**Manufacture of a refractory plastic mass [for crucibles].** MASCHINENFABR. OERLIKON (G.P. 416,766, 24.6.24. Conv., 12.5.24).—The usual mixture of fireclay and graphite is moistened with a solution containing boric acid and borax in the molecular ratio of 4:1. Articles made of this mixture dry rapidly in the air without the formation of fissures, even when drying is accelerated by heat. A. R. POWELL.

**Decorating or finishing earthenware or [other] pottery.** LOVATT AND LOVATT, LTD., and A. E. LOVATT (E.P. 242,898, 27.5.25).—Colouring matter, such as the oxide of a metal, preferably in powder form, is mixed with a matt medium, also in powder form, composed of about 2 pts. of quartz, 1 pt. of lime, and 1 pt. of clay. The mixture is worked to a viscous mass with liquid gum or other substance. The proportions of matt medium and colouring agent vary according to the strength of the latter. The design is transferred, or printed, with this mixture, upon ware which has been dipped in glaze and dried, but not fired. A single firing operation then produces an unglazed design upon a glazed ground. F. SALT.

**Opacifying enamels and glazes.** H. KRETZER (G.P. 416,937, 16.5.15).—The vitreous constituent of enamels and glazes is ground with insoluble fluorides of metals which form white oxides and with silica or acid silicates of metals the oxides of which are white. Titania or acid titanates may also be added. Subsequent strong ignition of the mixture improves the covering power. A. R. POWELL.

**Refractory material.** S. J. LUBOWSKY, ASS. to METAL AND THERMIT CORP. (U.S.P. 1,567,445, 29.12.25. Appl., 18.12.22).—See E.P. 232,679; B., 1925, 548.

**Porcelain crucible.** A. KÖNIG, ASS. to STAATL. PORZELLAN-MANUFACUR (U.S.P. 1,567,654, 29.12.25. Appl., 5.8.24).—See E.P. 220,618; B., 1925, 244.

**Sintering and melting refractory oxides etc.** (G.P. 417,375).—See X.

## IX.—BUILDING MATERIALS.

### PATENTS.

**Treating timber for preventing subsequent shrinkage.** SPIRITUS-PRESSHEFE U. CHEM. FABR. HAMBURGER KUFFNER A.-G., and E. MURMANN (E.P. 230,044, 16.2.25. Conv., 27.2.24).—Timber is subjected in closed vessels to the simultaneous action of ammonia (up to 0.5% by weight of the timber) and steam at a temperature not exceeding 120°, preferably 70—100°. B. W. CLARKE.

**Protection of wood and other materials against termites and other gnawing insects.** THERMIT, LTD., A./S. (E.P. 243,595, 26.3.25. Conv., 17.2.25).—Wood is impregnated or coated with a dilute aqueous solution containing an alum and a small proportion of lead acetate, which interact to form aluminium acetate. The salts are mixed in the dry state, with or without the addition of camphor, volatile oils, or colouring matter. B. W. CLARKE.

**Manufacture of cement.** T. RIGBY (E.P. 243,410, 28.7, 13.8, 22.10, 3.12, and 5.12.24).—Cement slurry is dispersed in the kiln by spraying devices which are situated outside the kiln head and project the slurry to different regions spaced lengthwise along the kiln. Partly dried material or dry dust carried out in suspension by the kiln gases is collected by a portion of the slurry fed to the kiln as a liquid stream, or by the slurry before dispersion, concentrating this to a water content of 36—37%. The supply of slurry is arranged so that a wetter region is ensured nearer the kiln mouth. B. W. CLARKE.

**Alumino-calcareous hydraulic cement.** U. B. VOISIN (E.P. 243,876, 30.10.24).—A mixture of bauxite and calcareous material (lime) is heated for 9—12 hrs. at a temperature (900—1100°) well below the melting point in order to avoid partial melting. This prevents adhesion to the walls of the kiln, and produces an alumino-calcareous cement with rapid hardening properties and good resistance to sea water and selenitic waters. B. W. CLARKE.

**Paving and surfacing material.** C. E. RAMSDEN (E.P. 243,418, 1.8.24 and 7.2.25).—Granular materials possessing a low degree of porosity, e.g., ground flint, slag, or other silicious material, are superficially impregnated with a green colouring matter (chromium compounds) fixed by firing. The resulting material can be rammed or rolled, with or without a binding material consisting of blown linseed oil or rubber latex, to form a surfacing material for hard tennis courts or the like. B. W. CLARKE.

**Manufacture of building materials.** C. D. BURNEY (E.P. 244,142, 12.7 and 14.8.24).—Fibrous material, e.g., sawdust, impregnated with a solution of a metal salt, and treated to produce an insoluble

precipitate, is mixed with cement, mortar, etc., and moulded under pressure to form bricks and the like.

B. W. CLARKE.

#### Induration or mineralisation of organic matter.

C. D. BURNEY (E.P. 244,178, 12.9.24).—Fibrous organic matter, *e.g.*, sawdust, wood pulp, etc., is impregnated with a solution of a metal salt (excluding highly basic solutions) and treated to produce an insoluble precipitate. Thus, sawdust is treated with 10% ferrous chloride solution and mixed with calcium hydroxide or calcium carbonate; or treated with sodium aluminate and exposed to carbon dioxide; or treated with a mixture of ferric chloride and a soluble dichromate. The mineralised sawdust is mixed with cement, and, on setting forms artificial wood or artificial stone, according to the proportions of sawdust and cement.

B. W. CLARKE.

**Glazing or surfacing material for tiles, slabs, and other articles.** W. J. S. DUFTON and T. W. J., and L. S. OBANK (E.P. 244,312, 27.3.25).—A mixture of water colours, lime and/or cement, and polymerised oils, treated with slightly alkaline water, with or without the addition of infusorial earth, is applied to concrete, tiles, etc., as a cold glazing or facing material.

B. W. CLARKE.

**Sulphur-containing article.** R. F. BACON, W. H. KOBBE, and P. H. BASCOM, Assrs. to TEXAS GULF SULPHUR CO. (U.S.P. 1,561,767, 17.11.25. Appl., 25.11.22).—Concrete or burnt clay is immersed in molten sulphur at 125° until it has absorbed about 15% of its weight. The product has a tensile strength at least ten times that of the original concrete or clay.

T. S. WHEELER.

**Manufacture of artificial stone.** J. JAKOB (G.P. 417,360, 23.12.24).—Artificial stone may be made by melting with sulphates silicates of the type  $R''_2SiO_4$ , mixtures containing more bases than an equimolecular mixture of  $R''_2SiO_4$  and  $R''_2Si_2O_6$ , silicates of trivalent metals of the type  $R'''_4(SiO_4)_3$ , mixtures more basic than an equimolecular mixture of  $R'''_4(SiO_4)_3$  and  $R'''_4(Si_2O_6)_3$ , or mixtures of any of the foregoing classes of compounds.

A. R. POWELL.

**Cement compositions for making artificial stone and treatment of castings made therefrom.** W. J. S. DUFTON and T. W. J., and L. S. OBANK (E.P. 244,973, 27.3.25).

**Bituminous emulsions** (E.P. 243,398).—See II.

**Gypsum from anhydrite** (U.S.P. 1,566,186).—See VII.

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

**Influence of melting scrap on the working of the blast furnace and the economy of cast-iron production.** E. BORMANN (Stahl u. Eisen, 1925, 45, 2041—2049, 2085—2091).—The effect of the addition of up to 81% of scrap to an ore burden was investigated. The coke and lime consumption

fell to a minimum at 70% of scrap. The daily output rose to a maximum at 75% of scrap and the amount of slag produced was a minimum at 78%. In practice a saving in coke of about 30% and an increase in production of about 60% was obtained. Heat balances were drawn up for one ore charge and four charges with increasing additions of scrap. As the amount of scrap used rose the carbon monoxide in the waste gases increased and the carbon dioxide fell. The calorific value of the waste gases rose but the degree of efficiency of the fuel used fell. The total heat input and output first increased, then fell. The heat introduced by the hot blast increased, the heat in the waste gases rose, and greater quantities of cooling water were required. The heat losses were larger when scrap was added, but a working balance drawn up for the complete furnace installation showed that the heat consumption in a blast furnace working with scrap was smaller. The temperature and composition of the gases in a furnace working with scrap charges were taken at nine different points starting from the throat to just above the tuyère level. The volume of the gases increased in the tuyère zone and then remained approximately constant to within 4 m. of the throat, when it increased again. Nitrogen was approximately constant throughout, but decreased at the throat. The carbon monoxide, after remaining approximately constant at 60% (per 100 of nitrogen) to within 5 m. from the throat, first increased and then decreased. Carbon dioxide was absent from the tuyères up to 5 m. from the throat, when it increased fairly rapidly. Comparative figures are given for a furnace working with ore. In a blast furnace melting scrap the zone of direct reduction was large and that of indirect reduction small. Curves were obtained showing the total oxygen and carbon, also the excess oxygen and carbon, in furnaces working with ore and scrap. The temperature in the latter rises rapidly from the throat downwards and is considerably higher than in ore furnaces. Reaction equilibria in furnaces working with scrap are discussed and a diagram of reaction zones is given. Variations in the temperature and gas composition in the top zones of scrap-working furnaces during 90-min. pauses were obtained. At the throat the temperature continuously rises, and after a time the carbon monoxide increases and the carbon dioxide falls.

