BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

MAY 14, 1926.

I.—GENERAL; PLANT; MACHINERY.

Enclosed continuous filter. J. F. Wait (Ind. Eng. Chem., 1926, 18, 295—297).—A perforated drum supporting a filter cloth revolves within a shell, fitted with external controls and sight-glasses, in which the liquid to be filtered is maintained by pressure at the required level. The drum contains hollow sections connected to the filtrate outlet and to a supply of air or vapour under pressure. A scraper removes the cake from the cloth and drops it into a draining hopper. The cake is dried on the cloth by air or vapour blown through it, or preferably by a circulation method in which the air is withdrawn with the filtrate and returned to the filter vessel in a closed circuit. The cake produced by this method is considerably drier than that formed in a leaf filter or by a centrifuge. The process is applicable to volatile liquids, such as petroleum distillates, and enables filtration to be carried on under vacuum or pressure at elevated temperatures, which is a great advantage in the treatment of viscous oils or liquids.

B. W. Clarke.

New method of conducting filtration tests. D. R. Sperry (Ind. Eng. Chem., 1926, 18, 276—279).—The vertical movement of a float, situated in a cylindrical vessel in which the discharge from an experimental filter-press is collected, actuates a pen which records automatically the time–discharge curve of the process on a cylinder rotated at one revolution per hour by clockwork. This reduces the time actually required for observation of filtration tests and gives the time–discharge curves plotted ready for use. It has been operated successfully in filtration tests on syrups, clay slips, varnishes, plating liquors, etc., and may be adapted to the study and control of large-scale filtering operations.

B. W. Clarke.

Fractionating column calculations. T. S. Carswell (Ind. Eng. Chem., 1926, 18, 294—295).—The height of the equivalent theoretical plate, *i.e.*, the length of packing required to produce equilibrium between the vapour and liquid in the fractionating column, is shown to be directly proportional to the radius of the rings used for packing and independent of the radius of the column. It varies with the nature of the material in the column according to the equation $H.E.T.P.=kMd/T$, where M is the average molecular weight of substances under distillation, T the temperature of distillation, d the density of backflow in the column at the distillation temperature. This is confirmed by experimental data from the distillation of alcohol–water mixtures, benzene–toluene mixtures, etc. B. W. Clarke.

See also A., April, 343, **Air bubble viscosimeter** (Barr). 345, **Adsorption of gases by activated charcoal at very low pressures** (Rowe). 346, **Theory of adsorption by carbon** (Ruff); **Adsorption by coconut charcoal of saturated vapours of pure liquids. Adsorption by coconut charcoal from mixed vapours** (Tryhorn and Wyatt). 347, **Sorption of vapours by alumina** (Munro and Johnson); **Quantitative adsorption analysis by Wislicenus' method** (Lorenz). 365, **Inactivation of catalysts during transformation of carbon compounds** (Zelinski); **Fourth report on contact catalysis** (Taylor). 377, **All-metal mercury-vapour pump** (Kaye); **Continuous dialysis or extraction apparatus** (Hanke and Koessler); **Wiegner's elutriation apparatus** (Gessner). 378, **Nephelometer and colorimeter** (Dold); **Turbidimeter** (Baylis).

Bituminous coal and coke for generating steam in a low-pressure boiler. Augustine, Neil, and Myler, jun.—See II.

Patents.

Centrifugal apparatus. E. C. Duhamel, and Comp. Gén. des Industries Textiles (E.P. 247,092, 6.8.25. Conv., 2.3.25).—Deposited solid matter is removed from the non-perforated bowl of a centrifugal machine, intermittently but without stopping the rotation, by means of a scraper operated like a lathe tool, *i.e.*, a small narrow knife is given a reciprocating axial motion the full depth of the bowl and is gradually fed radially into the deposit. The axis of the machine is preferably horizontal, the scraper is situated in the upper part of the bowl, and the detached material drops into a guide which deflects it outwards from the bowl. B. M. Venables.

Centrifugal machines and processes. Sharples Specialty Co., Assees. of L. D. Jones and A. U. Ayres (E.P. 233,327, 15.4.25. Conv., 1.5.24).*—The patent relates to a centrifugal apparatus in which the treated substance is discharged in dispersed form, and in which the atmosphere within the separator may be regulated to control the condition of the treated substance. The bowl, 1, is supported inside the closed casing, 10, and has outlets, 3, 4, which discharge into chambers, 8, 7. The pulley, 25, of the machine is driven by the pulley, 22, operated by an external motor. The mechanism for transmitting motion to the bowl comprises a part, *e.g.*, the hollow shaft, 26, which is supported firmly in its bearing, 27, and another part, *e.g.*, the spindle, 60, which is free to vibrate with the bowl during its rapid rotation. The shaft, 26, may be sealed by packings, 31, 32, with a ring, 33, between them providing a chamber, 34, around the shaft. Passages, 36, provide communication between the chamber, 34, and a groove, 35, on the ring connected by a passage, 38, to a pipe, 39, whereby pressure in the chamber may be regulated or the chamber may be supplied with liquid according to the working of the machine. A seal of the labyrinth type may also be used, or a liquid seal as shown in Fig. 7. A sleeve on the shaft carries a disc, 52, provided with impeller vanes, 54, to propel fluid in the chamber, 53, in a direction opposite to that in which the leakage pressure would tend to move it. Fig. 5 shows the connexions whereby the separator can be exhausted by the vacuum pump, *V*, or placed under pressure by the pump, *P*; or a gas may be supplied by the pump, *P*, and partly withdrawn by the pump, *V*; *S*, S^1 are supply tanks and *D* discharge tanks. Low pressure may be used to cause evaporation, or prevent foaming and oxidation, and higher pressure may be used to prevent escape of fumes or dissolved gases. An inert atmosphere may be used to prevent chemical change or the latter may be effected by a chemically active gas. R. B. Clarke.

FIG. 1.

