BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

MARCH 4, 1927.

I.-GENERAL; PLANT; MACHINERY.

Method of measuring the size of particles. P. LUKIRSKY and M. KOSMAN (J.S.C.I., 1927, 47, 21-25 T).—A method for the study of the distribution of particles with respect to their sizes is described, the hydrostatic pressure at one or in two points of the falling suspension of powder being determined at different moments. A method has been worked out for the measurement of the difference of levels due to those pressures. The method affords a simple means of measuring this difference with an accuracy up to 1 micron.

Particle size and distribution by sedimentation. J. H. CALBECK and H. R. HARNER (Ind. Eng. Chem., 1927, 19, 58—61).—The authors describe the experimental details of the determination of sedimentation gravimetrically, which they prefer to centrifugal and "change of density" methods. The derivation of sedimentation curves and the development therefrom of distribution curves and their rectangular equivalents —"histograms"—are explained from first principles and illustrated from the results of experiments with samples of red lead and litharge. S. S. WOOLF.

Action of acids and alkalis on fuller's earth. F. WELDES (Z. angew. Chem., 1927, 40, 79-82).-Improvement in the bleaching properties of fuller's earth by preliminary treatment with acids is not due to hydration of the silica, but to solution of part of the alumina and iron oxide, principally the former, resulting in a highly porous product with an extensive active surface. The use of hydrochloric or sulphuric acid is essential to attain the maximum effect, as the hydrogen-ion concentration of organic acids, such as tartaric acid, is insufficiently high to dissolve out the necessary quantity of the oxides. Dilute alkalis impair the bleaching properties by forming silicates within the pores, but the activity can be restored by subsequent treatment with dilute inorganic or organic acids; prolonged treatment with strong alkalis causes solution of considerable quantities of the silica, destroying the structure of the material and thereby rendering it inactive and incapable of further activation.

L. A. Coles.

Calibration of the burette consistometer. W. H. HERSCHEL and R. BULKLEY (Ind. Eng. Chem., 1927, 19, 134—139).—Flow-pressure data on translucent and not too stiff materials may be obtained by using a simplified form of Auerbach's burette consistometer. Two such instruments were calibrated by flow tests on standard liquids, corrections to the ordinary expression for stream-line flow of a viscous liquid being derived to allow for (a) surface tension effects and (b) variations in the coefficient of the kinetic energy correction.

S. S. WOOLF.

Device for adjusting the levelling bulb on a gasanalysing apparatus. A. M. McCollister and C. R. WAGNER (Ind. Eng. Chem., 1927, 19, 86).—Accurate adjustment of a levelling bulb may be brought about by using a sliding block for carrying the ring for the bulb, actuated by a screw fitted with a knurled wheel (or rack and pinion). The device is carried on a ring stand clamped for rough adjustment. An ordinary split ring may be cut in two about the middle of the shank, and both ends threaded, and the sliding block drilled and tapped to receive the ring, and the main part fitted with the clamp portion of the original ring. D. G. HEWER.

Mixing and agitation. M. PAILLY (Rev. gén. Colloid., 1926, 4, 295–298, 328–333).—A brief description of known methods and apparatus.

PATENTS.

Apparatus for determining the moisture content of masses of particles [e.g., moulding sand]. R. L. MCILVAINE (E.P. 263,450, 8.9.26).—A tube enclosing an electric battery in circuit with an indicating instrument is provided with a plunger of insulating material carrying a pair of terminals and slidable in the open end of the tube against spring pressure. Means are provided for holding the plunger rigid with the tube until the open end of the tube has been inserted into the particles. The plunger is then free to slide inwards to close a switch which completes the indicating circuit through the terminals and the particles. H. HOLMES.

Apparatus for determining the specific gravity of gases, in which a stream of gas flows in a tube provided with a baffle. J. H. REINEKE (G.P. 432,520, 25.3.24).—Gas flows at a constant rate from slits in two opposed vessels connected with a gas meter and clockwork rotating in a case, and the specific gravity is determined from the law of effusion of gases through an orifice. J. S. G. THOMAS.

Feeding solids into or removing solids from vessels under pressure. J. Y. JOHNSON. From BADISCHE ANILIN U. SODA FABRIK (E.P. 262,901, 5.11.25). —The powdered or granular material is forced into the vessel against a pressure of 100 atm. or more through a tube in which it forms a gas-tight closure. The material entering the tube from a hopper is pushed forward by a reciprocating plunger, and if its caking quality is insufficient to make the closure gas-tight, a layer of rubber, paper, cardboard, metal, or other material capable of providing such a closure is introduced at 128

each forward stroke of the plunger. A plunger device may be used similarly for pressing material out of the vessel through a tube. H. HOLMES.

Dispersing substances in water. W. B. PRATT, Assr. to RESEARCH INC. (U.S.P. 1,609,308, 7.12.26. Appl., 13.11.24).—Gums, waxes, asphalt, or like semisolid substances are agitated with water (10—15%) between 0° and 100° until the liquid is completely absorbed, a dispersing agent (4%), such as clay, agar, or glue, is added, and the mass is then mixed with increasing amounts of water, until dispersion occurs.

T. S. WHEELER.

Producer or shaft furnace. WOODALL-DUCKHAM (1920), LTD., and J. W. REBER (E.P. 262,668, 7.7.26).— The cooling jacket is constructed in upper and lower sections supplied with water under high and low pressures respectively, and the blast nozzles extend through the lower section. The water circulates in the lower section in a closed cycle, including a heat exchanger in which the water passing through the upper section is heated. H. HOLMES.

Centrifugal separators for liquids. F. GRIMBLE, M. N. CAIRD, and E. COOMBS (E.P. 262,902, 7.11.25).— A- centrifugal separator is provided with a filtering medium placed in the path of the liquid flowing from the outer annular space to the neck of the bowl. The filter material may be placed between the usual set of conical separating plates, or made up to an appreciable depth to take the place of some of the separating cones. An additional filter comprising a medium sandwiched between two perforated plates may be placed at the neck or overflow weir of the bowl. B. M. VENABLES.

Centrifugal separators or clarifiers. F. MORTENSEN (E.P. 263,021, 18,5.26).—Inside the bowl of a centrifuge are placed one or more inverted cups or bells, which are screwed down to make liquid-tight joints at their lower and wider ends. Heavy matter is then separated on the interior surfaces of the bells as well as on that of the outer bowl, the transfer ports or passages from bell to bell being arranged as near the axis as possible. One or more of the bells may be arranged to have a permeable filter surface. B. M. VENABLES.

Separators. FULLERTON, HODGART, AND BARCLAY, LTD., and J. C. ASTON (E.P. 263,284, 3.12.25).—Liquid from which it is desired to remove solid matter is admitted at high velocity tangentially to the lower part of a cylindrical vessel, and the cleaned liquid exhausted tangentially from the upper part. The solid matter moves to the centre of rotation and drops through a central hole to the space between the double bottoms of the vessel, where it settles. B. M. VENABLES.

Centrifugal separators. P. FESCA (C. A. FESCA & SOHN) (E.P. 263,348, 3.3.26).—A centrifugal separator of the type having two pans or bowls placed base to base, which are drawn apart to discharge collected solid matter, is arranged with both pans perforated, the upper one rotating but fixed axially, the lower one rotating and movable axially by hydraulic or pneumatic means. B. M. VENABLES.

Drums for centrifugal separating apparatus. K. J. SVENSSON and K. A. P. NORLING (E.P. 263,443;

3.9.26. Conv., 29.12.25).-A centrifugal separator for material containing at least two liquid constituents, also solid matter in suspension, is arranged so that the finer solid matter (slime) is removed continuously from the bowl along with the heavier liquid constituent, thus preventing or postponing the necessity of stopping the bowl for cleaning. This is effected by making the discharge passages for heavy liquid leading from the outer part of the bowl to the discharge neck small, and thus maintaining the velocity of the outflowing heavy liquid high enough to carry the slime with it. The position of the entrances to these passages will vary with the nature of the solid matter in the feed; if the solid matter contains no pieces large enough to block the passages, they may start at the extreme outer part of the bowl, but if chips or large pieces are present, the passages must start rather inwards, so as to allow space for large pieces to collect.

B. M. VENABLES.

Hydro-extractors. BAKER PERKINS, LTD., and J. E. POINTON (E.P. 263,303, 22.12.25).—To reduce the power demand for operation of two or more extractors, these are mounted on a common base with a single driving motor, and the transmission mechanism is provided with clutches enabling the extractors to be started into operation successively, and to be maintained in operation simultaneously. H. HOLMES.

Jaws or breaker plates for stone crushers and the like. P. BECHGAARD (E.P. 263,070, 12.10.26).— Jaws for crushers with corrugations or other form of projections on them are constructed with cavities within the substance of the jaw which are of the same form as and immediately behind the outer corrugations. When the original outer ridges are worn away the cavities are exposed and form fresh corrugations. The cavities may either be left empty or filled (during or after the casting of the jaw) with softer or more brittle metal, which is subsequently driven out. B. M. VENABLES,

Crusher. R. C. GREENFIELD, Assr. to ALLIS-CHALMERS MANUF. Co. (U.S.P. 1,607,615, 23.11.26 Appl. 30.9.22).—A crusher comprises a conical dish, in which rotates a vertical shaft carrying two conical crushing heads, so that there are formed two tapering crushing spaces, one above the other. Packing of the material in the crusher is avoided. T. S. WHEELER.

Absorption refrigerating apparatus. A. L. MOND. From Platen-Munters Refrigerating System Aktie-BOLAG (E.P. 262,870, 19.9.25).—In a refrigerating system

employing, e.g., ammonia, water, and hydrogen, arranged as represented in the diagram, where V is a rectifier, K a condenser, G an evaporator (or refrigerator proper), A an absorber, and O a boiler, the invention lies in the arrangement of the conduit, P, which carries liquid saturated with absorbent from the absorber, A, to the boiler, O. The



saturated liquor, after pre-heating by heat exchange with the returning barren liquor in the conduit, L. is boiled by a heater, W, within the convolutions of the conduit, P, and the bubbles of gas thus produced alternate with short columns of liquid in the vertical part of the conduit, P, which is kept small for the purpose of preventing free exit of the gas bubbles. The gas-lift pump effect produces a circulation throughout the boiler, absorber, and conduits, P and L. The liquid is further boiled by the same heater, W, extending into the boiler, O. B. M. VENABLES.

Refrigerating apparatus. W. H. CARRIER, and CARRIER ENGINEERING CORP. (E.P. 263,052 and 263,206, 11.8.25).-(A) In a refrigerating system utilising a volatile liquid as refrigerant, and comprising a main evaporator (or refrigerator), a compressor and a condenser, a portion of the uncondensed vapour and noncondensible gases is withdrawn from the top of the main condenser (which is preferably cooled by a downward counter-current flow of water) and led through the heating coil of a rectifier (see below) to an auxiliary condenser and separating chamber, which is cooled by cold refrigerant drawn from the main evaporator. From this separating chamber the non-condensible gases are pumped to atmosphere, and the condensed refrigerant joins the main bulk of liquid in the evaporator. The rectifier is supplied with a portion of liquid from the spraying device at the top of the evaporator, which is separated into impurities (drawn off at intervals) and pure vapour of refrigerant, which re-enters the evaporator. (B) An approximately constant rate of rectification is maintained by means of a heating coil, which is only partly submerged in a new charge of comparatively pure and easily-boiling liquid, but fully submerged in the liquid when it contains practically nothing but impurities. B. M. VENABLES.

Apparatus for heating liquids [water]. A. G. TAVLOR and H. STUBBING (E.P. 263,401, 4.6.26).— The liquid is circulated through a casing traversed by tubes through which combustion gases from a heater pass upwards to an outlet flue. The top of the casing is convex, and a baffle, slightly spaced from it above the tubes, is similarly shaped. The bottom of the casing is concave, and is removably mounted on a stand enclosing the heater. The outlet flue is carried centrally by a cover removably mounted on the top of the casing. H. HOLMES.

Fractional distillation. R. B. CHILLAS, JUN., ASST. to ATLANTIC REFINING CO. (U.S.P. 1,612,572, 28.12.26. Appl., 30.6.25).—A proportion of the total descending reflux liquid is removed at a predetermined point, and this proportion is maintained constant irrespective of variations in the rate of the reflux flow. H. HOLMES.

Apparatus for separating or filtering liquids from materials containing them. LEVER BROS., LTD., and J. L. CLOUDSLEY (E.P. 262,840, 11.8.25).—The material is compressed within a cylinder by a worm on an axial shaft, and the expressed liquid is discharged between the coils of a helix of stout wire or tubing constituting a liner for the cylinder. The coils may be grooved or notched to expedite the discharge, and the inner face of the cylinder or of a plain liner therein may be provided with conduits for the further discharge of the liquid from the apparatus. When a tubular helix is used a

heating or cooling fluid may be circulated through it, or a fluid escaping through perforations in contact with the material may be supplied. H. HOLMES.

[Boiler] furnaces. T. E. ROBERTSON. From POWER SPECIALTY Co. (E.P. 263,369, 10.4.26).

Dialysing membranes (U.S.P. 1,608,886).-See V.

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

Lignin and oxycellulose theory [of coal formation]. J. MARCUSSON (Z. angew. Chem., 1927, 40, 48-50; cf. B., 1926, 809).—Completely decayed wood, three samples of peat, a lignite, and a brown coal have been submitted to the method of analysis previously described, with results confirming the author's theory of coal formation. The decayed wood gave a high yield (17.7%) of non-volatile water-soluble acids, consisting partly of glycuronic acid and partly of acids which appear to be transition products between glycuronic and humic acids. The cellulose content of the peat decreased with the age of the sample, being replaced by oxycellulose and humic acids; no progressive increase was observed in the lignin content. Similar results were found for the lignite and brown coal. The peat analyses of Odén and Lindberg (B., 1926, 568) are open to criticism. Extraction by sulphurous acid under pressure will remove the water-soluble acids with the lignin, giving much too high a figure for the latter, and will moreover attack the cellulose. The author's results are confirmed by those of Keppeler (B., 1920, 394 A).

A. B. MANNING.

Cleaning of small coal. A. GROUNDS (Proc. S. Wales Inst. Eng., 1927, 42, 529-577).-Various types of vibrating screens (Overstrom, Sturtevant, Hum-mer) and concentrating tables (H. H. Overstrom, Massco, Butchart, H.H. Universal Curvilinear) used for coal washing are described, some of them in detail, and a number of results of recent tests quoted. Electrically operated screens require the installation of special generators, and compare unfavourably, for example, with the Overstrom, of which the mechanism, based on the vibrations of an unbalanced pulley, is extremely simple. Concentration tables differ from one another mainly in the distribution of the riffles. It has been found possible to replace the usual linoleum covering for the table by rubber, the riffles being rubber covered also; the life of the covering is thereby considerably increased. Systems depending on air separation, in particular the Birtley table, are described. The advantages of air separation, at any rate for coal above is-in. size, are more than offset by the added screening capacity required, the extra power absorbed by the fans, and the added capital expenditure for dust collecting plant. The question of de-watering is dealt with, descriptions being given of the H.H. machine, the Carpenter centrifuge, the Oliver rotary filter, and several A. B. MANNING. types of coal drier.

Torbanite and its treatment by the Bergius method. A. W. NASH (J. Inst. Pet. Tech., 1926, 12, 568-581).—The author reviews the researches which have been made on the nature of torbanite found in different parts of the world, and traces its origin to matter similar to Coorongite, a product of decomposition of algæ found in lagoons in South Australia. Experiments were made in berginising New South Wales torbanite in presence of hydrogen or nitrogen, the results being compared with those of ordinary and steam distillation. A decrease of pressure was noted in the experiments with hydrogen, whereas an increase in pressure occurred with nitrogen. The yields of oil were inferior to those of ordinary distillation, both in the cases in which phenol was added as a disperse medium and without phenol. Prolongation of the treatment led to thermal decomposition of a part of the oils. The residual gases of hydrogenation contained $8 \cdot 5 - 26 \cdot 3\%$ of methane. H. MOORE.

Investigation of the behaviour of solid fuels during oxidation. II. B. MOORE and F. S. SINNATT (Fuel, 1926, 5, 377-380).—The changes in the properties of freshly-mined coal after 1 and 21 years' storage exposed to air were examined by the method previously described (B., 1925, 486). The glow-point temperature of the coal and the ignition temperature of the volatile matter were determined. The ignitions of the volatile matter in the coals after storage were less in magnitude than those of the freshly-mined samples, and the glowpoint temperatures increased slightly during storage. The tendency of a coal to ignite is diminished by storage due to the formation of compounds of greater thermal stability, or with higher temperatures of ignition. With coals obtained from seams associated with "gob fires" the time interval between glow-point and ignition of the volatile matter is shorter than for other coals.

A. C. MONKHOUSE.

Oxidation of the constituents of a resinous Utah coal. J. D. DAVIS and D. A. REYNOLDS (Fuel, 1926, 5, 405-411) .- A non-coking Utah coal was extracted with benzene at 275° and 750 lb. pressure; the extract was separated into solid and oily bitumens using Fischer's method (B., 1925, 656). The rates of oxygen absorption at 60° over periods of 100 hrs. were determined for the three separated constituents, and the results compared with those of the original coal. The absorption of oxygen is shown to be due to the oxidation of all parts of the coal substance, and not to any particular constituent of the coal. The residue after extraction oxidised twice as rapidly as the original coal on account of the increased surface exposed. Similar results were obtained with the bitumens after being dispersed on pumice. Water is the main product of oxidation of the bitumens, carbon dioxide predominating in the oxidation of the residue. A. C. MONKHOUSE.

Thermochemical comparison of various types of lamp black. L. HOCK and S. BOSTROEM (Kautschuk, 1927, 21—22).—The heat generated on wetting amorphous carbon such as lamp black or gas black with benzene is believed to be inversely proportional to the radius or surface area of the constituent particles. The results place lamp black in an intermediate position between gas black and thermatomic black, and reveal differences between various blacks of the same type.

D. F. Twiss.

Comparison of vitreosil, illium-alloy, and platinum crucibles for determination of volatile matter in coal. H. M. COOPER and F. D. OSGOOD (Fuel, 1926, 5, 381-385).-Crucibles of vitreosil, platinum, and illium-alloy (62.21 Ni-Cr, with Cu, Mo, W, Fe, Mn, and Al) are compared for the determination, by the standard American method, of the volatile matter of 10 fuels containing 1-48% of volatile matter. Vitreosil and illium-alloy crucibles give results in agreement with those obtained by using a platinum crucible, except with high-volatile non-coking coals. The disadvantage of the vitreosil and illium-alloy crucibles is their high sp. heat, and tests using a water-cooled plate gave times of cooling of 6-8 min. as compared with 21 min. for platinum crucibles. For ease of manipulation and long service platinum and illium-alloy are superior to vitreosil. A. C. MONKHOUSE.

Influence of ash on calorific power. R. STUMPER (Bull. Soc. chim. Belg., 1926, 35, 417-421).—The net calorific power, P_N , calculated from the heat of combustion, H, determined by the bomb calorimeter, and the percentage of ash, a, by the formula $P_N =$ 100 H/(100 - a), is plotted against the ash content; a, for a large number of Belgian coals, and found to fall slightly as the value of a rises. The variation is only 0.4% of the mean value for values of a below 20, but becomes more considerable when a is over 20.

S. I. LEVY.

Trend of design in modern coke-oven construction and its bearing upon refractory materials. A. E. J. VICKERS and A. T. GREEN (Fuel, 1927, 6, 4—14). —The systems of heating used in the principal types of coke oven are outlined. Recent work on the refractory properties of silica brick, siliceous firebrick, and fireclay is summarised in so far as it bears on the use of these materials in coke oven construction (cf. Wilson, B., 1924, 514; Dale, B., 1925, 717; Middleton, *ibid.*, 947; Green, B., 1926, 947). It is concluded that silica material has many advantages over fireclay; it stands up better under load, is more resistant to corrosion, and enables the ovens to be operated more quickly. A full bibliography is appended.

A. B. MANNING.

Residual and extinctive atmospheres of flames. T. F. E. RHEAD (Fuel, 1927, 6, 37-40).-The composition of the residual and extinctive atmospheres of flames depends on (1) the relative rates of diffusion of the combustible gases, (2) their oxygen requirement, (3) the relative speed of flame propagation in the air-gas mixture, (4) the extent of the range of inflammable mixtures, and (5) the specific heat of the products of combustion as compared with that of the diluent gas in the original atmosphere. The low value of the oxygen content of the residual atmosphere from the combustion of hydrogen $(5 \cdot 6\%)$ as compared with the corresponding values for methane (16.6%) and carbon monoxide (12.3%) are thus explained. The results obtained in determining these values are to some extent dependent on the experimental conditions. Some measurements of the oxygen content of atmospheres (oxygen-nitrogen mixtures) which just cause extinction of flames of methane, ethane, propane, and butane, have been made

by a "flow" method, in which a flame of the gas issuing from a jet was supplied with a steady stream of an "atmosphere" of which the oxygen content could be varied. The results were influenced by the size of orifice, the speed at which the gas issued, and the relative speed of the gas stream and the surrounding atmosphere; the values for methane, for example, varied from 16.6 to $18 \cdot 2\%$. The results have a bearing on such problems as the sealing off of gob fires and the design of burners for domestic gas ovens. A. B. MANNING.

Spectrography of flames in a combustion engine. A. HENNE and G. L. CLARK (Compt. rend., 1927, 184, 26-28).—The explosion spectra of a combustion engine operating normally, with "knocking," and in the presence of anti-detonators, have been photographed at four stages of each explosion. The extent of the "knocking" is measurable by the movement of the lines of the normal spectrum towards the ultra-violet, and is greatest in the first quarter of the explosion. "Knocking" is due to a sudden liberation of energy, the effect of the addition of an anti-detonator being to distribute this over a longer period of time. All the substances used (lead tetraethyl, aniline, and ethylenic hydrocarbons) produced the same spectrum as was obtained under normal circumstances. Lines due to lead appeared only in the first quarter of the explosion, indicating that the catalytic action takes place at the beginning of the reaction. The artificial "knocking" was produced by J. GRANT. pressure.

Addition of waste gases from industrial furnaces to a producer blast. C. AMMON (Chem.-Ztg., 1927, 51, 41).—A considerable amount of steam has to be added to a producer blast to obtain a rich gas and to lower the temperature of the gasifying zone. The same results can be attained by using waste gases from furnaces, there being sufficient moisture for the production of carbon monoxide and hydrogen. The resulting producer gas has a smaller moisture content, which is advantageous for metallurgical processes. The small initial cost of the additional plant required is soon covered by the saving in steam. W. G. CAREY.