T. H. BURNHAM.

**Analysis of materials containing a mixture of metallic iron and iron oxides.** H. C. M. INGBERG (Ind. Eng. Chem., 1925, 17, 1261—1262).—The total iron (metallic iron plus bivalent iron plus trivalent iron) is determined by one of the usual methods. To determine trivalent iron 0.5 g. of the sample is treated with 35 c.c. of  $KCuCl_4$ -citric acid solution (3 g. of citric acid dissolved in 100 c.c. of a solution containing 560 g. of  $CuCl_2 \cdot 2H_2O$  and 245 g. of  $KCl$  per litre), stirring and keeping the temperature below 16°. After keeping for 3 hrs. the residue is washed with cold citric acid solution and three times with hot water and dissolved in hydrochloric acid, trivalent iron being then determined by one of the usual methods. A third portion of the sample

is used to determine the quantity of chlorine (g. equiv.,  $c$ , per mg. of sample  $m$ ) necessary to oxidise metallic iron and bivalent iron present to trivalent iron. 0.3—0.4 g. of the sample is weighed into a Bunsen-Fresenius absorption apparatus and 100 c.c. of  $\text{KCuCl}_3\text{-FeCl}_3$  solution (10 g. of  $\text{Fe}_2\text{Cl}_6, 12\text{H}_2\text{O}$  dissolved in 100 c.c. of a solution of 560 g. of  $\text{CuCl}_2, 2\text{H}_2\text{O}$  and 245 g. of  $\text{KCl}$  per litre) are added. After 3 hrs., 20 c.c. of concentrated hydrochloric acid are added, the mixture is boiled, and 1 g. of manganese dioxide added. The chlorine evolved is absorbed in a solution of potassium iodide, and the iodine titrated with 0.1*N*-sodium thiosulphate. Then  $(x \times m)/(55.84 \times 100/3) + (y \times m)/(55.84 \times 100) = c$ , in which  $x = \%$  metallic iron,  $y = \%$  bivalent iron, and  $z = \%$  trivalent iron.

H. MOORE.

**Electrolytic production of heavy metals from fused electrolytes. I. Iron.** F. SAUERWALD and G. NEUENDORFF (Z. Elektrochem., 1925, 31, 643—646).—Melts made up of 75% of sand and 25% of ferrous oxide (containing ferric oxide) are fluid at 1260°. When these are electrolysed with iron electrodes in externally heated cells at 1.7—2.0 volts or under self-heating conditions at 20—40 volts, there is cathodic deposition of spongy iron, which has a tendency to grow towards the anode. Current efficiencies in the former case were in the neighbourhood of 28%, in the latter of 8%.

W. A. CASPARI.

**Density measurements at high temperatures. VI. Change in volume of pig-iron on melting.** F. SAUERWALD and J. WECKER (Z. anorg. Chem., 1925, 149, 273—282; cf. Sauerwald, Allendorf, and Landschütz, B., 1924, 715).—The apparatus previously used requires modification on account of the fact that fused sodium chloride attacks solid white pig iron. This effect is absent with fused white pig iron, and less pronounced with grey pig iron, so that it would appear to be due to solid cementite. Density determinations show that grey pig iron contracts when it melts, whereas white pig iron expands. The contraction is probably due to the formation of carbide in the fused mass.

R. CUTHILL.

**Variation with temperature of the resistance to impact of steel.** J. COURNOT and K. SASAGAWA (Compt. rend., 1925, 181, 1065—1066).—The Charpy pendulum has been adapted to the measurement at various temperatures of the work of impact per unit volume and the percentage elongation of extra hard and soft steels. From these data the mean unit tension has been calculated, but no correspondence is shown with the rupture-load of the ordinary tensile tests. Both determined values show maxima at 200°, and minimum values at 500° and 600° for soft and hard steels respectively. These are followed by second maxima at 625° and 700° respectively, and finally by a sharp fall. More complex results were obtained with nickel-steel.

J. GRANT.

**Rusting of iron.** W. KISTIakovSKI (Z. Elektrochem., 1925, 31, 625—631).—Electrodes of iron may

exist in five distinct conditions ranging from "super-active" ( $E_n = 0.5\text{--}0.9$  volt), attainable only in alkaline electrolytes, to "passive" ( $E_n = -0.2$  to  $-0.9$  volt). In the former condition there is an unbroken coating of hydride, in the latter of oxide, and in neither is it possible for the iron to rust. When the coating of oxide is ruptured, which may occur through mechanical or chemical attack, or by crystallisation of the oxide film, local currents are produced and rusting sets in. The acceleration of rusting by carbon dioxide is attributed to its depolarising action in the local currents. When the electrolyte is neutral, e.g., a solution of sodium sulphate (containing dissolved carbon dioxide and oxygen), the formation of sodium carbonate at the passive parts of the metal surface and of ferrous salt at the active parts can be experimentally demonstrated.

W. A. CASPARI.

**Electrolytic deposition of metals. I. Theory of the mechanism.** P. K. FRÖLICH and G. L. CLARK (Z. Elektrochem., 1925, 31, 649—655).—On a review of the evidence, the authors consider that, on deposition at the cathode, metals do not assume any intermediate state between discharge of the ions and crystallisation of the deposit. Metallic overvoltage is greatest in the case of metals at which hydrogen shows the lowest overvoltage, and *vice versa*. Whereas, therefore, the discharge of ions is a reversible process, metallic overvoltage is an effect due to co-operation of cathodic hydrogen, e.g., by way of transitory hydrides.

W. A. CASPARI.

**Electrolytic deposition of metals. II. X-Ray investigation of electrolytic nickel.** G. L. CLARK and P. K. FRÖLICH (Z. Elektrochem., 1925, 31, 655—658).—Deposits upon platinum and aluminium from electrolytes of various compositions have been examined by means of slit and pinhole beams of molybdenum  $K\alpha$  radiation and by the Laue method with white tungsten radiation. For a fibrous or oriented structure in the deposited nickel, low current density, low temperature, and the presence of gelatin are favourable; evolution of hydrogen is unfavourable. The orientation of the structure is parallel to that of the cathode metal in the case of platinum; upon aluminium, however, the deposit shows random orientation, probably due to a film of aluminium oxide.

W. A. CASPARI.

**Reduction of ferric oxide and iron ores by hydrogen.** H. KAMURA (J. Iron and Steel Inst., 1925, 112, 279—298).—See B., 1925, 804.

**Ancient iron from Richborough and Folkestone.** J. N. FRIEND (J. Iron and Steel Inst., 1925, 112, 225—237).—See B., 1925, 806.

**Dendritic segregation in iron-carbon alloys.** A. SAUVEUR and V. N. KRIVOBOK (J. Iron and Steel Inst., 1925, 112, 313—321).—See B., 1925, 806.

**Influence of strain and of heat on the hardness of iron and steel.** A. SAUVEUR and D. C. LEE (J. Iron and Steel Inst., 1925, 112, 323—329).—See B., 1925, 810.

**Retained austenite.** J. A. MATHEWS (J. Iron and Steel Inst., 1925, 112, 299—312).—See B., 1925, 807.

**Equilibrium at high temperatures in the iron-carbon-silicon system.** M. L. BECKER (J. Iron and Steel Inst., 1925, 112, 239—253).—See B., 1925, 806.

**Chromium-iron equilibrium in carbides re-covered from annealed 2.23% chrome steels.** E. D. CAMPBELL and J. F. ROSS (J. Iron and Steel Inst., 1925, 112, 255—265).—See B., 1925, 807.

**Iron-nickel and iron-cobalt equilibrium diagrams.** L. GRENET (J. Iron and Steel Inst., 1925, 112, 267—278).—See B., 1925, 808.

**Sulphatisation of burnt pyrites.** MAKOVECKI and SCHABALIN.—See VII.

#### PATENTS.

**Manufacture of [steel alloy] articles hardened in their marginal layers by nitrogenisation.** G. BREWER. From F. KRUPP A.-G. (E.P. 243,613, 16.5.25).—Articles, the external layers of which are to be hardened by nitrogenisation, are made from steel alloys which contain 0.5—2% Al, also silicon, manganese, nickel, chromium, molybdenum, tungsten, vanadium, titanium, or zirconium, either separately or together, in quantity amounting to 0.5—4%, and up to 0.6% C. C. A. KING.

**Decarbonisation of cast iron or other metals.** P. J. MARTIN and G. F. BERTELS (E.P. 244,204, 3.10.24).—Cast iron is decarbonised by heating with carbon dioxide under pressure. The carbon monoxide formed is re-oxidised to carbon dioxide by means of a regenerating agent, such as a metal oxide, which is included in the system.

L. M. CLARK.

**Process of making malleable iron castings.** W. J. MILES, JUN. (U.S.P. 1,564,437, 8.12.25. Appl., 10.1.20).—Pig iron is purified partially by melting in a cupola and the molten iron is caused to impinge in a fine stream out of contact with the atmosphere on to the hearth of an air furnace.

C. A. KING.

**Electroplating [iron with nickel].** W. R. KING, Assr. to HANSON AND VAN WINKLE CO. (U.S.P. 1,564,581, 8.12.25. Appl., 3.5.24).—Metals subject to corrosion, *e.g.*, iron, are first coated with a nickel-zinc alloy and then with pure nickel.

A. R. POWELL.

**Treatment of iron sulphide ores containing other metals.** A. T. K. ESTELLE (U.S.P. 1,565,353, 15.12.25. Appl., 12.6.25).—Iron sulphide ore containing other valuable metals, after suitable preliminary treatment, is leached with dilute sulphuric acid. Copper is removed from the solution and ferrous sulphate obtained by crystallising. The impure crystalline mass is treated with ammonia vapour and air and from the dried ferric hydroxide, ammonium sulphate is washed out and separated from accompanying metals (zinc, nickel, etc.).

L. M. CLARK.

**Cupola furnaces.** A. POUMAY (E.P. 232,630, 18.4.25. Conv., 18.4.24).—A cupola furnace is constructed with three sets of tuyères for the air blast, one for directing air to the melting zone, a second higher one introducing air in a gyratory manner, and a third arranged spirally around the cupola above the last-mentioned set and supplying air to the red-hot fuel. By these means the consumption of fuel is reduced as compared with the usual type of cupola.