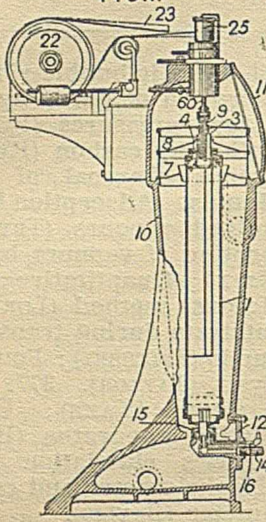


FIG. 4.

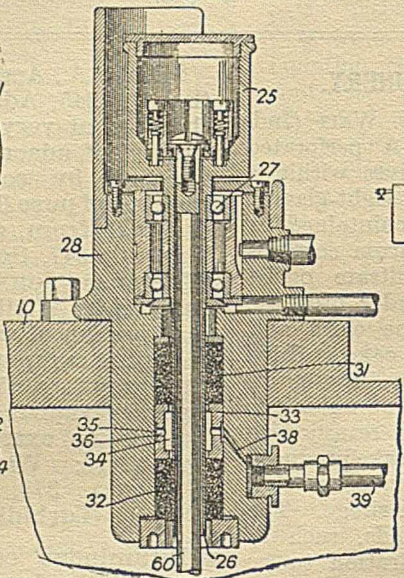


FIG. 5.

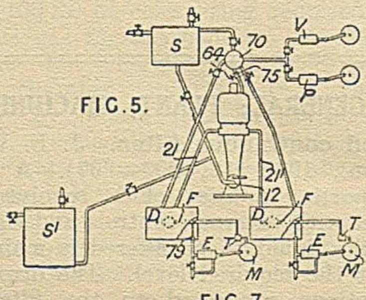
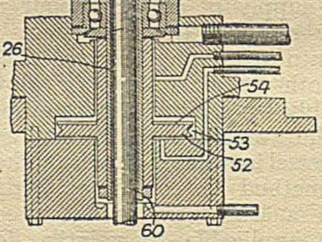


FIG. 7.



Machine [horizontal centrifuge] for separating liquids from solids. H. C. Behr (U.S.P. 1,565,002, 8.12.25. Appl., 24.7.22).—A rotating horizontal or inclined shaft is fitted with two concentric conical screens which rotate in the same direction at different rates, the outer being the faster. The mixed liquid and solids to be treated are introduced axially at the small end of the cones and pass through the intermediate space towards the bases under the action of centrifugal force and of screw threads cut in the inner screen. The liquid passes through the outer screen, while the solid is withdrawn at the bases of the cones. Fan blades are attached to the shaft to force air from inside the inner screen through the solid so as completely to free it from liquid and also to assist the passage of the material through the apparatus. Baffles are also provided which distribute the material evenly on the screens and so prevent undue strain on the shaft.
T. S. Wheeler.

Centrifugal separator. W. C. Laughlin, Assr. to Laughlin Filter Corp. (U.S.P. 1,572,612, 9.2.26. Appl., 2.6.25; cf. E.P. 235,916; B., 1926, 255).—A centrifugal bowl with horizontal axis has concentric discharge throats at each end, and a peripheral discharge at some point between the ends surrounded by a collector.
B. M. Venables.

Tube mills for grinding or crushing. Wicking'sche Portland-Cement & Wasserkalkwerke, Assees. of A. Andreas (E.P. 241,174, 14.9.25. Conv., 11.10.24).*—The apparatus comprises a coarse-grinding chamber and fine-grinding chamber with an intermediate transferring and screening device. The partly ground material passes through the apertures, *f* (Fig. 1), in the end wall, *g*, of the coarse grinding chamber into the transfer chamber, *c*, and through the ports, *n*, into the annular sifting chamber, *s*, which is shown (see Fig. 2) divided into eight compartments by alternate impervious

FIG. 1.

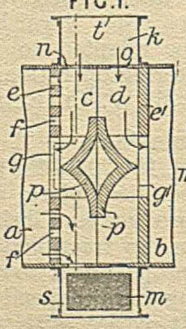
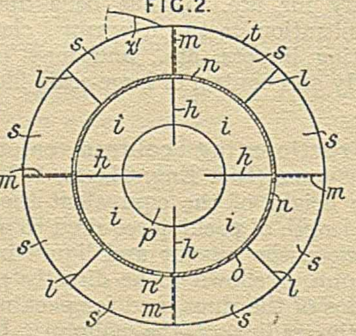


FIG. 2.



walls, l, and screens, m. Material that passes through the radial screens, m, emerges from the sifting chambers through ports, o, into the right-hand side, d, of the transfer chamber, and, striking the deflector, p, enters the fine-grinding chamber through the central aperture, g^1, in the end wall. The material that is too coarse to pass the screens, m, returns through the ports, n, to the left-hand side, c, of the transfer chamber and is deflected back into the coarse-grinding chamber through the central aperture, g. The screens may be changed or cleaned through dust-tight flaps, z^1; if desired the screens and walls, m and l, may be curved as blades and the two transfer spaces, c and d, may be separated by an impervious wall. B. M. Venables.

Ball and ring and roller and ring mills for grinding and crushing. C. E. V. Hall (E.P. 247,756, 10.3.25).—The mill is of the pendulum-roller and ring type, the pendulum arms rotating in ball bearings carried by a spider. The spider and driving pulley are mounted on a sleeve shaft running on a fixed central shaft.

B. M. Venables.

Grinder and pulveriser. H. J. Shelton (U.S.P. 1,572,692, 9.2.26. Appl., 17.7.22).—The housing of the apparatus comprises a main casting and a side casting hinged to it. A grinding ring rotates within the main casting and a pair of grinding rolls make contact with the ring at diametrically opposite points, each being mounted on a shaft carried by an arm pivoted on the side casting. The grinding rolls are kept in position against the grinding ring by a spring. H. Moore.

