BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

AUG. 12, 1927.

I.—GENERAL; PLANT; MACHINERY.

Tentative standards, 1926. AMERICAN SOCIETY FOR TESTING MATERIALS (Separate, 1926, 1100 pp.).
CHEMICAL ABSTRACTS.

PATENTS.

Kilns. M. M. MINTER (E.P. 269,361, 18.6.26).—A series of pottery kilns are connected by ducts leading from the centre of any kiln (outlet) to the circumference, under the fire doors, of the next kiln in cyclic order. A pair of dampers are placed in each of the cyclic connexions, and cross-connexions are provided leading from between the dampers to a main induced-draught exhaust heading and to a natural-draught ring main surrounding the group of kilns. The gases from the latter may be passed through dryers for green ware. Other dampers are placed in the cross-connexions, and the usual method of operating is as follows. A kiln is fired by fuel placed in the fire doors burning in air taken through the recently burnt hot goods in the next kiln before, and the products of combustion are sent through the next kiln after, to the main induction heading. If desired, the products of combustion may pass direct from the kiln being fired to the main induction heading. The second (and possibly third) kiln before the one being fired is (or are) being finally cooled by air drawn through by natural draught to the ring main. B. M. VENABLES.

[Supply of air to] furnaces. B. LJUNGSTRÖM (E.P. 267,723, 1.4.26).—Secondary air is introduced above the fire in a furnace substantially at right angles to the movement of the bed of fuel and to the products of combustion, and is guided in at least two whirling paths, preferably rotating in opposite directions.
B. M. VENABLES.

Working shaft furnaces with the aid of furnace dust. P. HESKAMP (E.P. 269,071, 25.10.26. Conv., 6.4.26).—Blast-furnace dust is blown into the furnace shaft above the smelting zone by means of a non-oxidising gas, *e.g.*, blast-furnace gas. C. A. KING.

Refrigerating apparatus. E. L. BARNES (U.S.P. 1,625,878, 26.4.27. Appl., 22.5.25).—A refrigerating system working by the expansion and evaporation of a liquid medium under pressure is provided with a cooler on the high-pressure side for freezing and separating moisture from the liquid medium. B. M. VENABLES.

Spray cooling. B. R. SAUSEN and H. D. BINKS, Assrs. to BINKS SPRAY EQUIPMENT CO. (U.S.P. 1,626,360, 26.4.27. Appl., 19.9.21).—An upright casing open at the bottom and ventilated at the top has its lower edge dipping into an annular drip trough, the inside wall of which forms a collar which, in conjunction with a lower and smaller collar, guides an upwardly directed water spray (within the latter) across a rising current of air.
B. M. VENABLES.

Method of pulverising and apparatus therefor. W. R. WOOD (E.P. 269,319, 1.4.26).—A disintegrator comprising a shallow bowl, rotating about a vertical axis, is provided with an air draught from below the bowl past the circumference, which is deflected downwards by the walls of the chamber to the centre of the working or upper surface of the bowl, at which point the coarser material drops out of the air stream to be reground, while the air and fine material are deflected upwards again through a central exhaust pipe. The working surface of the bowl is free from ribs or other projections, but may be lined with abrasive material. B. M. VENABLES.

Pulverising machine. W. K. LIGGETT, Assr. to JEFFREY MANUF. CO. (U.S.P. 1,625,553—4, 19.4.27. Appl., 8.6.23).—(A) A disintegrator is supplied with material through a space round the shaft in an end wall. (B) A form of construction of disintegrator grating is described. B. M. VENABLES.

Roller crushing or grinding mills or machines. W. H. CAMPBELL. From J. E. HUMBERSTONE (E.P. 269,104, 14.12.26).—In a roller mill one roller is given an endways reciprocating movement by means of wedge-like devices operating behind thrust bearings, the wedges being reciprocated by eccentrics on another shaft.
B. M. VENABLES.

Tube and like mills. J. H. BENTLEY (E.P. 268,245, 3.11.26).—A tube mill with horizontal axis is constructed of a number of cylindrical sections which increase in diameter from the inlet to the outlet, the sections being separated by diaphragms each consisting of two plates with tapered holes placed together with the smallest ends of the holes in the middle or common face, so that the diameter of the apertures is not increased by wear.
B. M. VENABLES.

Machine for breaking ore and other minerals. R. HUSH (U.S.P. 1,626,535, 26.4.27. Appl., 12.2.25. Conv., 18.2.24).—In a crusher the swing jaw is directly operated (from an eccentric or crank) and the fixed jaw is adjustable by means of a wedge block formed into two pieces, one piece having a convex face and the other a corresponding concavity, to allow for variations in the angle between the jaw and crusher body when the wedge is moved. B. M. VENABLES.

Mixing machine. J. T. SIMPSON (E.P. 267,840, 12.11.26).—The machine consists essentially of an elaborated mortar mill, in which the discharge is through a central hole in the bottom of the pan. The mullers

(rollers) are adjustable, and there are usually more than one in line radially. Between each set of mullers ploughs are arranged, also in sets radially, a set being adjustable as a whole, and each plough individually as to inclination, to regulate the rate at which the material is deflected towards the central outlet. B. M. Venables.

Mixing machine. I. W. Benson (E.P. 268,447, 4.1.26).—A portable concrete mixer is provided with a combined delivery chute and shovelling plate so shaped and hinged that it can be folded up within the general contour of the machine, for transport.

B. M. Venables.

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

Schramm's method for determining in the laboratory the fields of coke and by-products from coal, and its importance in coking practice. H. Müschenborn (Brennstoff-Chem., 1927, **8**, 138—140; cf. J. Gasbeleucht., 1913, **56**, 389).—Coal (15 g.) is placed in the sealed end of a glass combustion tube, with broken pieces of firebrick next to it and cotton-wool at the open end. The coal and firebrick are heated in a gas combustion furnace (the firebrick at a temperature above or below 1100°, according to large-scale conditions), the cotton-wool end of the tube is immersed in a water-bath at 90°, and the gas (freed from tar by the cotton-wool) passes through absorbing vessels containing sulphuric acid, cadmium acetate, and active charcoal to a gas receiver. The yields are in close agreement with those found in actual coking practice.

W. T. K. Braunholtz.

"Turner" process of low-temperature carbonisation. H. Illies (Brennstoff-Chem., 1927, **8**, 155—156. Cf. A. W. Sanders, Iron and Coal Trades Rev., 1927, **145**, 520—522).—Coal is fed into the top of a vertical retort, superheated steam entering at the bottom and the semi-coke being continuously removed from the bottom by a worm. The volatile products leave near the upper end of the retort through a self-acting valve which opens for about 1 sec. when a given pressure is reached, and then closes for 8—20 sec. when the pressure has been released. The by-products are condensed in the usual manner, the hot cooling water from the primary cooler being returned to the steam generator. No cracking of the volatile hydrocarbons occurs, no permanent gases are formed, and the oil is almost completely free from pitch. Typical bituminous coals with 30% of volatile matter and 9—10% of ash give an average yield of about 32 gals. of oil per ton.

W. T. K. Braunholtz.

Influence of the chemical and physical properties of brown coal on its briquetting qualities. Kegel (Braunkohle, 1926, **25**, 389—395).—The chemical properties of brown coal (bitumen content etc.) are without appreciable influence on the briquetting qualities, which are, on the contrary, largely determined by the physical properties. To produce strong briquettes a certain water content is necessary, and also a certain composition with regard to the proportion of binder and dust. The factors determining the optimum proportion, which is different for different coals, are fully discussed.

A. B. Manning.

Action of concentrated sulphuric acid on different types of coal. I. D. J. W. Kreulen (Brennstoff-Chem., 1927, **8**, 149—154).—Powdered samples of four different types of coal (volatile matter 41·3%, 38·4%, 22·8%, 15·4%, respectively) were warmed for different lengths of time with 96% sulphuric acid. The action is primarily oxidising, humic acid being formed and the coals losing all coking properties. The effect on each of the coals is to reduce the ash content (reckoned on the dry and ash-free basis) and calorific value, to increase the moisture content, and, in the case of the older coals, the content of volatile matter. The yield of low-temperature tar and its content of phenols is reduced, whilst its content of matter insoluble in benzene is increased. Photomicrographs of coal sections treated with concentrated sulphuric acid show that vitrain and clarain are much more readily attacked than durain and cannel coal.

W. T. K. Braunholtz.

Ternary coal mixtures. II. D. J. W. Kreulen (Chem. Weekblad, 1927, **24**, 229—232; cf. B., 1927, 289).—The ternary mixture previously described has been further examined, and the relations between swelling and coking properties and composition expressed by means of triangular diagrams. Data and diagrams bearing on the same properties are given for other ternary mixtures. S. I. Levy.

Cracking process. A. Sachanen (Sachanov) and M. Tilitscheyev (Petroleum, 1927, **23**, 521—525).—A wax oil of *d* 0·883 was cracked in a still of 2½ litres capacity provided with dephlegmator and condenser and with pressure regulation. The products were analysed by Egloff's method. The yield of benzine and kerosene increased with the duration of cracking up to a maximum not dependent upon the temperature. The yield of benzine was 38—39%, and of benzine and kerosene 65%, higher yields being obtainable by repeated cracking. The time to attain the maximum yield is influenced by temperature, the rapidity of cracking increasing some five times for each increase of 25° from 375° to 500°. The residue had an increased resin acid number and *d* up to 1·04. Long duration of cracking favours the production of asphaltenes and carboids. The cracking of solar oil is twice as slow as that of wax oil, and the cracking of kerosene still slower. No condensation products nor naphthenes result from the cracking of paraffin wax. Oils with high aromatic content yield the most coke. The cracked products contained 4—7% of naphthenes, 60·7—49·6% of paraffins, 14·3—19·6% of aromatics, and 7·0—25·5% of olefines. H. Moore.

Composition and chemical constitution of lubricants (oils) and their synthesis. A. Spilker (Petroleum, 1927, **23**, 448—451).—In synthetic research on the formation of highly viscous substances, attention was directed to the high-molecular substances obtained by addition from olefinic products with double linkings. The viscosities (Engler) at 50° of additive and condensation products of benzene homologues was: from toluene–styrene, 0·4; xylene–styrene, 0·6; ψ-cumene–styrene, 1·2; toluene–allyl alcohol, 0·9; xylene–allyl alcohol, 2·2; ψ-cumene–allyl alcohol, 16·2. The attachment of methyl groups to aromatic rings greatly increases viscosity; normal hydrocarbon chains have little viscosity, but *iso*-compounds are highly viscous. Reduc-

tion products from coal and coal tar by the Bergius process at lower temperatures and with nickel as catalyst were examined. Engler viscosities at 50° were found for the hydrogenated products of acenaphthene, 0·5; phenanthrene, 0·6; anthracene, 0·4; fluoranthrene, 1·8; pyrene, 2·3; naphthafluorene, 3·1; and chrysene, 4·5. Polyhydrides of chrysene have the characteristics of lubricants, but they are not identical with those of petroleum oils, the sp. gr. being over 1, and the hydrogen content higher. The high mol. wt. of substances derived from pitch favours the formation of highly viscous hydrogenation products. H. Moore.

Compilation of data in favour of the organic origin of petroleum. R. Potonié (Petroleum, 1927, **23**, 395—399).—The author reviews the data and opinions of experts on the origin of petroleum, and the conclusions to be drawn from the presence of fossils. H. Moore.

"Saturation" of the petroleum lubricant hydrocarbons as shown by their reaction with bromine. C. F. Mabery (J. Amer. Chem. Soc., 1927, **49**, 1116—1117; cf. B., 1926, 970).—A further series of brominations of various lubricants confirms the original conclusion that these hydrocarbon mixtures do not contain olefinic derivatives. F. G. Willson.