L. M. CLARK.

**Metallurgical furnaces.** A. BREITENBACH (E.P. 243,402, 25.6.24).—In a furnace for smelting metals, in particular iron, of the type in which a collecting chamber for the molten metal is connected with a melting chamber, heating gases are caused to impinge in an inclined direction on to a shallow depth of molten metal at one end of the collecting chamber so as to stir the metal thoroughly. Towards the other end of the chamber the molten metal collects in a deeper pool, wherein separation of slag is effected. Between the shallow and deeper regions the collecting chamber is restricted by means of a roof inclined downwards, and the heating gases are directed by the roof on to the surface of the metal, which is large in relation to the depth. The waste gases from the melting hearth may be utilised to heat the collecting chamber, the two chambers being so arranged in relation to one another that the gases flow in the collecting chamber at an angle to the direction of flow of the gas in the melting chamber.

C. A. KING.

**Manufacture of rods, blocks, and the like refractory of very large crystals of highly refractory metals such as tungsten.** N. V. PHILIPS' GLOEILAMPENFABRIEKEN (E.P. 235,213, 5.6.25. Conv., 6.6.24).—When tungsten powder is compressed into rods, the size of the crystals formed depends on the pressure. The curve representing crystal size as a function of the pressure shows a maximum for a definite value of the pressure, the position of the maximum depending on the initial state of the tungsten powder. For example, with tungsten powder in which the size distribution is 10—20 $\mu$ , 8%; 6—10 $\mu$ , 35%; 3—6 $\mu$ , 26%, and less than 3 $\mu$ , 31% of crystals of more than 1 cm. size are obtained by pressing under a pressure of 884 kg./cm.<sup>2</sup>

L. M. CLARK.

**[Aluminium-copper] alloys.** BRIT. ALUMINIUM CO., A. G. C. GWYER, and H. W. L. PHILLIPS (E.P. 243,405, 19.7.24).—The structure of aluminium-copper alloys, composed mainly of aluminium, with or without other metals, is varied by the addition of a "modifying" agent to the molten alloy. The "modifying" agent may be an alkali oxide or hydroxide, preferably sodium hydroxide, an alkaline-earth metal, a fluoride, or sodamide. For each agent there is an optimum quantity, which yields the best results. For example, in modifying an alloy composed of 92% Al and 8% Cu by means of calcium the optimum quantity is 0.3% Ca. The best percentage in the case of sodium hydroxide and sodium fluoride is usually about 5%, but is dependent

on the composition of the alloy and the cooling rate (cf. E.P. 210,517 and 219,346; B., 1924, 262, 793).  
M. COOK.

**Treating molten metals [aluminium-bronze] with calcium-copper alloys.** W. G. HARVEY, Assr. to AMER. MAGNESIUM CORP. (U.S.P. 1,563,188, 24.11.25. Appl., 10.9.21).—Molten aluminium-bronze is deoxidised by adding a brittle alloy of calcium and copper having a melting point substantially lower than that of the treated metal.

T. H. BURNHAM.

**Producing calcium-copper alloy.** W. G. HARVEY, Assr. to AMER. MAGNESIUM CORP. (U.S.P. 1,563,187, 24.11.25. Appl., 13.8.21).—A molten calcium salt is electrolysed in the presence of a solid copper cathode until sufficient calcium has been taken up by the cathode for it to become molten in the presence of the molten salt.

T. H. BURNHAM.

**Process for de-oxidisation, and for the protection from oxidation, of metals [during melting].** O. JUNKER (E.P. 243,998, 8.6.25).—Metals indifferent to carbon are covered with a layer of lampblack or soot during melting or heating processes. Carbon in this form is very finely divided and does not occlude oxygen, and it forms an effective barrier against penetration of oxygen into contact with the metal.

C. A. KING.

**Forming metallic compositions [alloy filaments].** H. BOVING, Assr. to WESTERN ELECTRIC Co. (U.S.P. 1,562,202, 17.11.25. Appl., 1.6.22).—Nickel, platinum, or tungsten is formed into a suitable shape, such as a filament, and heated in a closed chamber in an atmosphere of an inert gas. When a suitable temperature is attained the vapour of an alkaline-earth metal is led into the chamber. The temperature must not exceed the melting point of the alloy formed.

T. S. WHEELER.

**Tin-zirconium alloy.** H. S. COOPER, Assr. to KEMET LABORATORIES Co. (U.S.P. 1,562,540, 24.11.25. Appl., 27.6.22).—A pyrophoric alloy containing zirconium and 20–40% of tin is claimed.

H. MOORE.

**Alloy.** C. E. HANSEN (U.S.P. 1,562,958, 24.11.25. Appl., 6.4.22).—An alloy contains more than 50% of gold, substantial amounts of nickel and iron, and a smaller amount of manganese or magnesium sufficient to increase the tensile strength and workability of the alloy.

T. H. BURNHAM.

**Obtaining vanadium values etc. [from petroleum].** E. L. BALDESCHWIELER, Assr. to STANDARD DEVELOPMENT Co. (U.S.P. 1,563,061, 24.11.25. Appl., 4.8.23).—Petroleum ash is treated with an alkaline reagent to extract the vanadium.

T. H. BURNHAM.

**Electroplating with metallic cadmium and bath therefor. Cadmium-plating.** C. M. HOFF, Assr. to GRASSELLI CHEMICAL Co. (U.S.P. 1,563,413–4, 8.12.25. Appl., [A] 17.1.24, [B] 6.10.24).—(A) A

bath for obtaining electrolytic cadmium deposits comprises a solution containing a cyanide, a cadmium compound, and an ammonia compound. (B) A cadmium-plating bath contains a cadmium compound, a substance which tends to inhibit the co-deposition of zinc, an alkali, a cyanide, and a substance which tends to improve the quality of the deposits.

A. R. POWELL.

**Coating with metals.** A. Z. PEDERSEN, Assr. to MADSENELL CORP. (U.S.P. 1,564,710, 8.12.25. Appl., 14.5.20. Renewed 10.11.23).—The metal surface to be coated is cleaned by making the object the anode in a bath of sulphuric acid of more than 75% strength.

M. COOK.

**Treatment of argentiferous sulphide ores.** F. E. ELMORE, Assr. to N. C. CHRISTENSEN (U.S.P. 1,565,072–3, 8.12.25. Appl., [A] 26.3.21, [B] 9.6.22).—(A) Argentiferous lead-zinc sulphide ore is mixed with sodium chloride and heated in the presence of air above 400° but not high enough to cause volatilisation of lead as halogen compound. The zinc sulphide remains mostly unattacked and the oxidised mixture is extracted with strong sodium chloride solution, after which silver is extracted from the residue. (B) After leaching the heated ore with acid brine, the argentiferous zinc sulphide residue is leached with acid chloride brine solvents which extract the silver and leave zinc sulphide undissolved (cf. E.P. 162,026; B., 1921, 435 A).

M. COOK.

**Solder.** J. B. SPEED and A. H. FALK, Assrs. to WESTERN ELECTRIC Co. (U.S.P., 1,565,115, 8.12.25. Appl., 11.1.24).—A solder containing 11% Ag and 86–89% Sn is claimed.

M. COOK.

**Alloy for electrical contacts.** L. A. GARDNER, Assr. to AMER. TELEPHONE AND TELEGRAPH Co. (U.S.P. 1,565,358, 15.12.25. Appl., 19.2.24).—The alloy is composed chiefly of gold, together with nickel, zinc, and copper in successively decreasing proportions.

L. M. CLARK.

**Treating [zinc]-coated materials.** E. CORNELL, JUN., Assr. to WESTINGHOUSE ELECTRIC AND MANUF. Co. (U.S.P. 1,565,420, 15.12.25. Appl., 21.12.23).—Zinc-coated materials prior to being worked are heated to a temperature sufficient to change the grain structure of the zinc.

L. M. CLARK.

**Process by which aluminium and its alloys may be applied to ferrous metal.** C. W. PFEIL (U.S.P. 1,565,495, 15.12.25. Appl., 1.5.22).—Aluminium is very finely divided in a bath of an air-excluding, film-producing material, and the compound thus formed is applied to the metal to be coated and is then heated.

L. M. CLARK.

**Process for making and combining "corrode-resisting" metals.** C. W. PFEIL (U.S.P. 1,565,496, 15.12.25. Appl., 20.9.22).—A tin-coated ferrous metal is heated until the tin melts and the molten tin is saturated with finely divided aluminium.

L. M. CLARK.

**Zinc-condenser.** H. A. GRINE, Assf. to GRASSELLI CHEMICAL Co. (U.S.P. 1,565,928, 15.12.25. Appl., 3.4.24).—A composition for zinc condensers comprises broken zinc condenser, zinc ore, and a refractory bonding material. L. M. CLARK.

**Refining lead.** P. W. DAVIS (U.S.P. 1,566,078, 15.12.25. Appl., 14.5.25).—Lead is refined by exposing molten lead alloys to the action of molten litharge, both being in bodies of small dimensions. L. M. CLARK.

**Continuous sintering and melting of highly refractory metal oxides, ores, etc.** ROMBACHER HÜTTENWERKE, and J. I. BRONN (G.P. 417,375, 13.3.23. Addn. to 368,328; B., 1923, 508 A).—The charge is passed through a tunnel furnace having a knee-shaped moving hearth heated by means of an arc which moves in the same direction as the hearth. The furnace is especially suitable for the treatment of very viscous materials which tend to adhere to the walls and hearth. A. R. POWELL.

**Smelting reacting mixtures of oxides and sulphides in suspension.** F. KRUPP, GRUSONWERK A.-G. (G.P. 417,458, 23.2.24).—For the oxidation of sulphides during smelting, solid oxides, sulphates, nitrates, or silicates are added to the charge and for the reduction of oxides, sulphates, nitrates, or silicates, solid sulphides are added. In this way better utilisation of the heat of reaction is obtained, as the volume of gas evolved is reduced. A. R. POWELL.