Oxidation of ammonium sulphide. [Removal of sulphur from gas.] M. P. APPLEBEY and J. A. LANYON (J.C.S., 1926, 2983-2994).—The oxidation of the sulphur contents of coal gas without the preliminary removal of ammonia is attempted, and thus ammonium sulphate formed without the supply of extraneous sulphuric acid. Ammonium sulphide was quantitatively transformed into a mixture of ammonium sulphate and sulphite at 450-650° in the presence of catalysts. The optimum mixture is 650 vols. of air, 50 vols. of hydrogen sulphide, and 100 vols. of ammonia. Alumina, best in the form of gel, is the most efficient catalyst, but pumice can also be used. Ferric oxide and chromic oxide are unsuitable because they catalyse the oxidation of ammonia, hydrogen sulphide acting as a promoter to ferric oxide. The efficiency of the above changes is seriously interfered with by coal gas. The yield was considerably reduced and much contaminated with tar, especially at the lower temperatures ; at higher tempera tures a green liquid was formed with a strong garlic odour suggesting carbonyl sulphide. Experimental

devices described include an apparatus for generation, storage, and delivery of pure hydrogen sulphide at constant pressure, a quantitative and rapid absorbent for hydrogen sulphide, and a method for the determination of sulphite and thiosulphate in a mixture of the two. W. THOMAS.

Accuracy of the A.S.T.M. distillation method. BATAAFSCHE PETROLEUM MAATSCHAPPIJ (J. Inst. Pet. Tech., 1926, 12, 586-590).-Investigations of thermometer lag with thermometers of different types failed to show any constant difference, the results being irregular. Comparisons were made of the results obtained by four experimenters, carrying out five distillations each on four different pieces of apparatus. The smallest variation was in the successive results of one experimenter on the same apparatus, being 1° for initial and final b.p. and 0.2° for the middle distillation range. These errors become 1.3° and $0.4-0.5^{\circ}$ when one observer works with various apparatus, and with various observers and apparatus 1.4° for initial b.p., more than 0.5° for middle range, and final b.p. 1.30-2.5°. The accuracy with which the volume of benzine distilling at a certain temperature is determined is equal to accuracy of temperature reading multiplied by cotangent of the angle of the distillation curve at that point. H. MOORE.

Solvents for separating aromatic and aliphatic hydrocarbons in oils. O. GÖHRE (Petroleum, 1927, 23, 73-77).-After a survey of the solvents previously used, the author discusses several new solvents that he investigated, including four which give satisfactory results. Lævulic acid, which can be used at the ordinary temperature, and is readily recovered by extraction with water, gives theoretical results for the aromatic content of oils containing up to 90% of these constituents. In extracting light oils or oils of medium viscosity the proportion of solvent to oil is $3\frac{1}{2}$: 1, but with highly viscous oils or mixtures containing turpentine oils a proportion of 2:1 gives more reliable results. Phenylhydrazine is suitable for extracting many oils, the proportions varying with the nature of the oil, but it is not suitable in the case of hydrocarbons of low b.p. Glycol monoacetate in the proportion of 3:1 gives reliable results at the ordinary temperature for light oils and oils of medium viscosity, and of 2:1 for highly viscous oils, except where the aromatic content is high, when the mixture must be cooled with ice. In such cases lævulic acid is to be preferred. Furfuraldehyde used in the proportion of 1:1 is a reliable solvent for extracting all oils; it must, however, always be used at -10° . L. A. Coles.

Polymerisation. I. H. I. WATERMAN and J. N. J. PERQUIN. II. H. I. WATERMAN and J. C. JAMIN (J. Inst. Pet. Tech., 1926, 12, 506-509, 510-517).-I. Traces of oxygen may cause decomposition of hydrocarbons at a low temperature. Various unsaturated hydrocarbons were kept in contact with bleaching earth or active carbon, and their properties after distillation compared with those of the products of distillation of the untreated substances, the result being tabulated. Some hydrocarbons liberate heat on being mixed with the porous substance as in the case of hexylene and silica gel, but the product may not be changed, except when much heat is liberated. The reaction with the porous substance is accelerated when the temperature is raised above 100°, as with indene and floridin at 140—150°. Silica gel caused only a slight change in amylene. The bromine number was often increased by distillation, but the results were irregular. Various hydro-aromatic and saturated hydrocarbons gave low bromine (addition) numbers. How far these were due to contamination of the substances examined could not be determined.

II. When 2 pts. of amylene were mixed with 1 pt. of norit, a rise in temperature was observed; after 28 hrs. the mixture was distilled at a pressure of 25 mm. of mercury, and the vapours were condensed with solid carbon dioxide and alcohol. The quantity of hydrocarbon remaining in the norit varied inversely with the moisture content of the latter, and could not be expelled by heating at 40° in vacuo. The addition of pumice stone caused the distillation temperature to be raised, and the residue to smell of turpentine. Amylene was treated with norit with about 1.6% moisture content for 24 hrs., and distilled under high vacuum. An examination of the amylene left in the norit showed that it had undergone little change, its unsaturation toward bromine having only increased 0.3%. Amylene was heated and its vapour passed over dried floridin in Lebedev and Filonenko's apparatus, the floridin being kept at 45-50°. The amylene residue in the floridin had a high refraction and sp. gr. and a reduced bromine number, showing that considerable change had taken place. The degree of unsaturation had decreased by $5 \cdot 5\%$. Similar differences marked the behaviour of isobutylene with norit and floridin H. MOORE. respectively.

Oxidation of lubricating oil. H. MOORE and J. BARRETT (J. Inst. Pet. Tech., 1926, 12, 582-585).-The property of oiliness does not come into action in machinery in which bearing surfaces are of adequate dimensions and bearing pressures moderate. Most failures in lubrication are occasioned by oxidation changes in the oil interfering with its regular supply to bearings. Oxidation leads to the formation of viscous or solid substances, and of jelly-like emulsions with water, and the necessity for an oxidation-resisting lubricant is marked in cases where the oil is returned to a sump and again fed to the machine. Experiments were made on 8 oils of approximately similar viscosity, with various bases, the Michie sludge test and Air Board oxidation test being applied, and hard asphaltum content, and viscosity and coke value before and after blowing being taken as an indication of liability to oxidation. In this respect the samples were found to vary greatly.

H. MOORE.

Oxidation of transformer oils. R. SCHLAEPFER (Z. angew. Chem., 1927, 40, 50–51; cf. Stäger, B., 1926, 331).—The apparent contradiction between the author's results and those of Stäger on sludge formation during the oxidation of transformer oils by air is due to the use by the latter of insufficiently refined products. A highly refined paraffin-base oil gives only oil-soluble acids on oxidation. A. B. MANNING.

Control of oils in newly-filled transformers. M. TILGNER (Chem.-Ztg., 1927, 51, 43).—The oil of newly filled transformers should be examined as to quality. Poor oils decompose rapidly with the formation of water, acids, peroxides, and sludge, which are troublesome and dangerous. Even good oil deteriorates if subjected to imperfect purification methods, or by catalysis. There should be no separation of dark sludge insoluble in benzine after heating for 70 hrs. at 120°. W. G. CAREY.

Surface tension and wetting power of asphalt [and tar]. F. J. NELLENSTEYN (Chem. Weekblad, 1927, 24, 54—58).—The wetting power of liquids is discussed in relation to capillary phenomena, and it is shown that the assumptions usually made are inconsistent. A low surface tension enables a liquid to spread over a smooth surface, but does not necessarily favour its rise in a capillary tube. The surface tensions of various mineral oil asphalts and of coal tars were determined at $180-200^{\circ}$ by noting the differential rises in a wide and in a narrow capillary tube in an atmosphere of nitrogen ; they vary between 23 and 25 dynes/cm.² for the mineral asphalts; for coal tar the values found were $43 \cdot 0$, $40 \cdot 9$, and 32 at 20° , 50° , and 190° respectively.

S. I. LEVY. Gas-analysing apparatus. McCollister and WAGNER.—See I.

Blast-furnace process. UHLMANN.-See X.

Uses of coke-oven gas in the steel industry. WILSON.—See X.

Aluminium as constructional material in industry. Buschlinger.—See X.

PATENTS.

Manufacture of briquettes from lignite. C. L. McCREA (U.S.P. 1,607,012, 16.11.26. Appl., 22.10.24).— A plant for briquetting raw lignite is combined with a lignite carbonising machine, the products from which pass through a steam-heated chamber in which the heavy tar constituents condense. The hot pitch and associated substances so produced are pumped in regulated amount to the stream of powdered lignite to be briquetted, as it is being fed to a drying and mixing chamber. The mixture of pitch and lignite is dried by contact with the hot gases from the carbonising machine, after which it is cooled and pressed into briquettes. S. PEXTON.

Apparatus for washing and sorting coal. F. BASCOUR (E.P. 256,211, 19.7.26. Conv., 28.7.25).— Powdered coal is allowed to gravitate down an inert column of water. Some distance down the column a stream of water is forced transversely across it through openings at substantially the same level. Valves and slides are provided whereby the transverse flow can be regulated in quantity and in its angular direction, so that the dense particles fall through the stream and the lighter particles pass away with the stream and are separately collected. S. PEXTON.

Dehydration of coal sludge. K. and K. WOLF (E.P. 260,002, 18.10.26. Conv., 17.10.25).—Coal sludges obtained from flotation or similar processes are mixed with dry coal or coke of 0—2 mm. size until the final product is capable of being handled with shovels or moulded into briquettes, the product having a water content of less than 25%. The mixture is dried by exposure to air; the drying may be accelerated by using preheated air or drying drums. A coal sludge, containing $58 \cdot 2\%$ of water, when spread out in a layer 5 cm. deep, after 72 hrs.' exposure to air at 18° contained $47 \cdot 5\%$ of water; the same sludge mixed with coal and coke as described after 72 hrs.' drying contained $5 \cdot 7\%$ of water, or if briquetted and dried $1 \cdot 3\%$ of water.

A. C. MONKHOUSE.

Fuel-drying apparatus. H. KREISINGER, J. E. BELL, and J. ANDERSON, ASSTS. to COMBUSTION ENGI-NEERING CORP. (U.S.P. 1,608,699, 30.11.26. Appl., 28.8.23).—In each chute supplying fuel to the pulverisers is provided a number of flue passages through which hot waste furnace gases are exhausted. S. PEXTON.

Manufacture of agglomerated adsorbent carbon. Soc. DE RÉCHERCHES ET D'EXPLOITATIONS PÉTROLIFÈRES (E.P. 244,461, 8.12.25. Conv., 9.12.24).—The adsorbent carbon is finely ground and mixed with an organic binder soluble in water, and dissolved in a solution of a soluble salt. The paste obtained is moulded to the shape required, dried in an oven, and then coated with an aqueous solution of an organic substance to which is added a soluble salt. The granules are then carbonised in a closed vessel, the coating forming an envelope to protect the granules from mechanical action. After washing with acid and water, a further heating at red heat is given in order to restore the adsorbent properties.

A. C. MONKHOUSE.

Production of active carbon in a pulverulent form at low temperatures. K. BUBE (E.P. 262,278, 22.12.25).—Oils such as producer-gas tar or crude oil rich in asphalt are heated in a pressure-resistant apparatus at 350—500° in such a way as to avoid vaporising the whole of the oil. The carbon formed by cracking is protected from overheating by the presence of the liquid oil. The products are all discharged from a common outlet, and the pulverulent active carbon is purified by treatment with hot water. S. PEXTON.

Hydrogenating and cracking carbonaceous matter. F. BERGIUS (U.S.P. 1,607,939, 23.11.26. Appl., 5.4.24. Conv., 31.5.23).—Hydrocarbons or carbonaceous materials are treated in a reaction vessel fed with hydrogen. The mixed gases and vapours are passed from the reaction sphere through a condenser followed by an oil washer in which the permanent gases are scrubbed under high pressure. The residual gases containing hydrogen are returned to the reaction vessel. The wash oil is stripped of its hydrocarbons, which are decomposed at a high temperature into hydrogen and carbon, the hydrogen being returned to the reaction chamber. S. PEXTON.

Retort furnaces [for carbonisation of coal]. W. M. CARR, H. J. TOOGOOD, and R. DEMPSTER & SONS, LTD. (E.P. 263,269, 6.11.25).—The furnace is heated by coal gas from the retort, and the combustion gases are utilised in a waste-heat boiler. To reduce the calorific value of the coal gas sufficiently to avoid deposition of lampblack on the walls of the retort, a portion of the combustion gases is mixed with it by utilising the pressure at the outlet of the boiler fan.

H. HOLMES.

Annular hearth oven. E. W. HARTMAN, Assr. to HARTMAN INTERESTS, INC. (U.S.P. 1,608,597, 30.11.26. Appl., 20.11.24).—A cylindrical retort is provided centrally with a number of superimposed steam-tight chests. The flange plates, divisional between the successive chests, extend outwards from the chests, forming decks which retard the flow of material to be distilled in its downward passage through the retort. A mechanical agitator displaces the material from the successive decks. Independently regulated steam supplies are connected to each of the steam chests which form the heating elements. S. PEXTON.

Ovens for distilling coal. J. DANIELS (E.P. 239,884, 14.9.25. Conv., 13.9.24).—In a battery of retorts or ovens which has vertical combustion flues there is provided a series of roof-flues running lengthwise throughout the whole of the battery. These flues, besides collecting and transferring the combustion products from the up-flow flues to the down-flow flues, form channels for equalising the distribution of hot gases in the down-flow flues, and make for even temperatures not only in each oven, but throughout the battery. S. PEXTON.

Treatment of peat or marsh soil to render them proof against moisture and fire. L. G. WILKENING (E.P. 244,716, 2.10.25. Conv., 17.12.24).—Peat, marsh soil, or substances containing vegetable mould are impregnated with a dilute solution of a halogen salt of an alkali metal or of ammonium. The excess solution is squeezed out, and the product when pressed forms material suitable for building or for insulating purposes. S. PEXTON.

Method and apparatus for the disposal of exhaust gases. A. E. WHITE. From C. E. THOMPSON (E.P.262,181, 3.9.25).—Exhaust gases from an internal-combustion engine are rendered innocuous and odourless by mixing with air, igniting electrically, and passing over a catalyst to promote combustion. In cases where the exhaust gases contain insufficient combustibles for the combustion to be self-supporting in the presence of the catalyst, means are provided for introducing fuel gas from the engine inlet to the exhaust prior to the treatment. S. PEXTON.

Apparatus for absorption of hydrocarbons. D. L. NEWTON (U.S.P. 1,608,416, 23.11.26. Appl., 19.7.24).-Gas to be scrubbed with a liquid medium is passed up a tower containing a number of trays down which the scrubbing medium flows. Each tray is sealed in the washing fluid to the height of an overflow through which liquid passes to the next tray below. The trays are perforated to allow for the passage of gas, each perforation being surmounted by a circulating tube having an open top and provided with side openings near the bottom. The circulating tubes are completely submerged in the washing medium, and are separated into rows by baffle plates. S. PEXTON.

Generation of gaseous fuel. F. UMPLEBY (E.P. 263,561, 8.10.25).—A vertical retort is enclosed in a furnace consisting of mild steel plates lined with heatinsulating bricks. Colloidal, liquid, or pulverised fuel is admitted to the furnace through a series of nozzles pointing in a downward direction; the products of combustion are withdrawn at the top of the furnace and pass through a waste-heat boiler. The ash is cooled by a series of water pipes at the bottom of the furnace, and removed automatically. Colloidal, liquid, or pulverised fuel is conveyed by means of an air or gas stream to the retort through an annular discharge pipe, and passes down through the distillation zone, which contains a vertical pipe for withdrawal of the gases, to the gasification zone, to which air and steam are admitted. The ash is ejected from the bottom of the retort by means of compressed air or steam, or if coke be formed this may be fed back to the furnace. A. C. MONKHOUSE.

Joint manufacture of carburetted water-gas and volatile hydrocarbon motor fuels. F. A. HOWARD, Assr. to STANDARD DEVELOPMENT Co. (U.S.P. 1,609,023, 30.11.26. Appl., 24.3.21).—In the manufacture of carburetted water-gas the oil feed is controlled with respect to the temperature of cracking, so that the resulting fixed hydrocarbons are from 15% to 60% by weight of the oil supplied to the carburettor. The mixed gases and vapours are cooled whereby the condensed oil containing the volatile hydrocarbon motor fuel is separated from the fixed gases, the calorific value of these being 450—650 B.Th.U./cub. ft. according to the rate of oil feed. S. PEXTON.

Apparatus for the destructive distillation of bones and the like. C. H. SHEARMAN (E.P. 263,659, 17.3.26).—A vertical steel cylinder lined with refractory material has a grate at the bottom supporting at its centre a short tube of firebrick perforated with holes. A layer of wood is placed on the grate and the cylinder filled with bones. As the charge burns, air vents, arranged in a staggered manner round the cylinder, are opened by the removal of firebricks. Low-pressure steam is admitted and the products of distillation are removed by a fan and pass down a chamber containing metallic pipes with insulated rods inside. These are connected to a high-tension current, and the liquid products condensed are removed at the base of the chamber.

A. C. MONKHOUSE.

Apparatus for continuous distillation [of oil]. F. M. HESS (U.S.P. 1,608,741, 30.11.26. Appl., 29.4.22). —A continuous still is built up in sections with heating plates inclined alternately to the right and to the left. Crude oil flows by gravity over the heating plates, and in its passage from one section to another passes through a seal which prevents the counter flow of the vapours. The vapours are withdrawn from each section and condensed in separate units, from which the several condensates are withdrawn. S. PEXTON.

Distillation of solid carbonaceous materials. J. F. RICHARDSON (U.S.P. 1,609,128, 30.11.26. Appl., 24.4.22).—Solid carbonaceous material is distilled in a combination vertical retort, the heat being supplied by the maintenance of a zone of combustion within the retort with a regulated supply of air. The air is admitted to the retort through a fluid-sealed inlet, the extent of the seal varying directly with the pressure in the retort in such a way that the rapidity of heating is controlled automatically by variations in the rate of air supply.

S. PEXTON.

Destructive decomposition of organic substances. J. H. WALLIN (U.S.P. 1,608,075, 23.11.26. Appl.,

18.4.23. Conv., 26.8.20).—Organic substances are heated at not less than 250° and under 40—500 atm. pressure with sufficient caustic alkali to combine with all acids formed. S. PEXTON.

Pressure distillation of hydrocarbons. F. M. HESS (U.S.P. 1,610,523, 14.12.26. Appl., 7.6.22).—The distillation stock is heated under pressure by a fluid heating medium and hot residuum, each of which circulates in separate pipe systems within the still; the vapours and residuum pass, out of contact with each other, to a dephlegmator, reflux from the condensation of the vapours returns to the still, and uncondensed vapours pass to a condenser. W. N. HOYTE.

Cracking of [hydrocarbon] oils. U. S. JENKINS (E.P. 262,666, 25.6.26).—The cracking stock is fed to a still at a greater rate than is ordinarily required for cracking, and adsorptive material such as fuller's earth or lime is added. The oil is subjected in the still to heat and pressure, the vapours formed by cracking are conducted away, the residuum together with adsorptive material is continuously drawn off into an evaporator, and the pressure thereon is reduced to atmospheric. Further disengagement of vapours takes place, aided by live steam if desired. The residuum finally flows very slowly through a settling tank in which the adsorptive material together with suspended carbon are deposited. By the flushing action of the excess of oil and by the presence of the adsorptive material deposition of carbon in the cracking still is prevented. W. N. HOYTE.

Desulphurisation and hydrogenation of unsaturated and waste [hydrocarbon] oil. J. A. BISHOP (U.S.P. 1,610,242, 14.12.26. Appl., 9.4.23). —The oil is maintained at 450—500°, carbon monoxide and steam are introduced independently, carbon dioxide and nascent hydrogen are produced, and hydrogenation and the formation of hydrogen sulphide take place.

W. N. HOYTE.

Recovering resinous substances from cracked petroleum distillates. J. C. MORRELL, Assr. to UNI-VERSAL OIL PRODUCTS CO. (U.S.P. 1,608,135, 23.11.26. Appl., 27.4.23).—Cracked petroleum distillates are distilled with, or filtered through, an adsorbing agent, such as bentonite, charcoal, or the like, and the adsorbent is extracted with a solvent, such as ether-alcohol, or liquid sulphur dioxide. T. S. WHEELER.

Method and apparatus for determining, indicating, and recording the calorific value of liquid and gaseous fuels. J. M. MOREHEAD (U.S.P. 1,607,684, 23.11.26. Appl., 2.2.23).-Liquid or gaseous fuel is burned at a measured rate in a still which has the form of a vertical gas-tube boiler, the tubes forming flues whereby the products of combustion are conveyed to a condensing coil immersed in a vessel through which liquid flows into the calorimeter around the tubes. The liquid in the calorimeter boils and distils into a second condensing coil which drains into the same outlet as the first, both coils being in the same condensing bath. The rate at which the condensate collects is recorded, or alternatively can be measured over a suitable time interval. S. PEXTON.

Fuel for internal combustion engines. E. G. E. MEYER (E.P. 262,363, 12.6.25).—Oil of relatively high b.p.

is mixed thoroughly with 4% by vol. of ethyl ether and 1 pt. by wt. in 10,000 of ammonia solution; if required 10% by vol. of volatile hydrocarbon is added. A satisfactory motor fuel is produced. The addition of ammonia causes the retention of the ether in the mixture, and prevents gum formation on the valves.

W. N. HOYTE.

Tool for repairing gas retorts, furnaces, etc. R. J. MILBOURNE and C. POULSON (E.P. 263,419, 29.7.26).

Atmospheric gas burners. CANNON IRON FOUNDERS, LTD., and H. S. HAWTHORNE (E.P. 263,335, 11.2.26).

Apparatus for storing inflammable liquids or for supplying such liquids. E. G. E. BEAUMONT, and ANGLO-AMERICAN OIL CO. (E.P. 262,613, 8.1.26).

Feeding solids into or removing solids from vessels under pressure [e.g., for hydrogenation of coal] (E.P. 262,901).—See I.

Dispersing substances in water (U.S.P. 1,609,308). —See I.

III.—TAR AND TAR PRODUCTS.

Main constituents and possible utilisation of primary tar. C. J. WARD (J. Inst. Pet. Tech., 1926, 12, 591-597).-The author reviews researches which have been made on primary (low-temperature) tars. A fresh tar produced from a blend of Arley and Butterley coals, carbonised at 620°, was examined. Solids were precipitated by addition of 400 c.c. of ether to 20 c.c. of tar. Treatment with sodium carbonate solution, dilute sulphuric acid, and caustic soda solution, and further extraction with ether resulted in a yield of 3.8% of solids, 27.09% of phenols, 6.63% of bases, and 59.11%of neutral oil of d 0.975. Similar treatment of a tar which had been kept several months gave 12.66% of solids. Continuous precipitation of solids indicates this to be a time reaction. H. MOORE.

Sorption of the vapours of benzene and toluene by silicic acid gel impregnated with carbon (carbo-gel). H. A. FELLS and J. B. FIRTH (J.S.C.I., 1927, 46, 39—40 T).—Silica gels uniformly impregnated with carbon ("carbo-gels") have been prepared, and their sorptive capacities determined for benzene and toluene vapours over the range pure gel to pure carbon. The results show that the sorptive capacity of the gel increases with rise of carbon content to a maximum at about 18% of carbon, and then continuously decreases.