Helium in oil-well gases. Butescu and Atanasiu. —See VII.

Patents.

Washers for coal and the like. B. Norton (E.P. 263,422, 3.8.26).—Coal washers are constructed in which a layer of coal in water is pulsated by the action of air. The washers, built of sheet metal, are supported from the sides, thus allowing free access to a screw conveyor casing which removes shale from the bottom of the washer to enclosed elevator chambers at each end of the washer. The elevator chambers are produced by the extension of the sides of the washer, thus avoiding specially-cast chutes for collecting the shale from the washer screens and transferring it to the elevators. S. Pexton.

Screening apparatus for coal breakers or crushers. S. E. Page. From Pennsylvania Crusher Co. (E.P. 263,231, 24.9.25).—In a modified Bradford crusher a series of screen plates have their longitudinal edges bent at different angles so that, when built into the form of a cage by attachment to the rims of wheels carried by a central axle, the edges of the screen plates overlap and reinforce one another. S. Pexton.

Production of water-resistant fuel briquettes. Maschinenbau-A.-G. vorm. Breitfeld, Daněk & Co., and G. Plochmann (Austr. P. 104,110, 2.6.24. Conv., 13.2.24).—The material to be briquetted is air-dried and treated with the cooled vapours from the distillation of coal, wood, crude oil, oil residues, or bituminous shales, etc. in such a way that a small quantity of the vapour is absorbed by the material or precipitated thereon as a fine deposit. The resulting briquettes are highly resistant to water. A. B. Manning.

Dewatering peat. G. A. Schroter (U.S.P. 1,625,058, 19.4.27. Appl., 13.7.25).—Wet peat is coagulated into a slurry with just sufficient lime to render the mass alkaline, the liquid is then decanted and burnt lime added to the residual peat, after which it is compressed and dried in air. H. Royal-Dawson.

Production of carburetted water-gas. A. D. Little, Inc. [a], From A. D. Little. [b], From E. P. Stevenson (Can. P. 259,411—2, 21.5.24).—(a) A gas current containing the vapour of a petroleum distillate is submitted to vapour-phase cracking, the heavier residues and motor spirit are separated by condensation, and the gas, after the further removal of the hydrocarbons with three or more carbon atoms to the molecule, is mixed with water-gas. (b) Mineral oil fractions are cracked, the constituents of the gaseous product which are liquid at the normal temperature and pressure are removed, and the residual gas is submitted to a temperature higher than the cracking temperature. A. B. Manning.

Production of hydrocarbon gas. A. Gibson (Austral. P. 20,366, 3.11.24).—Air is passed through a volatile hydrocarbon in a partly-filled carburetting vessel, and the resulting gas passed through water. A. B. Manning.

Production of carbon black from natural gas. E. B. Parsons, W. D. Inskeep, and W. Hunt (U.S.P. 1,614,685, 18.1.27. Appl., 19.5.25).—Natural gas is fed through a flame and the precipitated carbon black is washed from the residual gases by means of a liquid spray (*e.g.*, water or an aqueous solution). S. Pexton.

Distillation of carbonaceous material. J. D. Zieley and F. A. Rudolf (U.S.P. 1,617,697, 15.2.27. Appl., 15.10.20).—Liquid hydrocarbons are produced by continuously distilling coal or other solid hydrocarbonaceous materials with sodium chloride. Air and steam are introduced into the base of the retort, and the volatile hydrocarbons produced are separated from the gases by condensation. S. Pexton.

Manufacture of lubricants. H. A. Montgomery (U.S.P. 1,617,455, 15.2.27. Appl., 30.8.24).—An emulsifiable oil is rendered insoluble in water by treatment with a fatty acid. Small quantities of water are then beaten into the mixture until the viscosity of the emulsion has been greatly increased. Finally, a solid lubricant is brought into suspension in the mixture by gradual addition while agitating. Lubricants so prepared are useful in metal working. S. Pexton.

Process and apparatus for distilling hydrocarbons and other liquids and fractionally condensing the vapours. R. B. Millard, E. J. Atckison, C. D. Coulter, and South Western Engineering Corp. (E.P. 264,549, 19.8.25).—The oil to be distilled is preheated by the hot residue and vapours resulting from the distillation, to about 170°, separation of vapours is permitted in a blow case in which the oil falls down a tower over suitably placed plates, the residue is heated at about 385° in a pipe still, and further evaporation takes place in a vertical tower, the evaporator being fitted with plates into which steam can be blown. The hot residue flows away to heat exchangers. The vapours from the evaporator pass into the bottom of a bubble tower, the first of a series. The vapours from the blow case pass to the bottom of the final bubble tower in the series. The bubble towers to deal with the heavy

portions of the distillate are fitted with flat perforated trays, those dealing with the lighter portions have partitions through which the vapours pass, followed by downward deflection by a bubble cap through a pool of condensate, the level of which on the partition can be adjusted. The vapours from the top of each tower pass downwards over a bank of tubes. This bank can be divided by valves into several sections, and oil on its way to the blow case, or water, flows through these sections arranged either in series, parallel, or series-parallel. Condensate and vapours, resulting from the passage of vapours over the bank of tubes, are separated in a baffled circular path, the vapours proceed to the bottom of the next bubble tower, and condensate returns to the top of the bubble tower. The temperature of the vapours on emerging from the circular path exercises a thermostatic control, short-circuiting when necessary the flow of liquid through the bank of tubes. Definite fractions are drawn off at the bottom of each bubble tower, sharp fractions being obtained. Steam can be introduced into any bubble tower as required, or the condensate from one partition may be drawn off, heated, and returned to a lower partition in that tower. The vapours from the final bubble tower are condensed as completely as possible. W. N. Hoyte.

Distillation of petroleum and similar hydrocarbons. De Bataafsche Petroleum Maatschappij (E.P. 253,489, 20.4.26. Conv., 13.6.25).—The preheated oil is pumped through a pipe still where it is heated at the required temperature, and discharged into a vaporising chamber into which steam is also blown. The residue is drawn off at the bottom, and may again be heated in a pipe still with subsequent discharge to a vaporiser. The vapours from these vaporisers are led separately through a vapour separator to a rectifier, a large vessel in which further separation of vapours takes place, the separated liquid being cooled and the vapours condensed. The entire plant from the charging pump to the collecting tanks is maintained under a high vacuum. W. N. Hoyte.

Treatment of oils. W. O. Snelling, Assr. to Gasoline Products Co., Inc. (U.S.P. 1,624,848, 12.4.27. Appl., 5.5.15. Renewed 17.10.22).—Petroleum oils and their vapours are maintained under such conditions of heat and pressure as will produce equilibrium, and the liquid products are slowly withdrawn and replaced by fresh oil. C. O. Harvey.

Treatment of hydrocarbons. W. M. Cross, Assr. to Gasoline Products Co. (U.S.P. 1,624,889, 12.4.27. Appl., 1.6.15. Renewed 4.1.22).—The oil is heated and digested in a coil maintained in liquid communication with an enlarged chamber, and substantial equilibrium of pressure is attained between the oil and vapour in the enlarged chamber before withdrawal of the products of conversion therefrom. C. O. Harvey.

Manufacture of gasoline. H. Thomas, Assr. to Sun Oil Co. (U.S.P. 1,624,692, 12.4.27. Appl., 12.8.25).—Cracked hydrocarbons in liquid phase under high pressure are allowed to vaporise, and the heavier hydrocarbons condensed thereby are drawn off. A flowing stream of the vapours is partially condensed, intimately mixed with the resulting condensate, and the partially purified gasoline vapours obtained are filtered (at a controlled temperature) through a body of decolorising material wherein further partial condensation occurs. The remaining decolorised vapours are condensed. C. O. Harvey.

Washing minerals (E.P. 268,253).—See X.

III.—TAR AND TAR PRODUCTS.

Composition and constitution of lubricants and their synthesis. Spilker.—See II.

IV.—DYESTUFFS AND INTERMEDIATES.

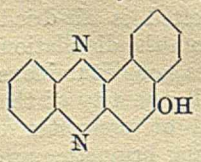
Preparing blue colours of the hydron series. E. I. Orlov and M. Catchourine (Ukraine Chem. J. Tech. Sect., 1926, 2, 65—73).—The methods of preparing colouring matters from indophenols are reviewed. 3-*p*-Benzoquinoneiminocarbazole was boiled with alcohol, and, after evaporating to dryness, treated with technical sodium sulphide (47% Na_2S, 10·7% NaHS), and the product treated with sodium hydrosulphide containing dissolved zinc. Zinc sulphide is precipitated, and the pigment goes into a solution which dyes paper violet, and from which the dyestuff is precipitated on oxidation in air. When the above iminoquinone is boiled with alcohol and sodium hexasulphide (Na_2S_6), and, after evaporating to dryness, is treated with sodium sulphide and then with sodium carbonate, a dark blue colour is produced. Since no colour is formed when the above reactions take place in sodium hydroxide solution, it is suggested that it is sodium sulphide and not alkaline sodium hydrogen sulphide that reacts with the iminoquinone. E. Rothstein.

Coal tar dyes in wines. Valentine.—See XVIII.

Patents.

Anthraquinone [acid] dyes. British Dyestuffs Corp., Ltd., and W. W. Tatum (E.P. 268,542, 19.3.26).—The acid dyes of E.P. 21,897 of 1900 (B., 1901, 1205) are found to be obtainable by the action of neutral sulphite solution on 2-halogeno-4-arylamino-1-hydroxyanthraquinones. Thus, 4-*p*-tolylamino-1-hydroxyanthraquinone-2-sulphonic acid, which dyes wool reddish-blue shades, is prepared by heating 2-chloro-4-*p*-tolylamino-1-hydroxyanthraquinone dissolved in phenol with an aqueous solution of sodium sulphite at 150—180° for 5 hrs. C. Hollins.

Preparation of [quinone] vat dyes. I. G. Farbenind. A.-G., Assees. of G. Kränzlein, H. Greune, and H. Vollmann (G.P. 435,611, 28.10.24. Addn. to G.P. 433,192; cf. F.P. 593,117; B., 1926, 266).—2-Hydroxy-1 : 4-quinones are condensed, in the presence of a dehydrating agent if desired, with *p*-hydroxyphenazines, and subsequently oxidised, *e.g.*, with chlorine water. By heating 5-hydroxy-αβ-naphthaphenazine (annexed formula) with 2-hydroxy-1 : 4-naphthaquinone and acetic anhydride in nitrobenzene, there is obtained a *dye* which gives greenish-yellow shades on vegetable and animal fibres. Similar *dyes* are prepared from 2-hydroxy-1 : 4-naphthaquinone and αβ-naphthaphenazine-4 : 5-sultam or 6-chloro-5-hydroxy-αβ-naphthaphenazine. C. Hollins.



Manufacture of dinitro-products of perylene and its halogen derivatives. F. Bensa, Assee. of K. Stieger (E.P. 260,568, 11.10.26. Conv., 28.10.25).—Perylene or its halogen derivatives may be dinitrated by adding concentrated sulphuric acid or sulphuric–acetic acid to a hot suspension of the compound in glacial acetic acid to which has been added a concentrated aqueous solution of potassium nitrate. A yield of 96% of crude dinitroperylene is claimed, destruction by oxidation being avoided. C. Hollins.