**Bearing metal.** L. KAUL and E. HABERER (G.P. 417,742, 9.3.24).—Refined zinc is treated in an electric furnace first in the liquid and then in the gaseous state, with complete exclusion of oxygen and nitrogen, whereby a "zinc-nitrogen-hydrazine" compound is formed. This is melted with zinc and tin to form an alloy containing 67.93% Zn, 10.18% Sn, and 21.89% of "zinc-nitrogen-hydrazine." A. R. POWELL.

**Desulphurisation and concentration of sulphide iron ores.** W. S. MILLAR (U.S.P. 1,567,378, 29.12.25. Appl., 10.3.25).—See E.P. 236,256; B., 1925, 725.

**Extracting or refining magnesium.** B. E. F. RHODIN (E.P. 234,074, 27.4.25. Conv., 13.5.24).—See U.S.P. 1,539,955; B., 1925, 598.

**Alloy.** E. HAAGN, Assf. to W. C. HERAEUS, G.m.b.H. (U.S.P. 1,566,534, 22.12.25. Appl., 21.8.24).—See E.P. 230,356; B., 1925, 363.

**Making sheet copper electrolytically.** M. A. JULLIEN (U.S.P. 1,567,737, 29.12.25. Appl., 4.11.24).—See E.P. 244,916; B., 1925, 288.

**Reducing ores and producing cement.** A. FERGUSON (U.S.P. 1,567,934, 29.12.25. Appl., 13.3.25).—See E.P. 235,606; B., 1925, 677.

**Metal-melting furnace [provided with agitator].** L. HALL (E.P. 244,915, 24.12.24).

**Precipitating and filtering (E.P. 242,383).—**See I.

**Electric furnace (U.S.P. 1,562,825 and 1,564,800).—**See XI.

## XI.—ELECTROTECHNICS.

**Transformer oils.** STAEGER.—See II.

**Insulating material from sapropel tar.** ZELINSKI and MAXOROV.—See III.

**Determination of coloured gases by the photo-electric cell.** COPAUX and COPAUX.—See VII.

**Rusting of iron.** KISTIAKOWSKY.—See X.

### PATENTS.

**Removing coatings from conductors.** BRIT. THOMSON-HOUSTON Co., LTD., Asses. of H. P. HOLLNAGEL (E.P. 232,257, 14.4.25. Conv., 11.4.24).—Sheaths or coatings of insulating material are removed from electrical conductors by immersion in a bath of fused alkali. If a long length of wire is to be treated it is unwound from a reel and passed through a bath containing fused alkali, which must be carefully freed from water but need not be chemically pure. The temperature should not exceed 700°. To strip the ends of conductors these are dipped for a few seconds in fused alkali at 400–600° and subsequently washed in a spray of water. When it is desired to "tin" the bared ends of the conductors, they are dipped without washing into molten solder or other metal capable of alloying with the conductor, preferably through a thin layer of molten alkali. M. E. NOTTAGE.

**Electric furnace.** G. EVREYNOFF (U.S.P. 1,562,825, 24.11.25. Appl., 11.11.24).—A furnace for the treatment of steel or the like consists of a carbon crucible forming one of the electrodes and a carbon rod vertically above it which constitutes the other electrode. The material in the crucible is heated by an arc passing from the rod to the material and through it to the crucible. The arc is given a helical form and caused to rotate by means of a coil through which a current is passed. This stabilises the arc and renders its control more easy. T. S. WHEELER.

**Electric furnace.** M. UNGER, Assf. to GEN. ELECTRIC Co. (U.S.P. 1,564,800, 8.12.25. Appl., 12.3.24).—The charge is heated by the passage of the current in a crucible providing a relatively wide channel which has a deep narrow groove at the bottom for increasing the hydrostatic head of molten metal. M. E. NOTTAGE.

**Electrolytic cell.** M. W. COWLES (U.S.P. 1,564,406, 8.12.25. Appl., 2.5.24).—In a cell comprising a number of units, each of which consists of an anode and cathode separated from each other, a device is provided by means of which the electrolyte may be fed into the space between the anode and cathode of each unit independently of the other units. M. E. NOTTAGE.



**Electrolysis of alkali chlorides.** M. BAMBERGER and J. NUSSBAUM (Austr. P. [A] 100,562, 12.2.17, and [B] 100,563, 7.8.17).—Alkali chloride electrolysis is effected with the aid of a horizontal filter diaphragm composed of (A) asbestos coated with a gel, *e.g.*, of magnesium hydroxide or of an alkaline-earth silicate, or (B) a partially peptised or partially flocculated gel.  
D. F. TWISS.

**Production of electrical incandescence heating material of carbon.** DRAHTLOSE HEIZ- U. WIDERSTANDSKÖRPER FÜR ELEKTRIZITÄT G.M.B.H. (G.P. 416,776, 4.7.24).—A long-lived heating element is formed by coating the inner wall of a fireproof tube with a conducting mixture of graphite and a carbonate of a heavy metal; the tube is kept air-tight by stoppers which also serve for effecting electrical contact. The carbon dioxide which is liberated inside the tube when a current is passed protects the conducting material against oxidation.  
D. F. TWISS.

**Iron hydride resistances for regulating electric currents.** SÜDDEUTSCHE TELEFON-APPARATE-, KABEL- U. DRAHTWERKE A.-G. (G.P. 417,810, 10.5.23).—Resistance wire produced from electrolytic iron which has been melted in a vacuum is maintained at a red heat in a hydrogen atmosphere until saturated with the gas; such wire shows constant behaviour in use.  
D. F. TWISS.

**Method of making cores for cathodes of vacuum tubes.** H. T. REEVE, Assr. to WESTERN ELECTRIC Co. (U.S.P. 1,565,200, 8.12.25. Appl., 12.10.20).—A core for an electron-emitting cathode is made by pressing a mixture of powdered platinum and nickel in the desired proportions into a coherent ingot, heating the ingot to a sintering temperature in the absence of oxidising conditions, and cold-working the ingot into filamentary form. At intervals the work should be annealed at high temperature, the early stages of the cooling being done in the absence of oxidising conditions.  
M. E. NOTTAGE.

**Electrolytic cell.** A. E. KNOWLES (U.S.P. 1,566,543, 22.12.25. Appl., 3.4.24).—See E.P. 219,381; B., 1924, 838.

**Incandescence lamp.** G. R. FONDA, Assr. to GEN. ELECTRIC Co. (U.S.P. 1,566,848, 22.12.25. Appl., 26.1.22).—See E.P. 201,629; B., 1923, 919 A.

See also pages 113, Preventing adhesion of scale (E.P. 243,415). 125, Electrode for making sulphuric acid (U.S.P. 1,565,691). 126, Copper carbonate (U.S.P. 1,565,367). 128, Melting and fining glass (U.S.P. 1,564,235); Fused silica (U.S.P. 1,563,853). 133, Alloy filaments (U.S.P. 1,562,202); Alloy for electrical contacts (U.S.P. 1,565,358). 134, Sintering and melting oxides etc. (G.P. 417,375).

## XII.—FATS; OILS; WAXES.

**Rapid oxidation of drying oils; effect of anti-oxidising agents.** F. TARADOIRE (Compt.

rend., 1926, 182, 61—63).—Cotton treated with a mixture of a drying oil, turpentine oil, and a heavy-metal resinate ignites spontaneously after exposure to air. Untreated cotton is spontaneously inflammable at 210°, and the temperature of asbestos fibre treated with a mixture of drying oil, turpentine oil, and heavy-metal resinate rises to 300°. The spontaneous ignition of cotton waste similarly treated is retarded by treatment of the material with 1% of phenol,  $\beta$ -naphthol, or quinol, and prevented by treatment with guaiacol,  $\alpha$ -naphthol, aniline, dimethylaniline, diphenylamine, quinhydrone, hexamethylenetetramine, or sulphur (*cf.* A., 1924, i, 635).  
L. F. HEWITT.

**Stabilising agents for oils.** E. DE' CONNO, E. GOFFREDI, and C. DRAGONI (Annali Chim. Appl., 1925, 15, 475—484).—Experiments made with linseed and olive oils show that phenol, resorcinol, quinol, and pyrogallol, far from acting as anti-oxygens, actually accelerate the autoxidation of these oils. This oxidation is retarded, but not inhibited, by salicylic or benzoic acid, whereas complete stabilisation of non-drying and drying oils is effected by acetic and glycollic acids respectively, the action of these acids being quite comparable with the catalytic action of phenols in stabilising acraldehyde  
T. H. POPE.

**Analysis of waxes.** New chemical constant. R. ROUSSEAU (Bull. Sci. pharmacol., 1925, 449; Ann. Chim. Analyt., 1925, 7, 355—357).—The saponification values of the crude wax, of the wax after acetylation, of the unsaponifiable matter, and of the unsaponifiable matter after acetylation, are determined. The difference between the first two values gives the acetyl value of the free alcohols, and the difference between the last two values the acetyl value of the total alcohols; the acetyl value of the esterified alcohols is then obtained by difference. The ratio of the acetyl value of the esterified alcohols to the acetyl value of the total alcohols is of use for differentiating various waxes. It amounts to about 0.84 for beeswaxes and crude wool wax ("suintine"), 0.96 for spermececi, 0.6 and 0.5 for carnauba and raphia waxes, and 0.8 for candelilla wax.  
D. G. HEWER.

**Determination of the clouding point of soap solutions.** K. BRAUN (Chem.-Ztg., 1925, 49, 1012).—The clouding point is defined as that temperature at which a soap solution containing 3% of fatty acids combined with alkali becomes turbid. In washing textiles, if the clouding point lies above the temperature of the washing water, soap is precipitated on the fibres and interferes with subsequent dyeing or printing. Apparatus for determining the clouding point comprises a jacketed beaker fitted with a thermometer and stirrer, and placed in a vessel filled with hot water. The jacket has a narrow vertical slit in one side and a slit three times as wide with a narrow strip down the middle on the opposite side. Soap solution heated above its clouding point is poured into the beaker and viewed through the narrow slit, illumination being provided

behind the wider slit, and the temperature is read at which cloudiness first begins to appear.