Ore-grinding mill. W. N. Beyerle (U.S.P. 1,573,032, 16.2.26. Appl., 4.3.24).—A number of balls ride in a circular groove. A weighted upper member with a similar circular groove rides on the balls. The material to be ground is introduced through a hopper in the centre of this upper member and when sufficiently fine emerges through vertical screens, surrounding the outer circumference of the grooves, into an annular space. The portions of the mill are held together so as to yield sufficiently when the upper member is rotated.

W. N. Hoyte.

Extraction and recovery of volatile liquids. E. A. Ironside (E.P. 246,930, 8.11.24).—In an apparatus for extraction of greases etc. by means of a volatile solvent, the solvent is removed from both the extract and from the residual material by means of steam or hot air, the bulk of the solvent being recovered in a condenser, connected with a decanter in which condensed water is separated. At the end of the distillation stage, the vapours which are weak in solvent are passed through an adsorbent, from which the solvent is subsequently removed by heating and recovered in the condenser.

B. M. Venables.

[Dust] containers and means for emptying them. W. Carpmael. From Farbenfabr. vorm. F. Bayer & Co. (E.P. 247,744, 24.2.25).—A container filled with dust (coal, cement, dyes) is emptied by means of one or more rotating jets of air within the lower part of the container. The container is made air-tight so that the dust, having been loosened by the air jets, is expelled by the accumulated air pressure. B. M. Venables.

Adsorbent material [from silica gel]. C. S. Teitsworth, Assr. to Celite Co. (U.S.P. 1,570,537, 19.1.26. Appl., 27.3.24).—Powdered diatomaceous earth, pumice, or other solid porous substance is mixed with sodium silicate solution, and silica gel is formed by addition of hydrochloric acid. The gel which contains the earth (2—20% on the weight of the gel) dispersed through it has an adsorbent power very much greater than that of ordinary silica gel. For example, it will adsorb 83% of its weight of water from air saturated at 20°. Other inorganic gels such as aluminium hydroxide gel may be used.

T. S. Wheeler.

Heating gases [air] for drying. W. A. Darrah (U.S.P. 1,571,575, 2.2.26. Appl., 25.4.23).—An apparatus for heating indirectly gases such as air which are to be used in dryers, consists of a series of combustion chambers in which a fuel such as oil is burned. The walls of these chambers are formed of a highly conducting material, such as carborundum, while those of flues leading from them which are less highly heated are of metal. The air to be heated is drawn, in counter-current to the flue-gases, through conduits in contact with the combustion chambers and flues. All the passages and flues are tortuous and are fitted with baffles so that eddies are set up. The walls between the air conduits and flues are made of highly conducting material, but walls of material of low heat conductivity, such as firebrick, are also provided in the air passages, and are heated by radiation from the conducting walls. A 70—90% thermal efficiency is attained in practice.

T. S. Wheeler.

Combined spreading and scraping mechanism for distillation apparatus. W. M. Grant, Assr. to Illinois Anthracite Corp. (U.S.P. 1,569,478, 12.1.26. Appl., 8.11.23).—The mechanism comprises a moving hopper which feeds material into a retort or oven, and means for levelling and smoothing the charge as it is fed in.

A. B. Manning.

Fractional condensation. J. E. Bell, Assr. to Sinclair Refining Co. (U.S.P. 1,573,129, 16.2.26. Appl., 23.3.22).—The vapours to be condensed are brought in contact with pipes containing a circulating cooling medium, the temperature of which is regulated by introduction of fresh medium.

W. N. Hoyte.

Filtering process. H. S. Coe, Assr. to Cycle Co. (U.S.P. 1,574,558, 23.2.26. Appl., 26.1.20. Renewed 29.10.25).—A number of filtering tanks, each with a horizontal filter bottom arranged so that a settling action also takes place, are arranged in a series so that the solid matter (thick pulp) collected on any one (say the first) is continuously removed and mixed with the filtrate from another tank (say the third) and re-filtered in another tank (say the second). B. M. Venables.

Apparatus for effecting catalytic gas syntheses under pressure. G. L. E. Patart (F.P. 598,966, 25.5.25).—Reacting gases pass under pressure in the same direction through a horizontal tube containing catalytic material. L. A. Coles.

Production of catalysts for hydrogenation processes. J. D. Riedel A.-G. (G.P. 424,067, 24.9.20).—Nickel or cobalt salts, or mixtures of these with copper salts, are reduced in a pure, non-basic liquid medium which is stable at high temperatures, such as molten naphthalene, or toluene or acetone, or their hydrogenation products, such as tetrahydronaphthalene, methyl*cyclo*hexane, or *iso*propyl alcohol, and the catalyst is subsequently separated from the medium and from volatile reaction products by distillation. L. A. Coles.

Preventing the deposition of adherent crystals [scale] upon metal surfaces. Antiscale A.-G. zur Verwertung industrieller Patente (F.P. 599,188, 8.6.25. Conv., 3.7.24).—The walls of vessels containing solutions from which crystals may separate are subjected to the action of a constant, variable, or intermittent magnetic field, whereby weak electric currents are induced in the liquid. L. A. Coles.

Centrifugal separator. W. C. Laughlin, Assr. to Laughlin Filter Corp. (U.S.P. 1,572,611, 9.2.26. Appl., 21.6.24).—See E.P. 235,916; B., 1926, 255.

Producing gels for catalytic and absorbent purposes. W. A. Patrick (U.S.P. 1,577,186, 16.3.26. Appl., 28.2.20).—See E.P. 159,508; B., 1922, 812 a.

Preparing catalytic agents. W. A. Patrick, Assr. to Silica Gel Corp. (U.S.P. 1,577,187–8, 16.3.26. Appl., 18.11.22).—See E.P. 212,034–5; B., 1924, 360.

Drying apparatus. O. Söderlund, T. Boberg, and N. Testrup, Assrs. to Techno-Chemical Laboratories (U.S.P. 1,577,545, 23.3.26. Appl., 9.6.24).—See E.P. 219,792; B., 1924, 815.

Tanks for treatment of liquids or solids mixed with liquids. R. O. Stokes (E.P. 248,679, 3.10.24).