Preparation of acid triarylmethane dyes. I. G. Farbenind. A.-G., Assees. of K. Thiess and T. Meissner (G.P. 436,830, 14.2.24).—Level-dyeing, non-bronzing, soluble acid dyes which do not resinify are obtained by oxidising a mixture of a disulphodibenzyldialkyldiaminodiarylmethane and a hydroxyalkylated arylamine. A sulphonic group may be present in the arylamine or the dye, or its leuco-derivative may be sulphonated. Disulphodibenzyldiethyldiaminodiphenylmethane, for example, is condensed with ββ-dihydroxydiethylaniline by means of dichromate and the product is salted out. C. Hollins.

Preparation of primary aromatic amines. I. G. Farbenind. A.-G., Assees. of O. Schmidt and A. Feller (G.P. 436,820, 12.1.24).—In the catalytic reduction of technical aromatic nitro-compounds, the effect of catalyst poisons is avoided by adding to the catalyst an alkaline-earth metal, aluminium, rare earths, or compounds of these. An activator, such as chromium oxide, manganese oxide, alkali, or alkali silicate, is usually also added. Thus, dry copper carbonate is ground with calcium oxide to a fine powder, pasted on pumice with sodium silicate solution, and reduced at 220—230° to form a catalyst suitable for reduction of crude nitrobenzene vapour at 200°. Technical *o*-nitrotoluene and 3-nitro-*o*-xylene may similarly be used. C. Hollins.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Patents.

Removing the dressing from fibrous vegetable material. I. G. Farbenind. A.-G., Assees. of L. Löchner and H. Korte (G.P. 434,667, 25.7.24).—The dressing is removed and adhering fats and wax are partially hydrolysed by treating the material with strongly alkaline chlorine solution; *e.g.*, starch dressing is removed by treatment for ½ hr. at 50° with a solution containing 10 g. of sodium hydroxide and 3 g. of active chlorine per litre. L. A. Coles.

Dry cleaning. A. E. Hatfield, and Achille Serre, Ltd. (E.P. 266,850, 31.12.25).—Solvents used in the dry-cleaning industry are freed from water and colloidal impurities by treatment with finely-divided porous, cellular silica of low sp. gr., *i.e.*, not more than 12 lb./cub. ft. (minimum bulk of an aqueous suspension after settling), either alone or together with decolorising carbon and reagents which are capable of flocculating suspended impurities, *e.g.*, alkali hydroxides, or carbonates, or sodium aluminate or silicate in conjunction with the equivalent quantity of an inorganic acid. The process is continuous, the treated and filtered liquor being returned to the washing machine at such a rate that the solvent therein is changed every 2—5 min. D. J. Norman.

Dry cleaning. S. G. S. Dicker. From American Dry Cleaning Co. (E.P. 266,975, 3.7.26).—The material is agitated with a low-boiling solvent the vapour of which is heavier than air and preferably non-inflammable, *e.g.*, carbon tetrachloride, in an apparatus the whole of which, including the recovery plant, is at all times in free communication with the atmosphere. The solvent left on the cleaned articles after draining is removed by a current of hot air and condensed. Specially designed plant capable of withstanding sudden changes in pressure is unnecessary, and practically the whole of the solvent is recovered. D. J. Norman.

Treatment for carroting fur. P. C. Donner (U.S.P. 1,625,458, 19.4.27. Appl., 28.4.25).—Fur is treated with an aqueous solution containing nitric and tannic acids. C. O. Harvey.

Production of artificial silk, filaments, threads, bands, ribbons, and the like. A. Eichengrün (E.P. 243,350, 17.11.25. Conv., 20.11.24).—A non-inflammable homogeneous spinning solution, which may be prepared in the cold, is obtained by dissolving acetone-soluble cellulose acetate of any degree of acetylation in a compound solvent comprising methylene chloride in admixture with alcohol, or a homologue thereof, or any cellulose acetate solvent, or solvent mixture the components of which may or may not of themselves be solvents for cellulose acetate. Mixtures containing about 30% of alcohol or 20% of acetone represent the safe limit for complete inflammability. Suitable spinning solutions are obtained by dissolving 10 pts. of acetone-soluble cellulose acetate in (*a*) 65 pts. of methylene chloride and 25 pts. of alcohol, or (*b*) 65 pts. of methylene chloride, 7·5 pts. of alcohol, and 7·5 pts. of benzene. D. J. Norman.

Spinning bath for viscose [filaments]. Spinning process for fine filaments. Production of very fine viscose silk filaments. Erste Oesterreichische Glanzstoff-Fabr. A.-G. (Austr. P. 104,237—9, [A] 21.5.20, [B] 22.3.20, and [C] 20.9.21, Addn. to Austr. P. 88,651).—(A) The bath contains sulphuric acid together with a hydroxycarboxylic acid, *e.g.*, lactic acid. (B) The bath contains a certain minimum amount of sulphuric acid depending on the thickness of the filament required. For filaments of 0—2 denier, (d_1), this minimum, (a), is 250 g./litre, and for any other denier, (d_2), it is $a\sqrt{d_1/d_2}$. (C) The bath contains sulphuric acid and ammonium sulphate together with sodium sulphate derived from the wash waters of the fibres. A. R. Powell.

Coating fibres with cellulose esters. A. É. P. Girard and M. J. P. Roumazeilles (F.P. 611,899, 16.6.25).—The fibres are steeped in a solution containing 8—10% or 10—15% of cellulose acetate, 20—30% or 20—25% of methyl acetate, acetone, or similar liquid, 15—20% or 10—15% of benzene, and 15—20% or 15—30% of a plasticising agent, for fine or coarse fibres, respectively, and are then drained and dried. The process is repeated as desired. L. A. Coles.

Treatment of cellulose. F. Olsen and H. A. Aaronson (U.S.P. 1,615,343, 25.1.27. Appl., 9.11.25).—Cellulose is first steeped in, and later heated in an acid solution until the optimum physical degradation of the fibre with the minimum hydrolysis has taken place.

D. J. Norman.

Production of objects from cellulose xanthate. A. Pinel (F.P. 611,994, 2.3.26. Conv., 12.3.25).—Cellulose xanthate is treated with a solution of zinc salts, the precipitate washed, the water pressed out, and the product powdered and moulded hot with simultaneous drying. The powder can also be incorporated in plasticisers or solvents (*e.g.*, solutions of ammonium or magnesium sulphide) and worked up for plastic masses, after addition of a filler if desired.

B. Fullman.

Softening of artificial substances from cellulose esters. Kalle & Co. A.-G., Assees. of M. P. Schmidt and J. Voss (G.P. 434,640, 5.8.23).—To cellulose esters are added ethers or thioethers of esters of glycollic acids or their homologues with higher alcohols, *e.g.*, diamyl diglycollate or thiodiglycollate, or the corresponding *cyclo*hexanol esters.

B. Fullman.

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

Calcination of dolomitic limestone. H. T. Briscoe (Proc. Indiana Acad. Sci., 1925, **35**, 133—139).—There is a relation between the rate of hydration of lime and the porosity and hardness of the stone. Lime of maximum activity is obtained by burning for the shortest time permitting complete expulsion of the carbon dioxide. Lime produced below 950° is comparatively hard and crystalline. The increased activity of lime burned at low temperatures is due to the active magnesium oxide, and to the fact that the grains have not had an opportunity to grow or partly to fuse.

Chemical Abstracts.

Thermal analysis of the dehydration of gypsum. R. Stumper (Compt. rend., 1927, **184**, 970—972).—Samples of chemically pure powdered gypsum and of amorphous silica calcined at 1100° were heated at various rates (2·5—25° per min.) in an oil-bath, and the temperatures noted at intervals. The curves obtained show that the temperature of formation of the hemihydrate of gypsum increases with the rate of heating, but the temperature of formation of the anhydrite is not influenced by this factor.

J. Grant.

Production of dichromates from chromate ores with soda and lime. L. I. Popov (Continental Met. Chem. Eng., 1926, **1**, 143—144).—Poor ores should be ground as finely as possible, the amount of lime employed should be lower than for richer ores, whilst the soda should be used in theoretical quantity. Rich ores need pass a sieve of only 2300 meshes per cm.^{2} For ore containing 40—50% Cr_2O_3, 0·9 part of lime per 1 part of ore is preferable; for richer ores, 1·2 parts of lime are desirable. The amount of soda used may be 20% less than the theoretical. A temperature of 1100° is employed.

Chemical Abstracts.

Manufacture of barium chloride. H. Molitor (Continental Met. Chem. Eng., 1926, **1**, 139—142).—The processes employed are reviewed. A continuous extraction process is described in which the residue contains only 0·1% of barium chloride. Methods of obtaining fine and coarse crystals are described.

Chemical Abstracts.

Occurrence of helium in oil-well gases. D. Butescu and V. Atanasiu (Petroleum, 1927, **23**, 391—394).—The helium content of 40-litre samples of various well gases was ascertained. The sample was freed from carbon dioxide by potassium hydroxide and dried with calcium chloride, and the hydrocarbons, together with oxygen, were removed by cooling with liquid air. Hydrogen, nitrogen, and the rare gases were removed by adsorption with coconut charcoal at the temperature of liquid air. Remaining traces of neon and hydrogen were distinguished spectroscopically. The amount of helium was determined by admitting air to the apparatus till the helium lines appeared with the same intensity, and calculating from the known amount (0·0005%) present in air. The yellow, green, and blue lines are most readily seen. The helium content in the samples tested varied from 0·00006 to 0·0012%.

H. Moore.

Patents.

Manufacture of silicofluorides and products thereof. B. Gehauf and H. W. Walker (U.S.P. 1,617,708, 15.2.27. Appl., 14.5.26).—Silicon fluoride is made to react simultaneously with water and a basic substance, *e.g.*, sodium carbonate, to give a gelled mixture of silicofluoride and silica. This is dried and comminuted to form an insecticide.

H. Royal-Dawson.

Production of lead sulphate. R. Daloze (F.P. 611,699, 25.2.26).—Material containing lead is treated with a mixture of nitric and sulphuric acids maintained below the b.p. of nitric acid (70°), a current of air or other oxidising gas being passed through the acid.

L. A. Coles.

Manufacture of anhydrous magnesium chloride. Comp. de Prod. Chim. et Electrométallurgiques Alais, Froges, et Camargue (E.P. 255,042, 21.6.26. Conv., 8.7.25).—A compound (*e.g.*, fused carnallite) containing magnesium chloride in the anhydrous state is treated with anhydrous methyl or ethyl alcohol or with a mixture of these alcohols capable of dissolving the magnesium chloride without dissolving the other compounds accompanying it, separating the solution, and crystallising by evaporation.

W. G. Carey.

Manufacture of aluminium hydroxide. H. Pedersen, Assr. to Aluminum Co. of America (U.S.P. 1,618,105, 15.2.27. Appl., 7.6.26. Conv., 23.5.25).—Compounds of lime and alumina from slags and similar materials are leached with a solution consisting chiefly of an alkali carbonate and a small quantity of free alkali hydroxide. The aluminium hydroxide produced is low in silica.

H. Royal-Dawson.

VIII.—GLASS; CERAMICS.

Microscopical examination of quartzites and lime-quartz bricks (silica bricks, Dinas bricks). J. E. Hibsch (Feuerfest, 1926, **2**, 93—95, 113—117).—Preliminary examination of quartzites with the binocular magnifier suffices to distinguish between rock quartzite

and "cement" quartzite (amorphous). The former consists solely of quartz grains, practically uniform in size, in immediate contact; in the latter the grains are embedded in an opaque matrix or cement. Identification of all the structural ingredients is possible only by examination of thin sections under the petrological microscope, the use of which is explained in detail. Microsections of rock and cement quartzites are contrasted. Opal is never present in rock quartzites; mica flakes, however, are often present in rock quartzites, but never in cement quartzites. Rock quartzites are considered to be silicified sandstones, and the latter to have been formed by the addition of a siliceous bond to loose sands and quartz powders. Fine sands and quartz powders produced quartzites of a dense structure resembling hornstone. These quartzites are very suitable for making silica bricks; they do not require excessive grinding, and may be fired at a comparatively low temperature. Rock quartzites must be reduced to an impalpable powder, and fired at a high temperature for a long period, in order to effect the same degree of quartz conversion. In a good silica brick, at least 70% of the quartz is converted into a glass or tridymite, the remainder being visible under the microscope as small, irregular fragments embedded in a colourless glass. Cristobalite is not usually found in silica bricks until they have been in use, particularly in the Martin furnace. The microscopical examination may be supplemented by sp. gr. determinations in silica bricks in order to obtain an indication of the degree of quartz inversion.
F. Salt.