L. A. COLES.

*iso*Oleic acid and other unsaturated fatty acids formed by distillation of *ν*-hydroxystearic acid. VESELY and MAJTL.—See A., 1926, 47.

Chaulmoogric and hydnocarpic acids. SHRINER and ADAMS.—See A., 1926, 47.

See also pages 117, Petroleum hydrocarbons from fats (MARCUSSON and BAUERSCHÄFER). 136, Colour of oils etc. (WILBORN). 140, Coconut oil (HANUS and KOMOROUSOVÁ; LUKAS; BERTRAM and OTHERS.)

#### PATENTS.

Removing phosphatides from vegetable oils. H. BOLLMANN (E.P. 243,643, 20.7.25. Conv., 15.5.25).—The oils are treated with barium hydroxide. For example 90 pts. of soya-bean oil are shaken with 10 pts. of a 0.1% barium hydroxide solution and the oil is subsequently separated from the aqueous mixture. The removal in this manner of the phosphatides prevents the formation of troublesome emulsions during purification of the oils.

H. M. LANGTON.

Removing free sulphur from [wool] grease. H. CHRISTISON and C. L. NUTTING, Assis. to ARLINGTON MILLS (U.S.P. 1,561,911, 17.11.25. Appl., 3.6.21).—Grease from raw wool is boiled with a solution of sodium sulphite, when the sulphur present forms sodium thiosulphate and is removed. The grease is then separated from the solution by centrifuging.

T. S. WHEELER.

Saponaceous cleansing compositions. K. HAAS (E.P. 243,423, 22.8.24).—A mixture of a protein (casein, glue) and fat is saponified with excess of alkali, whereby partial hydrolysis of the protein results. When evolution of ammonia becomes distinctly noticeable, formaldehyde or similar substance is added so as to form *in situ* hexamethylenetetramine, which prevents further hydrolytic dissociation of the protein. A product is obtained having the appearance of good household soap and with enhanced washing and lathering properties due to the soap containing 15% of stable proteins.

H. M. LANGTON.

Making emulsions using emulsifiers derived from wool fat. O. HERZOG (E.P. 244,598, 10.1.25).—See U.S.P. 1,543,384; B., 1925, 680.

Membranes of parchment paper (G.P. 418,210).—See I.

Adding A-vitamins to oils (E.P. 243,907).—See XIX.

### XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Determination of solvent in paints, varnishes, etc. H. WOLFF (Farben-Ztg., 1925, 31, 746—747).—Owing to the retention of relatively high-boiling

solvents by the non-volatile portion of a paint or varnish, the usual steam-distillation process for solvent recovery requires the use of unwieldy receivers or careful attention over a lengthy period to avoid overflow. The author uses a receiver in which the distilled solvent collects over water which continually drains away *via* a suitably bent side arm sealed on to the main tube. When no obvious alteration in the amount of solvent collected can be seen, the receiver is changed for a smaller tube of the same type, the narrow bore of which renders the presence of very small quantities of solvent apparent. The solvent is either run off and weighed or else its volume is read *in situ*. The volatile medium is held with abnormal tenacity by some paste paints, particularly those containing basic pigments, and the absence of non-aqueous distillate after  $\frac{1}{4}$  hr. (by which time the bulk of the solvent will normally have distilled) may give a misleading impression. Where such cases are recognised the addition of a moderate quantity of hydrochloric or sulphuric acid will facilitate removal of the solvent by breaking down the colloid system.

S. S. WOOLF.

Determination of the colour of varnishes, oils, etc. F. WILBORN (Farben-Ztg., 1925, 31, 747).—The author claims that the use of aqueous iodine-potassium iodide solutions provides satisfactory matches for all the products in the varnish industry the colour of which is of importance, *i.e.*, the paler oils and varnishes. More concentrated iodine solutions afford less satisfactory comparison with the darker products, but the dichromate-sulphuric acid standards used in America, while giving better colour matches, are prone to colour change due to reduction caused, *e.g.*, by dust particles present inadvertently. Fonrobert's "colour numbers" (B., 1925, 931) are considered unsuitable, since two matched samples may show large divergences on parallel treatment either as to dilution or viewing in different thickness of layer. Any method involving liquid "wedges" in hollow prisms must be rejected on this score and the use of standard glass tubes is insisted upon. The permanence of iodine solutions leaves much to be desired, but there is no objection to the use of more permanent comparison liquids, provided that these are first standardised against iodine.

S. S. WOOLF.

Oxidation of drying oils: effect of anti-oxidising agents. TARADOIRE.—See XII.

#### PATENTS.

Hard rubber varnishes. W. J. MELLERSH-JACKSON. From MECHANICAL RUBBER Co. (E.P. 243,966, 84. 25).—A varnish of vulcanised rubber is obtained by introducing 15–32% of sulphur (calculated on the rubber) into a solution of rubber in a high-boiling solvent, such as solvent naphtha, and heating, *e.g.*, at 163°, until substantially the whole of the sulphur has gone into combination. New rubber may be used or vulcanised scrap rubber; fillers may be added and also an accelerator of vulcanisation. By concentration, it is possible to

obtain a fluid varnish with a solid content up to 80%. Paper, fabrics, and similar materials treated with such varnish are rendered resistant to the action of water and have good mechanical and dielectric characteristics. D. F. TWISS.

**Waterproof paints.** LATEX DEVELOPMENTS, LTD., and R. RUSSELL (E.P. 244,150, 3.9.24).—A waterproof paint which can be applied with a brush without risk of coagulation and, when dry, is resistant to atmospheric influences, is produced by blending a mixture of casein, borax or soda ash or similar alkali, phenol, and ammonia with the desired wet-ground filler or pigment, e.g., lithopone, and with preserved latex, some or all of the casein mixture being introduced into the latex before the addition of the pigimentary material. D. F. TWISS.

**Synthetic resin composition.** A. E. ALEXANDER. From J. S. STOKES (E.P. 243,470, 9.9.24).—Synthetic resins of superior quality to known phenol-formaldehyde condensation products are obtained by condensing furfuraldehyde with phenolic substances in presence of acid or basic catalysts. As hardening agent (to convert the products from the fusible into the infusible state) furfuramide is used, and this substance may also be used to harden the initial fusible product of a phenol-formaldehyde condensation. Synthetic resins may also be obtained without the use of a catalyst by heating furfuraldehyde-phenol mixtures to 215–230°—a much higher temperature than is ordinarily used in such processes. (Reference is directed, in pursuance of Sect. 7 (4), of the Patents and Designs Acts, 1907 and 1919, to E.P. 187,480.) S. S. WOOLF.

**Production of resinous bodies.** E. SCHAAL (E.P. 243,556, 20.1.25).—Copal substitutes are produced by heating glyceryl esters of resin acids (ester-gums) or rosin, mixed with oxidising and dehydrating agents, to a temperature below melting-point in a rotating drum to which a stream of air is admitted. A typical mixture is 100 pts. of finely-powdered ester-gum, 0.3 pt. of cobalt acetate (or manganese borate or resinate), and 40 pts. of anhydrous sodium sulphate (or 20 pts. each of the latter and dry sodium chloride). The temperature is raised from 30° to 100°, the stream of air inhibiting melting and caking. The mass is well washed with warm water and dried by heating to incipient fusion. A similar process serves for rosin, except that the temperature during the heat treatment must be maintained about 10° lower. The products are suitable for spirit- as well as oil-varnishes, but in the former case 5–10% of glycerin or a mixture of glycerin and linseed oil is added as plasticising agent. S. S. WOOLF.

**Vulcanising fat substances.** J. H. VAN DER MEULEN (U.S.P. 1,566,785, 22.12.25. Appl., 14.7.23).—See E.P. 201,531; B., 1924, 917.

#### XIV.—INDIA-RUBBER; GUTTA-PERCHA.

**Periodic tapping of *Hevea* [rubber trees].**  
I. Experimental basis of periodical tapping. J. GRANTHAM. II. Effect of alternate periods of

**tapping and resting on the quality of the rubber.** B. J. EATON and R. O. BISHOP (Malay. Agric. J., 1925, 13, 342–350).—Alternating periods of daily tapping with periods of rest, the periods ranging from  $\frac{1}{2}$  to 2 months, and tapping on half the circumference of the tree, gives a yield of rubber at least equal to that of daily tapping on one-third of the circumference; tapping for alternate periods however causes fluctuations in the concentration of the latex. The rubber obtained immediately after a period of rest is slow in vulcanisation (cf. de Vries and Spoon; B., 1925, 17) but the effect of periods of rest of one month or less is greater than was observed by earlier workers. D. F. TWISS.

**Aggregation and re-aggregation of raw rubber in the normal and deformed state.** M. KRÖGER (Gummi-Ztg., 1926, 40, 782–784).—The effect of cold in producing a change in rubber comparable with that of ordinary vulcanisation has a parallel in the effect of pressure. Masticated or heated rubber on storage at the ordinary temperature tends to regain its strength by a process of “re-aggregation,” the recovery being greater in “Para hard cure” rubber than in crêpe rubber. When rubber rings were stored for one month in a state of tension, the sample under 180% extension exhibited a greater final tensile strength than corresponding samples whether under 800% extension or unstretched, the influence of the various degrees of extension being analogous with that of progressive increase in the period of an ordinary vulcanisation process; the term “deformation-vulcanisation” is proposed for the effect of strain on the recovery of heated or masticated rubber. Stretched rubber is also attacked by bromine or iodine much more rapidly (per unit of surface) than the unstretched material; this greater reactivity of stretched rubber is of much significance in connexion with the resistance of rubber to atmospheric oxidation. D. F. TWISS.