Condensing and/or cooling apparatus. E. H. Beckett (E.P. 248,872, 24.12.24).

Liquid-cooling towers. O. Sorge (E.P. 249,420, 6.10.25. Conv., 28.5.25).

Bricks containing metals or metal oxides (G.P. 422,715).—See IX.

Electrical precipitation (U.S.P. 1,574,237 and 1,575,165).—See XI.

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

Influence of moisture on the spontaneous heating of coal. J. D. Davis and J. F. Byrne (Ind. Eng. Chem., 1926, 18, 233—236).—The spontaneous heating of Pittsburgh and Sharon coals was examined in an adiabatic calorimeter, the initial temperature being 70°. The coals as received, containing 2·2% and 11·8% of moisture respectively, did not heat in dry oxygen; in oxygen saturated at room temperature the coals heated or cooled depending on the rate of circulation of oxygen and the resulting rate of moisture evaporation. Curves are given showing the heating of the coals with varying degrees of moisture in dry oxygen. With coals dried at 140° for 22 hrs. the heating proceeded slowly from 70° to 97°, where it tended to stop, due either to the complete removal of moisture or to a change in the colloidal state of the coal. It is concluded that it is better to store coal moist than dry. A. C. Monkhouse.

Indirect determination of the calorific value of coal. J. Geidel and W. Rehwinkel (Chem.-Ztg., 1926, **50**, 116—117).—A method of calculating the calorific value of a coal is described, based on the constancy of the calorific value of the pure coal substance in all coals of the same origin. Knowing this value (R) for a particular mine or field, the calorific value (H) of a coal from that mine or field can be calculated from a determination of its ash (A) and moisture (W), thus: $H=R[100-(A+W)]/100-6W$, both H and R being net values. The value of R is found from one, or better, several exact calorimetric determinations for the coal mine or field in question. The error of the method does not in general exceed 1%. The results obtained for a number of coals of various origins are tabulated and compared with the directly determined calorimetric values, as well as with the values given by other indirect methods. A. B. Manning.

Theoretical and recorded pressures in oxygen bomb determinations [of calorific value]. M. J. Bradley, C. Z. Rosecrans, and R. M. Corbin (Ind. Eng. Chem., 1926, 18, 307—309).—In order to determine the limits of weight of fuel and initial oxygen pressure which can be safely used, experiments were made with crude petroleums, coals, benzene, kerosene, and benzoic acid; the pressures developed within the oxygen bomb during combustion were determined and photographic records made. A heat loss of 50% is assumed before the maximum temperature is attained. Rate of combustion and therefore the maximum pressure may be controlled by the condition of the fuel and the size and shape of the containers in the bomb. For kerosene and crude benzol, the weight of material should not exceed 1·5 g., and the initial oxygen pressure should be as low as possible. By accurately determining the volume of the bomb and the Bourdon gauge, and leading 100 c.c. of the gases produced on combustion into an Orsat gas apparatus, and determining the carbon dioxide, the carbon content of the original material may be calculated. Further, by cooling the bomb to the original temperature the loss in volume due to combustion of hydrogen may be directly read from the gauge. D. G. Hewer.

Sampling and examination of mine gases and natural gas. G. A. Burrell, F. M. Seibert, and G. W. Jones (U.S. Bur. Mines, Bull. 197, 1926, 108 pp.).—A revision of Bull. 42, in which the latest laboratory methods for the analysis of mine and natural gases are described, together with the latest types of apparatus (cf. Burrell and Seibert, B., 1913, 1096 ; 1914, 808 ; 1915, 267 ; 1916, 947). A large number of illustrations are given of apparatus designed for special purposes, *e.g.*, for the complete and accurate analysis of mixtures containing small amounts of different constituents and of mixtures rich in methane, hydrogen, and carbon monoxide ; for the rapid determination of methane and carbon dioxide in mine air ; and for the determination of carbon dioxide and oxygen in connexion with ventilation problems. A. R. Powell.

Value of bituminous coal and coke for generating steam in a low-pressure cast-iron boiler. C. E. Augustine, J. Neil, and W. M. Myler, jun. (U.S. Bur. Mines, Tech. Paper 367, 1925, 45 pp.).—By-product coke, Pittsburgh high-volatile lump coal, and Lower Kittanning medium-volatile coal having calorific values of 11,720—11,890, 13,150—13,750, and 12,970—13,570 B.Th.U./lb. respectively, were burned in a hand-fired low-pressure cast-iron boiler of a size suitable for heating large buildings with the object of comparing the relative steaming values of the fuels and of separating the heat losses in order to determine the effect of the method of firing and of structural changes in the boiler when operated at ordinary capacities. The firing period was varied from 60 to 20 min. to suit the different rates of steaming, which were from 50% to 125% of the rated capacity of the boiler. At low rates of steaming, the steaming values (*i.e.*, thermal efficiency × calorific value) of the bituminous coals and of the coke were about equal, but at high rates, that of the coke was about 90% of the value of the bituminous coals. The thermal efficiencies obtained using coke, Pittsburgh coal, and Lower Kittanning coal varied from 66% to 76%, 65% to 74%, and 66% to 72% respectively, Pittsburgh coal showing the lowest and coke the highest efficiency at low rates of steaming. The heat transferred to water per square foot of heating surface per hour varied from 3400 to 10,000 B.Th.U. Other things being equal, the nearer to the fuel bed the secondary air is supplied and the more thoroughly it is mixed with the rising combustible gases, the more rapid and efficient will be the combustion. Wing walls leaving a vertical slot in the centre line of the boiler are rather more efficient as a mixing device in the combustion chamber than chequer-work. The use of such a mixing device also helps materially to reduce smoke. The pressure drop of air through the fuel bed was about the same for coke and Pittsburgh coal and was about half that required for equal ratings with Lower Kittanning coal, which ignited less readily, burned more unevenly, and required more frequent attention. A. W. Hothersall.