Valuation of pitch as a binding material for carbon electrodes. G. SCHUCHARDT (Chem.-Ztg., 1927, 51, 42).—The usual tests are of little value for determining the suitability of pitch for carbon electrodes. For the determination of carbon 0.5 g. of the pitch is boiled for 1 hr. with 50 c.c. of water-free tetralin under a reflux condenser, and, after cooling, the mixture is filtered through a Gooch funnel and the residue is washed with warm tetralin, dried, and weighed. The coking test is most suitable for judging the pitch, and may be made by heating a small block of the electrode mixture in an iron tube closed at one end for 15—20 min. in a forge stove. Preferably, however, the test is made by coking a whole electrode; this takes several hours, but information as to the quality of the electrode itself is also obtained. Pitch for electrodes should have a low ash, a softening point of about 75°, and should coke quickly, giving a high yield of hard coke.

W. G. CAREY.

Surface tension and wetting power of asphalt [and tar]. NELLENSTEYN.—See II.

PATENTS.

Production of bitumen emulsion. C. H. THOMPSON and W. J. MCGIVERN (E.P. 263,307, 5.1.26).—Stable emulsions suitable for road dressing are prepared by adding 3—7 pts. of "liquid rosin" and then $\frac{1}{2}$ —1 pt. of solid caustic soda in 15 pts. of water to 50 pts. of melted bitumen, the temperature being kept constant and the mass vigorously agitated. "Liquid rosin," which contains a large proportion of resinic acids, is a by-product in the treatment of wood with sulphite liquor. S. PEXTON.

Manufacture of phenolic compounds. W. J. HALE and E. C. BRITTON, ASSTS. to DOW CHEMICAL CO. (U.S.P. 1,607,618, 23.11.26. Appl., 7.1.24. Cf. U.S.P. 1,213,142—3; B., 1917, 382).—Chlorobenzene is heated with 1 or 2 mols. of sodium hydroxide and water at 380° for 1 hr. in presence of 10% by weight of diphenyl oxide, which depresses the formation of further quantities of itself, so that phenol is obtained in satisfactory yield. T. S. WHEELER.

Production of active carbon (E.P. 262,278).— See II.

Composition of bitumen and rubber (E.P. 263,028). —See XIV.

IV.—DYESTUFFS AND INTERMEDIATES.

PATENTS.

Manufacture of yellow azo dyestuffs. I. G. FARB-ENIND. A.-G., Assees. of A. DORRER (U.S.P. 1,610,936, 14.12.26. Appl., 20.11.25. Conv., 15.12.24).—Monoazo dyestuffs, obtained by coupling a diazotised naphthylaminemonosulphonic acid with diphenylamine, are treated, preferably after conversion into the corresponding nitroso-derivatives, with a mixture of nitric and sulphuric acids, so that mono- and di-nitro-derivatives are obtained. The products dye silk in a bath containing soap and sodium sulphate, and also wool, paper, and leather. T. S. WHEELER.

Direct blue disazo dyestuff. P. CACCIA (U.S.P. 1,609,793, 7.12.26. Appl., 25.9.25).—1:8-Aminonaphthol-3:6-disulphonic acid (1 mol.) and 2-naphthylamine-5-sulphonic acid (1 mol.) are boiled with sodium cyanide solution (0.2%), mixed, and poured into diazotised benzidine (1 mol.). The *product*, which is separated by addition of sodium carbonate and sodium chloride, is probably the disazo dye with the two amino-groups converted into cyanamido-groups. It dyes artificial silk light blue shades in a bath containing soap and sodium carbonate, and navy blue shades in a sodium sulphate bath. T. S. WHEELER.

Trisazo dye. Tetrakisazo dye. J. B. OESCH, ASST. to NEWPORT Co. (U.S.P. 1,605,973-4, 9.11.26. Appl., [A, B], 19.9.25).-(A) Diazotised acetamido-Cleve's acid (4-acetamido-1-naphthylamine-6- and -7-sulphonic acids) or (B) a diazotised aminoazo-dyestuff, such as 4-amino-2 : 2'-dimethylazobenzene-6 : 4'-disulphonic acid, is coupled with *m*-toluidine, the product is diazotised and coupled with *m*-toluidine, and this product is diazotised and coupled with salicylic acid, or an alkyl or halogen derivative, to yield *substances* which dye unmordanted cotton orange to brown shades, very fast to light.

T. S. WHEELER.

Manufacture of 1 : 4-diarylamino-5 : 8-di[hydr]oxyanthraquinones. W. CARPMAEL. From I. G. FARBEN-IND. A.-G. (E.P. 263,370, 13.4.26).—The condensation of leuco-1 : 4 : 5 : 8-tetrahydroxyanthraquinone with arylamines is carried out in presence of arsenic acid as oxidising agent. *E.g.*, 4 pts. of leuco-1 : 4 : 5 : 8-tetrahydroxyanthraquinone are dissolved in 40 pts. of *p*-toluidine, and 1 pt. of arsenic acid is added at about 100°. After 15 min., 0.8 pt. of boric acid is added. The reaction begins at once, and is complete in $1-1\frac{1}{2}$ hrs. The product is worked up in the usual way.

A. DAVIDSON.

Vat dyestuffs of the anthraquinone series. I. G. FARBENIND. A.-G., Assees. of F. FUNCKE (U.S.P. 1,609,084, 30.11.26. Appl., 17.9.25. Conv., 27.9.24) .- Aryl-3 : 3dichloro-2-keto-1 : 2-dihydro-p-thiazines are condensed with o-arylenediamines to give, if one of the components is an anthraquinone derivative, products which dye cotton yellow to brown in a hyposulphite vat. The shades are fast to alkali if an alkylated or arylated arylenediamine is used, but if not, they can be rendered so by alkylation or arylation, e.g., by treatment with ethyl p-toluenesulphonate. The condensation is carried out by heating the compounds in a high-boiling solvent in presence of a condensing agent. $E.g., \alpha\beta$ -anthraquinone-3: 3-dichloro-2-keto-1: 2-dihydro-p-thiazine (7.5 pts.) is heated with 1 : 2-diaminoanthraquinone (4.8 pts.) in nitrobenzene (80 pts.) containing anhydrous sodium acetate (3.5 pts.) for 2-3 hrs. at 145° to give a product which on ethylation dyes cotton fast yellow shades.

T. S. WHEELER.

Vat dyestuffs of the 2-thionaphthen-2-indoleindigo series. R. HERZ and J. MÜLLER, ASSTS. to GRASSELLI DYESTUFF CORP. (U.S.P. 1,613,275, 4.1.27. Appl., 23.3.26. Conv., 25.10.24).—Vat dyes of the probable general formula :—



are obtained by condensing perinaphthoxypenthiophens of the general formula (I), where X = H, or a univalent



substituent, with α -isatin derivatives of the general formula (II), where R is a benzene or naphthalene residue,

possibly substituted, and R_1 a halogen or an arylidogroup. The *dyes* produced dye cotton and wool fast blue to green shades. A. DAVIDSON.

Manufacture of sulphur dyestuffs. I. G. FARBEN-IND. A.-G., Assees. of J. WUKTE and W. HAGGE (U.S.P. 1,609,927, 7.12.26. Appl., 8.6.25. Conv., 14.6.24).— In the manufacture of sulphur dyes as described in F.P. 343,377, E.P. 14,543/05, G.P. 179,021 (B., 1904, 1026; 1906, 260; 1907, 681), in which an organic compound is treated with sulphur in presence of metallic copper or a copper salt, the formation of copper sulphide is inhibited, and a dye giving clearer shades is obtained if the copper is added in the form of potassium cuprocyanide, or if the copper salt usually employed, *e.g.*, copper sulphate, is mixed with an alkali cyanide. T. S. WHEELER.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Conversion of fibroin, chitin, casein, and similar substances into the ropy-plastic state and colloidal solution. P. P. VON WEIMARN (Ind. Eng. Chem., 1927, 19, 109-110).-Fibroin in the form of silk wadding possesses higher colloidal dispersability in aqueous salt solutions than cellulose, and 30% colloidal solutions in such salts as calcium chloride and calcium nitrate are possible. A filiform coagulum can be prepared by addition of ethyl alcohol to a 10% solution in calcium nitrate cooled from 115° to 50-25°. Colloidal solutions of chitin are very similar to those of cellulose; casein is readily dispersed in lithium thiocyanate solutions, whilst fibrin and keratin require extremely soluble salts in highly concentrated solution. Rate of dispersion depends not only upon the salt used and its concentration and temperature, but also upon the life history, age, previous treatment, and purity of the preparations used. The same range of inequalities appears to hold for all the above substances, thus:

$$LiCNS > LiI > LiBr > LiCl; NaCNS > NaI;$$

 $Ca(CNS)_2 > CaI_2 > CaBr_2 > CaCl_2.$
D. G. HEWER.

Determination of copper in specially treated fabrics. L. LEVI (Ann. Chim. analyt., 1927, [ii], 9, 2-7). -Hemp, linen, and cotton materials subject to the action of fermenting media are protected by treatment with insoluble metallic soaps (chiefly copper) with or without previous treatment with aniline black and fixation with potassium dichromate. Determinations of copper show that when the raw material has been directly treated with a copper soap, all the copper passes into a nitric acid solution of the calcined product, but with the aniline treatment a product of the form CuCr₂O₄, 2CuO is formed which on calcination gives the soluble copper oxide and insoluble CuCr2O4. In order to determine the total copper 1 dm.² of material is calcined, the ash treated with boiling 50% nitric acid, filtered, any soluble copper washed out of the insoluble residue, which is then calcined in a platinum crucible and the residue treated with 3 g. of Meker's oxidising mixture. After cooling, the ash is dissolved in dilute nitric acid, the solution added to the first, and the mixture electrolysed. To determine copper insoluble in water 1 dm.² of material is washed for 12 hrs. in running water and treated as above. D. G. HEWER.

Nitration of cellulose in the presence of phosphoric acid. C. K. KRAUZ and F. J. BLECHTA (Chem. News, 1927, 134, 1-4, 17-20).—The substitution of phosphoric acid for sulphuric acid in the mixed acid used for the nitration of cellulose would eliminate the costly boiling and pulping processes at present necessary for the removal of sulphuric esters, which are the chief cause of instability in cellulose nitrate made by the usual method. The product is sufficiently stable to be used in explosives manufacture after washing with cold water until neutral, owing to the non-formation of phosphoric esters of cellulose during nitration. The action of an anhydrous mixture of nitric and phosphoric acids (1:1) leads to a cellulose nitrate containing 13.0% N, which is the most highly nitrated product obtainable with these two acids. The addition of water to this mixture causes a rapid fall in nitrogen content, and with acids containing more than 3.5% of water gelatinisation occurs. An acid containing 18% of water produces a cellulose nitrate having only 4.9% N, whereas a nitric-sulphuric mixture of corresponding composition gives a product containing 12% N. The optimal proportion of nitric to sulphuric acid in mixed acid is usually 1:3, but that of nitric to phosphoric acid is 1:1. As the proportion of phosphoric acid is increased beyond this ratio, the nitrogen content of the product falls continuously. The addition of 5% of sulphuric acid to the nitric-phosphoric acid mixture causes the formation of cellulose sulphuric esters. Nitration takes place much more slowly with nitricphosphoric acid than with nitric-sulphuric acid, 4 hrs. being required for complete nitration in the case of the former mixture. Below 30° the nitration proceeds normally, but at higher temperatures products of lower nitrogen content and higher solubility in waste acid are formed. The rôle of the phosphoric acid in the nitricphosphoric acid mixture appears to be that of a diluent. W. J. POWELL.

Resistance of cellulose to heat and its absorptive power for gases. D. COSTA (Annali Chim. Appl., 1926, 16, 636—647; cf. A., 1925, ii, 956).—Experiments made with cotton wool and with filter-paper cellulose subjected to various heat treatments show that the absorptive power of cellulose for ammonia, hydrogen chloride, sulphur dioxide, and carbon dioxide bears no relation to the length or physical structure of the fibre, but varies appreciably with the chemical character of the complex. When heated in a bath of inert material, the cellulose fibre resists the prolonged action of temperatures up to 230° without substantial change in either morphological or absorptive properties. T. H. POPE.

Resistance of cellulose to heat. II. D. COSTA (Annali Chim. Appl., 1926, 16, 647-652; cf. preceding abstract).—When heated in a paraffin bath, cellulose begins to decompose at $260-270^{\circ}$, emitting gases and volatile products consisting principally of carbon dioxide and water which are formed at the expense of the oxygen of the cellulose molecule itself. As the temperature is raised the decomposition progresses, until at 365° the fixed residue has the composition C $83\cdot11\%$, H $6\cdot4\%$, O $10\cdot49\%$, which corresponds approximately with the mean composition of gas coal, namely, C 80-85%, H $5\cdot8-5\cdot0\%$, O $14\cdot2-10\cdot0\%$ (cf. Bergius, B., 1912, 761). After precipitation by means of Schweizer's reagent, cellulose exhibits less resistance towards heat than the original fibre, but the residue obtained at 365° is of similar composition to that given above. T. H. Pore.

Fluorescence of wood cellulose and vegetable tanning extracts. O. GERNGROSS [with N. BAN, G. SÁNDOR, and K. TSOU] (Papier-Fabr., 1927, 25, 49-52). -The admixture of synthetic tanning agents or substitutes derived from sulphite liquor with natural tanning extracts can be detected by examining the colour and intensity of the fluorescence of the diluted extract in ultra-violet light. Most of the synthetic products exhibit a characteristic violet fluorescence which, in the case of extracts derived from sulphite liquor, changes to green on making the solution alkaline. Cellulose fibres when dipped in tanning solutions irreversibly adsorb some of the fluorescent substance; thus cotton, wool, viscose silk, hydrocellulose, and starch after immersion in quebracho or tizerah extracts appears yellow (B., 1925, 643), while pine or larch bark extracts cause them to exhibit a violet fluorescence. Diacetylcellulose and acetate silks readily adsorb both the violet and yellow fluorescent material. Nitrocellulose does not adsorb the violet substance, and the amount of the yellow substance adsorbed depends on the extent to which the cellulose is nitrated. A nitrocellulose containing 11% N exhibits a strong yellow fluorescence after immersion in quebracho extract, but a guncotton of $13 \cdot 2\%$ N has very little adsorptive action. Sucrose, lactose, dextrose, cystine, tyrosine, and glycine anhydride exhibit no fluorescence with either solution. The violet fluorescence observed in sulphite liquor, when exposed to ultra-violet light, is also shown by unbleached sulphite-cellulose (B., 1926, 911). Lignin, on treatment with calcium bisulphite solution, also yields a solution having a violet fluorescence, but cotton wool dipped in this solution remains practically colourless. Solution-fluorescence and fibre-fluorescence are therefore due to the presence of different substances. Wood chips when heated with water at 115° give a liquor which causes fibre-fluorescence. It is, therefore, unlikely that this property is due to the presence of lignosulphonic acid, but to that of some substance already in the wood which has similar properties to, and may be identical with, the fluorescent principle of pine bark extract. It is sensitive to alkalis and bleaching agents, hence bleached and soda cellulose do not exhibit fluorescence. W. J. POWELL.

Preparation of sugar from sawdust. E. Hägg-LUND (Papier-Fabr., 1927, 25, 52-60).-Highly concentrated hydrochloric acid has, in comparison with sulphuric acid, a low solvent power for cellulose. With the latter one part of acid to one of cellulose suffices for complete solution, but with hydrochloric acid the proportion necessary is 7:1. The use of such quantities of acid commercially is uneconomical, but since an equilibrium is set up between the acid solution and the carbohydrates in the wood, and a sugar-hydrochloric acid solution which has completed its reaction with one charge of sawdust still has the power to hydrolyse part of the cellulose in a fresh charge, the difficulty has been overcome by the use of a continuous process (B., 1924, 593). A 30% sugar solution containing about 30% of hydrochloric acid and practically carbohydrate-free lignin are the

products obtained. The concentration of sugar can be raised to 44% by working at 30-40°, but with highly concentrated sugar solutions reversion to *iso*maltose takes place. The hydrochloric acid is removed by distillation under reduced pressure, the heat being supplied by mixing hot oil with the acid sugar solution. The resultant syrup (sugar 56%, hydrochloric acid, 9%) is dried by a current of hot air, the final product containing only 1% of hydrochloric acid. This is suitable without further purification for the manufacture of alcohol. Sugar obtained from fir wood consists of dextrose 61.9%, mannose 24.7%, galactose 4%, lævulose 1.4%, and xylose 8%. W. J. POWELL.

Relation between analytical "chlorine values" and factory bleach consumptions for wood pulps. G. K. BERGMAN (Papier-Fabr., 1926, 24, 742-746).-Careful observations were made on the bleaching of various types of wood pulp on the large scale according to standard procedure. The pulp at about 4% concentration was treated with a known quantity of bleach liquor slightly in excess of the expected consumption, the temperature being raised during 11 hrs. to 40°, the total time of bleaching being 5 hrs. Tests were made every $\frac{1}{2}$ hr. of the fall in alkalinity and the rate of disappearance of active chlorine. A correction, equivalent to $\frac{1}{4}$ hr. further bleaching, was added at the end to compensate the continued action during washing off. Typical values for actual consumptions were :--Sulphite pulps, easy bleaching, different cooks, 3.17, 4.41, 4.36, 3.09; sulphate pulp, easy bleaching, 5.05; aspen sulphite, 2.55, all values being in terms of active chlorine consumed per cent. of dry cellulose. In practice, an excess over the actual consumption is always used to stimulate the operation, such excess being a matter of judgment and economics. Comparing the mill results with the indications given by various laboratory methods, it was found that the Bergman method (B., 1923, 9 A) gave the closest concordance, maximum error $\pm 10\%$. The Tingle chlorine factor (B., 1922, 137 A) gave too high results for the sulphite and too low for the sulphate pulps. A modification of the standard German " chlorine value " method, devised by Enso for factory control and commonly used in Finland, gave results generally too low; it is, however, possible to determine an expression for converting Enso values into Bergman values for sulphite and sulphate pulps respectively.

J. F. BRIGGS.

PATENTS. Method of reeling-off silk cocoons. B. LOEWE (U.S.P. 1,607,959, 23.11.26. Appl., 27.12.23. Conv., 24.1.23).—The cocoons are treated, without previous degumming, in a cold aqueous solution of at least one substance containing an acid radical until the silkworm pupæ are killed. The cocoons are then immersed for not less than a minute at 25° or less in an alkaline bath, and reeled off at the ordinary temperature without using hot water. The silk may be subsequently degummed in hot water without the addition of soap.

D. J. NORMAN.

Yarn dryer. H. HAAS (E.P. 263,463, 12.10.26).— Hanks of light material such as silk or artificial silk are submitted to an ascending stream of hot air in a preliminary chamber of a drying tunnel, the lower portions of the hanks being thereby heated to a temperature higher than that of the succeeding chambers, whilst in the latter complete drying without tangling is obtained by means of descending currents of hot air.

B. P. RIDGE.

Production of cellulose pulp. A/S. RAOUL PICTET, & F. THARALDSEN (E.P. 252,344, 26.4.26. Conv., 20.5.25).—Wood or like material is digested with aqueous solutions containing more than 100 g./litre of sulphur dioxide at such temperature, preferably below 110°, that a pressure in excess of 8 atm. is developed in the digester. The process is complete in 8—16 hrs., and gives high yields of pulp of good colour. D. J. NORMAN.

Filtering wood pulp. J. B. BEVERIDGE (U.S.P. 1,603,507, 19.10.26. Appl., 16.1.26).—The alkali-laden foam produced during the filtration of wood pulp made by the alkaline process is broken down, and the alkali trapped, by passing the foam-laden air through a liquid bath on its way to the pump. D. J. NORMAN.

Manufacture of artificial silk threads from viscose. H. Bass, and Erste Böhmische Kunstseide-FABR. A.-G. (E.P. 260,681, 5.8.25).-A spinning bath for viscose silk contains, in addition to sodium bisulphate, an excess either of sodium sulphate or of sulphuric acid. An excess of sodium sulphate imparts to threads of medium and high denier excellent lustre and softness, whilst an excess of sulphuric acid is particularly useful when filaments of 2-3 deniers are required. The addition of both molasses or distiller's wash and water-soluble salts of multivalent metals favourably affects the softness, lustre, and covering power of the threads. A suitable spinning bath contains sodium sulphate (22 pts.), magnesium sulphate (15 pts.), sulphuric acid (11 pts.), molasses (15 pts.), and water (37 pts.). D. J. NORMAN.

Process and apparatus for producing artificial silk filaments. K. GRUNERT (E.P. 263,462, 8.10.26).— A cellulose solution is squirted through an open-topped vertical funnel containing a descending column of precipitating liquid, the velocity of which is regulated by the flow of an opposing column meeting the first near the outlet of the funnel, and the filaments formed are drawn off in the form of a spun thread. The apparatus comprises a number of squirting tubes arranged above corresponding outlets in the floor of a tank, the height of liquid in the tank determining the velocity of outflow from the tubes. B. P. RIDGE.

Production of dialysing and pervaporating membranes. P. A. KOBER (U.S.P. 1,608,886, 30.11.26. Appl., 17.6.18).—The membranes are formed from a solution containing nitrocellulose and a peptone.

D. J. NORMAN.

Manufacture of nitrocellulose film. J. A. WILSON, Assr. to DURATEX CORP. (U.S.P. 1,603,499, 19.10.26. Appl., 22.10.20).—Newly-made celluloid is coated with a film-forming solution containing nitrocellulose, a nondrying vegetable oil, a solvent, and a diluent in order to prevent loss of camphor. D. J. NORMAN.

Treating waste sodium monosulphite liquors. V. DREWSEN (U.S.P. 1,605,925-8, 9.11.26. Appl., [A, B, C], 3.4.22 and [D] 9.10.22).—(A) The liquor is concentrated, treated with caustic lime, incinerated, and CL. VI. -BLEACHING; DYEING; PRINTING; FINISHING. CL. VII. -ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS. 139

extracted with water to recover sodium carbonate. (B) The concentrated liquor is mixed with 20-30% (by weight) of limestone and burnt in, e.g., a rotary furnace in the presence of air to form calcium sulphide and sodium carbonate. The latter is extracted from the pulverised residue with water, and converted into sodium sulphite by the action of sulphur dioxide, whilst the calcium sulphide is suspended in water and treated with carbon dioxide to liberate hydrogen sulphide for use in the preparation of sulphur dioxide. (c) The waste liquor is dried, incinerated, and extracted with water; the resulting sodium sulphide is converted into sodium bicarbonate and the sulphur into sulphur dioxide. (D) A mixture of an excess of lime and nitre cake which has been causticised with powdered quicklime is incorporated with the concentrated liquor; the mass is then dried and incinerated to form calcium sulphide and sodium carbonate, which latter is recovered by extraction with water. D. J. NORMAN.

Treating waste magnesium monosulphite cooking liquor. V. DREWSEN, ASST. to WEST VIRGINIA PULP AND PAPER CO. (U.S.P. 1,605,929, 9.11.26. Appl., 17.12.24).—The liquor is boiled with slaked dolomitic lime to precipitate magnesium hydroxide. This is recovered and converted into bicarbonate by the action of a solution of carbon dioxide under pressure; the resulting solution is filtered and treated with magnesium acid sulphite to regenerate magnesium sulphite.