Surface deposits formed in glass furnace regenerators. H. Insley (J. Amer. Ceram. Soc., 1926, **9**, 635—638).—The deposits formed on the surfaces of two refractory bricks of high alumina content, which had been in use in glass furnace regenerators, were examined with the petrographic microscope, and were found to be composed chiefly of nephelite and carnegieite (the low- and high-temperature forms of $Na_2O,Al_2O_3,2SiO_2$) and corundum. Nephelite and carnegieite probably form only where the temperature is considerably below the glass-melting temperature. Corundum may be formed in the hotter parts of the furnace. F. Salt.

Mullite content of some American tank blocks. F. S. Thompson and H. I. Vormelker (J. Amer. Ceram. Soc., 1926, **9**, 639—640).—Samples of eight American glass tank blocks, ground to impalpable powder, were treated with pure hydrofluoric acid for 12 hrs., and the residues (mullite) weighed and analysed. Refiring the original samples increased the mullite content considerably, but the results do not justify definite conclusions regarding optimum conditions for mullite formation. The quantity of mullite formed was not proportional to the alumina content. F. Salt.

Wearing away of tank blocks. D. W. Ross (J. Amer. Ceram. Soc., 1926, **9**, 641—653).—The surfaces of used tank blocks were submitted to detailed examination. The glass dissolves exposed block material, a clay-bearing glass of higher sp. gr. than normal glass being formed. Hence, dissolution of the blocks takes place in an upward direction from horizontal joints or cracks. Where this upward dissolution occurs, the downward-facing surface of the block usually has a number of circular holes drilled vertically upward and terminating in thimble-like gas cavities. The deeper the horizontal joint or crack below the metal line in the tank the less severe is the attack. Excessively reducing atmospheres accelerate dissolution of the block material at the glass line, particularly if the batch contains excess of salt cake. F. Salt.

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

Manufacture of steel in India by the duplex process. B. Yaneske (Iron and Steel Inst., May, 1927, advance copy, 29 pp.).—The duplex process is a combination of the Bessemer and open-hearth methods of steel manufacture, and consists in desiliconising, and partly or almost completely decarburising molten pig iron from the blast-furnace in an acid-lined Bessemer converter, and subsequently dephosphorising the metal in the basic open-hearth furnace. The plant consists of five blast-furnaces, a hot-metal mixer of the non-active type heated either with coke-oven gas or with coal-tar, two acid-lined Bessemer converters, and two tilting open-hearth furnaces. The process, as practised by the Tata Iron and Steel Co., in India, is described in some detail. M. E. Nottage.

Action of complex saline solutions on the ferrous metals. R. Girard (Compt. rend., 1927, **184**, 818—820; cf. A., 1926, 926).—The corrosive effects of a "synthetic" sea-water containing chlorides of sodium and magnesium, and sulphates of magnesium and calcium (20, 3, 1·75, and 1·8 g./litre respectively) on steel and rusted cast iron are characterised by the nature of the products of corrosion rather than by their extent. The total effect is due to the combined effects of the individual salts, *i.e.*, calcium sulphate and sodium chloride act as precipitants in aerated solutions, the former in non-aerated solutions also, whilst corrosion is produced by the latter in non-aerated solutions, and by magnesium chloride in both types of solution.
J. Grant.

Changes in the solubility and hardness of twisted and bent iron. B. Garre (Z. anorg. Chem., 1927, **161**, 305—308).—The rate of dissolution of iron in dilute sulphuric acid increases linearly with the number of twists to which the metal has been subjected in the torsion machine, whereas the diameter of the impression made by a standard ball under a pressure of 3000 kg. decreases logarithmically under the same conditions. Twisted rods become appreciably softer after prolonged immersion in 1% sulphuric acid, and are completely annealed by heating at 900°. The solubility of iron after bending is greater than before, and subsequent annealing, although it decreases the rate of dissolution in acid, does not reduce it to that of the unbent metal.
A. R. Powell.

Wear-resistance of carburised steel *versus* cast high-manganese steel. W. J. Merten (Trans. Amer. Soc. Steel Treat., 1927, **11**, 233—244).—Tests on flexible spring seats and pads made of case-hardened low-carbon and medium-carbon steels and 14% manganese steel showed that under high pressure and sliding motion

free from shock and pounding the case-hardened steels were more resistant to wear. This holds good for all structural conditions of manganese steel, viz., as cast, as quenched, and also reheated to give a martensitic structure. The results obtained on the case-hardened steels were more consistent, due it is thought to irregular plastic flow of the manganese steel. T. H. Burnham.

Inclusions in light metals [and steels] and their effect on mechanical properties. H. Steudel (Z. Metallk., 1927, **19**, 129—137).—Examples with photomicrographs are given of the deleterious effect of slag inclusions in chromium steels and of inclusions of $FeAl_3$ in aluminium and its alloys on the tensile strength, ductility, and hardness of the metal. In rolled bars the tensile strength is greatly reduced perpendicular to the direction of rolling, but not nearly so seriously affected parallel to this direction when the inclusions are numerous; this is due to the formation of a fibrous structure in the direction of rolling, the fibres being separated from each other by elongated particles of the foreign substance. In the case of aluminium any treatment which serves to bring the impurities into solid solution or to cause their even distribution in small particles throughout the mass tends to nullify their effect on the mechanical properties. A. R. Powell.

Relationships between the Rockwell and Brinell numbers. S. N. Petrenko (U.S. Bur. Standards, Tech. Paper No. 334, 1927, **21**, 195—222).—Comparative Rockwell and Brinell hardness tests have been made on a number of ferrous and non-ferrous materials. The following equations are theoretically derived Brinell number $= a/(130 -$ Rockwell ball number$) = b/(100 -$ Rockwell cone number$)^2$. The constants a and b are evaluated from the experimental results. The equations then give an error of $\pm 10\%$ in determining Brinell numbers from Rockwell numbers. Similar relationships are obtained between the tensile strengths of ferrous materials and Rockwell numbers, but do not hold for non-ferrous materials. L. M. Clark.

Tin-iron alloy in tin-plate. E. F. Kohman and N. H. Sanborn (Ind. Eng. Chem., 1927, **19**, 514—518).—Increase of the time of immersion of an iron plate in molten tin increases the amount of alloy-tin (insoluble in boiling sodium plumbite), but at a gradually decreasing rate. The coating tin is unaffected. Increase of alloy-tin in this way was found to be, if anything, detrimental in respect of corrosion by fruit juice. Untinned cans are perforated much less readily than tinned cans, as would be expected on the electrochemical theory of corrosion, but bulging, owing to hydrogen generation, is greater. This may be due to the higher overvoltage of tin and the effect of depolarising agents in fruit juice. Charcoal plate was found to give better service than coke plate. It is suggested that the beneficial effect of tin in protecting against corrosion is largely due to its acting as a lubricant in can manufacture. Photomicrographs of sections of tin-plate are given. C. Irwin.

Orthotaxy and thermotaxy. F. Rinne (Z. Metallk., 1927, **19**, 162—163).—The term "orthotaxy" is applied to the structure of a metal or other substance formed of a series of long parallel crystals in columnar formation, and the term "thermotaxy" to the same structure when it is produced by heat conditions, *e.g.*, when a metal is cast in an open mould whereby, on solidification, radial columnar crystals spread inwards perpendicular to the surface of the mould. As an example of thermotaxy the structure of artificial periclase is discussed, and shown to be precisely analogous to that of cast iron or copper (cf. Tammann and Meyer, A., 1926, 783), *i.e.*, cube planes are parallel to the cooling surface and cube edges lie in the direction of heat flow. A. R. Powell.

Tendency of metal crystals to flow. E. Schmid (Z. Metallk., 1927, **19**, 154—157).—The elastic limit of single crystals of metals depends on the orientation of the crystal to the direction of application of the stress. Thus, in the case of a zinc crystal, the elastic limit in a direction making an angle of 60° with the hexagonal axis is 217 g./mm.^{2}, whereas in a direction at 87° to the same axis it is 1520 g./mm.^{2}; in the first case elongation takes place by slip along a basal plane, and in the second case along a prism face. From these and other results from differently oriented crystals a solid model has been constructed in which the length of the radius vector from the centre of the model to its surface represents the magnitude of the elastic limit of that crystal, the orientation of which is given by the relative position of the radius vector to the crystal axis. An analogous flow model of a face-centred cubic crystal has also been constructed based on theoretical considerations supported by some preliminary work of Czochralski ("Moderne Metallkunde," Berlin, 1924) on aluminium crystals. A. R. Powell.

Corrosion of metals. W. Palmaer (Tekn. Tid. [Uppl. C., Kemi], 1926, **56**, 17—21, 27—31, 35—40).—See B., 1926, 589. Chemical Abstracts.

Patents.

[Tin-silver] alloy. W. S. Ireland, Assr. to Lipman Refrigeration Co. (U.S.P. 1,626,038, 26.4.27. Appl., 29.1.26).—The alloy consists of 95—97·5% Sn and 2·5—5% Ag. F. G. Crosse.

Compositions for alloying molybdenum with other metals. Molybdenum Corp. of America, Assees. of E. A. Lucas (E.P. 245,422, 21.11.25. Conv., 30.12.24).—With the object of providing a suitable form of molybdenum for addition to molten baths of other metals, *e.g.*, steel, without loss of molybdenum, a mixture of the lower molybdenum oxides and suitable fluxing agents is formed into a fused coherent mass, having a lower m.p. than the alloying metal. The fluxing agents may include lime, iron oxide, magnesium silicate or fluoride, alumina, silica. C. A. King.

Protecting metals against oxidation at high temperatures. British Thomson-Houston Co., Ltd., Assees. of F. C. Kelley (E.P. 250,975, 19.4.26. Conv., 17.4.25).—Metals, *e.g.*, iron, nickel, molybdenum, and tungsten, are given a surface-coating of alloy which is resistant against oxidation at high temperatures, by heating the metal at 1000—1500° in contact with a mixture of equal parts of powdered chromium and aluminium oxide (or magnesium oxide) to which 10% of powdered silicon has been added. The heating process is conducted under non-oxidising conditions, *e.g.*, in an

atmosphere of hydrogen (cf. E.P. 159,102; B., 1921, 266 A). C. A. KING.

Treatment of metal baths. F. M. BECKET, Assr. to ELECTRO METALLURGICAL CO. (U.S.P. 1,622,078, 22.3.27. Appl., 3.9.21. Cf. U.S.P. 1,322,158 and 1,461,643; B., 1920, 30 A; 1923, 894 A).—Light deoxidising agents, *e.g.*, magnesium, are added to steel baths in the form of an alloy with lead. The distribution of the active metal in the steel is facilitated, and the fluidity of the slag is increased by the presence of lead oxide. T. S. WHEELER.