**Action of nitrogen tetroxide on caoutchouc.** F. EMDEN (Ber., 1925, 58, 2522–2527).—If a solution of caoutchouc from *Hevea brasiliensis* or *Parthenium argentatum* in carbon tetrachloride is slowly added to a solution of nitrogen tetroxide in the same solvent, the nitrosate,  $C_{10}H_{16}O_6N_2$ , is precipitated in large, white flocks, decomp. 90–95°. The composition of the product is remarkably constant even when the temperature of the solution is varied between –15° and +5° and the duration of the reaction from 10 to 90 min.; the yield is approximately theoretical. The product is initially insoluble in acetone in which, however, it dissolves on prolonged contact, yielding a clear, reddish-brown solution from which it is precipitated in a brownish-yellow soluble form by addition of water. The latter variety is the more stable and does not evolve carbon dioxide or other gas when dissolved in boiling acetone. Its production appears to be due to transformation within the molecule. The formation of an oxidised product under conditions specially designed to exclude oxidation as far as possible

renders improbable the existence of the "dinitro-caoutchouc,  $C_{16}H_{16}O_4N_2$ " described by Weber (Ber., 1902, 35, 1947) as derived from caoutchouc and nitrogen dioxide.  
H. WREN.

**Comparative resilience of leather and rubber heels.** WILSON.—See XV.

#### PATENTS.

**Manufacture of new accelerators and of intermediate compounds for use in the vulcanisation of rubber.** BRITISH DYESTUFFS CORP., C. T. CRONSHAW, and W. J. S. NAUNTON (E.P. 244,159, 9.9.24).—Diarylthiocarbamides containing an alkylamino-group in each aryl nucleus are desulphurised with formation of similar substituted diarylguanidines; thus tetramethyldiaminodiphenylthiocarbamide and diethyldiaminodi-*p*-tolylthiocarbamide are converted into tetramethyldiaminodiphenylguanidine and *p*-diethyldiamino-*m*-dimethyldiphenylguanidine respectively. The products have an increased accelerating action as compared with diarylguanidines, without danger of pre-vulcanisation.  
D. F. TWISS.

**Vulcanising rubber.** S. M. CADWELL, Assr. to NAUGATUCK CHEMICAL Co. (U.S.P. 1,564,824-5, 5.12.25. Appl., [A] 15.5.22, [B] 6.8.25).—Rubber is mixed with a vulcanising agent and (A) a thioaldehyde or (B) an arylated thioaldehyde, and vulcanised.  
D. F. TWISS.

**Vulcanisation of caoutchouc.** J. M. GILLET, Assr. to GOODYEAR TIRE AND RUBBER Co. (U.S.P. 1,566,247, 15.12.25. Appl., 31.7.22).—A fibrous material is produced by mixing a relatively small quantity of fibres and rubber in a rubber solvent, precipitating the rubber on the fibres, introducing sulphur dioxide and hydrogen sulphide into the liquid, straining the fibres from the liquid so as to obtain a felted mass, and then drying.  
D. F. TWISS.

**Uniformly and intimately mixing materials with rubber latex.** E. HOPKINSON (U.S.P. 1,567,506, 29.12.25. Appl., 16.10.22).—See E.P. 205,487; B., 1925, 18.

**Alkali polysulphides** (E.P. 243,394).—See VII.

**Hard rubber varnishes** (E.P. 243,966).—See XIII.

**Waterproof paints** (E.P. 244,150).—See XIII.

### XV.—LEATHER; GLUE.

**Astringency of vegetable tanning materials.** E. CREDE (J. Amer. Leather Chem. Assoc., 1925, 20, 573—576).—The Wilson-Kern method of tannin analysis (cf. B., 1921, 819A) measures only the tans which when fixed by hide resist washing with water. Assuming that these correspond with the astringent tans, the astringency can be defined as the ratio, tannin by Wilson-Kern method : tannin by official method. The following figures have

been obtained:—Quebracho 72.5%, hemlock 63.0%, cutch 64%, chestnut oak bark 53.1%, wattle bark 54%, chestnut wood 46.5%, valonia 37.5%, divi-divi 21.3%, myrobalans 16.5%.  
D. WOODROFFE.

**Comparative resilience of leather and rubber heels.** J. A. WILSON (J. Amer. Leather Chem. Assoc., 1925, 20, 576—579).—Measurements of the rebound of a weight dropped on to various samples of leather and rubber heels showed that only one make of rubber heels had a resilience comparable with that of oak-tanned leather.  
D. WOODROFFE.

**Preparation of leather for analysis.** L. BALDERSTON (J. Amer. Leather Chem. Assoc., 1925, 20, 583—589).—Samples of leather prepared by sawing and slicing respectively show differences in moisture content, in proportion of tans to non-tans in the water extract, and in fat content. The author has devised a machine which slices the leather, the knives being arranged similarly to those in an ensilage cutter, and another set of knives being arranged to slice the pieces longitudinally in order to subdivide them into small pieces. Sole leather in this cutter yields pieces  $\frac{1}{4}$  in.  $\times$   $\frac{1}{8}$  in.  $\times$   $\frac{1}{100}$  in.  
D. WOODROFFE.

**Machine for preparing leather samples for analysis.** A. C. ORTHMANN (J. Amer. Leather Chem. Assoc., 1925, 20, 579—583).—Detailed drawings are given of a machine for preparing any kind of leather samples for analysis. Lamson cuttee heads are used.  
D. WOODROFFE.

**Reduction of gelatin.** ABDERHALDEN and SCHWAB.—See A., 1926, 83.

#### PATENTS.

**Stuffing of chrome-tanned heavy leather.** R. H. PICKARD, D. JORDAN-LLOYD, and A. E. CAUNCE (E.P. 243,438, 27.8.24).—Chrome-tanned leather in the wet "blue" state is sprayed with, or steeped in, acetone until the water content of the leather is reduced to 14—20%, or until a sample cutting dried at 57° will wet back in water. The acetone is then removed by subjecting the leather to warm air at 57°, and the leather is dipped in or treated with a suitable stuffing material.  
D. WOODROFFE.

**Manufacture of gelatin.** A. H. TOD (E.P. 244,019, 8.8.25).—A continuous supply of hot water is passed slowly through a rotating basket containing gelatinous matter, and the liquid is removed at the same rate. The inlet and outlet pipes are fitted with valves which are connected together. The rate of flow is regulated so as to allow the liquid to reach the desired degree of concentration. The apparatus may or may not be operated in a total or partial vacuum.  
D. WOODROFFE.

**Tanning skins and hides.** J. HELL (U.S.P. 1,567,644, 29.12.25. Appl., 29.8.21).—See E.P. 180,758; B., 1922, 602A.

## XVI.—AGRICULTURE.

**Irrigation and soil reaction.** SCHWÖRER (Z. Pflanz. Düng., 1925, B4, 557—563).—The author discusses possible explanations of the fact that irrigated meadow land, in the Black Forest area, carries a heavier crop and a markedly better type of herbage than similar meadows which are not under irrigation. The soils are naturally acid; both the "actual" and the "exchange" acidity are much reduced where irrigation is practised. The irrigation water is very poor in bases, but such large quantities are used that the cumulative effect of the small percentage present probably eventually accounts, to a great extent, for the change in reaction. Further, an appreciable loss of iron from the irrigated soils can be demonstrated. Manures are seldom applied and it remains difficult to explain the continued good yields from these meadows.  
C. T. GIMMINGHAM.

**Neubauer method and determination of the nitrogen requirements of soils.** E. BLANCK and F. SCHEFFER (Z. Pflanz. Düng., 1925, B4, 553—556).—An attempt to apply the Neubauer "seedling" method (cf. Z. Pflanz. Düng., 1923, A2, 329) to the determination of the nitrogen requirements of soils gave results which were not in agreement with those obtained by careful vegetation experiments. The method was applied exactly as it is used for the determination of the potassium and phosphorus requirements of soils, but it is recognised that, in dealing with nitrogen, a number of new factors are involved. The data are published as a contribution to the working out of the method and do not detract from its value in regard to potassium and phosphorus.  
C. T. GIMMINGHAM.

**Influence of manuring with straw on the yield [of various crops].** GERLACH (Z. Pflanz. Düng., 1925, B4, 534—550).—Details of field experiments are given which lead to the conclusion that the use of straw as manure is, in general, uneconomical. Under practical conditions, most of the nitrogen is washed out of the soil or lost as gas during the period when the crop cannot be there to make use of it.  
C. T. GIMMINGHAM.

**Physics of spray liquids. II. Protective action of various substances on lead arsenate suspensions. III. Ease of formation of emulsions. IV. Creaming capacity of emulsions—paraffin solutions.** R. M. WOODMAN (J. Pom. Hortic. Sci., 1925, 4, 78—94, 95—103, 184—195; cf. B., 1924, 803).—The formation and stabilisation of suspensions of lead arsenate in water by various protective agents has been studied, using a method involving siphoning off fractions of the suspension at definite intervals and measuring the amount of lead arsenate present by density determinations. Gelatin at concentrations between 0.5% and 0.2% was the most efficient of the materials examined; calcium caseinate was almost as good in promoting the formation of suspensions, but was less effective as a stabiliser; dextrin and starch gave intermediate results; sodium caseinate and soap were ineffective,

and the free alkali present tended to form soluble arsenates. The use of gelatin together with finer grinding of the lead arsenate than is usually adopted is recommended. The preparation of emulsions by intermittent shaking (cf. Briggs, B., 1920, 341 A) has been used to compare the effect of various conditions such as temperature, concentration of emulsifier and mixtures of emulsifiers on ease of emulsification. The "cream" which forms on the surface of emulsion mixtures is considered to be the only true emulsion, and a distinction is drawn between the true stability of an emulsion, *i.e.*, the resistance to separation into layers of the disperse and continuous phases, and the stability to creaming. Rapid creaming is usually due to large differences in the densities of the two phases; experiments are recorded on the addition of a third substance to equalise the densities and so make the mixture cream more slowly. Creaming of soap solution—paraffin oil emulsions is greatly retarded by addition of cresol, and in some cases, actual solution of considerable amounts of oil can be obtained.  
C. T. GIMMINGHAM.