D. J. NORMAN.

Treatment of black liquor. Treatment of residual liquor [from wood pulp manufacture]. L. BRADLEY and E. P. MCKEEFE, Assrs. to BRADLEY-MCKEEFE CORP. (U.S.P. 1,606,338 and 1,606,501, 9.11.26. Appl., [A] 19.5.21; [B] 3.5.26).—The residual black liquor from alkaline wood-pulp digesters is sprayed into a tower up which hot gases containing (A) carbon dioxide or (B) sulphur dioxide, or both, are passed. Under the action of these gases the liquor is concentrated, carbonated or sulphited, and organic matter is precipitated. The product is filtered, causticised to any desired extent, and re-employed in the digester.

T. S. WHEELER.

Manufacture of artificial threads, ribbons, films, and the like of viscose. A. KÄMPF (U.S.P. 1,614,036, 11.1.27. Appl., 27.1.26. Conv., 6.8.21).—See E.P. 184,450; B., 1923, 711.

Production of acylated cellulose ethers. W. H. GLOVER and E. VAN WEYENBERGH, ASSTS. to COURTAULDS, LTD. (U.S.P. 1,613,451, 4.1.27. Appl., 22.7.25. Conv., 15.9.24).—See E.P. 241,679; B., 1926, 48.

Ageing apparatus for treating fabrics. J. WOOD (E.P. 263,246, 7.10.25).

Artificial silk and like spinning machines. J. L. RUSHTON (E.P. 263,239, 26.9.25).

Hydro-extractors (E.P. 263,303).-See I.

Production of bitumen emulsion (E.P. 263,307).— See III.

Dyeing cellulose compounds [artificial silk] (U.S.P. 1,609,702).—See VI.

[Electrolyte for] electric batteries (E.P. 263,587).— See XI. Making [aqueous] solutions of resins (E.P. 263,393).—See XIII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Bleaching of wood pulps. BERGMAN.-See V.

PATENTS.

Dyeing cellulose compounds [artificial silk]. W. DUISBERG, W. HENTRICH, and L. ZEH, ASSTS. to GRASSELLI DVESTUFF CORP. (U.S.P. 1,609,702, 7.12.26. Appl., 18.3.25. Conv., 18.3.24).—Cellulose esters and ethers can be dyed a variety of brilliant shades by treatment with sulphomethylaminoanthraquinone derivatives. *E.g.*, sodium 1:4-diaminoanthraquinone-*N*methyl- ω -sulphonate (6 pts.), dissolved in water (10,000 pts.), gives bright clear violet shades on cellulose acetate silk at 70° in $\frac{3}{4}$ hr. T. S. WHEELER.

Process of dyeing and printing acetylcellulose. H. Hoz, W. BERNOULLI, and A. LINK, Assrs. to Soc. ANON. J. R. GEIGY (U.S.P. 1,613,228, 4.1.27. Appl., 5.3.24. Conv., 31.3.23).—See E.P. 231,897 and 213,593 ; B., 1925, 588, 708.

Compositions for colouring hair. C. C. HUFFMAN (E.P. 263,349, 6.3.26).

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

Volatility of the compounds formed by heating barium sulphate with sulphuric acid. F. KRAUSS (Chem.-Ztg., 1927, 51, 38).—An acknowledgment of Hahn's criticism (B., 1927, 106) of the author's discovery that barium sulphate moistened with sulphuric acid imparts a green colour to the Bunsen flame. The origin of the colour is the subject of further investigations.

A. R. POWELL.

Action of acetic acid on red lead. Formation of basic lead peracetate. C. BRÜCKNER (Chem.-Ztg., 1927, 51, 55).—Glacial acetic acid reacts with red lead to form lead acetate and basic lead peracetate, the bulk of the latter crystallising out as a mass of microscopic white needles, addition of water to which results in hydrolysis with the formation of lead peroxide. Even with 40% acetic acid the momentary formation of basic lead peracetate may be observed; this compound is therefore an intermediate product in the reaction, $Pb_3O_4 + 4Ac \cdot OH = 2Pb(OAc)_2 + PbO_2 + 2H_2O$.

A. R. POWELL.

Plant for the production of carbon monoxide. -F. W. BURSTALL and S. J. ELLIS (J.S.C.I., 1927, 46, 35-36 T).—A short description of a plant for the production of carbon monoxide using sulphuric and formic acids in electrically heated reaction vessels.

Oxidation of ammonium sulphide. Applebey and LANYON.—See II.

Lixiviation of copper minerals. FESTER and BERTUCCI.—See X.

Selenium in rubber compounds. Boggs and Fol-LANSBEE.—See XIV.

Direct titrimetric methods for magnesium, calcium, and sulphate ions, and their application in water analysis. SCHOCH.—See XXIII.

PATENTS.

Manufacture of chemically pure sulphuric acid. M. KRAFFT (U.S.P. 1,611,534, 21.12.26. Appl., 5.4.23. Conv., 10.4.22. Cf. E.P. 220,413; B., 1924, 868).— The acid content of gases from the lead chamber is removed by passing them through an acid-proof filter tower before they are returned to the chamber.

H. ROYAL-DAWSON. Manufacture of sodium bicarbonate and production of nitrogen. E. E. ARNOLD, ASST. to NITROGEN CORP. (U.S.P. 1,611,401, 21.12.26. Appl., 21.10.24).---Waste blast-furnace gases are burned in air, thus converting the carbon monoxide and hydrogen contents into carbon dioxide and water with a proportionate increase of nitrogen. The gaseous mixture is then compressed and passed through ammoniated brine.

H. ROYAL-DAWSON.

Synthetic production of ammonia. C. Mott, Assr. to COMPRESSED GAS CORP. (U.S.P. 1,611,359, 21,12.26. Appl., 9.10.22).—A mixture of nitrogen, oxygen, and an inert gas is passed over an oxidisable material to remove oxygen. The purified nitrogen is then mixed with hydrogen and passed through a device causing a proportion of the nitrogen to combine with the hydrogen. On removal of the ammonia produced, the residual gaseous mixture is passed through another synthesising device and the ammonia again removed, this process being continued till the percentage of inert gas is materially increased, the residue from the last separating device being used to reduce the material oxidised in the first part. H. ROYAL-DAWSON.

Manufacture of aluminium chloride. R. J. DEAR-BORN, Assr. to TEXAS Co. (U.S.P. 1,605,098, 2.11.26. Appl., 29.11.21).—A heated mixture of an aluminium ore, such as bauxite, and carbonaceous material is introduced into the top of a vertical retort, in which it is treated with chlorine or hydrogen choride at such a temperature that only the iron present is converted to chloride, which volatilises. The material then falls into a lower vertical retort maintained at a higher temperature, so that on treatment with chlorine or hydrogen chloride, aluminium chloride is formed.

T. S. WHEELER.

Production of calcium arsenate. E. A. TAYLOR, Assr. to GRASSELLI CHEMICAL Co. (U.S.P. 1,612,233, 28,12.26. Appl., 14.4.25).—A mixture of lime and white arsenic is heated in the presence of an oxidising medium, the heat of the reaction being so conserved that only sufficient additional heat is supplied to complete the oxidation of the arsenite to arsenate.

H. ROYAL-DAWSON. [Manufacture of] sodium fluoride. W. SEIGEL (F.P. 607,546, 8.12.25),—Potassium silicofluoride is treated with sodium carbonate, hydrogen carbonate, or hydroxide, etc. in amount less than sufficient for the theoretical conversion: $K_2SiF_6 + 3Na_2CO_3 = 6NaF + K_2CO_3 + SiO_2 + 2CO_2$. A. COUSEN.

Apparatus for the production of oxygen. Soc. ANON. LE SALVOXYL (E.P. 252,318, 16.12.25. Conv., 23.5.25. Cf. E.P. 252,319; B., 1926, 744).—A portable apparatus for therapeutic uses for producing oxygen by the action of an anhydrous alkaline oxide on an excess of hydrogen peroxide. H. ROYAL-DAWSON. Production of chlorine and aluminium chloride. E. R. WOLCOTT, Assr. to TEXAS Co. (U.S.P. 1,612,686, 28.12.26. Appl., 28.2.21).—Hydrogen chloride is passed over heated alkaline-earth oxide, followed by an excess of oxygen in contact with the resulting metallic chloride, thus producing the oxide and free chlorine; the excess of oxygen contained in the chlorine mixture is reduced, and the reduced gas mixture is passed in contact with the compound of aluminium containing oxygen together with heated carbon to produce volatile aluminium chloride, which is separated from the resulting gases, the latter being treated to regenerate hydrochloric acid gas to be used again in the cyclic process.

H. ROYAL-DAWSON.

Process for mining sulphur. W. T. LUNDY and H. S. BURNS, ASSTS. to FREEPORT SULPHUR CO. (U.S.P. 1,612,453, 28.12.26. Appl., 5.8.26).—A mixture of hot water and finely-divided earthy material, having a viscosity greater than that of the water, is injected into the sulphur-bearing formation. H. ROYAL-DAWSON.

Synthesis of ammonia [dehydration of gases]. G. CLAUDE, Assr. to LAZOTE INC. (U.S.P. 1,609,058, 30.11.26. Appl., 19.7.21. Conv., 4.10.18).—See E.P. 129,637; B., 1920, 63 A.

Production of titanium oxide. P. A. MACKAY, Assr. to NATIONAL METAL AND CHEMICAL BANK, LTD. (U.S.P. 1,613,234, 4.1.27. Appl., 15.5.26. Conv., 28.5.25).—See E.P. 256,734; B., 1926, 876.

Treating monosulphite liquors (U.S.P. 1,605,925—9).—See V.

Electrode for ozone production (E.P. 263,356).— See XI.

VIII.-GLASS; CERAMICS.

Ageing of thermometer glasses. L. HOLBORN and J. OTTO (Z. Instrumentenk., 1926, 46, 415—424; Chem. Zentr., 1926, II, 1782—1783).—Tests on various types of glass (Jena 59 III and 16 III, Supremax, and hard Thuringian) showed that, in order to age thermometer glass, it was necessary to heat the finished ware to some $20-30^{\circ}$ above the initial temperature of the critical zone of the thermal expansion for 3 hrs., then to cool it in about the same time, and to hold at the softening limit for 6 hrs. The method of subsequent cooling had but little influence. At the highest temperature employed the glass was still so viscous that there was no appreciable deformation, particularly if thin-walled instruments were suspended in the furnace.

A. COUSEN.

Heat treatment as an agent in [quartz] rock breaking. B. W. HOLMAN (Bull. Inst. Min. Met., Jan., 1927, advance copy, 16 pp.).—When many forms of quartz are heated at 560—600° and quenched in water the mineral becomes so friable that it may be reduced to a 30-mesh powder by gentle pressure between finger and thumb. The best results are obtained by rapid heating, but equally good results may be obtained by repeated heating to 300—400° followed by quenching in water. Air-cooling between the successive heatings results, however, in a noticeable increase of compressive strength. The fact that a marked change takes place in the dielectric constant, and that the heated mineral is more readily soluble in hydrofluoric acid indicates that the quartz undergoes molecular re-arrangement; this change begins at about 340°, and is complete above 575°. The fuel consumption of a large-scale plant using a rotary coalfired kiln would be about 40 lb. of coal per ton. It is suggested that the above described phenomenon formed the basis of the Roman method of "fire-setting."

A. R. POWELL.

Hydraulic properties of a slag sand. A. GUTT-MANN and C. WEISE (Zement, 1926, 15, 527-531; Chem. Zentr., 1926, II, 1783) .- Dumped slag-sand loses its granular hard structure and cakes together somewhat. It smears on rubbing and produces, in iron-Portland cement, greater strength than does fresh material. The vitreous sand, on storing, forms silicic acid, and the porous particles there existing adsorb litmus and methylene blue. The formation of a gel is indicated by the dehydration curve. In storing it is partly converted into the carbonate. Water which contains carbon dioxide decomposes fresh slag in 3 days, so that it can be coloured with methylene blue. The ability of the slag to react can be determined by attacking finely-powdered sand with 5% potassium hydroxide solution, then washing, and colouring with methylene blue. The slag is also mixed with standard sand and, after a 3-day treatment with water, tested for resistance to compression; the material which gives the strongest colour gives the highest resistance to compression. A 28-day treatment gives similar results. The method does not give such definite results if a mixed storage is substituted for the A. COUSEN. water storage.

Determination of alumina in silicate analysis. F. STEINBRECHER (Sprechsaal, 1926, 59, 295-297; Chem. Zentr., 1926, II, 1783).—In the method of Kallauner and Matejka some silica is always precipitated with the iron and aluminium; this may be removed by evaporating four times with sulphuric acid and 2 drops of hydrofluoric acid. The process occupies 30 min., and no iron or aluminium is lost by volatilisation.

A. COUSEN.

Study of the firing and glazing of porcelain and stoneware by measuring the porosity. P. BREMOND (Céramique, 1926, 29, 217-226; Chem. Zentr., 1926, II, 1783) .- Glazing usually takes the same course, felspar and lime generally being present. Felspar porcelain commences to glaze at 1050°, lime porcelain at 1200°, the degree of glazing being equal at 1250°. Stoneware glazes sooner than porcelain, and its porosity can be kept lower (with correct firing-control) when the same firing conditions hold, if the enclosed gas particles are given time to escape. From 1200° carbon may be left in the ware through dissociation of carbon monoxide, but this can be oxidised again by carbon dioxide and water. To effect these reactions the porosity must be less than 5%. By regulating the furnace atmosphere and the temperature either the oxidising or the reducing condition may be obtained, and any desired degree of porosity produced. The presence of sulphides and fluorides can seriously increase the porosity of the A. COUSEN. material.

Trend of design in modern coke-oven construction and its bearing upon refractory materials. VICKERS and GREEN.—See II.

PATENTS.

Manufacture of glass or quartz transparent to ultra-violet light. R. HADDAN. From CORNING GLASS WORKS (E.P. 263,410, 1.7.26).—A glass transparent to light waves shorter than 300 $\mu\mu$ can be prepared by reducing the iron impurities in the raw materials to less than 0.055% as ferric oxide, and the titanium oxide impurities to less than 0.050%, and carrying out the melting in a crucible free from these oxides, under nonoxidising conditions, *e.g.*, in the presence of carbon, carborundum, or hydrogen. Calcium phosphate glass, silicate glasses, and fused quartz can be prepared in this way. B. W. CLARKE.

Apparatus and process for fusing silica. BRITISH THOMSON-HOUSTON CO., LTD., Assees. of P. K. DEVERS (E.P. 255,118, 13.7.26. Conv., 13.7.25. Cf. E.P. 240,489; B., 1926, 667).—Quartz is fused under a vacuum in a closed crucible of porous, highly refractory material, such as graphite, provided with a heavy-walled exhaust pipe of similar material, through which the gaseous products of the reaction are withdrawn, thereby preventing contamination of the fused quartz.

B. W. CLARKE.

Kilns for salt glazing. W. A. ROBERTSON (E.P. 261,262, 21.4.26).—The kiln comprises a cylindrical wall provided with fire holes accommodating furnaces placed opposite to bag walls fitted to a perforated bottom, the products of combustion passing downwards through this, and then, by means of up-take vents regulated by dampers, over the crown of the kiln, which is surmounted by a coned chimney. B. W. CLARKE.

Forming sheet glass. L. Mellersh-Jackson. From Hartford-Empire Co. (E.P. 263,394, 31.5.26).

IX.—BUILDING MATERIALS.

PATENTS.

Fine grinding of cement or the like in ball or tube mills. F. L. SMIDTH & Co., A/S., Assees. of F. L. SMIDTH & Co. (E.P. 256,987, 13.8.26. Conv., 14.8.25).— Ball or tube mills are fitted with a tube which rotates with the mill, and has a worm conveyor and an outlet towards the discharge end of the mill fitted with scoops which conduct the balls into the tube; in this they are mechanically or chemically cleaned from the adhering film of finely-ground cement, which reduces their grinding action, and returned to the mill at the supply end.

B. W. CLARKE.

Manufacture of spontaneously pulverised aluminous cements. U. B. VOISIN (E.P. 259,203, 23.9.26. Conv., 2.10.25).—Raw materials for the manufacture of aluminous cement are so selected that the calcined mass contains at least 25% of alumina, together with 40-50% of that amount of silica, and a lime content of $3-3\cdot25$ times the silica content. Spontaneous pulverisation of the mass will then occur upon slow cooling, thereby eliminating the high cost of grinding. B. W. CLARKE.

Process and apparatus for the preparation of raw materials used in the manufacture of cement. I. E. LANHOFFER (E.P. 263,221, 19.9.25).—The raw materials are formed into a paste of suitable plasticity, which is squirted in narrow strips on to a conveyor in a current of hot gases, where the strips are partially cut through, so that when the material is delivered to a rotary drum the strips break themselves up into fragments of practically spherical form. These fragments are dried at a low temperature to prevent deformation, freed from dust, reheated, and fed into a rotary cement kiln. The use of small uniform fragments of this type results in greatly increased thermal efficiency in the kiln.

B. W. CLARKE.

Manufacture of porous or cellular cements. J. A. RICE (E.P. 263,571, 19.10.25).—A foam-assisting agent, e.g., natural or artificial resins, glycerol, cellulose or rubber derivatives, in solution or suspension in suitable liquids such as acetone or alcohol, with or without the addition of formalin, is added to a foam-producing agent consisting of a colloidal solution of glue, gelatin, or glucoside- and saponin-containing materials, with or without the addition of soap or formalin, and the mixture is beaten to form a foam and added to cement, mortar, etc. to form a strong porous or cellular concrete on setting. B. W. CLARKE.

[Lime-]mixing apparatus. F. B. LEOPOLD (U.S.P. 1,613,663, 11.1.27. Appl., 6.6.25).—A lime-treating apparatus comprises a hydrating chamber and a solution chamber, each provided with a mixing device and a lime-feeding device. A water motor drives these devices in one of the chambers, the escaping water being conducted to the chambers. B. W. CLARKE.

Apparatus for making plaster and mortar. A. E. TUTTLE, ASST. to BLUE DIAMOND MATERIALS CO. (U.S.P. 1,613,682, 11.1.27. Appl., 14.11.24).—Lime putty is pumped from a suitable container through a delivery pipe, whence it issues in a continuous jet, the length of which is measured, and determined by a regulating valve in the delivery pipe. B. W. CLARKE.

Composition for making casting patterns, pattern mounts, and the like. C. H. PAPÉ (U.S.P. 1,614,315, 11.1.27. Appl., 26.9.23).—A slow-setting cementitious composition comprises a mixture of comminuted magnesium chloride with fibrous material and a dilute solution of magnesium chloride.

B. W. CLARKE.

Improving the quality of wood. A. J. AUSPITZER (E.P. 253,925, 17.6.26. Conv., 17.6.25).—Soft wood held in a suitable container is subjected to a drawing or rolling process in a longitudinal direction, thereby producing a consolidation and hardening of the wood without destroying the cohesion of the fibres.

B. W. CLARKE.

Preserving wood by impregnation. J. HIMMELS-BACH, Assr. to GEBR. HIMMELSBACH A.-G. (U.S.P. 1,613,459, 4.1.27. Appl., 31.3.26. Conv., 3.11.25).— See E.P. 253,041; B., 1926, 669.

Bitumen emulsion (E.P. 263,307).-See III.

Composition of bitumen and rubber (E.P. 263,028). —See XIV.

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

Blast-furnace process. P. W. UHLMANN (Chem.-Ztg., 1927, 51, 37—38).—The heat balance of a suggested new blast-furnace process for the production of pig-iron using gaseous or liquid fuel has been calculated, and it is shown that, on theoretical grounds, it should be possible economically to produce a very pure iron direct from ore using a mixture of equal volumes of producer gas and electrolytic hydrogen together with air enriched by oxygen for firing the blast furnace and for reducing the ore. The process should be cheaper than direct electric smelting in spite of the necessity of obtaining the hydrogen and oxygen required by the electrolysis of water. In place of producer gas, crude petroleum, atomised tar spray, or other liquid fuel may be used together with charcoal or anthracite to carburise the iron sufficiently to make it flow freely from the furnace. This process has the advantages that contamination of the iron with the sulphur and phosphorus impurities usually present in the solid fuel used in blast-furnace smelting is avoided, and the composition of the iron and temperature of the furnace can be more easily controlled. A. R. POWELL.

Cooling devices for the Siemens-Martin furnace. G. BULLE (Stahl u. Eisen, 1927, 47, 41—52, 85—90).— A large number of cooling methods applicable to various parts of the furnace are described. The advantages obtained through cooling are enhanced durability of furnace with consequent increase in service and less frequent interruptions and repairs to flame passage. The disadvantages are the increased fuel consumption and cost of installing and operating the cooling plant. L. M. CLARK.

Uses of coke-oven gas in the steel industry. L. M. WILSON (Fuel, 1927, 6, 29-36).-Coke-oven gas can be used in melting furnaces designed for producer gas by introducing some of the extra air required for combustion as primary air. A short sharp flame very suitable for melting purposes is produced. Coke-oven gas is not recommended for use in soaking pits, but may be used with advantage in slab reheating furnaces if the latter are specially designed for the purpose. It is ideal for continuous furnaces. By operating with a mixture of coke-oven gas and producer gas and varying the relative proportion to meet the varied requirements at different stages of steel making, considerable heat economy may be achieved. Factors governing the type of flame produced are discussed. "Flame intensity" depends on the calorific value of the gas-air mixture and the velocity constant of the reactions in progress; in furnace work the latter is mainly influenced by the amount of turbulence. Surface combustion due to contact catalysis also plays a part, particularly with gases of high hydrogen content, and may produce harmful effects on the brickwork. Very great economy can be attained where coke ovens, blast furnaces, and steel works are in close proximity, by using a mixture of coke-oven gas and blast-furnace gas (giving preferably about 250 B.Th.U. per cub. ft.) instead of producer gas. The necessary modifications in plant and operation which would be occasioned by the change are discussed. A. B. MANNING.

Deep cementation by gas and its influence on the core in case-hardened steel. W. ROHLAND (Stahl u. Eisen, 1927, 47, 52—57).—By the action of coal gas at

900—1050°, on two carbon steels (C 0.06%, 0.12%) and on a steel containing 1.85% Ni, 0.44% Cr, and 0.18% C, a case-hardening effect was produced to a depth of 1.55-5.55 mm. A case 4 mm. thick was obtained from which free cementite was absent, and which was made glass-hard throughout. A double quenching from 930° in oil and from 770° in water produced a fine-grained, ductile core in the carbon steels, though the grain size was thereby raised to between two and three times its original value. The nickel steel gave more satisfactory results, its grain size being increased only by 50%, whilst its higher tensile strength was combined with a sufficient degree of ductility. L. M. CLARK.

Changes of volume on cold-working steel. E. HOUDREMENT and E. BÜRKLIN (Stahl u. Eisen, 1927, 47, 90-93).—Contrary to Maurer's theory of hardening steel, production of the same change in density by cold working and by quenching gives greater hardness and higher tensile strength in the latter case. It is concluded that both types of hardening are due to the development of internal stresses, which, in turn, give rise to change in volume. The fact that the density changes accompanying equal increases in strength are not the same in the two cases is to be attributed to the difference in stress distribution, which is extremely uniform in quenched steel but most irregular in coldworked specimens. L. M. CLARK.