Determination of unburnt carbon from the analysis of flue-gases. W. R. Chapman (Fuel 1926, 5, 128—129).—The amount of unburnt carbon lost during an industrial heating operation can be calculated from the analysis of the flue gases and of the coal, using the following equation :—% of carbon unburnt=

$$100+37{\cdot}5\frac{\epsilon}{a}-\frac{1}{a}\left[\frac{(r+s+v)(1140\beta+42{\cdot}8\delta-142{\cdot}5\gamma}{100-4{\cdot}8r-2{\cdot}9s-4{\cdot}8t+0{\cdot}9u+2{\cdot}8v}\right]$$

where a, β, γ, δ, ϵ represent the percentage in the coal, calculated on the ash-free, dry basis, of C, H, O, N, and S respectively, and r, s, t, u, v represent the percentage in the flue-gases of CO_2, CO, O_2, H_2, and CH_4 respectively. A. W. Hothersall.

Determination of the degree of swelling of coking coals. M. Dolch (Brennstoff-Chem., 1926, 7, 69—73).—A simple apparatus is described for determining the apparent volume of a sample of coke by displacement, using fine lead shot as a filling material. It is suggested that the determination should be included in the course of the ordinary examination of coking coals, following the coking test, the same coke sample being afterwards used for the ash determination. At the same time the density of the coal is determined on a number of pieces of suitable size, or, if data are available, by calculation from the ash content. The degree of swelling is expressed by the ratio coke volume/coal volume. The results for 7 gas coals are tabulated. In general the degree of swelling determined on a finely powdered coal differs considerably from that obtained by coking a single piece of the same coal (cf. Krönig, B., 1926, 160). A. B. Manning.

Research on low-temperature carbonisation at the Sarre mines. J. St.-Claire Deville (Chim. et Ind., 1926, 15, 163—172).—Experiments have been carried out with two plants, one a small retort of the Salerni type of 100 kg. capacity, the other a setting of two larger Salerni retorts, each of 15 tons throughput per day. On carbonising a washed fine coal high in moisture practically the whole of the water is evolved before oil and gas begin to appear. Once started, however, the evolution of the tar proceeds rapidly (95% within an hour with the smaller apparatus) and is complete when the temperature has reached 500°. Raising the temperature of the semi-coke further yields only a gas rich in hydrogen, and some ammonia. Details of working and some difficulties met with in the operation of the larger plant are described. The washed fine coal, containing 8% of ash on the dry material and 15—20% of moisture, yields 50 kg./ton of a heavy tar, high in tar acids and poor in paraffin wax, and nearly 100 m.^{3} of a rich gas containing 40 g./m.^{3} of crude light oil, which, on refining, gives 75% of its volume of a good quality motor spirit. A schist containing bands of vitrain (60—65% of ash, 16—18% of volatile matter, and 2% of moisture)

yielded 40—50 litres of a light tar with 28% of phenols, and rich in lubricating oils and solid paraffins. The economic aspect of low-temperature carbonisation is briefly dealt with; the process can only be economically successful when applied to fuels of poor quality, similar to those mentioned above.
A. B. Manning.

Combustibility of blast-furnace coke. R. A. Sherman and S. P. Kinney (Fuel, 1926, **5**, 98—105).—The combustibility of coke as determined by exploring the hearth zones of blast furnaces and of an experimental furnace by sampling the gases at intervals across the hearth (cf. Sherman and Blizard, B., 1923, 436 A; Royster and Joseph, B., 1924, 470) is not greatly influenced by the coking time, specific gravity, porosity, volatile matter, or the coking temperature. The size of the pieces, however, has a marked effect on the combustibility. The size of the pieces of coke which reach the tuyères of a blast furnace will be determined by the resistance of the coke to impact and abrasion. Such variations as were found in similar sizes of various cokes were so slight that it is improbable that they would make any material difference in furnace operation. There is no definite relation between the character of the coke and its combustibility in carbon dioxide as determined by Perrott and Fieldner (Amer. Soc. Testing Materials, June, 1923). The available data show considerable variations in the combustibility of various cokes in carbon dioxide, but they show no apparent relation to the actual operating data. The correlation of laboratory tests on the combustibility of coke in air and in carbon dioxide with actual furnace conditions is difficult if not impossible.
A. W. Hothersall.

Coal gas condensation. T. H. Prater (Gas J., 1926, **173**, 544—547).—Coal gas condensation is reviewed with special reference to the hydrocarbon content of the cooled gas. Shock cooling in water-cooled condensers yields tar of higher water content than slow cooling in atmospheric condensers, and when the respective tars are distilled, although on the dry basis they contain similar proportions of "light oil," the water-cooled condenser tar yields more "light oil" distillate up to 170° because of the enhanced "steam distillation effect" of its greater water content. Rapid condensation is more efficient in the removal of naphthalene than slow condensation over the same temperature range. Laboratory experiments on the washing of gas at various temperatures with tar from different sources were made. Washing at 80°, except with tar previously distilled to 170°, materially increased the hydrocarbon content of the gas. Below 80°, the results were dependent on the "light oil" content of the tar; under favourable conditions an improvement was effected but generally the process was detrimental.
S. Pexton.

Elimination and recovery of phenols from crude ammonia liquors. R. M. Crawford (Ind. Eng. Chem., 1926, **18**, 313—315).—At three coke-oven installations in America the phenols are now extracted from crude ammonia liquor by washing with benzol. This operation is performed in two large towers in series, the benzol being sprayed upwards from the bottom through the descending ammonia liquor with which the towers are filled. The phenolated benzol is drawn off from the top of the second tower and is sprayed through caustic soda in two similar but smaller towers. The sodium phenoxide solution is circulated through one tower only till saturated. It is then drawn off and worked up as usual, the weaker phenoxide from the second tower being transferred to the first and fresh caustic soda added to the second. A portion of the benzol is continuously by-passed from the circuit and passed through sulphuric acid to remove pyridine bases. The crude phenol finally produced contains about 50% of phenol and 26% of cresols. With liquor containing 2 g. of phenols per litre 16·6 lb. of crude phenol are recovered per 1000 gals. with a loss of 5 lb. of benzol. The process removes difficulties in the disposal of ammonia-still effluent caused by phenols.
C. Irwin.