**Influence of media on germination of seeds.** CERIGHELLI.—See A., 1926, 99.

## PATENTS.

**Manufacturing solid calcium nitrate.** BADISCHE ANILIN- u. SODA-FABR., Assees. of C. EYER and R. GRIESSBACH (U.S.P. 1,564,410, 8.12.25. Appl., 29.6.25).—Solid calcium nitrate containing a small quantity of an ammonium salt "in molecular distribution" is claimed.  
A. R. POWELL.

**Simultaneous manufacture of ammonium chloride and sulphate, especially for fertilisers.** H. DANNEEL (G.P. 417,214, 29.7.24).—A mixture of sulphur dioxide, chlorine, and ammonia in the stoichiometrical proportions is brought into contact with at least the requisite amount of water for the reaction. The product may be utilised directly as a fertiliser, or ammonium chloride and sulphate may be separated from the product by fractional crystallisation.  
A. R. POWELL.

**Treating fertilisers.** P. T. AXELSEN, Assr. to NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAB (U.S.P. 1,567,408, 29.12.25. Appl., 14.1.24).—See E.P. 210,409; B., 1925, 20.

**Product [insecticide] resulting from a reaction between barium and a metal of the sulphur group.** C. DICKENS (E.P. 244,951, 20.2.25).—See U.S.P. 1,536,379; B., 1925, 611.

**Coating particles of copper sulphate (U.S.P. 1,562,821).**—See VII.

## XVIII.—FERMENTATION INDUSTRIES.

**Amylase from germinated wheat and rye.** N. M. TAYLOR, M. SPENCER, and M. HOUSE (J. Amer. Chem. Soc., 1925, 47, 3037—3039).—Wheat and rye were germinated for 12 hrs. in a nutrient solution (cf. Bakke and Erdmann, Amer. J. Botany,

1923, 10, 8), and then spread on paraffined cheese-cloth supported over the solution for 3 days at 16–18°, with access of air. The grain was then washed, air-dried, and ground to a fine flour. The latter was soaked for 3 hrs. in 2½ times its weight of cold water, dialysed in a collodion container for 24 hrs., filtered, the active material precipitated by adding ammonium sulphate, and purified by dialysis in aqueous solution till free from sulphate (cf. Sherman and Schlesinger, A., 1913, i, 1255; 1915, i, 183, 604). The solution was then concentrated to one-half its original volume by pervaporation (cf. Kober, A., 1917, ii, 295), this step being omitted in the case of the rye. Addition of 60% of cold alcohol precipitated inactive material, after removal of which further addition of alcohol precipitated the active amylase. The products thus obtained from wheat and rye gave typical protein tests, showed optimum activity at  $p_H$  3.5–5.1, and compared favourably with amylase from malt (cf. Sherman, Thomas, and Baldwin, A., 1919, i, 181).

F. G. WILLSON.

See also A., 1926, 93, Diastase (SYNIEVSKI). 94, Activation and heat stability of rennin and pepsin (WOHLGEMUTH and SUGIHARA). 95, Plant reductases (PALLADIN, PLATISCHENSKI, and ELLADI); Co-zymases in different fermentations (VIRTANEN); Azozymase and cozymase (NEUBERG and GOTTSCHALK); Action of adrenaline etc. on self-fermentation of yeast (POPPER); Influence of oxygen on alcoholic fermentation (MEYERHOF). 96, Influence of ions on sugar assimilation of oxygenated yeast (LIEBEN and LÁSZLO); Fixation of nitrogen by yeast (FULMER and CHRISTENSEN); Behaviour of acetylmethyl-carbinol to yeast (NEUBERG and KOBEL). 97, Lactic acid formation by bacteria (NEUBERG and GORE).

#### PATENTS.

Production of practically alcohol-free beverages. J. F. MEYER and H. LÜCKER (E.P. 244,988, 11.5.25).—See U.S.P. 1,537,252; B., 1925, 564.

Production of yeast. S. SAK, ASSR. to FLEISCHMANN Co. (U.S.P. 1,566,431, 22.12.25. Appl., 14.12.20; renewed 7.11.25).—See E.P. 153,667; B., 1921, 57 A.

### XIX.—FOODS.

Determination of coconut oil in margarine. S. H. BERTRAM, J. P. K. VAN DER STEUR, and F. VERHAGEN (Chem. Weekblad, 1925, 22, 549–550; cf. *ibid.*, 1923, 20, 610).—The fat is hydrolysed in glycerin by potassium hydroxide; the solution is cooled and diluted, and the insoluble magnesium soaps are precipitated at 70–80° by addition of magnesium sulphate with continuous stirring. The solution is cooled to 20° and allowed to stand for 10 min., the soaps are filtered off, and the filtrate is neutralised and divided into two parts. One part is treated with sodium nitrate and silver nitrate, the insoluble silver soaps are filtered off after settling, and the excess of silver, A, determined in the filtrate

by titration with thiocyanate. The second part is treated with a large excess of silver, the precipitated silver salts are filtered off, the filtrate is acidified, and the volatile acids are distilled off in the Polenske apparatus, and determined (B) by titration with sodium hydroxide. From the values A and B the percentages of butter and coconut fat are obtained by reference to a standard chart. S. I. LEVY.

Detection of coconut oil in cacao butter and in products containing the latter. J. HANUS and B. KOMOROUSOVÁ (Chem. Listy, 1925, 19, 394–397).—The ethyl ester values of coconut oil and of cacao butter differ by about 20 units and a determination of the ester value of a mixture will therefore give clear indications of the presence of each fat.

A. R. POWELL.

Determination of coconut oil in chocolate fondants. J. LUKAS (Chem. Listy, 1925, 19, 397–399).—The fats are extracted from the chocolate by means of ether and the ethyl ester value is determined. The value for cacao butter is 4 and for coconut oil 80; from these figures the proportion of each substance in a mixture of the two may be readily calculated if the value for the mixture is known. (Cf., B., 1925, 929; Vaubel, B., 1924, 524, and *supra.*)

A. R. POWELL.

Detection of small quantities of arsenic in cocoa. H. LÜHRIG (Pharm. Zentr., 1926, 67, 1–3).—Owing to the difficulty of destroying the organic matter of cocoa without loss of arsenic; the usual methods of determining traces of the element in cocoa yield low results and require considerable time. As little as 0.024 mg. of arsenic may be detected in 15 g. of cocoa by boiling the powder with 75 c.c. of 16% hydrochloric acid and a bright strip of copper for 20–25 min. A grey to black deposit which is converted into white octahedral crystals on gently heating over a small flame indicates the presence of arsenic. A quantitative analysis may then be conducted by evaporating to dryness a mixture of 15 g. of the cocoa powder with 10 c.c. of water, 0.5 g. of magnesia, and 5 c.c. of nitric acid, heating the residue until it carbonises, extracting the soluble matter with hydrochloric acid, evaporating the solution with sulphuric acid, and carrying out the Marsh test.

A. R. POWELL.

Photoactivation of vitamin-A etc. by ultra-violet light. HAMANO—See A., 1926, 98.

Vitamin-B. LEVENE and VAN DER HOVEN.—See A., 1926, 98.

Nitrogenous constituents of lucerne. VICKERY.—See A., 1926, 99.

#### PATENTS.

Process for adding A-vitamins to oils. AARHUS OLIEFABRIK A./S., and K. H. HANSEN (E.P. 243,907, 30.12.24).—Vegetable, animal, fish, or edible mineral oils are agitated with an aqueous solution of soap, formed by saponifying a vitamin-containing marine animal oil, such as cod-liver oil,

with soda or potash lye. During the agitation, preferably with exclusion of air, the A-vitamins present in the marine animal oil in the form of unsaponifiable emulsified particles are dissolved by the oils under treatment. It is beneficial to add to the soap solution about 0.5–1% of a fat solvent such as benzene.  
H. M. LANGTON.

**Apparatus for treating the vapours arising from plants for drying wet organic matter.** J. R. STERLING (E.P. 243,780, 6.8.24).—In the production of animal foods etc. by treating wet organic matter, such as meat, bones, fish, or vegetable substances with a hot gas, such as steam, in a closed container connected with a jet or barometric condenser, offensive vapours are deodorised by means of deodorants, such as permanganate, creosote solutions, etc. supplied to the condenser with the cooling liquid.  
H. M. LANGTON.

**Preparing fruit juice.** W. C. PIERCE (E.P. 237,592, 13.7.25. Conv., 24.7.24).—See U.S.P. 1,556,572; B., 1925, 968.

**Vacuum evaporating apparatus** (U.S.P. 1,560,598).—See I.

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

See A., 1926, 81, Synthesis of galegine (SPÄTH and SPIZY). 82, Alkaloid of *Cocculus lauri folios* (KONDO and KONDO); Feebly toxic alkaloidal derivatives (POLONOVSKI and POLONOVSKI); Oxyberberine, palmatine, and tetrahydrojatrorrhizine (SPÄTH and QUIETENSKY); Oxyacanthine (SPÄTH and KOLBE). 83, Codeine and thebaine (GULLAND and ROBINSON). 91, Physiological activity of benzyl compounds (JENSEN). 97, Chemical properties of insulin (SCOTT); Chemical composition of insulin (GLASER and HALPERN). 98, Dialysis and adsorption of insulin (DINGEMANSE); Stability of insulin (DINGEMANSE). 99, Alkaloid content of *Lupinus luteus* during growth (SABALITSCHKA and JUNGERMANN).