Impact tests of steels at low temperatures. R. YAMADA (Sci. Rep. Tôhoku Imp. Univ., 1926, 15, 631-659).-Bending impact (Charpy machine), tension impact, and repeated impact tests have been made on simple and alloy steels at temperatures down to that of liquid air. Very low carbon steels (0.1% C) bend and do not break under the Charpy test at room temperature, but break below a certain temperature, which depends on the size of the notch in the test piece. Steels with more than 0.3% C are broken even at room temperature. All steels become more brittle with fall in temperature, but in both plain and alloy steels a sorbitic steel is not merely more tough than a pearlitic steel at room temperature, but shows a less rapid decrease in toughness as the temperature falls. Pearlitic steels containing nickel and chromium are similarly superior to plain carbon steels, but small quantities of copper or manganese have little effect. If the absorbed energy is plotted against the bending angle a straight line is obtained passing almost through the origin, indicating that the absorbed energy is used almost entirely in bending the test-piece. The sorbitic structure is again superior in the repeated impact tests. Microscopical examination showed that in ferrite grains the fracture takes place through the crystal at room temperature, but intercrystalline fracture occurs to an increasing extent as the temperature falls. Pearlite grains are broken in all directions relative to that of the lamellæ.

W. HUME-ROTHERY.

Duralumin. R. BECK (Z. Metallk., 1927, **19**, 12—14). —The characteristic properties of duralumin alloys are briefly reviewed, and a table showing average values of the chief mechanical properties of the three alloys that are used in Germany for constructional work is given, together with examples of their use in boatbuilding and in cotton-spinning machinery.

A. R. POWELL.

Spectrographic detection and determination of impurities in aluminium and its alloys. R. ADAN (Bull. Soc. chim. Belg., 1926, **35**, 447–451).—Photographs of arc and spark spectra are examined, and the presence and proportions of the common impurities deduced from the presence and strength of the chief lines. The most persistent lines for copper, lead, zinc, tin, iron, magnesium, and silicon are given.

S. I. LEVY.

Aluminium as constructional material in the organic chemical industry. BUSCHLINGER (Z. Metallk., 1927, 19, 25-36).-The behaviour of a large number of organic chemical products in contact with metallic aluminium $(99\cdot4\%)$ at different temperatures is recorded. The paraffin and aromatic hydrocarbons, lubricating oils, crude petroleum, trichloroethylene, and carbon tetrachloride have little or no action either hot or cold, but ethylene dibromide vigorously attacks the metal at high temperatures. Aluminium is slightly attacked by ethyl alcohol-water mixtures containing more than 20% of alcohol, and more vigorously by methyl alcohol; aluminium vessels, however, are suitable for use in brewing operations conducted at temperatures below 50° and for storage purposes. The action of the lower fatty acids, oxalic, succinic, citric, and tartaric acids is very slight at the ordinary temperature, but increases rapidly with the temperature; the action of tartaric acid is more vigorous the lower the concentration. Phenols are without action up to about 100°, but at 140° anhydrous phenols rapidly attack the metal. A. R. POWELL.

Aluminium in electro-technology. W. WUNDER (Z. Metallk., 1927, 19, 36—37).—For the same carrying capacity as copper an aluminium conductor must have a cross-section 1.6 times as large and a diam. 30%greater, but the weight of the conductor is only half that of the corresponding copper wire. A core of steel having one-sixth the cross-section of the aluminium is necessary when large conductors are carried over long spans. Difficulties also arise at the supports owing to corrosion set up by the *P.D.* between the wire and the support. Aluminium alloys may, however, be used for the housing of electrical units, especially those which are portable. A. R. POWELL.

Determination of tin and lead in solder and of tungsten in ferrotungsten by calculations on the Archimedean principle. KOCH (Chem.-Ztg., 1927, 51, 54-55).—By determining the sp. gr. of solder or of ferrotungsten by the water-displacement method, the proportions of tin and lead or of tungsten present may be calculated from the known sp. gr. of tin, lead, tungsten, and iron. As the sp. gr. of manganese and tin are so near to that of iron, the proportion of these impurities in ferrotungsten, if small, has no effect on the tungsten calculation. A. R. POWELL.

Lixiviation of copper minerals with ammonia and preparation of arsenical compounds of copper. G. FESTER and F. BERTUCCI (Anal. Asoc. Quím. Argentina, 1926, 14, 243-250, and Z. angew. Chem., 1927, 40, 82-84).—By repeated extraction of finelydivided cuprite with 10% ammonia, up to $94\cdot3\%$ of the copper present was extracted. The recovery of copper is less where some is present as sulphide or silicate; a smaller recovery is obtained from roasted ores. Cupric oxide may be obtained by passing steam through the ammoniacal solution. Electrolytic separation was unsatisfactory. The copper may also be precipitated as copper arsenate by addition of arsenic acid, or as copper arsenite and arsenate by adding arsenious oxide and passing steam and air through the solution. G. W. ROBINSON.

Electromagnetic separator for laboratory use. C. J. KSANDA (J. Opt. Soc. Amer., 1926, 13, 713—715).— A powerful electromagnet is described by means of which minerals may be fractionated with a high degree of separation, according to their magnetic susceptibilities. Each pole is wound with 5500 turns carrying 1.95 amp. and operated on 110 volts. Full constructional details are given. C. J. SMITHELLS.

PATENTS.

Manufacture of pure iron. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (E.P. 262,938, 14.12.25) .-- Iron carbonyl vapour, formed by the action of carbon monoxide at a high temperature and pressure on impure iron or iron ores, is diluted either by admixture with an inert or reducing gas and/or under reduced pressure, and then passed over or through substances heated at or above 100°, e.g., iron turnings or molten metals, oils of high b.p., or melts of anthracene, phenanthrene, or paraffin hydrocarbons of high mol. wt. The rate at which the iron carbonyl vapour passes over should be such that no unaltered vapour escapes with the waste gases. The iron so obtained is substantially free from carbon. The carbon monoxide may be recovered M. E. NOTTAGE. completely.

Magnetic materials [iron-nickel alloys]. WEST-EEN ELECTRIC CO. From BELL TELEPHONE LABORA-TORIES, INC. (E.P. 263,207, 18.8.25. Cf. E.P. 245,986; B., 1926, 244).—The permeability in magnetic fields of small intensity and the resistivity of iron-nickel alloys containing from 70 to 85% Ni may be substantially increased by the addition of a small proportion of a third element such as chromium, when the alloy is subsequently suitably heat treated. For an alloy containing 78.5% Ni, 2% Cr, and remainder iron, the best magnetic properties are obtained by heating at 1100°, slowly cooling, and reheating to the neighbourhood of the magnetic transition temperature, followed by rapid cooling below this transition point.

L. M. CLARK.

Production of an aluminium solder. O. R. CROY (E.P. 263,402, 15.6.26).—An aluminium solder producing strong joints with any solderable metal is obtained by the addition of 0.1-5% Al to a molten mixture of 70-25% Zn and 25-70% Sn. The solution of the aluminium is carried out under a layer of charcoal, ammonium chloride being used as a flux.

L. M. CLARK.

Production by electro-thermic means of aluminium-silicon alloys practically free from carbide. METALLBANK U. METALLURGISCHE GES. A.-G. (E.P. 252,160, 10.5.26. Conv., 12.5.25).—By using initial materials free from iron, an aluminium-silicon alloy which is almost free from iron may be produced, whereas if the silicon content is increased to 35-47%, then, by suitably proportioning the ingredients of the furnace charge, the formation of carbide disappears almost completely. These alloys rich in silicon may be alloyed with pure aluminium with or without the incorporation of other known additional metals. M. E. NOTTAGE.

[Lead] plating method. R. J. SHOEMAKER, ASST. to LEADIZING CO. (U.S.P. 1,608,250, 23.11.26. Appl., 13.7.23. Cf. U.S.P. 1,405,167 and 1,566,984; B., 1922, 221 A; 1926, 163).—Iron and steel articles can be given a dense, smooth, adherent coating of lead by first dipping them in molten lead, or in a 45% solution of lead acetate at about 75°, and then adding further lead by electrolysis of a 10% lead acetate solution. In depositing copper, tin, nickel, or silver on iron by electrolysis, it is of advantage first to dip the article in molten lead or lead acetate. T. S. WHEELER.

Sintering apparatus. J. E. GREENAWALT (E.P. 263,363, 6.4.26. Conv., 5.2.26).—A mechanism is described for emptying the sintering pan used in ore sintering operations, by complete rotation through 360°, and at the same time for producing a rocking motion in the attached grate bars. L. M. CLARK.

Metal coatings on aluminium and aluminium alloys. Dr. O. Sprenger, Patentverwertung Jirotka M.B.H., Assees. of B. Jirotka (U.S.P. 1,607,676, 23.11.26. Appl., 15.1.26. Conv., 29.10.24).—See E.P. 249,971; B., 1926, 496.

Apparatus for determining the moisture content of moulding sand (E.P. 263,450).—See I.

Coating vessels etc. to render them chemically stable (E.P. 250,525).—See XIII.

XI.—ELECTROTECHNICS.

Valuation of pitch as a binding material for. carbon electrodes. Schuchardt.—See III.

Submarine insulation with special reference to the use of rubber. WILLIAMS and KEMP.—See XIV.

PATENTS.

Apparatus [anodes] for electro-deposition. INTER-NAT. COPPERCIAD Co., Assees. of T. ROBINSON (E.P. 255,113, 4.8.25. Conv., 5.8.24).—An anode assembly for use in electro-deposition, more especially in cases where the plating or the article itself is relatively thin, comprises an anode on which is mounted an insulating spacing member having portions lying against each face of the anode, and a contact member also carried by the anode and having portions lying on the outer faces of the spacing member. J. S. G. THOMAS.

[Electrode] for the electrification of gases [for producing ozone]. C. H. SHEARMAN (E.P. 263,356, 13.3.26).—Groups of points are arranged in a plane or planes parallel to the electrode and around regularlyspaced apertures in the electrode, so that the distance between the nearest points of a group is $\frac{1}{4}$ of the distance, measured in the direction of gas flow, between the nearest points of two groups in one plane.

J. S. G. THOMAS.

Transmitting electric charges through a gaseous medium. L. LEVY (E.P. 252,167, 11.5.26. Conv., 14.5.25).—Electric charges are propagated in a gaseous fluid by means of carrier waves or beams, *e.g.*, acoustic or ultra-acoustic waves of frequencies from 1000—10,000 periods/sec. J. S. G. THOMAS.

Thermionic valve [cathode]. A. C. HYDE (U.S.P. 1,608,317, 23.11.26. Appl., 26.5.25. Conv., 20.6.24).— A colloidal solution of tungstic acid, containing finelydivided thorium or uranium, is coated on a core of tungsten or molybdenum, which is then dried and heated *in vacuo*, or in an inert atmosphere, at 1700—2000°, when a highly emissive coating is obtained on the core. In place of tungstic acid, any salt of that metal, or of a metal such as platinum, which will yield the metal on heating and which, preferably, will dissolve in an organic solvent, can be employed. T. S. WHEELER.

Tungsten arc lamp. GENERAL ELECTRIC Co., Assees. of PATENT-TREUHAND-GES. FÜR ELEKTRISCHE GLUH-LAMPEN, M.B.H. (E.P. 263,405, 19.6.26. Conv., 3.2.26).— In a direct current tungsten arc lamp, two or more anodes, connected in parallel, co-operate with a single cathode, and are connected in series with a resistance. A slit is formed between adjacent anodes oblique to the common plane, so that the anodes in use present an unbroken illuminated surface in the principal direction of radiation. A small quantity of a gas of low anode drop of potential, *e.g.*, 2—10% of argon or mercury, is added to the nitrogen used as filling.

J. S. G. THOMAS.

[Electrolyte for] electric batteries. F. MELMS (E.P. 263,587, 6.11.25).—Alkali-cellulose is used as an electrolyte in batteries and accumulators.

J. S. G. THOMAS.

[Retaining material in] electric storage batteries. W. B. STONE (E.P. 263,024, 19.5.26).

Breaking petroleum emulsions (U.S.P. 1,612,180). —See II.

Aluminium in electro-technology. WUNDER.— See X.

XII.—FATS; OILS; WAXES.

New index for the determination of butter fat. F. VON MORGENSTERN (Z. Unters. Lebensm., 1926, 52, 385—388).—The fat is saponified with potassium hydroxide and glycerin, and the solution diluted with water (cf. B., 1926, 447). After cooling, saponified cacao butter and copper sulphate solution are added, the whole is shaken, and after settling is filtered from the insoluble fatty acid copper salts. The filtrate is acidified with dilute sulphuric acid, distilled, and the distillate titrated with 0.1N-sodium hydroxide. From an empirical table the percentage of butter fat may be read off from the titration figure, which is called the "copper index." F. R. ENNOS.

Susceptibility of fats to autoxidation. G. E. HOLM, G. R. GREENBANK, and E. F. DEYSHER (Ind. Eng. Chem., 1927, 19, 156-158).—Loosely bound oxygen

compounds are regarded, especially in butter oils, as the first compounds formed in the autoxidation process, and under certain conditions, such as long storage and action of light, their potential oxidising capacity may affect oxidation. Conditions of manufacture in the refining process, rather than their constitution, appear to affect the susceptibility of cotton-seed oils to oxidation, whereas acids have relatively little effect. The oxygen-absorption reaction is probably not entirely analogous in this case to the reaction involved in autoxidation of the oleic acid radical. Hydroxyl groups attached to molecules other than that containing an unsaturated linking have a retarding effect on autoxidation, apparently due to a reaction with some intermediate oxidising compounds, but once absorption begins it seems to proceed at the rate of the original oil or fat. D. G. HEWER.

Hydrogen electrode in the study of the rate of saponification of oils and fats by aqueous alkali. J. W. MCBAIN, H. S. HOWES, and (MISS) M. THORBURN (J. Physical Chem., 1927, 31, 131-143. Cf. Norris and McBain, B., 1922, 719 A; Langton, ibid., 825 A).-The rates of saponification of coconut oil, trilaurin, and tripalmitin have been measured by a rapid and convenient method involving the use of a hydrogen electrode, and by means of which the influence of all factors can be separately studied. The rate is proportional to the concentration of hydroxyl ions as measured by the hydrogen electrode. The first small amount of oil greatly increases the rate, but further additions have a comparatively small effect, agreeing with Norris and McBain (loc. cit.) that a given amount of soap has a limited emulsifying action. Increasing the initial amount of soap present rapidly increases the rate constant up to a concentration of $2N_w$ -soap, beyond which the reaction mixture becomes too viscous for this method to be used. The explanation given is that the oil is more perfectly emulsified when more initial soap is present. The effect of salt depends on the physical state of the system, but the fastest rates were obtained when the concentration of sodium chloride approached saturation. Addition of glycerol diminishes the rate. Tripalmitin is more rapidly saponified than coconut oil. L. S. THEOBALD.

Gas coagulation theory of the drying of fatty oils. L. AUER (Kolloid-Z., 1926, 40, 334—338).—The experiments were conducted by measuring the increase in weight of varnish in air and in carbon dioxide contained in desiccators of varying drying power and at different pressures. The curve representing the increase in weight of the oil on exposure to air as a function of time can be resolved into two independent curves representing the increase due to absorption of oxygen and that due to the absorption of water vapour. In a high vacuum (10^{-6} mm.) the oil remained unchanged after many months. Drying occurs in gases other than air or oxygen, and is supposed to be due to a true coagulation after absorption. E. S. HEPCES.

Highly unsaturated fatty acids of fish oils. II. Limit of unsaturation in menhaden oil. R. R. McGREGOR and G. D. BEAL (J. Amer. Chem. Soc., 1926, 48, 3150-3161. Cf. A., 1923, i, 647).—Methyl esters were prepared from 12 litres of menhaden oil, fractionated, 146

the constants of the fractions determined, and the amounts of different carbon chains present in certain fractions determined by Twitchell's method of hydrogenation and m.p. depression (cf. A., 1917, ii, 428). Certain fractions of the esters were brominated in ether at -10° , and the ether-insoluble bromides extracted with boiling bromobenzene, which effected a partial separation, as the more highly brominated esters remained undissolved. From the results obtained, compositions of certain ester fractions and their bromides were deduced as follows :- Fraction 5 [b.p. 160-170°/ 3 mm., iodine value (Wijs) 146.3, mol. wt. 277.2, $n^{19\cdot5}$ 1·4630]: C₁₆ acids 12·1%, C₁₈ acids 72·5%, C₂₀ acids 15·4%, bromides insoluble in bromobenzene (Br = 66·4%) chiefly hexa- and octa-bromostearates; fraction 7 (b.p. 180–190°/3 mm., iodine value 325·0, mol. wt., $305 \cdot 6$, $n^{19 \cdot 5} 1 \cdot 4894$): C_{18} acids $1 \cdot 1\%$, C_{20} acids, $70 \cdot 3\%$, C_{22} acids, $28 \cdot 6\%$, insoluble bromides (Br = $71 \cdot 46\%$), decabromoarachidate; fraction 8 (b.p. 190-200°/3 mm., iodine value 348.8, mol. wt. 319.5, $n^{19.5}$ 1.4962) : C₂₀ acids, 8.6%, C₂₂ acids, 91.4%, insoluble bromides (Br = 71.99%) chiefly methyl dodecabromobehenate. It is concluded that the highest unsaturation to be found in menhaden oil corresponds to 2 double linkings in the C₁₄, 3 in the C₁₆, 4 in the C₁₈, 5 in the C_{20} , and 6 in the C_{22} acids, which is in accordance with the results of Armstrong and Hilditch (B., 1925, 137, 458). F. G. WILLSON.

Flower waxes. J. F. S. STRAMAN (Pharm. Weekblad, 1927, 64, 52—69).—The waxes examined were obtained during the manufacture of perfumes from the fresh flowers. The treatment consisted of extraction of the flowers with light petroleum ; after removal of the solvent, the residues were treated with alcohol for removal of the odorous ethereal oils, the waxes remaining undissolved. Samples from roses, jasmine, mimosa, Parma violets, and hyacinths were examined. Microscopical examination of the petals showed the waxes to be present as outer protective coverings of the epidermis. The results of chemical examination were as follows :—

Wax	Violet	Mimosa	Rose	Hyacinth	Jasmine	
14	0.963	0.960	0-929	0.956	0.932	
m.p	58°	59°	57 · 5°	48°	60°	
Acid value	12.01	16.42	3.40	2.20	5.40	
Ester value	53.68	89.31	23.98	102.66	55.50	
Saponif. value	65.69	105.73	27.38	104.86	60.90	
Iodine value	17.28	34.58	12.87	55.76	40.26	
Composition-						
Hydrocarbons	46.95	51.90	74.20	25.42	49.85%	
Higher alcohols	10.25	23.90	11.70	25.02	14.35%	
Saturated fatty						
acids	34.99	$14 \cdot 20$?	27.66	21.31%	
Unsaturated fatty						
acids	5.80	8.00	?	19.14	14.50%	

The hydrocarbons in each case seemed to consist almost entirely of hentriacontane, $C_{31}H_{64}$, the m.p. and mol. wt. being reasonably close to those of this material; the analyses in all cases gave low results. The higher fatty acids consist chiefly of cerotic acid, and of the lower acids only acetic acid could be identified. Mimosa wax and hyacinth wax also probably contain palmitic and stearic acids, but no volatile acids. The fatty acids from the rose wax were insufficient for separation, but only traces of unsaturated acids appeared to be present. S. I. Levy.

Xylene and xylene percentage numbers in butter. VAN RAALTE.—See XIX.

PATENTS.

Fat-splitting agent (U.S.P. 1,608,841, 23.11.26. Appl., 12.12.24. Conv., 5.1.24).—See E.P. 227,089; B., 1925, 728.

Dispersing substances in water (U.S.P. 1,609,308). —See I.

Cleanser for grease etc. (E.P. 263,275).-See XIII.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Boiling of linseed oil. J. S. Long, C. A. KNAUSS, and J. G. SMULL (Ind. Eng. Chem., 1927, 19, 62-65).-The observed rates of change of hexabromide value, iodine value, and mol. wt. of linseed oil when heated at 293° in vacuo or in a stream of nitrogen show that in the first stages intramolecular rearrangements preponderate, leading to decrease in the number of Δ° ethenoid linkages with little corresponding change in mol. wt. Mono- and di-glycerides thus or otherwise formed may then undergo condensations involving elimination of water etc., causing the subsequent relatively large increases in mol. wt. If the oil be heated in the presence of sulphur, selenium, or tellurium, condensation reactions are almost entirely absent. Linolenic monoglyceride was synthesised by heating linolenic hexabromide, zinc dust, and glycerol, and showed the anticipated exceptionally rapid rise in mol. wt. on S. S. WOOLF. heating.

Chemistry of tung oil. F. H. RHODES and C. J. WELZ (Ind. Eng. Chem., 1927, 19, 68-73).-On bodying tung oil at 150°, 170°, 190°, and 220°, the iodine value falls, the acid value and the saponif. value are not appreciably affected, whilst the mol. wt. rises until gelatinisation occurs at a value practically independent of the temperature of heating. The sample under test gelatinised at a mol. wt. of approx. 1700. Tung oil, gelatinised at 220°, was fractionally extracted with boiling light petroleum and absolute alcohol, and the fractions were separately examined. The soluble portion of the gel is shown to be a dipolymeride, containing one tetramethylene ring, formed by combination of 2 mols. of elæostearin at a single pair of double linkages. The remainder of the gel is more highly polymerised, in a manner not at present fully explicable. This holds for oils gelatinised at relatively low temperatures only, gels produced at 360° being contaminated by decomposition products of low mol. wt. The heat of gelatinisation of tung oil, determined by a new method involving its utilisation to vaporise weighed amounts of naphthalene, corresponds to a coagulation of polymerised material already present in the thickened oil, rather than to the formation of a fresh insoluble compound. The oxygenabsorbing power of tung oil decreases on bodying at a rate apparently dependent on the formation of the highly polymerised substance. It is, therefore, considered that the dipolymeride formed in the early stages of bodying is subsequently enmeshed in the gel produced when the progressively developed complex polymeride reaches its coagulation concentration. S. S. WOOLF.

Relative method for determining particle size of pigments. G. F. A. STUTZ and A. H. PFUND (Ind. Eng. Chem., 1927, 19, 51–53).—An apparatus for measuring the intensity of light transmitted by suspensions of a pigment at different states of subdivision is described. It is shown that the opacity of a pigment attains a maximum at a definite particle size, characteristic of the particular type of material. Suitable calibration curves having been prepared, the average particle size of any suspension may be rapidly determined. S. S. WOOLF.

Relation of yield value to particle size. H. GREEN and G. S. HASLAM (Ind. Eng. Chem., 1927, 19, 53-57). —The flocculated structure which gives rise to the "yield value" of a plastic mixture is attributed to interfacial tension and quasi-frictional resistance between layers. Expressions for interfacial area and number of points of contact per unit area of one layer of particles are derived, and the relations between these values, the percentage weight and volume of pigment, and yield value of experimental mixtures are represented graphically and discussed. Yield value is also correlated with the various average diameters of the particles of a nonuniform material. S. S. WOOLF.