Working up ores and metallurgical products of various kinds containing volatilisable metals. F. KRUPP GRUSONWERK A.-G., Assees. of H. STEPHANI (E.P. 252,679, 6.4.26. Conv., 26.5.25).—In the reduction of volatilisable metals in a rotary furnace, the reducing agent is raw anthracite or lignite together with other suitable substances, introduced directly into the reaction zone, *e.g.*, by blowing it in with air or gas in the same current as the main gas supply or through the furnace wall. The material to be reduced may be preheated in a separate furnace. C. A. KING

Non-oxidising annealing furnace. V. E. LANE (U.S.P. 1,624,258, 12.4.27. Appl., 15.2.26).—A muffle furnace constructed without bottom surmounts a water-filled pit in which is fitted an elevator carrying a transverse beam. A carriage mounted to travel on this beam forms the bottom of the furnace, and may be lowered and moved transversely in either direction, so that when the carriage is in position in the furnace a similar platform mounted on the other end of the trolley closes one or other of the openings into the pit. C. A. KING.

Furnaces for roasting sulphide and other ores. E. BRACQ (E.P. 248,711, 31.12.25. Conv., 9.3.25).—A furnace having a helical hearth or a number of superimposed hearths is provided with a central chamber of considerable area in which a hollow vertical column carries the scraper holders, which may be cooled by means of air or water. The interior of the annular hearths is screened so as to allow inspection of the process through openings in the central chamber. The central chamber as a whole is given an angular or helical movement and a reciprocating vertical movement in addition to the scrapers. C. A. KING.

Washing minerals by means of liquid streams. A. FRANCE (E.P. 268,253, 25.11.26).—In a mineral washing launder having single or multiple compartment separators depending from the launder, the launder may be divided by one or more longitudinal vertical partitions which may virtually extend so as to divide the compartments underneath, the latter portion being adjustable. The partition in each separating compartment may be forked at the lower end, and means are provided for regulating the discharge area. C. A. KING.

Classifying crushed ore and the like. S. H. DOLBEAR and B. L. EASTMAN, Assrs. to SELECTIVE TREATMENT CO., LTD. (U.S.P. 1,624,134, 12.4.27. Appl., 5.1.22).—Crushed material is brought into contact with a jet of water upwardly directed in a vessel containing relatively still water. Part of the solid material is then collected by centrifugal effect. C. A. KING.

Crucible [for metals]. SIEMENS-SCHUCKERTWERKE G.M.B.H. (E.P. 263,171, 16.12.26. Conv., 17.12.25).—Metals likely to be contaminated by the material of crucible walls are melted in an iron crucible having a coating of copper or nickel on its inner face, or an inner vessel of copper or nickel may be fitted into an iron crucible. C. A. KING.

Protection of metals which come into contact with lower-melting metals. SIEMENS & HALSKE A.-G., Assees. of G. MASING (G.P. 436,093, 20.3.25).—Metal articles are provided with a protective coating having substantially the same coefficient of expansion; *e.g.*, for iron vessels a coating made from lead glass and marble or calcium fluoride prevents attack in metal baths at the highest temperatures used. C. HOLLINS.

Annealing furnace. G. KÖRBER (E.P. 267,620, 21.12.25).—A furnace is provided with a rotating hearth supported on hollow rib members arranged as the radii of a regular polygon from a hollow vertical shaft; hollow stay members are also provided arranged as the sides of the polygon, and the top is formed of hollow plates. Water for cooling is passed through the whole, the hollow shaft being provided with partitions to separate inlet from outlet. The wall of the furnace is stationary, and is provided with channels within its thickness through which compressed air for combustion is passed and thus pre-heated. B. M. VENABLES.

XI.—ELECTROTECHNICS.

PATENTS.

[Electric] furnace and method of operating the same. F. W. BROOKE, Assr. to W. SWINDELL & BROTHERS (U.S.P. 1,626,263, 26.4.27. Appl., 11.10. 22).—A charge is melted in one furnace and refined in another in substantially the same length of time, whilst a predetermined atmosphere is maintained in the furnaces. J. S. G. THOMAS.

Copper oxide electric cell. TRANSMUTOR CO., G.M.B.H. (G.P. 437,336, 27.5.25).—A zinc electrode is arranged within a copper oxide electrode consisting of two co-axial parts protected against axial displacements. The cell cover, which forms a de-aerating chamber, is pressed down upon the outer part of the copper oxide electrode by screwing an outwardly extending projection attached to the inner part of this electrode. J. S. G. THOMAS.

Accumulator [plate]. E. SIEG (E.P. 260,244, 13.10.26. Conv., 22.10.25).—A soft-lead accumulator plate is provided with lugs or hooks of hard lead, *e.g.*, lead containing 5—11% Sb, for suspending the plate. J. S. G. THOMAS.

[Filling lead] accumulators] with pulpy electrolyte]. F. ALETTER and L. STRASSER (E.P. 264,539, 17.1.27. Conv., 16.1.26).—Cells are filled with a dry mixture of absorbent material, *e.g.*, silica gel, and sulphuric acid of higher concentration than is necessary for operating them, and the electrolyte is diluted by adding distilled water. J. S. G. THOMAS.

Treatment of discarded lead battery plates. A. STEWART, Assr. to C. L. CONSTANT CO. (U.S.P. 1,627,351, 3.5.27. Appl., 30.9.26).—Lead battery plates are melted

together with a dry salt which converts the lead peroxide of the paste portion of the plates into a salt which is separable from the metallic portion. J. S. G. Thomas.

Electric incandescence lamps. H. Wade. From N. V. Philips' Gloeilampenfabr. (E.P. 268,986, 14.5.26).—An electric incandescence lamp is provided with an auxiliary electrode coated with a getter, *e.g.*, calcium fluoride, potassium thallous chloride, which, under the influence of an electric discharge between the auxiliary electrode and the filament, generates a gas which forms a transparent compound with volatilised material of the filament, so that light absorption by the evaporated material is reduced. J. S. G. Thomas.

Gas-filled electric incandescence lamp with filament having increased strength. D. S. Gustin, Assr. to Westinghouse Lamp Co. (U.S.P. 1,622,826, 29.3.27. Appl., 29.11.24).—The addition of diphenylamine vapour to the gas employed to fill electric lamps increases the strength and life of the filament, the diphenylamine acting as a getter. T. S. Wheeler.

Manufacture of oxide cathodes for discharge tubes. H. Wade. From N. V. Philips' Gloeilampenfabr. (E.P. 269,341, 30.4.26).—A core of tungsten or molybdenum is coated with platinum and subsequently with copper. The copper film is oxidised partially or completely, and coated with one or more of the alkaline-earth metals, which is oxidised whilst the reduced copper is vaporised. J. S. G. Thomas.

Manufacture of electro-ionic discharge tubes. Edison Swan Electric Co., Ltd. From Radio-Röhren-Laboratorium Dr. Gerd Nickel G.m.b.H. (E.P. 232,979, 29.12.25).—The anode or cold electrodes of a discharge tube are activated by electropositive metal, *e.g.*, calcium, strontium, and barium, preferably by evaporation of the oxides of these metals mixed with a little aluminium, from the incandescent cathode or an auxiliary cathode, so that when the tube is in use the particles of these metals oscillate under the influence of the electric field and produce fluorescence at the surface of the anode or cold electrodes. [Reference is directed, in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Acts, 1907 and 1919, to E.P. 245,146, 229,622 (B., 1925, 663), 214,262 (B., 1924, 860), 208,729 (B., 1925, 391), 184,446, and 123,126 (B., 1919, 225 A).] J. S. G. Thomas.

Target for *X*-ray tubes. H. C. Rentschler and J. W. Marden, Assrs. to Westinghouse Lamp Co. (U.S.P. 1,625,426—7, 19.4.27. Appl., [A], 21.12.20, [B], 17.11.22. Renewed 6.12.26).—The target of an *X*-ray tube is composed of coherent metal (A) having an at. wt. between 230 and 240, (B) uranium. J. S. G. Thomas.

XII.—FATS; OILS; WAXES.

Marine animal oils. sperm-whale oil and spermaceti. E. André and M. T. François (Bull. Soc. Chim. biol., 1927, **9**, 117—125; cf. B., 1926, 247, 987).—The fatty matter from various parts of the sperm whale has been examined, and the properties of the fats, and some of their constituents, are recorded. The fats examined are those of the head, adipose tissue, and muscle. The last-named gives slightly higher values for density, refractive index, and acid value. The saponif. values are 129, 112, and 163, and the iodine values (Hanus) 91·5, 85·0, and 123·0, respectively. The amounts of glycerol present are 1·8, 1·3, and 5·5 g. per 100 g. of fat, corresponding to the presence of approximately 18%, 13%, and 55% of glycerides in the fats, respectively. The total fatty acids represent 62·6, 60·0, and 76·5% of the fats, and those obtained give mean mol. wts. of 301, 291, and 302, and iodine values of 97·3, 87·2, and 135·0, respectively. The unsaponifiable matter is 38·0, 40·0, and 17·5% of the total fat, and the m.p., iodine values, and acetyl values are given, together with the mean mol. wt. of the alcohols present. Samples of spermaceti have been examined, and the constants and properties of the fatty acids and unsaponifiable matter determined. Glycerol is present after saponification of the spermaceti, the amount corresponding to 7% of glycerides. A. Wormall.

Determination of free fatty acids [in cotton-seed oil]. H. B. Battle (J. Oil Fat Ind., 1926, **3**, 160).—Minute directions for the titration with sodium hydroxide are given. Chemical Abstracts.

Fractionation of linseed oil at 293°. H. D. Chataway (Ind. Eng. Chem., 1927, **19**, 639—640).—Two batches of linseed oil of iodine number 199·5 were heated in an oil-bath at 110° for 2 hrs. in an atmosphere of carbon dioxide, followed a day later by heating at 185° for 5 hrs. at 15 mm. pressure. The following day they were heated over a bare flame at 293° ± 4°, batch *A* at atmospheric pressure and batch *B* at 15 mm. pressure, two samples being removed from each batch hourly, the samples being used for determination of the percentage soluble or insoluble in acetone by the method previously described (cf. Whitby and Chataway; B., 1926, 551). The mol. wt. of the insoluble and soluble fraction from each sample was determined by the f.p. method in benzene at 4% concentration. The mol. wt. of the acetone-insoluble fraction indicates that it is essentially colloidal, the amount of this fraction being after 7 hrs.' heating 54·8% for batch *A* and 56·1% for batch *B*. The acetone-insoluble material is viscous, and on prolonged heating at 80° sets throughout to a solid mass; this fraction appears to be responsible for the viscosity and setting power of the treated oil. The acetone-soluble material has an apparent mol. wt. greater than that of the original oil; qualitatively this fraction is of the same consistency as the original oil, and has no marked drying properties. Raw linseed oil heated at 293° without previous heating at 185° *in vacuo* does not give rise to an insoluble fraction until or unless reduced pressure be applied. H. M. Langton.

Analysis of cotton seed. C. H. Cox (J. Oil Fat Ind., 1926, **3**, 125—127).—The preparation of cotton seed for analysis is described. The available oil in the seed is calculated from that left in the cake by assuming a constant relation between the oil and ammonia content of the cake. Chemical Abstracts.

Determination of oil and ammonia in cotton seed. Anon. (J. Oil Fat Ind., 1926, **3**, 247—248).—Concentrated hydrochloric acid (1·5—2·0 c.c.) is absorbed in the walls of a 2·5 in. flower pot, into which 50—60 g. of seed are placed; this is heated for 1 hr.

at 120—130°, and the powdered material analysed for water, ammonia, and oil (4 hrs.' extraction). The moisture content of the fresh sample is determined.
Chemical Abstracts.