**Methods of washing gases.** WEISSENBARGER, HENKE, and SPERLING.—See I.

### PATENTS.

**Manufacture of esters of unsaturated acids.** O. Y. IMRAY. From Soc. of Chem. Ind. in Basle (E.P. 243,510, 7.11.24).—Therapeutically active esters of unsaturated acids are prepared by esterifying with cholesterol an aliphatic or aliphatic-aromatic acid having a triple linkage, or an aliphatic acid having at least one double linkage and low in the series, or an aliphatic-aromatic acid having at least one double linkage in the side chain. Their therapeutic activity is enhanced by using them (externally or injected) in solution in phenylacetylene and camphor. The preparation of the *cholesteryl esters* of phenylpropionic acid (m.p. 153.5° with change of colour after softening at 148°), crotonic acid (m.p. 149° after softening at 90°), tetrolic acid (softens at

115°, melts at 120° to a turbid and at 124° to a clear liquid), and  $\alpha$ -benzylidenepropionic acid (softens at 103°, melts at 106° to a turbid and at 175° to a clear liquid, is described. W. T. K. BRAUNHOLTZ.

**Manufacture of *N*-methylsulphites of secondary aromatic-aliphatic amines.** FARBW. VORM. MEISTER, LUCIUS, U. BRÜNING, M. BOCKMÜHL, and A. SCHWARZ (E.P. 243,925, 24.1.25. Addn. to 164,002; cf. U.S.P. 1,426,348; B., 1922, 786 A).—In preparing therapeutically active *N*-methylsulphites of secondary aromatic-aliphatic amines (other than methyl-, ethyl-, or benzyl-aniline, an *N*-alkylated anthranilic acid or its nucleus-substitution product) the formaldehyde-bisulphite compound may be replaced by formaldehyde and a bisulphite separately, added in any order, or by treating a condensation product from a primary aromatic amine and formaldehyde with an alkylating agent and then with a bisulphite. Details are given of various methods of preparing the methylsulphites of *N*-methyl-*p*-phenetidine, and 1-phenyl-2:3-dimethyl-4-methyl (or ethyl)-amino-5-pyrazolone. W. T. K. BRAUNHOLTZ.

**Preparation of alkyl esters of 2-quinolone-4-carboxylic acid.** E. THIELEPAPPE (G.P. 416,769, 3.11.21; cf. A., 1922, i, 271).—*N*-Aryl- or *N*-aryl-*N*-alkylacetamides are treated with alkyl oxalates and sodium ethoxide, the resulting compounds of structure  $R.N.R^1.CO.CH_2.CO.CO_2R^2$  ( $R$ =aryl,  $R^1$ =H or alkyl,  $R^2$ =alkyl) being treated with a dehydrating agent, e.g., concentrated sulphuric acid.  
B. FULLMAN.

**Preparing esters of carbithionic acids and thiocarboxylic acids of the pyrazolone series.** CHEM. FABR. AUF ACTIEN VORM. E. SCHERING (G.P. 416,860, 17.2.24).—Pyrazolones are treated in carbon disulphide with aluminium chloride and alkyl chloroformates or alkyl halides, and the esters formed hydrolysed. For example, to 1-phenyl-2:3-dimethyl-5-pyrazolone and ethyl chloroformate or ethyl bromide, in boiling carbon disulphide, aluminium chloride is added in two portions during 3 hrs., and the solution boiled for 3 hrs. On removing the solvent in a vacuum and treating the residue with ice-water there is obtained *ethyl 1-phenyl-2:3-dimethyl-5-pyrazolone-4-carbithionate*, m.p. 178.5–179°, which on hydrolysis with water or alcoholic potassium hydroxide gives the corresponding *thiocarboxylic acid*, m.p. 81–82°. *Ethyl 1-phenyl-5-methyl-3-pyrazolone-4-carbithionate*, m.p. 114° and the *carbithionic esters* of 1-phenyl-3-methyl-5-pyrazolone, m.p. 81–82°, of 3-methyl-5-pyrazolone, m.p. 186°, and of 5-pyrazolone, m.p. 184–185°, are described. The compounds have therapeutic application.  
B. FULLMAN.

**Preparation of organic thiocarbonates.** C. GUERRY (F.P. 563,214, 20.5.22).—Aqueous solutions of the alkali salts of organic acids containing an olefinic linkage (especially unsaturated fatty acids of formula  $C_nH_{2n-2}O_2$ ) such as oleic, ricinoleic, and linoleic acids, and resins and colophony (abietic acid) are treated with a solution of sulphur in

carbon disulphide approximating in composition to

CS<sub>3</sub>. A ring of the annexed structure  $\begin{array}{c} \cdot\text{CH}\cdot\text{S} \\ | \\ \text{---} \\ | \\ \cdot\text{CH}\cdot\text{S} \end{array} \text{CS}$

is formed at the double bond, the products being *derivatives* of trithiocarbonic acid. They dissolve animal or vegetable fats, oils, waxes, resins, naphthene hydrocarbons, aromatic hydrocarbons and their substitution products, and spermaceti. They are unstable in presence of mineral acids. They are used in degumming silk; for dissolving fats to produce leather dressings; and as fungicides and insecticides, *e.g.*, as plant sprays in the form of their saturated solutions in coal-tar oil or in aromatic hydrocarbons or their nitro-derivatives.

B. FULLMAN.

Activated carbon (E.P. 243,801).—See II.

Alkali polysulphides (G.P. 243,394).—See VII

## XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

**Dark-room infection by red-sensitising agents.** E. von Angerer (Physikal. Z., 1925, 26, 864).—Ordinary photographic plates after development and fixation frequently show a set of fine wave-like black streaks which disfigure and sometimes ruin the negatives. The effect was traced to the action of traces of Pinacyanol and other red-sensitising agents, which are effective at very great dilution. Sufficient Pinacyanol is retained in a washed developing dish to affect the next plate to be developed in red light, using an alkaline developer. The streaks can best be avoided by using separate dishes for panchromatic or sensitised plates, or else by cleaning with chromic acid after using Pinacyanol.

R. A. MORTON.

## XXII.—EXPLOSIVES; MATCHES.

### PATENTS.

**Blasting-powder composition.** C. D. PRATT, Assr. to ATLAS POWDER CO. (U.S.P. 1,563,924-6, 1.12.25. Appl., 31.5.24).—Blasting-powder compositions contain the constituents of black blasting powder, together with (A) 5—35% of carbohydrates and 1—15% of a metal chloride, (B) 5—35% of one or more carbohydrates and 1—15% of one or more tartrates and oxalates, or (C) 1—35% of carbohydrates and other non-explosive organic material deficient in oxygen.

L. A. COLES.

**Manufacture of propellant powders.** C. R. FRANKLIN (U.S.P. 1,564,549, 8.12.25. Appl., 19.12.23).—Nitroglycerin is added with agitation to a mixture of nitrocellulose (N 12.60% approx.) with a large excess of water. The excess of water is removed and a stabiliser and flash-reducing compound are added. After mixing, the material is passed through heated pressure-rolls, seasoned, treated with a volatile solvent, passed through hot rolls, cut, and dried.

S. BINNING.

**Manufacture of detonators and cartridges.** H. W. BROWNSDON, and NOBEL'S EXPLOSIVES CO. (E.P. 243,771, 10.6.24).—Detonator shells made of an aluminium-silicon alloy, in which the content of silicon is from 2 to 5% are loaded with an azide, *e.g.*, lead azide, either alone or in admixture or conjunction with other suitable substances.

S. BINNING.

**Explosive.** N. A. UNGER (U.S.P. 1,566,784, 22.12.25. Appl., 14.3.24).—See E.P. 220,619; B., 1925, 268.

**Reducing viscosity of nitrocellulose** (U.S.P. 1,564,689).—See V.

**Removing pyridine from nitrocellulose** (U.S.P. 1,564,765).—See V.

## XXIII.—SANITATION; WATER PURIFICATION.

**Composition of mud balls [from water filters].** W. S. MAHLIE (J. Amer. Water Works Assoc., 1925, 14, 420—422).—No relation between the size and the composition of mud balls was established by the tests made on balls of different sizes taken from a filter which had received water coagulated with iron for nearly 5 years and then water coagulated with alum for nearly 6 months. The moisture contents, determined by drying in open pans at the ordinary temperature, varied from 27 to 42%. Washing losses, which were determined by stirring 1000 g. of the sample with water, allowing the sand to settle, pouring off the supernatant liquid, and repeating the process until the washings came away clear, varied from 16.8 to 22.8%. An air-dried evaporation residue from the washings showed upon analysis: ignition loss 31.61%, SiO<sub>2</sub> 30.00%, Fe<sub>2</sub>O<sub>3</sub> + Al<sub>2</sub>O<sub>3</sub> 29.16%, CaO 7.92%, MgO 2.35%, Mn trace. Observations made indicated that anaerobic bacterial action was taking place within the centre of the balls.

W. T. LOCKETT.

**Iron incrustation in water pipes.** D. ELLIS (Water and Water Eng., 1925, 27, 352—354).—The nodules of a hard incrustation which appeared in cast iron pipes coated with tar appeared to be completely separated from the iron of the pipe by the tar coating, and as they were found to contain iron bacteria, their formation was at first ascribed to deposition of iron from the water, which contained 0.04 p.p.m. of iron, and 10,000—60,000 bacteria per c.c. Experiments showed, however, that formation of the incrustation proceeded independently of the bacteria, and examination of the tar coating showed it to be porous to water, and it was concluded that the incrustation was derived from the pipe and not from the water. The water had *p<sub>H</sub>* 6 and contained a comparatively large amount of organic matter (8.7 p.p.m. oxygen absorbed). Ferruginous festoons and streamers which form in water pipes appear to be a purely biological problem, while discoloration of water due to iron in colloidal solution is brought about by both physical and chemical factors.

R. E. THOMPSON.