Yellow ink for marking rubber tensile strips. C. G. CASHION (Ind. Eng. Chem., 1927, 19, 45).—An ink prepared by precipitating lead chromate by potassium chromate, boiling, filtering, and grinding the lead chromate into glycerol before it is quite dry, and using on a blank pad moistened to the right consistency with glycerol, gives satisfactory lines for stress work, and is specially suitable for black treads and in ageing work.

D. G. HEWER.

"Acrolite "—a new synthetic resin. J. McINTOSH (Ind. Eng. Chem., 1927, 19, 111).—" Acrolite" is the condensation product of glycerol and excess of phenol. It is said to be superior to other commercial artificial resins in lustre and heat-resisting capacity, and to have all the desirable properties of the phenol-formaldehyde type of synthetic resin. S. S. WOOLF.

Determination of colour intensity of resins, varnishes, oils, etc. E. FONROBERT (Farben-Ztg., 1927, 32, 795—797, 850—851).—The author enumerates the advantages of exact determinations of colour of resins, varnishes, oils, etc. in connexion with the evaluation of raw materials, control of factory processes, and maintenance of uniform finished products. The Fonrobert-Pallauf colorimeter detailed is a simpler modification of the previously described apparatus for carrying out the determination of "iodine colour numbers" (cf. B., 1926, 201). Relatively large variations are shown to exist in the colour of commercial samples of the various rosin grades. S. S. WOOLF.

Effective metal content in siccatives and its determination. P. MÜLLER (Farben-Ztg., 1927, 32, 798—800, 851—853).—A true measure of the efficiency of a siccative preparation is not afforded by the customary ash determination, since this records uncombined metals, *i.e.*, unfixed oxides (fused driers) or excess of precipitating agents (precipitated driers) as well as the active metal content, *i.e.*, that combined with resin- or fatty oil-acids. From the observed drying times of a series of linseed oil-driers mixtures heated for $\frac{1}{2}$ hr. at 110—120°, the siccative action of suspended or unfixed driers is shown to be very small, and any apparent effect is to be ascribed to local overheating, with consequent fixation, rather than to catalytic action. A suggested method for resolving the metal content of driers into effective and inactive portions is as follows :---The resinates, linoleates, etc. are extracted by shaking in the cold with 3-4 vols. of acetic anhydride, in which solvent the majority of unfixed oxides and salts likely to be present are insoluble. The solution is evaporated to dryness, and the resinous residue converted into metal sulphates by means of concentrated sulphuric acid and ashing. This sulphated residue can be quantitatively analysed with more reliability than the normal asha mixture of reduced metal and oxides in doubtful state of oxidation. The drier as a whole and, if necessary, the portion insoluble in acetic anhydride can be similarly sulphated, and the active proportion calculated.

S. S. WOOLF.

Water content of bleached shellac, and a watercontaining artificial shellac. F. BAUM (Chem.-Ztg., 1927, 51, 42-43).—The price of bleached shellac is often lower than that of natural shellac, notwithstanding the loss of material by alkaline hypochlorite bleaching. Such shellac contains 25-30% of water, probably as a fine mechanical separation. A similar phenomenon occurs in an artificial shellac, which is a dark reddish-brown, transparent resin not affected by bleaching. A considerable proportion of the coloured portion can be separated by treatment with alcohol, benzene, and water. W. G. CAREY.

Particle size. LUKIRSKY and KOSMAN, also CALBECK and HARNER.—See I.

Thermochemical comparison of various types of lamp black. HOCK and BOSTROEM.—See II.

Gas coagulation theory of the drying of fatty oils. AUER.—See XII.

PATENTS.

Coating vessels etc. to render them chemically stable. SÄURESCHUTZ GES.M.B.H. (E.P. 250,525, 10.9.25. Conv., 11.4.25).—Metal sheets, tubes, or other apparatus to be rendered proof against acid etc. are provided with holes, notches, or recesses, thus giving good adhesion of a layer of phenol-aldehyde condensation product, which is applied and subsequently heat-"cured." With or without a preliminary removal of the outer crust of the first hardened layer, and a further heat treatment to drive off any volatile constituents still remaining, further layers of phenol-aldehyde resin, admixed with chemically-stable fillers, and fabric inserts may be applied. S. S. WOOLF.

Cleansing articles contaminated by oil, grease, paint, etc. J. L. BIGGART (E.P. 263,275, 20.11.25).— Articles to be cleansed are immersed for a suitable period in a composition of sodium silicate (34 pts.), calcium carbonate (51 pts.), and water (12 pts.), maintained at about 77°. S. S. WOOLF.

Making [aqueous] solutions of resins. PAPETERIES NAVARRE (E.P. 263,393, 28.5.26. Conv., 10.4.26).—Resinbearing aqueous fluids, suitable for paper and cardboard sizing etc., are obtained without the application of heat, by passing caustic soda solution, at a concentration lower than 10 g./litre, through vertical columns filled with the comminuted resin. S. S. WOOLF. Condensation products from mono- and dicyclic phenols and aldehydes. A. AMANN and E. FONROBERT, ASSTS. to CHEM. FABR. DR. K. ALBERT, G.M.B.H. (U.S.P. 1,614,171, 11.1.27. Appl., 13.12.23. Conv., 1.11.21).—Mono- or di-cyclic phenols in alkaline solution are added to aldehydes, the latter being in excess during the reaction. S. S. WOOLF.

Condensation product of ketones and phenols. A. AMANN and E. FONROBERT, ASSTS. to CHEM. FABR. DR. K. ALBERT, G.M.B.H. (U.S.P. 1,614,172, 11.1.27. Appl., 13.12.23. Conv., 25.4.21).—The hydroxyarylmethane resulting from the condensation of a ketone with a phenol is treated with an aldehyde in an alkaline medium, at slightly above 60°. The resulting resin is readily soluble in dilute alkalis. S. S. WOOLF.

Production of a neutral resin from gum accroides. K. H. T. PFISTER, Assr. to ROHM & HAAS Co. (U.S.P. 1,608,421, 23.11.26. Appl., 11.2.25).—Gum accroides (92 pts.) dissolved in alcohol (650 pts.) is treated with sodium hydroxide solution $d \cdot 383$ (38 pts.) and *p*-toluenesulphonyl chloride (106 pts.) at the b.p., when a tough, neutral resin, soluble in benzene, and insoluble in alcohol, is obtained. Other esterifying agents can also be employed. T. S. WHEELER.

Production of shellac substitutes. J. SCHEIBER and W. NOACK (E.P. 252,715, 25.5.26. Conv., 29.5.25).— Shellac substitutes are obtained by condensing polyhydroxy-fatty acids with hydroxycarboxylic acids of a hydro-aromatic nature (the analogues respectively of the aleuritic and shelloic acids composing the major part of natural shellac). In a typical example the mixed acids liberated from linseed oil and soft Manila resin are oxidised by permanganate, and heated together at 150° after purification. A clear resin is obtained, m.p. 90° (approx.), soluble in alcohol, alkali carbonates, and borax, but insoluble in fatty oils and benzene.

S. S. WOOLF.

Disposal of gases and vapours resulting from the boiling of oils, gums, resins, etc. D. E. GOGGIN (U.S.P. 1,612,915, 4.1.27. Appl., 29.12.24).—Varnish fumes etc. still sufficiently hot to preclude detrimental deposits of gummy substances are conveyed by a current of steam to a furnace in which they are burnt. S. S. WOOLF.

Dispersing substances in water (U.S.P. 1,609,308). —See I.

Recovering resinous substances from cracked petroleum distillates (U.S.P. 1,608,135).—See II.

[Pigment from] reduction of aromatic nitrocompounds (E.P. 263,376).—See XX.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Revertex process. E. A. HAUSER (Kautschuk, 1927, 2—16).—Revertex is obtained by the concentration of latex by evaporation together with an alkaline protective colloid in an externally heated rotating drum, inside which a freely rotating roller ensures thorough mixing. The pasty product, which contains only 20—30% of water, can be re-diluted for any purpose needing latex, and in this form can be vulcanised like ordinary latex. Vulcanised liquid latex also can be concentrated by the

revertex process, and homogeneous mixtures suitable for the manufacture of "dipped " goods or unmasticated vulcanised sheet rubber can be obtained from it by incorporating fillers, preferably as colloidal suspensions. Compounding of revertex can conveniently be effected in a mechanical kneading machine into which the powders are introduced through a brush sieve, water also being introduced as necessary; the subsequent coagulation and drying may be effected on a pair of heated friction rolls, the final milling being completed on smooth rolls. If a content of carbon black is desired exceeding 20% (on the rubber) further quantities up to a total of 200% or more can be introduced during the drying operation. Revertex mixtures vulcanise more rapidly than ordinary rubber, and, as with most rubbers containing the whole of the serum solids, the vulcanised products " age " well. D. F. Twiss.

Rubber latex concentration and industrial application of concentrated latices. E. A. HAUSER (Trans. Inst. Rubber Ind., 1926, 2, 226–238).—A review of the subject with especial reference to the revertex process (see preceding abstract). D. F. TWISS.

Action of ultra-violet light on rubber solutions in the presence of yellow phosphorus. F. KIRCHHOF (Kautschuk, 1927, 28—30).—A benzene solution of rubber containing yellow phosphorus if exposed to ultra-violet light gels similarly to a rubber solution treated with dilute sulphur chloride. The dissolved yellow phosphorus is apparently converted into an ultramicroscopic dispersion of amorphous phosphorus. Zinc xanthate accelerates this "photo-gelation" of the mixture. The result is distinct from gelation by light alone, the resulting amorphous red phosphorus presumably exercising a "vulcanising" effect. D. F. Twiss.

X-Ray studies on rubber and similar substances. E. A. HAUSER and P. ROSBAUD (Kautschuk, 1927, 17–21).—Calculation of the distance between the particles in unstretched crude rubber for the inner and outer amorphous rings gives results of $14 \cdot 88$ Å. and $6 \cdot 05$ Å., respectively. Metastyrene and a derived hydrocarbon $C_{16}H_{18}$ give diffraction patterns similar to those for unstretched raw rubber. D. F. Twiss.

What is rubber ? E. A. HAUSER (Trans. Inst. Rubber Ind., 1926, 2, 239-244).—An account of chemical and physical views as to the structure of rubber.

D. F. Twiss.

Fusion line of stretched rubber and its relation to the density. Law of elastic state. H. FEUCHTER (Kautschuk, 1927, 23—28).—Further consideration of the characteristics, particularly of the density and the rate of recovery when heated, of unvulcanised rubber which has been subjected repeatedly to a warming and stretching operation. The phenomena appear to accord with a "law of elastic state" in line with Le Chatelier's principle of "mobile equilibrium." The author's views as to the thermodynamics and structure of rubber are extended (cf. B., 1926, 204; 1927, 119).

D. F. Twiss.

New hypothesis of rubber structure based on recent X-ray researches. E. A. HAUSER (Ind. Eng. Chem., 1927, 19, 169-170).—A re-statement of the view that the "crystalline" aggregates of highly polymerised rubber are normally swollen by the presence of the less polymerised portion of the hydrocarbon. When rubber is stressed, the swelling agent is expelled, and the amplitude of vibration of the crystalline aggregates is thereby reduced to such a degree that the possibility of definite X-ray interference results. D. F. Twiss.

Relation between vulcanisation by sulphur chloride vapour and the permanence of the vulcanised products. R. DITMAR (Chem.-Ztg., 1927, 51, 26-29). -An investigation of the effect of various conditions on the character of the vulcanised films of pale crêpe rubber, obtained with sulphur chloride, mainly by the "vapour cure." Careful adjustment of the degree of mastication of the rubber is necessary. Rubber solutions in benzene, with or without the addition of a small percentage of alcohol, yield transparent products of more attractive appearance than corresponding solutions in light petroleum. Atmospheric moisture leads to turbidity and loss of transparency. The inclusion of paraffin oil, soya bean oil, and, in particular, aniline in the rubber solution, has a favourable influence on the softness of the products; Hevea rubber seed oil is undesirable. Short immersion of the vulcanised film in a benzene solution of aldol-α-naphthylamine does not enhance its stability. A mixture of triphenyl phosphate and lycopodium, boric acid, and colloidal clay are satisfactory as dusting powders, but the last two somewhat D. F. Twiss. impair the transparency.

Selenium in rubber compounds. C. R. Boggs and E. M. FOLLANSBEE (Trans. Inst. Rubber Ind., 1926, 2, 272—304).—A review of the uses of selenium in rubber compounding. Selenium can be used as a vulcanising agent or to accelerate vulcanisation by sulphur, the latter effect being attributed to the formation of selenium sulphide. The enhanced rigidity and abrasion resistance of tyre tread "compounds" vulcanised with sulphur and selenium in the presence of an organic accelerator are probably due to the joint addition of the two elements to the rubber molecule. D. F. Twiss.

Rubber softeners: their influence on ageing. W. N. BURBRIDGE (Trans. Inst. Rubber Ind., 1926, 2, 256-266. Cf. B., 1926, 598).-Features desirable from the use of a softener include an increase in the plasticity of the rubber with reduced resistance to milling, an enhanced capacity for absorption of compounding ingredients, and an improved resistance to ageing. Mineral oil, vaseline, ceresin wax, fatty oils, and fatty acids are classed as pseudo-softeners, and regarded as mere lubricants of the rubber cells, whilst naphthalene, mineral rubber, pine tar, rosin, and rosin oil are regarded as true softeners of the rubber nucleus. The true softeners, as a class, are more effective than the pseudo-softeners in their beneficial influence on the ageing properties of the mixing examined; exceptions in this respect include resin oil, oleic acid, and carnauba wax.

D. F. Twiss.

Effect of solid compounding ingredients as softeners [for rubber]. E. H. HURLSTON (Trans. Inst. Rubber Ind., 1926, 2, 267—271).—Not only can the plasticity of a rubber mixture be modified by the incorporation of soft wild rubbers or of definite "softeners," but many of the ordinary compounding ingredients have

distinct influence.ⁱ Organic accelerators, zinc oxide, red iron oxide, whiting, and gas black (in small proportion) exert a softening effect; barytes, hamp black, and china clay (in small proportions), lithopone, and antimony sulphide are neutral; magnesium carbonate and oxide, lime, litharge, and higher proportions of lamp black or gas black have a distinct "drying" influence.

D. F. Twiss.

Submarine insulation with special reference to the use of rubber. R. R. WILLIAMS and A. R. KEMP (J. Franklin Inst., 1927, 203, 35-61).-The limited supply and high cost of gutta percha and balata necessitate a substitute for submarine insulation, and such a material must have mechanical adaptability, suitable specific electric constants, and permanence of mechanical and electrical characteristics, a common difficulty being excessive brittleness or lack of flexibility at sea-bottom temperature, and a high water absorption leading to an increase in dielectric constant. Rubber has adequate mechanical strength, but in its raw state is not highly plastic, and is too resilient, so that it cannot be extruded so easily as gutta percha. Soft vulcanised rubber, however, can be adapted to be mechanically and electrically suitable and to withstand the action of sea water in a manner comparable with gutta percha. The rubber insulation of the Seattle-Sitka cable is in an excellent state of preservation mechanically after sixteen years. The principal factor to be controlled is the amount of water absorption ; gutta percha suffers some increase in dielectric constant from this cause, but rubber is still more affected. Porosity, the presence of proteins, and the osmotic pressure of internal and external fluids are important factors governing the inflow of water into rubber, but in oxygen-free salt solutions a definite limit of water absorption is reached. Lowered water absorption is attained by the removal of water-soluble matter from the rubber and by the use of suitable fillers. Fillers are required also to give the plasticity necessary to the good extrusion of rubber, but many are unsuitable because of high dielectric constant, or because of their solubility in water, or their tendency to form hydrates. They must be non-reactive and of suitable particle size, and have a minimum of adsorbed gases or other contamination on their surfaces. The best fillers for this purpose are hard rubber dust, silica roasted at 1000° for some hours to remove adsorbed gas, or zinc oxide.

W. G. CAREY.

Yellow ink for marking rubber tensile strips. Cashion.—See XIII.

PATENTS.

Composition of matter [nitrated rubber]. H. L. FISHER, ASST. to B. F. GOODRICH CO. (U.S.P. 1,609,806, 7.12.26. Appl., 19.10.22).—Rubber (500 g.), dissolved in carbon tetrachloride (6.25 litres), is agitated with concentrated nitric acid (500 c.c.) for 1 hr. The product (833 g.) has the probable formula $(C_5H_7NO_2)_x$, is soluble in acetone and nitrobenzene, insoluble in benzene, and is useful in the preparation of insulating materials. It decomposes at about 136°, and, when treated with methyl sulphate, yields a substance stable above 300°. T. S. WHEELER.

Composition prepared from bitumen and rubber. J. CAMPBELL (E.P. 263,028, 29.5.26).—A material suitable as a dressing for roads, as a protection for iron, steel, or wood, etc., is produced by stirring a mixture of ground scrap vulcanised rubber (70 pts.) with molten asphaltum or petroleum residue (30 pts.) until homogeneous. The characteristics of the mixture may be modified by the inclusion of a small proportion of pitch, resin, sulphur, rubber solvent or solution of rubber, fibrous material, and plaster of Paris. D. F. TWISS.

Vulcanisation of caoutchouc. C. W. BEDFORD, Assr. to B. F. GOODRICH Co. and GOODYEAR TIRE & RUBBER Co. (U.S.P. 1,613,572—3, 4.1.27. Appl., [A], 28.12.23. Renewed 5.6.26. [B] 11.2.25).—(A) Rubber containing an organic disulphide having a double linking adjacent to the C·S·S·C group is treated with hydrogen sulphide to produce the C·SH group, and is then vulcanised. (B) Vulcanisation of rubber is accelerated by successive treatment with a plurality of substances which combine together to form a dithiocarbamic compound.

Accelerators for rubber vulcanisation. E. C. R. MARKS. From E. I. DU PONT DE NEMOURS & CO. (E.P. 263,517, 17.9.25).—The vulcanisation accelerators produced by the condensation of aromatic amines with an aldehyde containing a plurality of carbon atoms are commonly sticky, viscous fluids. By further heating, *e.g.*, between 80° and 100°, with formaldehyde they are converted into paler, brittle, solid products which are more convenient for use. (Reference is directed, in pursuance of Sect. 8, Sub-sect. 2, of the Patents and Designs Acts, 1907 and 1919, to E.P. 251,005. See B., 1926, 555.) D. F. TWISS.

Device for registering the degrees of hardness of vulcanised rubber or other resilient materials. DUNLOF RUBBER Co., and E. SIMPSON (E.P. 263,636, 18.1.26).—An instrument capable of measuring small differences in hardness of resilient materials is operated by pressing a projecting plunger against the article under test. The spring maintaining the plunger in position is so selected that the latter penetrates considerably before the spring is depressed. The full range of the scale reading therefore corresponds with a limited range of variation in hardness. For convenience in reading, a device is included enabling the fixing of the dial needle. D. F. TWISS.

XV.-LEATHER; GLUE.

X-Ray spectrographic examination of the tanning of membranes and tendons. J. R. KATZ and O. GERNGROSS (Kolloid-Z., 1926, 40, 332—333).—The X-ray spectrograph obtained from untanned leather consists of a broad inner ring characteristic of the amorphous state, with an outer ring typical of interference due to crystalline arrangement. Various specimens of leather differ only in the intensity of these rings. With threads of collagen, tanning with formaldehyde does not alter the X-ray interference figure, a difference being noticed only when an extract of gall-nuts is used as the tanning agent. It is supposed that only the outermost layer of molecules of collagen is affected. E. S. HEDGES.

Fluorescence of wood cellulose and vegetable tanning extracts. GERNGROSS.—See V.

PATENTS.

Production of gelatin and glue from chromeleather or its shavings. J. RINCK (U.S.P. 1,612,746, 28.12.26. Appl., 4.9.24. Conv., 28.1.24).—See E.P. 226,722; B., 1924, 140.

Manufacture of artificial leather. P. MAGNUS (E.P. 263,004, 22.3.26).

XVI.—AGRICULTURE.

Sulphuric acid treatment of cotton seed. R. G. ARCHIBALD (Soil Sci., 1927, 23, 1—3).—Cotton seeds (500 g.) were treated with concentrated sulphuric acid (100 c.c.) for 15 min., washed for 10 min. in 2 litres of water, and dried. Sown immediately after treatment, the seed showed 95% germination, and, after storage for 6 months, 92%. In the field treated seed germinated better than the untreated. Soaking the seeds in acid for longer periods than one hour, even with a dilution of 1:500, affected their germinative power. Seeds infected with "Black Arm" were not completely sterilised by the acid treatment, but the active development of the disease was delayed, and young plants became well established before any injury was apparent.

A. G. POLLARD.

Use of collodion sacs in obtaining clear soil extracts for the determination of the water-soluble constituents. W. H. PIERRE and F. W. PARKER (Soil Sci., 1927, 23, 13—32).—The difficulty of filtering soil extracts without loss of calcium and phosphate is overcome by the use of collodion sacs. Prepared as described, the sacs are without effect on soluble ions. Equilibrium between soil suspension and dialysate is reached within 24 hrs., and with the use of a mechanical shaker in a much shorter period. Hydrogen-ion concentrations in dialysed soil extracts agree well with values determined electrically. The use of collodion sacs in studies of the buffer capacity of soils, the soluble mineral matter, etc. is indicated. A. G. POLLARD.

Occurrence of yeast in soil. R. L. STARKEY and A. T. HENRICI (Soil Sci., 1927, 23, 33-45).—Various species of yeasts were found in small numbers in many soils examined. The presence of yeasts was in no way dependent on the type of soil, the crop, or season.

A. G. POLLARD.

Obligate thermophilic bacteria from soil. W. A. FEIRER (Soil Sci., 1927, 23, 47-56).—A number of species of aerobic, obligate, thermophilic bacteria were isolated from surface soils. Their characteristics are described. Optimum growth occurred in the range 50-60°, and the death-point range was 125-155°. Organisms were not pathogenic to guinea-pigs. One species exhibited proteolytic activity.

A. G. POLLARD.

Oxidation of sulphur by micro-organisms during ammonification. G. GUITTONNEAU (Compt. rend., 1927, 184, 45—46. Cf. A., 1925, i, 1218).—Certain ammonising micro-organisms were placed in solutions containing peptone and free sulphur, and after 40—50 days it was found that in most cases thiosulphates had been formed. When the pure cultures were aided by the action of bacterium b_2 (B., 1925, 774), further oxidation to sulphates occurred. Aspergillus niger and Penicillium glaucum caused oxidation to sulphates without the aid of b_2 . The presence of sulphur thus affects the equilibrium during ammonification. B. W. ANDERSON.

Agrological investigations of the dynamics of biochemical processes in podsol soils. S. P. KRAVKOV (Pochvovedenie [Russia], 1925, 20, 5—19).— Determinations of nitrates, ammonia, total solids, organic and mineral matter, reaction, phosphorus, calcium, potassium, etc. in aqueous extracts of soils indicate that despite variations in meteorological and other conditions the type of curve of nitrate formation (and apparently of total solids) in natural soils remains the same. A. A. ELDRIDGE.