Properties of typical crude oils from the producing fields of the Western Hemisphere. A. J. Kraemer and L. P. Calkin (U.S. Bur. Mines, Technical Paper 346, 1925, 43 pp.).—A compilation of the more important chemical and physical characteristics of crude oils produced in Canada, Mexico, Trinidad, Venezuela, Argentina, Colombia, and Peru. For comparison the analyses of typical crude oils from the chief producing districts of the United States are also given. Considered broadly the Canadian oils have a high gasoline and low sulphur content. The Mexican oils are divided into two classes according to the geographical position of the fields and known as Northern heavy oil and Southern light oil. These asphaltic crudes are all highly sulphurous. Trinidad oils show variation between different fields, the sulphur varying from 0·3% to 2·6% and gasoline from 11 to 50%. Although the Argentine oils are similar chemically two samples show considerably less volatile components than the other two. Two samples each from Venezuela, Colombia, and Peru are tabulated, one from Peru showing a sulphur content of 0·02% and containing 43% of gasoline.
S. Bowman.

Industrial requirements for dry cleaner's naphtha. L. E. Jackson (Ind. Eng. Chem., 1926, **18**, 237—238).—The necessary properties of the naphtha are discussed, and the following specification is proposed:—Free from water; water-white colour; negative doctor test; not more than 2% of unsaturated compounds; distillation range 138—204°; acidity nil; aromatic content nil; sweet odour.
W. N. Hoyte.

New process for regeneration of spent decolorising powder. L. Gurwitsch (Kolloid-Z., 1926, **38**, 247—248).—A new method for regenerating decolorising powder used in the mineral oil industry, which avoids its removal from the filter, consists of extraction with a mixture of benzene and alcohol, and subsequent heating to about 150°. The extractive power of a solvent depends on its heat of wetting. Alcohol has a comparatively high heat of wetting (17·2 cal./g. against "Floridin S"), but is not a good solvent for the impurities it is desired to extract. On the other hand benzene is a bad "wetter" but a good solvent. The combination of the two thus effects satisfactory extraction. By the application of this method the same sample of "Floridin" was used for about 30 operations without any marked diminution in its decolorising power.

N. H. Hartshorne.

Machinery lubricating oils. J. Swoboda (Petroleum, 1926, 22, 247—253).—The most important qualities of a lubricant are its oiliness, or property of clinging to the lubricated surface, and its viscosity, or internal friction. The greater the viscosity the less the expenditure of lubricant, and the less it is liable to be displaced from between the bearing surfaces, but the greater is the friction. The oil should have minimum viscosity consistent with sufficient oiliness to ensure adherence to the rubbing surfaces. For greater speeds of rubbing surfaces oils of lower viscosity are required. The oil must resist change from the action of the air and high temperatures, must have a reasonably high flash point, must be quite free from inorganic acidity, and not have excessive organic acidity. Its boiling point should be high and its cold test low. The author discusses the properties of the various animal and vegetable oils, which possess greater oiliness than mineral oils, as regards their suitability for use in compounding mineral oils, and the requirements in lubricating oils for engines and machines of different categories. H. Moore.

Lubrication problem from the thermodynamic-molecular standpoint, and the measurement of the efficiency of lubricants. R. von Dallwitz-Wegner (Kolloid-Z., 1926, 38, 193—208).—The theory of lubrication is discussed and some methods of measuring the efficiency of lubricants are described. Bearing metals have a high molecular cohesion pressure of the order of 100,000 atm., while lubricants have a relatively low cohesion pressure of 300—400 atm. In a lubricating layer part of the cohesion pressure, K, of the lubricant is converted into a wetting pressure, K_b, on account of molecular attraction, and generally the extent of this conversion may be obtained from the relation, $K_b/K=\cos\theta$, where θ is the "marginal angle" of the lubricant, *i.e.*, the angle between the edge of a drop of the lubricant when placed on a plane surface of the metal, and that surface. Other things being equal the cosine of the marginal angle is a measure of the efficiency of the oil, for this depends on the wetting pressure, which determines the thickness of the lubricating layer. The marginal angle varies with the metal lubricated and can thus be used to find the most suitable metal for a particular oil. If it is desired to increase the viscosity of a lubricant, the sphere of action of the molecules must be increased. Since $\lambda=3a/K$, where λ is the sphere of action, a the surface tension, and K the cohesion pressure, this may be done by increasing a or decreasing K. The former process appears to be unsatisfactory, *e.g.*, tar oils have a high surface tension and a relatively small marginal angle, but are not good lubricants. Apparatus is described for measuring the thickness of the lubricating layer between a rotating shaft and its bearing, and for determining the marginal angle of an oil from measurements of the surface tension and wetting pressure, since $\cos\theta$ = wetting pressure/surface tension. N. H. Hartshorne.

***X*-Ray spectrographic investigations on lubricants.** J. J. Trillat (Compt. rend., 1926, **182**, 843—846).—Bragg's hypothesis (Nature, 1925, **115**, 266), that the origin of greasiness is to be found in the laminar structure which certain substances assume under pressure, is confirmed by the *X*-ray spectrographs of thin layers of greases formed under gentle pressure. This structure, which is destroyed by fusion, is probably present in all lubricants; it was feebly apparent in some oils. The laminæ of triglycerides are bimolecular; those of saturated hydrocarbons are unimolecular. It is considered that molecular orientation, favoured by the presence of certain active groups, takes place at the lubricated surface; thus in mixtures of fatty substance with mineral oils the former attaches itself to the metal and undergoes orientation, forming a surface of methyl groups over which the hydrocarbon molecules can slide very easily. The analytical significance of the *X*-ray spectrographs is alluded to. S. K. Tweedy.