Soap colour test of sulphur olive oil. H. P. Trevithick and W. H. Dickhart (J. Oil Fat Ind., 1926, **3**, 128—129).—The oil (10 g.) is saponified with sodium hydroxide (*d* 1·16), kept for 2 hrs., cooled, dissolved in 250 c.c. of alcohol, 50 c.c. then being diluted to 200 c.c., filtered, and examined (for grading) in a Lovibond tintometer. Chemical Abstracts.

Iodine number of California sardine oil. M. S. Dunn and B. S. Hollombe (Ind. Eng. Chem., 1927, **19**, 633—634).—The iodine numbers of commercial oleic acid and of five samples of commercial oil from the California sardine (*Sardinia cærulea*) freshly caught have been determined by both the Hübl and the Hanus methods. The values obtained for the oleic acid confirmed previous values. The average value for the iodine number of the sardine oil is 177·8, the values by the two methods being in very close agreement. The authors contrast these results with those of the following related species: Japanese sardine (*Clupanodon melanosticta*) 180—187; European sardine (*Clupea sardinus*), 160·9—191·7; *Clupea harengus*, 123·5—142; and *Clupea pilchardus*, 170·4—172·7. H. M. Langton.

U.S. Government master specification for grit-cake coap. (U.S. Bur. Standards, Circ. No. 130, Nov. 23, 1926. 6 pp.).—Type A, for glass and enamel, must contain 88—93% of insoluble siliceous material, ground to pass 100-mesh, not more than 5% being retained on 200-mesh, and of which 90% shall be ground felspar. Matter volatile at 105—110° must not exceed 4%, and the total alkalinity of matter insoluble in alcohol shall not exceed 1%, calculated as Na_2CO_3, nor must free alkali exceed 0·1%, calculated as NaOH. Anhydrous soda soap shall be within 1% of the difference between 100 and the materials mentioned above. Rosin, sugar, and foreign matter must not be present. Type B, for scouring and scrubbing, must answer the same requirements, except that volatile matter may be 5%, total alkalinity 3%, free alkali 0·1%, whilst 75—85% of siliceous material, mainly quartz ground to pass 100-mesh, is allowable. The usual methods of testing are detailed. W. G. Carey.

Patents.

Decomposition of fats or oils into fatty acids and glycerol. A. S. Richardson and C. V. Conley, Assrs. to Procter & Gamble Co. (U.S.P. 1,622,974, 29.3.27. Appl., 13.3.22).—Aromatic sulphonic acids of mol. wt. less than 250, *e.g.*, benzenesulphonic acid, are employed in hot aqueous solution to hydrolyse fats and oils.
T. S. Wheeler.

Production of a [hard-water] soap compound. H. H. Hanson, Assr. to Tarratine Manuf. Co., Inc. (U.S.P. 1,623,340, 5.4.27. Appl., 6.1.23).—A neutral vegetable oil soap (100 pts.) is dissolved in a mixture of water (70 pts.) and neutralised sulphonated castor oil (50 pts.), and after heating at 80° for 1 hr., glycerol (5%) and sugar (10%) are added, and the mixture is beaten at 35° until it assumes a creamy consistency.
T. S. Wheeler.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Study of the peroxide and persulphate methods for determining chromium in chrome paint pigments. E. F. Hickson (U.S. Paint Manufrs. Assoc., Nov., 1926, Circ. No. 294, 322—326).—The determination of chromium in chrome pigments by the method described in A.S.T.M. Standards, 1924, 864, gives low results. Of several contributory factors, incomplete oxidation of the chromium with sodium peroxide is the greatest source of error. The author recommends cooling the lead filtrate (rendered slightly ammoniacal) to 10—12° before adding sodium peroxide. After digestion until effervescence ceases, the solution is boiled and cooled, and a further quantity of sodium peroxide added. Digestion and subsequent boiling to eliminate hydrogen peroxide are followed by volumetric determination of the chromium with standard ferrous sulphate and potassium dichromate solutions. The application of the silver nitrate–persulphate oxidation method used in steel analysis is also suggested as an alternative to the sodium peroxide method. Chromate is determined electrometrically or volumetrically. Experimental details are fully quoted in each case, and tabulated results obtained by various analysts using these methods show satisfactory concordance. S. S. Woolf.

Tests with Hickson's "ice-cold" oxidation method for titrating chrome-green pigments. G. G. Sward (U.S. Paint Manufrs. Assoc., Nov. 1926, Circ. No. 294, 327—328; cf. preceding abstract).—Repeat analyses of a chrome-green pigment using a single oxidation with sodium peroxide at 25° gave 5·6, 8·5, 6·3, and 9·2% of lead chromate, whereas the corresponding figures when the solution was made ice-cold, and a double treatment was given, were 9·5, 9·5, 9·6, and 9·6%. S. S. Woolf.

White paint tests on zinc chloride and creosote-treated woods. H. A. Gardner (U.S. Paint Manufrs. Assoc., Sept., 1926, Circ. No. 286, 140—146).—Of 60 Southern yellow pine panels to be subsequently primed and painted, 20 were untreated, 20 were soaked in a 3% solution of zinc chloride, and 20 were soaked in creosote (the approximate absorptions per cub. ft. being ½ lb. of zinc chloride and 5 lb. of creosote, respectively). Of each group of 20 panels 10 were flat grained and the remainder edge grained. The primers used were based on zinc dust, aluminium, red lead, and nitrocellulose, followed by two coats of a fairly stiff white lead paint or of a lead-free white, ready-mixed paint (or 3 coats of paint in the absence of primer), 10 days' drying being allowed between coats in all cases. Formulæ for primers and finishing paints are given. After the application of two coats, the creosoted panels were half covered with tin foil (attached by thin varnish) in an attempt to prevent the "bleeding" that had already occurred from extending to the third coat, but after a fortnight's roof-exposure of the completed panels, these showed varying amounts of creosote stain. The remaining panels were then in good condition. Further reports on the exposure test are to be made.
S. S. Woolf.

Viscosity and mobility readings [of lacquer solutions] compared. A. W. Van Heuckeroth (U.S.

Paint Manufrs. Assoc., Nov., 1926, Circ. No. 292, 316—319).—The "mobility" times of a series of standard mineral oils of known absolute viscosity (used in filling the Gardner–Holdt viscosity standards) were determined using the mobilometer described in Circ. No. 265. On plotting "times" against "poises," a straight line relationship obtains, and factors for converting mobilometer readings into poises are derived. The viscosities of experimental nitrocellulose solutions determined in this manner show satisfactory concordance with the results obtained with the Gardner–Holdt viscosimeter.

S. S. Woolf.

Colour number of dry pigments, and experiments on the selective adsorption of various pigments and liquids. H. A. Gardner (U.S. Paint Manufrs. Assoc., Dec., 1926, Circ. No. 295, 329—351).—The fact that the oil in ready-mixed paints often becomes paler during long storage is explained by the adsorption of "foots" and colouring matter in the oil by pigments. The "colour number" is the number of milligrams of methylene blue adsorbed per gram of pigment when 20 g. of the pigment are mixed with 150 c.c. of the dyestuff solution (0·25 g./litre) and shaken vigorously for 2 min. every day for a week, the dye content of the supernatant liquor being determined after settling by titration with titanous chloride solution. The colour number, acid or alkali number (number of milligrams of acid or alkali to neutralise 1 g. of pigment), and oil absorption of 72 pigment samples are tabulated. The possibility of influencing the adsorption by preliminary heating, wetting with alcohol, etc. is discussed. A further series of experiments on the wetting of pigments by various liquid combinations is described, the method adopted being to introduce a small amount of pigment into a test tube containing 10 c.c. each of two immiscible liquids, *e.g.*, water and toluene, water and turpentine, water and linseed oil, etc. The behaviour of the pigment on addition, and its final distribution after shaking for a few seconds, are tabulated for 20 typical pigments and seven pairs of liquids, and it is suggested that the phenomena recorded should be capable of practical applications, *e.g.*, the incorporation of pigments in oil without the use of grinding apparatus, separation of fine from coarse pigments without recourse to elutriation, prevention of settling in lacquers, etc., on lines indicated by the author.

S. S. Woolf.

U.S. Government master specification for turpentine (gum spirits of turpentine and steam-distilled wood turpentine) (U.S. Bur. Standards, Circular No. 86, Oct. 11, 1926. 10 pp.).—The requirements for the specified types of turpentine are:—$d_{15\cdot5}^{15\cdot5}$ 0·860—0·875, n_D^{20} 1·465—1·478, initial b.p. 150—160°/760 mm., not less than 90% to distil below 170°/760 mm., residue after polymerisation with 38*N*-sulphuric acid not to exceed 2%, which residue must be viscous and straw or darker coloured, and of n_D^{20} not less than 1·5. Methods of sampling, testing, etc. are detailed. The specification does not cover destructively distilled wood turpentine.

S. S. Woolf.

U.S. Government master specification for water-resisting spar varnish. (U.S. Bur. Standards, Circular No. 103, Oct. 5, 1926, 6 pp.).—One grade only of spar varnish is described, having the following characteristics:—Clear and transparent, not darker than a solution of 3 g. of potassium dichromate in 100 c.c. of pure sulphuric acid (*d* 1·84), flash point (closed-cup) not below 30°, non-volatile matter not less than 45% by wt.; the varnish must have good working properties and normal gloss, must set to touch in not more than 5 hrs., and dry hard and tough in not more than 24 hrs., and must not dull, frost, etc. when exposed to direct draught for 5 hrs. immediately after flowing on, and allowed to harden overnight; the dried film must withstand cold water for 18 hrs. and boiling water for 15 min. without whitening or dulling; the varnish must be sufficiently elastic to pass a 50% kauri reduction test at 24°. Methods of sampling, testing, etc. are detailed.

S. S. Woolf.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Variation in the degree of polymerisation of rubber. P. Bary and E. Fleurent (Compt. rend., 1927, 184, 947—948).—The proportion of the more highly polymerised portion of rubber increases on long keeping in the dark at ordinary temperatures, and decreases considerably when maintained for some days at temperatures higher than normal.

B. W. Anderson.

XV.—LEATHER; GLUE.

Determination of the physical properties of leather. G. Povarnin (Collegium, 1927, 125—147).—The Russian Sole-leather Commission selects 7·5 samples per 100 for testing. 90% of these yield tensile strength figures which are within 0·1 kg./mm.^{2} of the correct result. It has been shown that it is preferable to select two strips from the shoulder of each hide, and the error is about 10% for 6 samples selected from every 100. The error is reduced to 6% by determining the strength of pieces both lengthwise and across the direction of the hide. The errors involved in sampling from different parts of the hide are discussed, but no particular method is preferred. The different layers of the leather affect the physical properties. The grain is weaker than the flesh side, which has been shown by wearing tests. The composition of the different layers varies; the outer layers contain more ash and water-soluble matter than the inner layers. Moisture and fats affect the leather. The tensile strength is diminished by drying, and increases with increased moisture content. Elasticity curves are given for various types of leather. The effect on the tensile strength has been determined of different modes of liming for sole leather and also of swelling. These results were obtained from 1700 samples, and show that liming at temperatures above 15° gives a lower tensile strength. Cold-limed pelts gave a greater tensile strength when tanned in cold liquors than in warm. Hides which had not been limed gave the highest tensile strength if swollen with organic acids and tanned in warm liquors. Unlimed pelts swollen with sulphuric acid for 8 hrs. and tanned in warm liquors gave a higher tensile strength than those tanned in cold liquors, but longer treatment with sulphuric acid diminished the strength.

D. Woodroffe.

XVI.—AGRICULTURE.