Sunlight and chemical nitrification. I. P. ZHOLTZINSKII (Pochvovedenie [Russia], 1924, 19, 80— 97).—Cellulose was treated with hot sulphuric acid $(d \ 1.84, 100 \ c.c.)$ and water (50 c.c.), washed, dialysed, and saturated with ammonia (1.83%) for 8 days. The dark-coloured filtrate, containing 0.48 g. of humus substances per litre, on exposure to sunlight became light in colour, and gave reactions for nitrates, the humic substances catalysing the oxidation. Experiments with 1—2% solutions of substances of the benzene structure showed that in photochemical humification hydrogen peroxide is produced.

A. A. ELDRIDGE. Soil structure and its significance to agriculture. K. K. GEDROIZ (Ann. Inst. Exp. Agron. [Russia], 1926, 4, 117—127).—Soil structure is determined by pressure (e.g., of clover roots) and coagulation. The coagulating power of cations is in the increasing order : lithium, ammonium, potassium, magnesium, calcium, hydrogen, aluminium, iron. Hydroxyl ions hinder coagulation, but the stabilising action of other anions is insufficient to offset the effect of the cations. Coagulation is closely connected with replacement and adsorption in the colloidal complex capable of base exchange.

A. A. ELDRIDGE. Origin of alkali soils. D. G. VILENSKII (Pochvovedenie [Russia], 1924, 19, 36—58).—Alkali soils are formed from salinised soils when the latter lose their contact with the ground waters. A. A. ELDRIDGE.

Colloidal fungicides. J. BORDAS (Rev. gén. Colloid., 1926, 4, 289—294).—The advantages of using fungicides in a colloidal state, both for spraying and seed disinfection, are discussed, and a short account is given of a number of such preparations, the most important of which contain either sulphur, copper compounds, or mercury sulphide. Some recent practical experiments, which have given promising results, are briefly noted.

C. T. GIMINGHAM.

Cellulose [bacteria]. I. A. ITANO (Ber. Ohara Inst. landw. Forsch., 1926, 3, 215—219).—A preliminary note, dealing mainly with the cellulose-decomposing powers of an aerobic, thermophilic bacterium. The organism is active both in pure culture and in composts of vegetable waste materials. C. T. GIMINGHAM.

Applicability of the indirect method of analysis to determination of sodium and potassium in soil solutions. R. E. NEIDIG and W. B. BOLLEN (Ind. Eng. Chem., 1927, 19, 154—156).—The formulæ used are essentially those of Crookes except that the factors are based on at. wts. from the International Tables. Indirect determination of sodium and potassium in solutions of their chlorides showed some individual errors even exceeding 2 mg., but the average was less than 1 mg. for Na: K or K: Na ratios of 0:100. In comparison with the chloroplatinate method of determination for soil extracts, the indirect method from a determination of the chloride is regarded as equal in accuracy, except where potassium alone is sought, and is superior from the standpoint of economy of time and cost of reagents. D. G. HEWER.

Storage of rice and changes of its physical properties during this period. M. KONDO (Ber. Ohara Inst. landw. Forsch., 1926, 3, 153—175).—The variations in temperature of stored hulled rice, in relation to the air temperature, have been studied, and observations made on the changes in water content, water-absorbing capacity, hardness, and other properties of the rice. Practical conclusions are drawn as to suitable conditions for the storage of hulled rice. C. T. GIMINGHAM.

Biilmann's quinhydrone electrode. I. Table for $p_{\rm H}$ values corresponding to electromotive forces determined in quinhydrone electrode measurements. II. A. ITANO and K. HOSODA (Ber. Ohara Inst. landw. Forsch., 1926, 3, 193—201, 203—214). —A number of points in connexion with the working of the quinhydrone electrode and the arrangement of the apparatus are discussed. The method is considered to have advantages over the use of the hydrogen electrode, particularly for soil investigations. A table is given of $p_{\rm H}$ values corresponding to the *E.M.F.* measured by means of the quinhydrone electrode.

C. T. GIMINGHAM.

Soil micro-organisms and activators. A. ITANO (Ber. Ohara Inst. landw. Forsch., 1926, 3, 185–191).

Extraction of copper ores with ammonia and production of arsenic-copper preparations. FESTER and BERTUZZI.—See X.

PATENTS.

Manufacture of superphosphate. B. BODRERO (E.P. 262,878, 22.9.25).—The raw phosphate is subjected to a preliminary washing with water in order to remove some calcium carbonate and render the material more porous. The material is then mixed with 3.5—10% of sulphur and, in some cases, putrefiable organic matter, and maintained at 40—50° in silos or ovens, in which it receives injections of water vapour. Under these conditions sulphur dioxide is produced and reacts with the mineral phosphate. G. W. ROBINSON.

Manufacture of phosphate fertiliser. L. ADE-LANTADO (E.P. 262,833, 9.6.25).—In the manufacture of mixed fertilisers containing water-soluble phosphates of the type M'_2HPO_4 and phosphates soluble in citric acid of the type CaM'PO₄, iron and aluminium phosphates or natural phosphates containing substantial amounts of iron and aluminium are treated with sulphates of the alkali metals or magnesium together with calcium carbonate, and a small quantity of sulphuric acid in the presence of water, and without the application of heat. The amount of acid used is equivalent to that required to convert all the phosphate, expressed as tricalcium phosphate, into the dicalcium phosphate. By increasing the speed of reaction, working at a low temperature, using a slight excess of acid, and storing so that heat is rapidly dissipated, a product rich in watersoluble phosphate is formed. By varying the conditions a product low in water-soluble phosphate but rich in citric-soluble phosphate may be obtained. Organic matter, *e.g.*, peat or sewage sludge, may be added if desired. G. W. ROBINSON.

Dry fertilisers and glycerin from vinasses. E. A. BARBET (E.P. 263,322, 30.1.26).—See F.P. 605,825; B., 1926, 893.

XVII.—SUGARS; STARCHES; GUMS.

Composition of mesquite gum: isolation of d-galactose and *l*-arabinose. E. ANDERSON and L. SANDS (J. Amer. Chem. Soc., 1926, 48, 3172—3177).— Hydrolysis of mesquite gum with 4% sulphuric acid at 80° affords *l*-arabinose ($50 \cdot 7\%$), which was separated from the calcium salts obtained by neutralising the solution with calcium carbonate. Further hydrolysis of these salts by 3% sulphuric acid in an autoclave at 1 atm. gauge pressure yields *d*-galactose ($18 \cdot 7\%$), and an *aldehydic acid* of the galacturonic acid group (13%). These three constituents, together with moisture, ash, and a small proportion of nitrogenous material, are practically the sole constituents of the gum.

F. G. WILLSON.

Preparation of sugar from sawdust. Hägglund. —See V.

XVIII.—FERMENTATION INDUSTRIES.

Experimental brewings with new varieties of hops. J. M. Lones and T. E. GRANT (J. Inst. Brew., 1927, 33, 6-11).—Three new varieties of hops which showed exceptionally high percentages of resins for English-grown hops were put on trial both as copper hops and as racking hops, and were also compared with a good quality British Columbian, 1924, crop. The antiseptic values determined chemically were 84, 54, and 76, and by the Chapman biological method 63, 83, and 90. The British Columbian hop, by the latter method, gave a value of 70. In brewing, fermentation, and racking no noticeable difference was observed between any of the brewings, whilst the weight, quality, and purity of the yeast outcrops showed very little variation. Compared with the British Columbian, the new varieties gave rise to slightly lower attenuations, and had equal flavouring properties, but possessed a somewhat inferior brewing value so far as keeping properties were concerned. With the exception of the foreign hop, the keeping properties showed a rough approximation to the preservative values as determined by the Chapman method. The "brewing value" appeared to follow very closely the "rub" of the hops. C. RANKEN.

Determination of amylase in the mash. F. WEN-DEL (Z. Spiritusind., 1927, 50, 9).—To determine whether the necessary excess of amylase is present in distillery wort, 5 c.c. of clear wort are added to 15 c.c. of a 1%solution of soluble starch. The mixture is incubated at $27-28^{\circ}$ for 1 hr. and a few drops of iodine solution are added. According as the resulting colour is yellow, reddish, or bluish-violet, an excess, sufficiency, or deficiency of amylase is present. To avoid the need for an

accurate balance and the preparation of large quantities of soluble starch solution, the soluble starch should be purchased in its prepared state in glass tubes each containing 2 g. C. RANKEN.

Wines from vintages attacked by the Cochylis and Eudemis. L. FERRÉ (Ann. Falsif., 1926, 19, 595-599).-Wines made from grapes attacked by the Lepidoptera Cochylis and Eudemis show chemical differences from the normal depending partly on the locality, but chiefly on the time of attack, so that natural chemical changes in the grape may be arrested at different stages. The dry extract is increased by 10-50% above the average. Total acidity differs considerably according to whether litmus or phenolphthalein is used as indicator, owing to the presence of weak organic acids of high mol. wt. The proportion of malic and tartaric acids depends largely on the time when development was arrested; alcohol precipitates substances convertible into sugars by 2% hydrochloric acid at 120°, probably of the nature of gums and pectic substances; the proportion of glycerin is increased, and the ratio of alcohol to glycerin, which is always greater than 10 in normal Burgundy wines, falls below 10. Tannic material, mineral and nitrogenous substances are present in D. G. HEWER. greater proportions than normal.

Butyl alcohol and acetone from corn [maize]. D. H. KILLEFFER (Ind. Eng. Chem., 1927, 19, 46–50).— Butyl alcohol, acetone, and ethyl alcohol are produced in the ratio of 6:3:1 by fermentation of low-grade maize by means of cultures of *Clostridium acetobutylicum*. This culture converts 3 lb. of starch into 1 lb. of mixed solvents in the form of a $2\cdot5\%$ solution, and a mixture containing 45% H and 55% CO₂ is evolved as a by-product. The solvent mixture is passed through continuous stills, and the resulting crude spirit (50% solvents) then fractionated. D. G. HEWER.

Purification of waste water from the fermentation industries. G. Bode (Z. angew. Chem., 1927, 40, 84-87).-The discharge of objectionable waste water from breweries is prevented by purifying the highly-contaminated water from the brewing house and the cellars before it is discharged into the main sewer and contaminates the remainder, which is comparatively innocuous. The impurities, being mainly of a solid nature, such as coagulated albuminous material, hop resins, and yeast, can be removed by sedimentation, and apparatus for this purpose is described. In potato distilleries, the residues are worked up into cattle fodder, and the waste water is not contaminated. The purification of the water from distilleries using molasses, the still residues of which contain much putrescible organic material, and of waste liquors from the manufacture of compressed yeast from molasses requires further atten-L. A. COLES. tion.

Oxidation of sulphur by micro-organisms during ammonification. GUITTONNEAU.—See XVI.

Absorption by vegetable tissues. Effront.— See XIX.

PATENTS.

Extraction of tartaric [acid] salts [from winelees etc.]. W. E. KLAVERSTEIJN (E.P. 263,340, 15.2.26). —The residues of wine-making (lees, tartars, or argols, etc.) are dried, ground, and roasted at 150°. Water or mother-liquor from a previous operation is added, and the liquid saturated with sulphur dioxide, which is maintained at a pressure of 3 atm. for 30 min. The potassium hydrogen tartrate and calcium tartrate of the wine residues are converted into soluble tartaric acid and the metal bisulphites. The liquid is filtered and the pressure reduced, when the above reaction is reversed, potassium hydrogen tartrate being precipitated. The reaction is interrupted when 2% of the latter remains, in order to prevent the calcium tartrate from precipitating. The mother-liquor is used again, being finally evaporated for the production of calcium tartrate.

B. FULLMAN.

Fertiliser and glycerin from vinasses (E.P. 263,322).—See XVI.

Production of leavened bread and other dough products (E.P. 235,874).—See XIX.

XIX.—FOODS.

Xylene and xylene percentage numbers [in examination of butter]. A. VAN RAALTE (Chem. Weekblad, 1927, 24, 59-60. Cf. B., 1926, 563).— The formula previously given is modified for percentage of milk fat to (xylene number $-0.63) \div 0.20$; the value 0.63 is not constant, but varies with the amounts of cacao butter and/or palm-kernel oil present. From examination of 108 samples, it is concluded that a butter having a lower xylene percentage number than 66 must be regarded as adulterated. S. I. LEVY.

Examination of sterilised milk 27 years old. G. SCHULZE (Z. Unters. Lebensm., 1926, 52, 380—384).— Apart from a separation into three distinct layers very little change had occurred in the milk. The upper layer resembled in composition and properties a fresh butter fat. In the middle watery layer the normal relationship between the lactose and the chloride persisted, and although the casein was somewhat less, the albumin and the residual nitrogen fell within the usual limits. Part of the lime and phosphoric acid of the milk had separated out as an insoluble crystalline phosphate, together with tyrosine, at the bottom of the container. F. R. ENNOS.

Power of absorption of vegetable tissues. J. EFFRONT (Chim. et Ind., 1926, 16, 376-384, 556-560, 730-736, 908-912).- A general account of absorption phenomena in which vegetable and animal tissues take part. The power of absorbing water possessed by wood varies greatly with the species, whilst that of fruit pulp is shown to vary with the hydrogen-ion concentration. The physical properties of yeast depend largely on the ratio between the amount of water absorbed by the The cells and that held mechanically in the interstices. consistency of the yeast varies with the amount of adhering water, which can be increased by the addition of salts, such as ammonium sulphate. The activity of the yeast is unaffected by this treatment. The absorbing power of fruit pulp for pepsin decreases as the fruit approaches maturity, but for acid or alkali the variation is slight. The ash content of the fruit falls as ripening progresses, hence the decrease in the

pepsin-absorbing power. Fruit after boiling with water for 5-6 hrs. is capable of absorbing an increased quantity of 0.1N-hydrochloric acid, but its affinity for 0.1N-sodium hydroxide is reduced. Drying the pulp at 80-100° reduces the absorbing power for both acid and alkali. The amount of pepsin absorbed by cellulose varies greatly with different samples, and depends rather on the physical structure of the latter than on their chemical purity. The proteins present as impurities in the pepsin are not absorbed, and by this method a very active sample of pepsin containing only 0.4% N can be obtained. Vegetable juices which have lost their hydrolysing power by being heated can be reactivated by simple filtration through paper, which absorbs the retarding substances formed during the heat treatment. The theoretical principles underlying absorption phenomena in therapeutics and in normal nutrition are discussed. W. J. POWELL.

Determination of caffeine. S. GOBERT (Ann. Falsif., 1926, 19, 586-594).-The following method gave satisfactory results for the determination of caffeine both in roasted and green coffee, and except in de-caffeinised samples the determination of nitrogen in the extracted residue is unnecessary. To 5 g. of finely-ground coffee 5 c.c. of ammonia solution (d 1.18) are added and left in contact with roasted coffee for 20 min. or with green coffee 30 min., with occasional shaking. Four extractions with 25 c.c. of ethyl acetate are then made, contact being in each case for 10 min., with continual shaking. After centrifuging for 5-7 min., decanting the liquor, and adding 0.5 g. of paraffin, the ethyl acetate is distilled off, and the residue dried, extracted three times with 50 c.c. of boiling water, and the united extracts are boiled, cooled, and filtered, and 20 c.c. of 1% potassium permanganate solution are added for roasted, and 10 c.c. for green coffee, and left for $\frac{1}{4}$ hr. The manganese is then precipitated by adding 12 vol. hydrogen peroxide containing 1% of glacial acetic acid and leaving for 1 hr. in the water bath. The liquid is filtered, the precipitate washed with boiling water, and the filtrate evaporated, dried, and extracted with warm chloroform, filtered, and washed with 15 c.c. of chloroform. The chloroform is then distilled off and the residue dried and weighed. Moisture should be determined at the same time as the caffeine.

D. G. HEWER.

Caffeine content of coffee extracts and their physiological action. H. JESSER (Z. Unters. Lebensm., 1926, 52, 389—392).—The caffeine contents of extracts made from roasted coffee with equal vols. of water and of a solution of sugar in water, are practically identical. The statement that coffee made by adding sugar before extraction has less action on the heart than that in which the sugar is added afterwards is not confirmed.

F. R. Ennos.

Determination of caffeine in black tea. W. STÜBER (Z. Unters. Lebensm., 1926, 52, 393-395). 5 g. of powdered tea are treated with 5 g. of 10% ammonia solution and 200 g. of chloroform and shaken for $\frac{1}{2}$ hr. The whole is filtered, 150 c.c. of the filtrate are evaporated to dryness, and the residue is dissolved in 80 c.c of hot water. 10 c.c. of 1% potassium permanganate solution are added to the cooled solution, which is boiled for $\frac{1}{4}$ hr., the excess being reduced by the addition of hydrogen peroxide acidified with acetic acid. After filtering, the solution is extracted first with 50 c.c. of chloroform, followed by three further extractions with 25 c.c. each. The combined extracts are evaporated to dryness, and the caffeine residue is dried to constant weight at 100°. F. R. ENNOS.

Detection of hydrogen peroxide in beverages preserved with this compound. C. D. HOWARD and N. CIVEN (Ind. Eng. Chem., 1927, 19, 161-162) .---Hydrogen peroxide used to preserve beverages does not decompose with such rapidity as has been sometimes assumed. The starch-potassium iodide test has been found reliable for the detection of small quantities of hydrogen perixode. 1-2 c.c. of the reagent are added to 10 c.c. of fresh milk and about 5 c.c. of the sample, either by flowing on top for the production of a blue zone or by mixing to give the uniform blue colour due to small amounts of hydrogen peroxide. If benzidine or p-phenylenediamine is used, slight positive tests may be given on controls by the zone method, and no blue colour on mixing. The vanadic acid test is worthless, as controls of cocoa and sugar alone give a positive test. D. G. HEWER.

Nutrose and eucasin. M. A. RAKUSIN and K. BRAUDO (Z. Unters. Lebensm., 1926, 52, 396—397).— Commercial nutrose is shown to be identical with sodium caseinate prepared by neutralisation of casein with sodium hydroxide and filtration through a Pukalk-Berkefeld filter. The eucasin of commerce, which is ammonium caseinate, is obtained by dissolving casein in ammonia and removing the excess of the latter by evaporation. It does not give the Ostromislenski reaction. From a nutrose solution caseinates of the heavy metals are obtained as coloured substances by double decomposition with their salts. F. R. ENNOS.

Chondrin and gluten. M. A. RAKUSIN and K. BRAUDO (Z. Unters. Lebensm., 1926, 52, 397-401. Cf. B., 1923, 851).-The chondrin molecule is dissociated in dilute solution, and on treatment of the opalescent (0.2%) solution with aluminium hydroxide part is absorbed leaving a clear solution of chondroitinsulphuric acid. With a 0.5% solution the biuret complex only is broken up, and with a still stronger solution (1.2%) a true absorption of the chondrin molecule by the alumina takes place. By evaporation of the clear solution the acid may be obtained as a crystalline powder (decomp. 180°). It has a strong negative rotation, shows none of the protein reactions, and gives a precipitate with barium chloride. In the case of clear gelatin solutions the detection and determination of this acid may be carried out by means of barium chloride, without any preliminary treatment with aluminium hydroxide.

F. R. ENNOS.

Chemical constituents which influence gluten quality. B. SULLIVAN and C. NEAR (Ind. Eng. Chem., 1927, 19, 159—161).—Gluten prepared from straight flours milled in a small experimental mill from strong Marquis wheat, and from patent and clear flours by a long milling process from the same wheat, were analysed, and the totals of starch, lipoids, protein, and ash in each case were slightly over 100%. The best quality gluten (the patent) had the lowest lipoid content. Analyses of the

ashes showed that the proportion of calcium decreased with the quality of the gluten, but potassium and magnesium varied in the opposite direction. Lipoids were determined by refluxing a mixture of the ground dry gluten (3 g.) with twice its weight of fine pumice in an alundum extraction cylinder of suitable porosity with a mixture of 90 c.c. of 95% alcohol, 5 c.c. of concentrated ammonia, and 5 c.c. of water, followed by extraction with ethyl ether for 2—3 hrs. The mixture of the alcohol and ether extracts is then evaporated, the residue taken up with chloroform or carbon tetrachloride, filtered if necessary, evaporated, and the residue dried to constant weight. D. G. HEWER.

Determination of cacao shell by sedimentation. J. GROSSFELD (Z. Unters. Lebensm., 1926, 52, 343-360 Cf. B., 1926, 688) .- Several formulæ are developed for calculating the amount of cacao shell from the percentage of sedimentation residue and its fibre content. Experiments with mixtures of known shell content confirm the results obtained by means of these formulæ, provided the percentage of shell is not very small. By repeated sedimentation on the first residue after airdrying and grinding, as little as 0.5% of shell can be detected. Mixtures containing shell powder and cacao germ give low figures for the shell content. The presence of cacao germ is indicated by an increase in shell content found after grinding the first sedimentation residue, and repeating the sedimentation several times. Neither the phosphoric acid content of the residue, obtained by ordinary sedimentation or by sedimentation in the presence of soluble calcium salts, nor the amount of carbohydrates obtained from the residue by hydrolysis, forms a satisfactory basis for calculating the shell content of a cacao product. F. R. ENNOS.

Examination of cacao beans and cacao products. IV. H. FINCKE (Z. Unters. Lebensm., 1926, **52**, 360—364. Cf. B., 1924, 489; 1925, 50; 1926, 73).—Cacao shell in its natural state has a small amount, usually less than 1% and never more than 2%, of a characteristic, viscous, yellowish-brown fat of high acidity. It is free from theobromine. Cacao shell separated from the commercial beans often has a higher percentage of fat and shows the presence of theobromine, due probably to the introduction of these constituents during the fermentation process. Cacao butter shows on the average 0.006%of lime-bearing ash. F. R. ENNOS.

"Cryolac" number of milk and milk products as a means to determine quantity of added water. P. Post (Z. Unters. Lebensm., 1926, **52**, 371—380).—Cf. B., 1926, 846.

New index for butter fat. MORGENSTERN.—See XII. Storage of rice and changes of its physical properties during this period. KONDō.—See XVI.

PATENTS.

Production of leavened bread and other dough products. T. B. WAGNER and C. A. GLABAU (E.P. 235,874, 13.6.25. Conv., 21.6.24).—The time required for leavening is considerably reduced by mixing the flour, yeast, and other ingredients with a yeast activator, which is preferably prepared from "corn solubles" and contains a large amount of phosphorus and calcium in organic combination. A gluten maturing agent, such as lactic, hydrochloric, or other acids, is then added in sufficient quantity to form with the water in the mixture a solution strong enough to mature the gluten in 1 hr., after which period the dough is baked. F. R. ENNOS.

Cultured-milk drink. T. H. MITTENDORF (U.S.P. 1,610,962, 14.12.26. Appl., 19.2.26).—Selected strains of bacteria are introduced into milk, which is cooled to 3°, and agitated *in vacuo*. It is then treated with carbon dioxide for several hrs. at a pressure such that the cultures are not destroyed, but reduced to a state of suspended animation, whence they may regain their biochemical activity by the restoration of atmospheric pressure. The pressure is then reduced, but not removed, and the milk bottled. F. R. ENNOS.

Treatment of nut kernels. J. A. THOMPSON and W. S. HOUGH (E.P. 263,518, 18.9.25).—Brazil nut kernels are blanched by subjecting them, while free to move in a closed vessel of smooth internal contour, for about 15 sec. to a blast of steam superheated to 200°, which removes the skins without cooking the kernels.