See also A., April, 341, **Pressures developed on explosion of gaseous mixtures at high densities** (David). 375, **Absorption of carbon monoxide by solutions of cuprous chloride** (Moser and Hanika). 380, **Microscopic structure of pit-coals** (Duparque). 381, **Hydrogenation of organic substances at high temperature under pressure** (Kling and Florentin). 420, **Determination of unsaturated in presence of saturated and tricyclic hydrocarbons** (Nametkin and Brüssoff).

Carbonising sulphite-cellulose waste liquor with mordant salts. Schwalbe.—See V.

Patents.

Drying materials [coal with waste furnace gases]. M. D. Jones, Assr. to Fuller Fuel Co. (U.S.P. 1,568,738, 5.1.26. Appl., 18.3.24).—Waste furnace gases at a high temperature and carrying a large proportion of moisture are mixed with cool air of low moisture content so that the temperature and humidity of the gases are reduced, and the mixture is passed over the fuel to be dried, for example, coal which is to be pulverised. All risk of ignition is avoided and rapid and uniform drying is obtained.

T. S. Wheeler.

Manufacture of combustible briquettes. J. Beaudequin (E.P. 225,849, 2.12.24. Conv., 3.12.23).—Carboniferous material, such as coal waste, is finely ground, compressed into briquettes, and charged into a horizontal tube externally heated to 300°. Each briquette is separated from its neighbour by a division plate. The briquettes are slowly pushed along, the rate being adjusted to obtain satisfactory binding. The tube protrudes out of the furnace to form a cooling chamber for the briquettes before these are discharged. S. Pexton.

Dehydrated lignite. E. P. Schoch (U.S.P. 1,574,174, 23.2.26. Appl., 18.8.24).—Lignite is dehydrated by heating with a hydrocarbon oil, the moisture being displaced by the oil, which latter is subsequently removed. A. C. Monkhouse.

Coking retort ovens. Koppers Co., Assees. of J. van Ackeren (E.P. 227,087, 29.10.24. Conv., 4.1.24).—In a regenerative vertical retort oven, the long vertical heating flues are supplied with hot fuel gas and hot secondary air at the middle as well as at the top. The products of combustion leave the vertical flues on one side of the retort at the bottom and pass up similar flues on the opposite side prior to entering one of a pair of regenerators. During the second part of the cycle the flows of fuel gas and products of combustion are reversed. S. Pexton.

Coking retort oven. J. van Ackeren, Assr. to Koppers Co. (U.S.P. 1,570,870, 26.1.26. Appl., 5.8.21).—In a coke-oven battery comprising coking chambers and vertical combustion flues, the latter are disposed in two groups, and can be put into communication with inflow and outflow groups of regenerators on each side and at opposite ends of the battery. A producer-gas supply is provided for heating the battery, with reversing valve connexions between the gas supply and some of the regenerators of each group on both sides of the battery. On each side of the battery are waste-gas tunnels with valves for establishing communication between the outflow regenerators on both sides with the corresponding waste-gas tunnels. A. B. Manning.

Coke oven with vertical heating flues. P. Chomé and L. Defossez (E.P. 247,646, 17.11.24).—A coke oven with horizontal coking chambers is provided with vertical flues which can be heated either from the top or from the bottom, the method of heating being reversed at intervals in order to attain more uniform carbonisation. The oven can be built either without or with regenerators and, in the latter case, is designed for heating either with rich gas or with poor gas by using gas regenerators as well as air regenerators. All the vertical heating flues are connected at their lower ends with two horizontal flues running below the oven, and at their upper ends with another pair of horizontal flues in the oven wall. Each of the upper and lower horizontal flues is connected to the regenerators or to the reversing device, the upper by one or more vertical conduits situated in the oven wall, the lower directly. When using a rich gas, this is admitted to burners in the top or the bottom of the vertical flues according to the method of heating, air from the regenerators being supplied through the corresponding pair of horizontal flues, and the products of combustion escaping by the opposite pair. When using poor gas, the latter is heated in the regenerators and passes thence to the heating flues by one of the upper or lower horizontal flues, air being supplied by the other upper or lower flue respectively. Other modifications of the heating arrangement are possible, utilising supplies of both poor and rich gas. A. B. Manning.

Distillation of carbonaceous material. M. Fränkl (E.P. 238,899, 24.8.25. Conv., 23.8.24).—A retort of rectangular section has nostril holes distributed throughout the lower portion of its two major walls. Preheated air admitted to the retort, via a regenerator and the nostrils holes on one side, consumes part of the carbonised fuel, and heats the charge, the combustion products leaving by way of the nostrils and regenerator on the opposite side. When the fuel bed has attained the desired temperature the supply of air is stopped, and a non-oxidising gas (which may be the gas produced by the process), introduced into the bottom of the retort, is caused to traverse the charge and distil the coal entering at the top. When the temperature of the fuel bed has fallen materially the stream of inert gas is stopped and air is again introduced, but in a reverse direction to that followed previously. S. Pexton.

[Liberation of hydrogen and methane in the] distillation of coal. L'Air Liquide, Soc. Anon. pour l'Etude et l'Exploit. des Proc. G. Claude (E.P. 243,665, 2.4.25. Conv., 28.11.24).—A part of the hydrogen and methane ordinarily retained in the coke after the distillation of coal is recovered by passing nitrogen, air, or combustion gases through the retorts or ovens at the end of the distillation process. When nitrogen is used the mixture of hydrogen, methane, and nitrogen obtained may be mixed with the other gases from the distillation process, and the whole mixture of gases so obtained may be subjected to a partial liquefaction or other separation process for the extraction therefrom of hydrogen and nitrogen for use in the synthesis of ammonia. A. B. Manning.