Potassium content of plants as an indicator of available supply in soil.—J. W. Ames and R. W. Gerdel (Soil Sci., 1927, **23**, 199—224).—From experiments with soils from manured plots, it is concluded that the Neubauer seedling method can furnish information as to the supply of available potassium in soils. Optimum conditions are furnished when 100 wheat seedlings are grown in 200 g. of soil diluted with 1000 g. of sand. G. W. Robinson.

Effects of some electrolytes on kaolin and the probable relations to the soil. J. R. Skeen (Soil Sci., 1927, **23**, 225—242).—Data are presented showing the effect of different substances on the turbidity, volume of sediment, and sign and intensity of the charge on particles of suspensions of kaolin which had previously been purified by prolonged dialysis. From a consideration of the migration velocity of the particles and the volume of sediment obtained it is considered by the author that of the ions used (sodium, hydrogen, calcium, barium, and aluminium) only sodium and aluminium exert a flocculating effect. Hydrochloric acid is adsorbed, but the other electrolytes show negative adsorption in the sequence NaCl, NaOH > $BaCl_2$ > $CaCl_2$ > $AlCl_3$. In concentrated solutions the particle charge is reversed in the order of intensity Al > H > Ca, Ba. Adsorption is not considered to be a function of p_H in clays. The amount of dissolved aluminium in soil moisture depends on the amount of phosphate present as well as on p_H; a slight decrease in both may cause a big increase in soluble aluminium and iron. The formation of hardpan is discussed. G. W. Robinson.

Effect of lime and fertilisers on the potash content of soil and crop. J. G. Lipman, A. W. Blair, and A. L. Prince (Proc. Internat. Soc. Soil Sci., 1926, **2**, 201—208).—In a series of parallel experiments with soils receiving various fertilisers with and without lime, the potash content of the limed series of soils and of the stems of maize grown therein was found to be lower than the corresponding figures in the unlimed series. A. G. Pollard.

Permeability of loam soils. J. Wityn (Proc. Internat. Soc. Soil Sci., 1926, **2**, 209—243).—In continuous percolation experiments, the permeability of soil to water fluctuated considerably from day to day. These fluctuations are attributed to differences in the nature of the ions leached out of the soil during the operation. The presence of calcium and of carbonates in the permeating water diminished the rate of flow; sodium ions had the reverse effect. A. G. Pollard.

Determination of soil fertility. J. Stoklasa (Proc. Internat. Soc. Soil Sci., 1926, **2**, 244—254).—The effect of fertilisers on the activity of soil organisms was examined by means of the rate of carbon dioxide production in soils. Nitrogenous fertilisers increased the amount of carbon dioxide produced, sodium nitrate being slightly more effective than ammonium sulphate. Superphosphate also stimulated the organisms. The effect of farmyard manure on carbon dioxide production depended not only on the quantity used, but also on the nature of the decomposable organic matter it contained. Productivity and carbon dioxide production in soils are closely parallel. Plant residues remain in soils under ordinary cultivation for a period sufficient to maintain the supply of organic matter necessary for optimum bacterial activity. A. G. Pollard.

Degree of humification of the dead covering of forest soils. A. Němec (Proc. Internat. Soc. Soil Sci., 1926, **2**, 255—258).—Humified matter can be determined by boiling the sample with 6% hydrogen peroxide solution, which renders the humified material soluble, leaving a residue of unaltered fibrous material. The proportionate humification in forest soils increases with decreasing acidity. Exposure to sunlight increases humification, which is greater in forests of broad-leaved trees than of conifers. The rate of humification seems parallelled by the rate of nitrification of soils under laboratory conditions. A. G. Pollard.

Effect of potassium ions on potatoes. Effect of root activity of plants on the soil. von Brehmer (Ernährung der Pflanze, 1926, **22**, 278—282; from Chem. Zentr., 1927, I, 345).—In experiments on the effect of different potassium salts on potatoes in sand–peat cultures, the best results were obtained with potassium chloride and with dipotassium hydrogen phosphate. Complete failures were obtained with potassium sulphate and potassium carbonate. The best growth corresponded with the most acid reaction (p_H 5·9). An alkaline reaction, consequent on the application of physiologically alkaline dressings, was unfavourable. The subsoil was always more acid than the top soil when the plants were well developed. When, on account of alkaline reaction, growth was inhibited, no difference in reaction between soil and subsoil was produced. G. W. Robinson.

Surface forces of soils in the neighbourhood of their hygroscopic capacity. H. S. Wolfe (Bot. Gaz., 1926, **82**, 195—206; from Chem. Zentr., 1927, I, 345).—The force with which water is retained by different soil types at different moisture contents, investigated by means of vegetation experiments, is equivalent to about 10—25 atm. when abundant moisture is present. On drying, great increases occur at or about the moisture content represented by the hygroscopic capacity. For example, with a loam soil, whilst the attractive force only increased by 25 atm. between 6% and 7%, the increase at 5% was 250 atm.; at 4%, 575 atm.; and at 3%, 875 atm. G. W. Robinson.

Solubilisation of sulphur and formation of thiosulphates in a soil rich in organic nitrogen. G. Guittonneau and J. Keilling (Compt. rend., 1927, **184**, 898—901).—Sulphur mixed with soil and calcium carbonate gradually forms soluble substances, among which thiosulphates are detected, more rapidly when peptone is also present (cf. A., 1926, 545). E. W. Wignall.

Fertilisers. F. T. Shutt (Dep. Agric. Canada, Rep. Dominion Chemist, 1926, 11—18).—Sodium chloride (400—600 lb. per acre), or more markedly Malagash salt (containing 1% K_2O), slightly increased the yield of mangels, but not of turnips or oats. Gypsum and sulphur increased the yield of potatoes, but neither substance prevented scab development. Chemical Abstracts.

Availability of phosphoric acid in slags and natural rock (Florida) phosphate. F. T. SHUTT (Dep. Agric. Canada, Rep. Dominion Chemist, 1926, 21—24).—The solubility of rock phosphate and open-hearth slag as determined by Wagner's method was 20—30% of that obtained by shaking 1 g. for 30 min. with 500 c.c. of 2% citric acid solution, or by shaking 1 g. for 5 hrs. with 500 c.c. of 1% citric acid solution. The third method gave somewhat higher results than the second with rock phosphate and Bessemer slag, but lower results with open-hearth slag alone or mixed with rock phosphate. CHEMICAL ABSTRACTS.

Properties of the colloidal soil material. M. S. ANDERSON and S. MATTSON (U.S. Dep. Agric. Bull., 1452, 1926, 1—46).—The colloidal soil materials of widely different soils vary considerably in all their properties, except density. Variations in one property usually parallel variations in other properties, possibly owing to relationship in the chemical nature, size, and structure of the particles. Variations in properties correspond with variations in the exchangeable bases and with variations in the ratio $SiO_2 : (Al_2O_3 + F_2O_3)$, but all properties are probably not chiefly governed directly by the silica ratio. Soil colloids are more lyophobe than lyophile, but are not typical of either class. CHEMICAL ABSTRACTS.

Nutritive value of pasture. II. Seasonal variations in the productivity, botanical and chemical composition, and nutritive value of pasturage on a heavy clay soil. H. E. WOODMAN, D. L. BLUNT, and J. STEWART (J. Agric. Sci., 1927, **17**, 209—263; cf. B., 1926, 506).—The results recorded in the present paper relate to pasture in a heavy soil in a season with abundant and well-distributed rainfall, and confirm the earlier conclusions as to the high nutritive value of young grass. Attention is also directed to the fact that, so far as the composition of young grass is concerned, there is no marked effect of species. Whilst the sandy pasture of the previous experiment consisted mainly of perennial rye grass and white clover, the clay pasture had creeping bent as the dominant species. The seasonal changes in mineral composition were in general agreement with the earlier results, in that the highest percentage of lime occurred in July, but the range was more restricted. The percentage of phosphate remained roughly the same. The results are discussed in connexion with the nutrition of grazing animals. G. W. ROBINSON.

Physical properties of soils. IV. Theory of capillary phenomena in soil. W. B. HAINES (J. Agric. Sci., 1927, **17**, 264—290; cf. B., 1925, 414, 1001).—The theory of the capillary behaviour of an "ideal soil" is further developed. Over a certain range of moisture there are alternative forms of water distribution. The theory is considered in relation to capillary rise and cohesion. The moisture distribution due to capillary rise can be derived from direct measurement of suction pressure. The pressure deficiency or suction necessary to draw an air–water interface into the pores of a soil characterises capillary behaviour over a considerable moisture range. The term "entry value" is applied to it. A size distribution curve for soil interstices can be derived from a complete suction curve. G. W. ROBINSON.

Biochemical processes influencing the transformation of phosphorus in podsol soils. O. K. ZIKHMAN-KEDROV (Pochvovedenie [Russia], 1926, **21**, 115—119).—The addition of lime to podsol soils stimulates the biochemical processes which liberate phosphoric acid from the organic material. The addition of chloroform, which renders the soil population inactive, prevents the production of soluble phosphate. The humic acid fraction primarily supplies the phosphorus. CHEMICAL ABSTRACTS.

High-dispersion phase of black alkali soils. A. A. SHOSHIN (Nature Agric. Arid Region U.S.S.R., [Russia], 1926, No. 1—2, 83—87).—Columnar alkali soil has a high-dispersion phase throughout its profile, increasing with the depth; it is 54 times as great as the dispersion phase of chernozem soil at a depth of 55—65 cm. The increase in dispersion runs somewhat parallel with the increase of sodium carbonate and the peptising agent. The lower horizons of the alkali soils, where the highly dispersed phase accumulated, contained an abundance of nutrient substances; it was specially rich in potassium and phosphorus. CHEMICAL ABSTRACTS.

Aluminium hydroxide and the "freezing up" of alkali soils during reclamation. W. T. MCGEORGE, J. F. BREAZEALE, and P. S. BURGESS (Science, 1926, **64**, 504—505).—Water used for leaching soils containing an excess of alkali salts often fails to percolate (the soil "freezes up") when the solute has been largely reduced, unless the irrigation water contains soluble calcium salts. When the concentration of the sodium salts approaches a minimum, the alkalinity rapidly increases owing to the formation of sodium hydroxide by progressive replacement and hydrolysis of sodium zeolite; aluminium then passes into solution as aluminate. The alkalinity is reduced by continued washing, proportionally more aluminium hydroxide being formed at the expense of the soluble aluminate. This, together with the almost complete dispersion of the clay colloids at these alkalinities, renders the soil practically impervious to water or air. A. A. ELDRIDGE.

Zeolite formation in soils. P. S. BURGESS and W. T. MCGEORGE (Science, 1926, **64**, 652—653.)—Zeolites in soils may be of very recent origin, and may even be in process of formation. The zeolite content of a soil can be increased by the addition of solutions of sodium aluminate and sodium silicate, compounds which are often present and in process of formation in black alkali soils. At strongly acid or alkaline reactions a high concentration of the component solutions is essential for the formation of the zeolitic gel, whilst in dilute solution combination occurs within a definite p_H range only; maximum precipitation occurs at p_H 5—7, whilst at p_H 3·6 the zeolite is completely soluble. The acid zeolite was synthesised from silicic acid and soluble aluminium and sodium, potassium, calcium, or magnesium salts, present in acid soils. The zeolite molecule is most stable under alkaline conditions. The formation of zeolites in alkaline soils is attributed to the presence

of sodium carbonate originating from calcium carbonate and sodium sulphate or chloride. A. A. Eldridge.

XVIII.—FERMENTATION INDUSTRIES.