F. R. Ennos.

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

Action of hydrogen chloride on methyl alcohol. S. R. CARTER and N. J. L. MEGSON (J.S.C.I., 1927, 49, 31-35 T).-The investigation of the interaction of hydrogen chloride and methyl alcohol (Carter and Butler, A., 1924, i, 603) has been extended, and it is found that in the gaseous state there is little or no tendency to combine over periods up to 45 hrs. at 100°, 150°, and 200° respectively, provided that all condensation is rigorously prevented. At 60°, at which partial conden-sation may occur, there is appreciable combination between methyl alcohol and hydrogen chloride. This tends to the same limiting value (57% decrease of hydrogen chloride in 87 hrs.) as the solution does at room temperature (57% decrease after 134 days). Methyl alcohol and hydrogen chloride react in the liquid state under conditions which would be expected from the law of mass action. In closed vessels the methyl chloride produced causes an excess pressure which tends to retard the reaction. In open vessels a retardation is also observed, on account of the evaporation of methyl alcohol, and consequent concentration of the hydrogen chloride. The inhibiting effect of water on the reaction in the liquid state is also in accordance with the law of mass action.

Analysis of mixtures containing water, alcohol, and ether. CHENEL (Mém. Poudres, 1926, 22, 145—147). —Air freed from moisture and carbon dioxide is passed at the rate of 300—500 c.c./hr. over the mixture to be analysed, and then through three U-tubes containing potassium carbonate, manganous chloride, and pumice soaked in sulphuric acid respectively. These tubes in turn retain water, alcohol, and ether, which may be determined quantitatively by finding the increase in weight of the tubes. By aspirating air for 22 hrs. over $2 \cdot 022$ g. of a mixture containing water $13 \cdot 1\%$, alcohol $26 \cdot 1\%$, and ether $60 \cdot 8\%$, the values thus obtained were $13 \cdot 5$, $25 \cdot 8$, and $60 \cdot 7$. S. BINNING.

Determination of mercury in mercuric salicylate. A. F. MURRAY (Amer. J. Pharm., 1926, 98, 639—642).—The following is a shorter and more accurate method than that given in the U.S.P. for the assay of mercury in mercuric salicylate. Dissolve 0.5 g. of mercuric salicylate in 10 c.c. of 10% aqueous sodium hydroxide, with warming. Add 10 c.c. of 10% sodium sulphide solution and boil. Acidify the hot solution with 10% hydrochloric acid, and add 5 c.c. excess. Filter hot through a prepared Gooch crucible, dried at 110°, and wash with hot distilled water until free from chlorides. Wash twice with 5 c.c. of alcohol, then with 5 c.c. portions of equal parts of ether and alcohol until the washings give no reaction with ferric chloride. Finally, wash with three 5 c.c. portions of carbon tetrachloride, dry at 110°, and weigh.

B. W. ANDERSON.

Micrographic detection of tartaric acid in official preparations. M. FRANÇOIS and C. LORMAND (Ann. Falsif., 1926, 19, 599-605. Cf. B., 1926, 802).-Tartaric acid may be detected by the characteristic microscopical appearance of the crystals of the d-acid as follows :---For syrups and lemonades 100 c.c. are diluted with 80 c.c. of water, filtered, and 20 c.c. of calcium acetate solution added, and after 3 days the crystals formed are filtered off, washed with alcohol at 32°, dried in the air, and examined. The test may be confirmed by means of sulphuric acid and resorcinol. In the case of syrup of iron iodide, the iron must first be eliminated. In wines, elixirs, and medicinal vinegars most of the sulphates present must first be eliminated to obtain pure crystals, and 25 c.c. of normal lead acetate solution (20%) are added to 100 c.c. of the sample, followed by 25 c.c. of sodium carbonate crystals (40%). The liquid is filtered after 15 min., made up to 180 c.c., 4 c.c. of glacial acetic acid are added, and 20 c.c. of calcium acetate solution. After 3 days the deposit is examined microscopically. For some wines the solubility of the calcium tartrate must be diminished by the addition of alcohol. For saline compounds, e.g., Sedlitz water, magnesium sulphate must be removed by addition of barium chloride solution, followed by sodium carbonate, to precipitate excess of barium and magnesium. After filtration, the filtrate is acidified with glacial acetic acid, and calcium acetate solution is added, when the crystals form slowly. D. G. HEWER.

Synthetic drugs. I. Significance of the acyl group in acylated drugs. H. P. KAUFMANN (Z. angew. Chem., 1927, 40, 69–79).—In order to extend the knowledge of the effect of the addition of acyl groups upon the physiological action of drugs, a number of new compounds have been prepared, including: octoylsalicylic acid, m.p. 70°; decoylsalicylic acid, m.p. 81°; laurylsalicylic acid, m.p. 77·5°; myristylsalicylic acid, m.p. 70°; palmitylsalicylic acid, m.p. 73—74°; stearylsalicylic acid, m.p. 88°; o-phthalyl-p-phenetidine, m.p. 189°; o-phthalylhydrazine, m.p. > 315°; o-phthalylphenylmethylhydrazine, m.p. 162°; o-phthalyldiacetylphenylmethylhydrazine, m.p. 162°; o-phthalyldiacetylphenylhydrazine, m.p. 247°; o-phthalyldiformylphenylhydrazine, m.p. 214°; o-phthalylhydrazobenzenem.p. 174°; o-phthalylhydrazotoluene, m.p. 174°; succinylhydrazobenzene, m.p. 245°; dibenzyl-o-phthalylhydrazine, m.p. 137°; 1-phenyl-2-allyl-4-diethyl-3:5-diketopyrazolidine, b.p. 190—200°/19 mm; 1:2-dibenzyl-4-diethyl-3:5-diketopyrazolidine, yellow oil; 2-acetyl1-phenyl-4-diethyl-3: 5-diketopyrazolidine, m.p. 96°; and 2-formyl-1-phenyl-4-diethyl-3 : 5-diketopyrazolidine, m.p. 110°. In the acylated salicylic acid series, resistance to hydrolysis by dilute alkalis, *i.e.*, under the conditions prevailing in the intestines, increases with increasing mol. wt. When the members of the series are taken internally, salicylic acid can be detected in the urine sooner, but persists for a shorter time the lower the mol. wt. The partition coefficient, Colive oil/Cwater, which is of physiological importance in indicating the extent to which the compounds can be absorbed by the lipoids, is $5 \cdot 1$ for salicylic acid, $1 \cdot 17$ for acetylsalicylic acid, and for decoylsalicylic acid and higher members is ∞ . Dilute salicylic acid solutions (0.01-0.0033N)had no narcotic effect on leeches, but caused death by irritation of the mucous membrane, whereas acetylsalicylic acid solutions caused marked narcosis, and were only toxic at the highest concentration (0.01N). Sodium salicylate is less toxic than the free acid, but causes no narcosis. The narcotic effect of sodium decoylsalicylate is less marked than that of sodium acetyl-L. A. COLES. salicylate.

Analysis of the fluid extract of Hydrastis Canadensis. F. E. RAURICH (Anal. Fis. Quim., 1926, 24, 647-654, 655-667, 668-676).-Hydrastine may be determined in fluid extracts of Hydrastis canadensis, after removal of ethyl alcohol, by precipitation at the b.p. and acid reaction with silicotungstic acid, the precipitate being washed with 0.5% hydrochloric acid, dried, and ignited. The determination may also be made by conductometric titration (cf. B., 1925, 1011) with silicotungstic acid. In the titration method two curves are obtained, one by using 2 c.c. of extract and 50 c.c. of water as diluent, and the other by using 2 c.c. of extract and 50 c.c. of 70% ethyl alcohol as diluent, 0.8-1 c.c. of 10% sodium acetate being added in each case. The difference between the abscissæ corresponding with the points of inflexion gives the amount of silicotungstic acid required for precipitation of the hydrastine present in the extract taken. Good agreement was obtained between the gravimetric and the volumetric methods in the case of two extracts. G. W. ROBINSON.

Aluminium as constructional material in the organic chemical industry. BUSCHLINGER. —See X.

Butyl alcohol and acetone from maize. KILLEFFER. —See XVIII.

Determination of caffeine. GOBERT.—See XIX. PATENTS.

Preparation of methyl alcohol. Soc. CHIM. DES USINES DU RHÔNE (F.P. 581,175, 7.8.23).—A mixture of hydrogen, or a gas containing it, and methyl formate vapour is passed at normal pressure and at 100—180° over the catalyst containing copper outlined in E.P. 219,649 (B., 1925, 869). Thus a mixture of 132 g. of the ester and 25 litres of hydrogen per hour was passed through a tube containing broken pot treated with the catalyst, and at 160° a mixture of hydrogen, 60 g. of unchanged ester, and 72 g. of methyl alcohol resulted, the two former being once more employed. The yield was some 90% of that calculated from the formic acid. Water-gas may be used instead of hydrogen. Decomposition of the ester is more rapid, and can be performed in a

smaller apparatus when this method is used than by earlier processes. A. COUSEN.

Preparation of formaldehyde. G. TRÜMPLER (Swiss P. 111,120, 26.6.24).—The aqueous vapour of methylamine together with oxygen and indifferent gas is led at below 400° over catalysts (large excess of oxygen being avoided), and the chief reaction occurring is $2CH_3 \cdot NH_2 + O_2 = 2CH_2O + 2NH_3$. As catalysts the oxides of copper, manganese, iron, nickel, and cobalt precipitated on porous or finely-divided material may be used, or simply material with large surface action as pumice, diatomite, kieselguhr, or asbestos. In the first case the most suitable temperature is below 300°; in the second, above 300°. The formaldehyde is easily removed from the condensate of the cooled reacting gas, giving a yield of 60% of the methylamine employed, whilst the ammonia can be recovered. A mixture of 5-10% of methylamine vapour, 10% of steam, and 80-85% of air, passed at 300-320° over granular diatomite with a velocity of 0.4 litre/hr. per 1 c.c. volume of reaction chamber, decomposed 30% of the methylamine, giving 24% of formaldehyde, 3% of carbon dioxide, and 3% of other oxidation products. A. COUSEN.

Production of alkylresorcinols. SHARP & DOHME, Assees. of A. R. L. DOHME (E.P. 250,892, 6.7.25. Conv., 16.4.25).—1 pt. of an acylresorcinol is reduced with $2\frac{1}{2}$ pts. of zinc amalgam, using 5 pts. of hydrochloric acid (d 1.16) and 6 pts. of water, with vigorous agitation, at 105°, for 10—12 hrs., the product being washed, and distilled *in vacuo*. The zinc amalgam is prepared from granulated zinc and 2% mercuric chloride solution. The acylresorcinols may be prepared in any way, but more especially from resorcinol, fatty acid, and zinc chloride according to E.P. 250,893 (cf. B., 1927, 59), when no special purification subsequent to distillation of the crude product is generally required.

B. FULLMAN.

Reduction of aromatic nitro-compounds. W. CARPMAEL. From I. G. FARBENIND. A.-G. (E.P. 263,376, 21.4.26).—Aromatic nitro-compounds are suspended in solutions of aluminium salts (especially the chloride) and reduced to amines by the addition of iron, acid being added if required. The presence of aluminium results in separation of the iron, after separation of the amine as usual, in the form of finely-divided vellow ferric hydroxide, which, after washing and drying, is available as a pigment, either immediately or, in red shade, on calcination. The red calcined product becomes brighter and more yellow as the amount of aluminium present increases. The aluminium salt may be produced during the reduction by addition of metallic aluminium to the iron. Examples are given of the application of the method to nitrobenzene, α -nitronaphthalene, and o-nitrotoluene. B. FULLMAN.

Production of camphene from pinene hydrochloride. H. GAMMAY (E.P. 263,311, 7.1.26).—Pinene hydrochloride is converted into camphene free from chlorine and phenol by heating and stirring it under pressure with excess of hydroxides or carbonates of the alkali or alkaline-earth metals in the presence of less than 20% of the amount of phenol required by the equation $C_{10}H_{17}Cl + C_6H_5 \cdot ONa = C_{10}H_{16} + C_6H_5 \cdot OH + NaCl.$ Naphthols, organic acids and their salts, and resin acids may also be used. E.g., 2500 kg. of pinene hydrochloride are heated with 2000 kg. of sodium hydroxide solution (d. 1.53) and 200 kg. of phenol under 6–8 atm. pressure, while stirring. B. FULLMAN.

Reduction of alkyl esters [methyl formate]. M. E. BOUVIER and E. BLANC, ASSTS. to SOC. CHIM. DES USINES DU RHÔNE (U.S.P. 1,605,093, 2.11.26. Appl., 18.9.23. Conv., 7.8.23).—See F.P. 581,175; preceding.

Extraction of tartaric [acid] salts [from wine-lees] (E.P. 263,340).—See XVIII.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Gelatin. X. [Sensitising action of thiosinamine.] H. H. SCHMIDT (Phot. Ind., 1926, 1016-1018).-Results are given of tests on three plates submitted by Sheppard :—(a) with no added thiosinamine; (b) and (c) with increasing amounts of thiosinamine added to the same emulsion as (a). The relative speeds increased from (a) to (c): the spectral sensitivity extended in all cases to 520 $\mu\mu$; gradation of (a) was flat and that of (b) and (c) was normal; clarity increased from (c) to (a), (c) being fogged. The grain size and distribution were different in the three cases. In this respect the results differ from those of Sheppard, and indicate that the thiosinamine does not only take part in surface reactions, but also affects the grain structure. Also Schmidt's theory of the splitting-off of halogen ions from the lattice, combined with deformation of the bromine electron orbits, cannot hold by itself. Plates were bathed in ammoniacal solutions of thiosinamine in an increasing series of concentrations, to form silver sulphide nuclei at the grain surfaces. With increasing thiosinamine concentration the speed progressively decreased, and the speed of the untreated plate was never exceeded. It is concluded that silver sulphide nucleus formation is not the cause of increased speed in Sheppard's plates. All the thiocarbamide-silver bromide complex would decompose in the first ripening process, and it is not clear why the emulsion gains its high speed in the subsequent digestion process, after washing, when no ammonia is present and no further gelatin is added. The sulphide nucleus theory cannot explain the marked increase in speed obtainable with acid emulsions. In general, it is concluded that thiosinamine does not give increased speed if it merely affects the grain surfaces, but only if it takes part in the actual formation of the grains. W. CLARK.

Comparison of X-ray and white light exposures in photographic sensitometry. R. B. WILSEY and H. A. PRITCHARD (J. Opt. Soc. Amer., 1926, 12, 661-689).—The effects of white light and of X-rays on photographic films have been compared. The characteristic exposure-density curves were similar for both types of radiation, and the maximum density that could be developed was the same. Reversal due to over-exposure was produced in the films by both X-rays and white light, and was found to consist of a progressive decrease in the rate of development, but not a decrease of the amount of silver developable. S. BARRATT. Sensitisation for the entire visible spectrum. B. H. CARROLL (J. Opt. Soc. Amer., 1926, 13, 35–37).—A bath conferring particularly uniform colour sensitivity and unusually high stability and white light sensitivity is made up as follows for a 5×7 plate tank : distilled water, 1500 c.c ; pyridine, 15 c.c.; 0.1% pinacyanol solution, 6 c.c.; 0.1% pinaflavol solution, 6 c.c. The pyridine and dye solutions are mixed together and then added to the water. Plates should be pre-washed for 5 min. in distilled water, then bathed for 1 hr. at not more than 15°. Not more than twelve plates should be bathed in the above quantity. Successful tests were made on Eastman 36 plates. L. F. GILBERT.

X-Ray spectrographic examination of the tanning of membranes and tendons. KATZ and GERNGROSS.— See XV.

Spectrography of flames in a combustion engine. HENNE and CLARK,—See II.

PATENTS.

Photography. TECHNICOLOR MOTION PICTURE CORP., and E. A. WEAVER (E.P. 263,331, 8.2.26).-A method is described for producing stained relief images in which the image has a more gradual gradation in the high lights than in the half-tone portions for the same range of light intensities in the subject, so that the detail of the scene may be accurately reproduced in the more highlyreflecting and/or illuminated parts of the scene. The characteristic curve of the dyed image has a concave lower portion, and the image is in the form of a relief having a stratum of uniform thickness in addition to the image stratum. Further, the image has more gradual thickness gradations in the thinner portions than in the thicker portions. The result is produced by exposing the sensitised material to a uniform light in addition to the image-printing light, the uniform exposure being of an intensity calculated to give an image the gradations of which are represented by a characteristic curve in which the lower portion is located above a tangent to the central part of the curve. The film is under-exposed to the image light, and the uniform exposure is made with light of a colour readily absorbed by the emulsion. The uniform exposure may be effected through the back of the film, and should not substantially exceed the W. CLARK. threshold exposure.

Producing chromophotographs on paper and chromodiapositives. F. JANZEN, ASST. to W. VOBACH (U.S.P. 1,613,515, 4.1.27. Appl., 14.3.23. Conv., 16.3.22).—See E.P. 195,056; B., 1924, 618.

XXII.—EXPLOSIVES; MATCHES.

Hydration of colloidal [propulsive] powders during drying. VIEILLE (Mém. Poudres, 1926, 22, 132—142).—Determinations have been made of the loss of water, alcohol, and ether from colloidal powders during various methods of drying, and also of the amount of volatile matter still remaining in the powder. Stability tests at 110° were then carried out on the powders, and showed that "hydration" of the colloid was responsible for the loss in stability which followed treatment of the powder with hot water. After drying by drainage, about 90% of the residual volatile matter in the powder is water. A powder which was hydrated to excess by steeping in alcohol and then allowed to drain in a saturated atmosphere could not be dried at 60° without a considerable loss in stability, and a steeping in hot water can have a bad effect on the stability.

S. BINNING.

Loss of volatile matters from colloidal [propulsive] powders. VIEILLE (Mém. Poudres, 1926, 22, 107-124, 125-131).-Tests on numerous types of French ordnance powders show that the loss of volatile matters takes place in three stages. First comes a rapid rate of loss, due to loss of moisture, followed by further loss at a slower rate caused by escape of solvent vapours. These two phases are separated by an intermediate stage, the nature of which varies with the type of powder. The phenomena are substantially the same whether the tests are carried out at 110°, 75°, 60°, or 40°, but the rate of loss naturally decreases with decreasing temperature, the loss in hours at 110° being practically equal to the loss in days at 75°, and probably equal to the loss in months at 40°. When a powder is heated at 110°, the percentage loss, after 4 hrs., represents the moisture, and the percentage losses from 4 to 20 hrs. or from 4 to 44 hrs. furnish a coefficient for the ease with which the particular powder loses it volatile matter. When heated at 110°, a French ordnance powder of satisfactory stability can give a coefficient of 0.6-0.9. There is no relation between the coefficients of loss of volatile matters and the stabilities at 110°, unless the coefficients fall below about 0.5 for strip powders, and to 0.6-0.7 for thicker powders. The chief cause of change in the ballistic properties of powders during storage is loss of moisture. A coefficient of 0.75 is suitable for powder during manufacture.

S. BINNING.

PATENTS.

Granulating ammonium nitrate. E. M. SYMMES, Assr. to HERCULES POWDER CO. (U.S.P. 1,613,334, 4.1.27. Appl., 8.11.24).—Ammonium nitrate is converted into granules having an internal void space by spraying it at 115—160° into a gaseous cooling medium. S. BINNING.

Ammonium nitrate explosive. E. M. SYMMES, Assr. to HERCULES POWDER Co. (U.S.P. 1,613,335, 4.1.27. Appl., 8.11.24. Cf. preceding abstract).—The explosive contains a liquid explosive, carbonaccous material, and ammonium nitrate in the form of substantially spherical grains with internal cavities.

S. BINNING.

Blasting methods and means. D. FARRELL and A. W. HELMHOLTZ (E.P. 262,941, 15.12.25).

XXIII.—SANITATION; WATER PURIFICATION.

Chloro-tastes [of water] and their eradication at Dallas, Texas. O. M. BAKKE (J. Amer. Water Works Assoc., 1926, 16, 730—736).—In one case, where the raw water was derived from a lake, chlorination of the raw water as well as the final effluent removed the tastes. Very satisfactory results were obtained when the residual chlorine of the raw water was maintained at 0.35 p.p.m., and that of the final plant effluent at 0.08-0.10 p.p.m. Tastes due to algæ could not, however, be eradicated in this manner. It was found necessary to control the algal growth by copper sulphate. In another case, taste was found to be due to the passage through old mains of chlorinated water deficient in bicarbonate. By reducing the lime dosage and producing a filter effluent having 30-40 p.p.m. of bicarbonate alkalinity and 10-20 p.p.m. of normal carbonate alkalinity, the objectionable taste was eliminated. W. T. LOCKETT.

Direct titrimetric methods for magnesium, calcium, and sulphate ions, and their application in water analyses. E. P. SCHOCH (Ind. Eng. Chem., 1927, 19, 112-115).-By using thymolphthalein as indicator, and operating at 90-100° with a neutral solution containing magnesium, calcium, and sulphate ions, and such non-interfering ions as sodium, potassium, and chloride, the magnesium ion may be determined by titration with a standard lime solution, calcium with standard sodium carbonate solution, and sulphate by adding a standard barium chloride solution in excess of the sulphate present and titrating this excess with standard sodium carbonate solution. Thymolphthalein at 90-100° begins to turn blue with an alkalinity corresponding to $p_{\rm H} 10.23$, and the titration of magnesium is completed with an alkalinity slightly less than that with which the colour appears. Precipitation of calcium carbonate is only complete when a definite blue colour is obtained, about half as deep as the standard. It is essential to remove hydroxyl ions from foreign sources (particularly those resulting from the titration of magnesium between neutral point and $p_{\rm H}$ 10.23) by neutralising. Boiling reduces the dissolved carbon dioxide to a practically definite minimum. The titration of the excess of barium chloride is complete only when the colour has reappeared and passed the standard. Details are given for the preparation of samples, and for typical analyses, including determination of sulphate ion alone, of permanent hardness or of sodium carbonates in natural waters, and of amounts of lime and soda required to soften water.

D. G. HEWER.

PATENTS.

Removal of air from water. E. PIRON (U.S.P. 1,612,218, 28.12.26. Appl., 10.7.22. Renewed 4.3.23).— The water is brought into contact with a fixed airabsorbing gas at a temperature materially less than 100° by passing the water and gas in opposite directions through a distilling column. D. WOODROFFE.

Chlorination of water. B. T. BROOKS, ASST. to MATHLESON ALKALI WORKS CORP. (U.S.P. 1,613,438, 4.1.27. Appl., 22.3.24).—Liquid chlorine is vaporised by passing it through a heat exchanger in indirect relation with the liquid, the flow of gas being regulated by the amount of liquid chlorinated, after which it is introduced into the liquid. H. ROYAL-DAWSON.

Exterminating injurious forms of life and composition therefor. H. MAXWELL-LEFROY, ASST. to GRAESSER MONSANTO CHEMICAL WORKS, LTD. (U.S.P. 1,613,402, 4.1.27. Appl., 15.6.25. Conv., 13.5.25).— See E.P. 261,055 and 261,241; B., 1927, 94.