Hydrogen ions in brewing processes. III. G. Hagues (J. Inst. Brew., 1927, **33**, 262—276).—During wort boiling the amount of protein matter coagulated is independent of hydrogen-ion concentrations more alkaline than p_H 4·0—5·0. On the acid side of this value less nitrogenous matter is precipitated. The amount of "total nitrogen" remaining in the wort after protein coagulation by boiling is independent of normal hop rates. The size of the coagulum particles is independent of p_H values more alkaline than approximately 5·0, but on the acid side of this value the size is very susceptible to this factor. The more acidly adjusted the original wort is in this region, the smaller is the coagulum particle in the boiled wort. Slightly larger particles are produced by aeration and agitation and by more concentrated worts. Except at p_H 4·0—4·5, the "total acidity" of a wort, titrated to absolute neutrality, changes on boiling. During boiling, alkaline substances are formed on the acid side of p_H 4·0—4·5, and on the alkaline side there is a production of acidic substances. The further removed from p_H 4·0—4·5 that the unboiled wort is, the more of either acid or alkaline substances are formed in solution. C. Ranken.

Electric charges on yeast, and hydrogen-ion concentration: their influence on attenuation and flocculation. F. Stockhausen (Woch. Brau., 1927, **44**, 121—124, 133—138).—In suspensions of clean bottom-fermentation yeast in water, which usually have a p_H value of about 6·5, the cells are positively charged, and in an electric field they travel towards the negative electrode. Owing to the mutual repulsion of the charged cells the yeast is in the so-called powdery or non-flocculating condition. If the hydrogen-ion concentration of the liquid is increased, the positive charge on the cells is reduced and disappears at p_H 3·8, at which point the cells show their maximum tendency to flocculate. At higher acidities the cells assume a small negative charge. In brewery wort the conditions are different owing to the presence of other colloidal matters, *e.g.*, proteins, which in water are negatively charged at p_H 6·5 and neutral at p_H 5·0—4·6. Yeast cells in wort may, by adsorbing negatively charged proteins, become neutral and flocculate at lower hydrogen-ion concentrations than would be the case in acidified water. This occurs at p_H 6·3 in hopped wort, at p_H 7·1 in wort boiled without hops, and at p_H 7·3 in unboiled wort. The importance of flocculation is that it causes an early deposition of the yeast, so that attenuation does not proceed so far as when the yeast is powdery and remains longer in suspension. Electrical factors have less play with top-fermentation yeasts. In aqueous suspensions the cells have only a small positive charge, and their isoelectric point is ill-defined at about p_H 4—6. The rising of the yeast to form the head in top fermentations is mainly due not to electrical causes, but to the rapid evolution of gas. J. H. Lane.

Malt extract evaporation plant. J. Weichherz (Chem.-Ztg., 1927, **51**, 273—274, 291—293).—In evaporation of malt extracts, it is found that, in the types of plant examined, a critical concentration is reached beyond which the efficiency of the system greatly diminishes. An illustrative series of measurements is given. L. M. Clark.

Characterisation of coal-tar dyes added to wine. R. A. Valentini (Boll. Chim. Farm., 1927, **66**, 161—164).—A sample of the wine (100 c.c.), rendered slightly alkaline with barium, potassium, or sodium hydroxide, is shaken with 20 c.c. of amyl alcohol and allowed to separate into layers. If the alcohol is violet, the presence of orchil is indicated; if pink, Biebrich Scarlet or roccelline; and if green, aminoazobenzene. If the alcohol is colourless, but on acidification turns pink, fuchsine or safranine is indicated; if yellow, aminoazobenzene, chrysoidine, or chrysaniline; or if violet, methyl violet or mauveine. Dyeing tests with wool and silk then serve to fix the nature of the actual basic dyestuff present. Similar tests are given for the acid dyestuffs, and Rota's method of analysis is described. The fact that fuchsine, sulphofuchsine, and most of the azo dyestuffs cannot be detected some time after being added to wine may be explained by the formation of insoluble compounds of the dye with normal components of wine, such as tannin, or as a result of alterations or diseases suffered by dyed wines, which are usually watered wines under the influence of foreign micro-organisms. T. H. Pope.

Patents.

Apparatus for industrial culture of ferments, yeasts, microbes, etc. C. Vigreux, Assr. to Établ. Poulenc Frères (U.S.P. 1,623,896, 5.4.27. Appl., 29.2.24. Conv., 17.3.23).—An apparatus for cultivating ferments and the like comprises a cylinder containing trays, means for circulating air at a controlled temperature through the cylinder, and means for introducing culture media and cultures to the trays, without opening the cylinder. T. S. Wheeler.

Fermentation processes. J. Van Loon (F.P. 611,663, 24.2.26. Conv., 25.2.25).—Per-compounds, such as benzoyl peroxide, are added to fermenting material. L. A. Coles.

XIX.—FOODS.

Variations in the susceptibility of the fat in dry whole milks to oxidation when stored at various temperatures and in various atmospheres. G. E. Holm, P. A. Wright, and G. R. Greenbank (J. Dairy Sci., 1927, **10**, 33—40).—The initial change is greatly modified by the enzymes present, which are largely removed by clarification. Free moisture has a retarding effect on susceptibility to oxidation; the optimum moisture content is 2—3%. Some compound containing loosely-bound oxygen causes oxidation of the fat in a vacuum. Chemical Abstracts.

Acidity of wheat and flour. H. L. Thompson (Amer. Miller, 1927, **55**, 160).—Little lactic or acetic acid appears to be present in normal flour, the acidity being due to acid phosphates and water-soluble phosphorus, but there is much acetic and lactic acid in unsound flour. Chlorine-bleached flours show an increased acidity. The acidity increases regularly with increasing

ash content. The acidity of various grades of flour is recorded. CHEMICAL ABSTRACTS.

Determination of glutenin in wheat flour. M. J. BLISH, R. C. ABBOTT, and H. PLATENIUS (Cereal Chem., 1927, **4**, 129—135).—8 g. of flour and 0·2 g. of crystallised barium hydroxide are digested for 1 hr. with 50 c.c. of water with frequent shaking, and made up to 205 c.c. with 96% methyl alcohol, the additional 5 c.c. being added to correct for the volume of the flour. After the starch has settled, the supernatant liquid is at once poured off through a cotton plug and 50 c.c. are withdrawn for Kjeldahl nitrogen determination. The difference between the total protein and that in the extract, each calculated from the nitrogen by using the factor 5·7, gives the percentage of glutenin in the flour. The results are in close agreement with those obtained by the methods of Sharp and Gortner (B., 1924, 29) and of Blish and Sandstedt (cf. Cereal Chem., 1925, **2**, 57—67). F. R. ENNOS.

Durum wheats. H. VOGEL and C. H. BAILEY (Cereal Chem., 1927, **4**, 136—149).—Durum wheat flour contains a higher average percentage of protein than flour from the vulgare wheats, but the ratio of glutenin to protein is about the same in each case (0·37). The quality constants of extracted suspensions of durum wheat flour, which average 2·87, are within the range of those of the vulgare varieties, and there is no correlation between this constant and the protein content. Extensibility tests show a lower value for doughs from the durum wheats. The two types of flour are most readily distinguished by the lower viscosity of the leached and acidulated suspensions of the durum variety. F. R. ENNOS.

Ash of hard spring wheat and its products. B. SULLIVAN and C. NEAR (Ind. Eng. Chem., 1927, **19**, 498—501).—Complete analyses of the mineral constituents of the ash derived from hard wheat by the hydrogen peroxide method and heating at 620° (cf. B., 1927, 313) show that hard and soft wheats require different treatment to give a satisfactory ash. Hard varieties require longer heating and a higher temperature, but this should not exceed 630° or fusion will occur, whilst at 600° destruction of carbonaceous matter is incomplete. Hard wheats have, in general, a higher phosphorus, a higher magnesium, and a lower potassium content than the soft grades. The phosphorus content tends to decrease with refinement of the flour, the actual compounds present being pyro- and meta-phosphates, the former predominating. The ash is accordingly always alkaline in character, the acidity often recorded being due to partial hydrolysis of the flour and consequent extraction of amino-acids. Chlorine, sodium, and sulphur compounds were found to be present in small amounts only, which is accounted for by the fact that they are present in the wheat in organic combinations which volatilise during the ashing process. In flours, the lipoid content is 20—50% higher than the fat content, as determined by ether extraction, but for middlings, bran, and germ, ether extraction gave at least as high results as the lipoid determinations. H. J. DOWDEN.

Alcohol in bread. V. SIMPSON and N. KNIGHT (Amer. Food J., 1926, **21**, 423, 443).—The percentage of alcohol in bread varied from 0·05% to 1·9%, the latter value being that for home-made bread. CHEMICAL ABSTRACTS.

Determination of starch in potatoes. G. RANKOFF (Z. Unters. Lebens., 1927, **53**, 138—146).—0·3—1·0 g. of finely-powdered potato starch (or dried potato) is shaken up with 100 c.c. of distilled water, and the resulting suspension heated on a calcium chloride bath at 110—115° for 20 min. The solution after cooling is diluted to 250 c.c. and filtered. 50 c.c. or 100 c.c. of the filtrate are treated with 60 c.c. of saturated sodium sulphate solution and sufficient iodine solution (5 g. of iodine and 10 g. of potassium iodide per litre) is added to give a yellow supernatant liquid. The precipitate is stirred and, after settling for 10—15 min., is filtered through a Gooch crucible containing asbestos covered by pumice stone, the coarser grains being in the upper layer. The precipitate, after washing with water containing sodium sulphate and iodine, is treated with 20 c.c. of sulphuric acid solution (1 : 3), and heated at 110—115° until all the iodine has been removed. The starch is then oxidised by means of boiling potassium permanganate solution. The liberated carbon dioxide is absorbed in soda lime tubes and weighed. The weight of starch is calculated by multiplying the weight of carbon dioxide produced by the factor 0·61393. H. J. DOWDEN.

Oxidising systems of fruits. W. V. CRUESS and W. Y. FONG (Fruit Products J., 1926, **6**, [3], 13—15).—The hydrogen-ion concentration markedly affects the inactivation temperatures of the oxidising systems of pears, peaches, prunes, oranges, apricots, and apples; the critical points are at about p_H 3·0 and p_H 10—11. Steaming for 3 min. at 100° destroys the peroxide, peroxydase, and catalase in halved apricots. Sulphurous acid checks the browning of apricots, pears, cherries, and peaches by inactivating the organic peroxide rather than the peroxydase; the action under normal conditions is not permanent. CHEMICAL ABSTRACTS.

Proteins. I. Amino-acids of soya bean meal. II. Amino-acids of herring meal. K. SHITA and T. YANAGIGAWA (Rep. Imp. Ind. Res. Inst., Osaka, 1926, **7**, [9], 1—16).—I. The nitrogen distribution of soya bean meal, hydrolysed by hydrochloric acid, was: amide-nitrogen 10·00, humin-nitrogen 4·83, diamino-nitrogen 26·43, monoamino-nitrogen 58·74%. Glutamic acid, aspartic acid, leucine, proline, and phenylalanine were isolated. II. Results for herring meal were: amide-nitrogen 3·18, humin-nitrogen 8·01, diamino-nitrogen 33·06, monoamino-nitrogen 55·75%. Alanine, leucine, proline, and phenylalanine were isolated. CHEMICAL ABSTRACTS.

Removal of gas from boiler-feed water. W. TÖLLER (Z. angew. Chem., 1927, **40**, 260—262).—A review of modern methods of removing oxygen from boiler feed water. Filtration through bundles of fine steel turnings appears to be the most satisfactory in that the filter can be introduced between the pump and the boiler so that there is no danger of re-absorption of oxygen during pumping. Freshly ignited wood charcoal is also an efficient deoxidiser, but is more expensive in use in that frequent heating is necessary to regenerate its absorptive properties. A. R. POWELL.