Distillation of carbonaceous material. O. H. Hertel (E.P. 247,639, 13.11.24).—Coal, shale, or other carbonaceous material is distilled in a slightly tapered vertical retort, 12—18 in. in width, provided with means for internal heating (in addition to the usual means for external heating) placed within one or more steel tubes extending vertically through the retort. These tubes are of non-circular cross section and can be rotated, thereby exerting a lateral pressure on the charge of material and producing vertical passages for the escape of gas. The retort works intermittently. A movable piston actuated by hydraulic pressure permits compression of the charge after filling the retorts, and also aids in the discharge. The bottom of the retort can slide vertically and when raised closes the retort; when lowered it permits ejection of the charge through two inclined discharge shoots. The charge on ejection divides into two portions along the line of the gas passages, each portion being discharged through the corresponding shoot. This division of the charge may be aided by separating blades disposed vertically within the retort. A. B. Manning.

Manufacture of carbon for decolorising and deodorising and other purposes. Artificial Coal Co. (Hamon Process), Ltd., and L. le W. Hamon (E.P. 246,954, 2.12.24).—On account of its self-bonding properties paper pulp waste (the fine fibres not retained by the screen of the paper-making machine, and subsequently recovered in a filter-press) forms a suitable material for manufacturing decolorising charcoal. Lime is added as a spacing material and the mixture carbonised and washed with acid. Less lime and therefore less acid are used than in similar known processes because of the fibrous structure of the paper pulp. A mixture of peat or other carbonaceous material of suitable dryness may be mixed with the paper pulp waste and treated in the same way. S. Pexton.

[Water-]gas manufacture. F. W. Steere (E.P. 247,803, 19.5.25).—In a water-gas plant consisting of a generator and superheater, the steam for the run is obtained by admitting water in a finely-divided spray at the top of the superheater during a " down " run and at the base of the generator during an " up " run. (Reference is directed, in pursuance of Sect. 7 (4), of the Patents and Designs Acts, 1907 and 1919, to E.P. 233,038, 109,323, and 21,028 of 1892.) A. C. Monkhouse.

Gas producer. J. F. Rogers, Assr. to Wellman-Seaver-Morgan Co. (U.S.P. 1,572,040, 9.2.26. Appl., 26.12.18).—A rotary producer with an independently rotating grate is provided with mechanism for automatically controlling the relative rates of rotation and causing one part to rotate more quickly than the other. S. Pexton.

Gaseous fuel production. J. R. Rose, Assr. to J. Harris (U.S.P. 1,573,524, 16.2.26. Appl., 28.5.23). —Water-gas is enriched by passing it through a mixing chamber in which a regulated quantity of a liquefied hydrocarbon gas is added to it. The latter should possess a vapour tension between 25 lb./sq. in. and 100 lb./sq. in. at atmospheric pressure and ordinary temperatures. A. B. Manning.

Utilisation of ferruginous limestone [in coke ovens and gas producers]. L. Schneider (F.P. 596,764, 22.7.24).—An intimate mixture of ferruginous limestone with pulverised coal and scrap iron or waste iron oxides and a suitable proportion of manganese is burnt in a coke oven or a producer. The sulphur in the coal is almost completely combined with the iron, and the gas evolved is almost free from sulphur. The highly ferruginous coke is used for the production of high-grade steel.
B. W. Clarke.

Catalysts for the hydrogenation of oxides of carbon. G. Patart (F.P. 599,588, 25.5.25).—The catalytic material consists of zinc chromate, tungstate, vanadate, or manganate, or similar compounds which form basic salts containing at least two equivalents of zinc to one equivalent of the acid radical.
L. A. Coles.

[Production of] hydrogen. G. Cicali (F.P. 599,614, 15.6.25. Conv., 16.2.25).—Water-gas is freed from carbon dioxide and sulphur and similar impurities. It is then compressed, cooled, and freed from carbon monoxide by cooling with liquid nitrogen. C. Irwin.

Obtaining volatile products by distillation [*e.g.*, of fuel] with superheated steam in a closed cycle. Le Gaz Industriel (Soc. Alsacienne des Anneaux Raschig et le Gaz industriel réunis) (F.P. 599,615, 15.6.25).—Gases produced by distilling material with superheated steam are cooled as they leave the retorts to a temperature sufficiently low to cause deposition of the higher-boiling products, and the deposited material is separated from the residual gases by suitable means.
L. A. Coles.

Gas washers. Kirkham, Hulett and Chandler, Ltd., and S. Hersey (E.P. 246,978, 3.1.25).— A series of inverted cones built around a vertical rotating shaft raise water through the annular spaces between the cones and spray it by centrifugal force through the gas. The efficiency of washing is improved by gradating the depth of the cones so that the shortest lies on the outside, and the planes of rotation of the upper and lower edges of each cone lie between those of the next inner cone. The upper edge of each cone is perforated and, to increase the water-lifting power of the rotors, spiral vanes are provided in the annuli between the cones.
S. Pexton.

Purification of gases [from iron carbonyl]. J. Y. Johnson. From Badische Anilin- & Soda-Fabr. (E.P. 247,050, 21.5.25).—Gas to be purified from iron carbonyl vapour is mixed with sufficient air and passed over an active contact material, such as charcoal or silica gel, when the carbonyl is oxidised with the deposition of iron oxide in the adsorbent, which when fouled is regenerated by acid washing. Alternatively the gas without oxygen may be passed over the adsorbent to remove the iron carbonyl by adsorption, and the adsorbent regenerated intermittently by air treatment and acid washing. Other substances, *e.g.*, hydrogen chloride, may be used instead of oxygen to decompose the iron carbonyl with formation of a non-volatile compound.
S. Pexton.

Gas calorimeter. R. G. Griswold, Assr. to Doherty Research Co. (U.S.P. 1,572,283, 9.2.26. Appl., 3.7.22).—The gas in burning heats a current of water which at the same time displaces the gas from its container, so that the volume of water heated is proportional to the volume of gas burnt. The rise in temperature of the water is registered in units corresponding to the calorific value of the gas.
A. B. Manning.

Distillation of oil-bearing materials. L. de Hernandez (E.P. 247,658, 19.11.24).—The material is distilled in a cylindrical retort supported by annular brickwork. The heating gases pass around the retort and also through a channel through its centre.

The distillates are removed at different levels and pass through a cooler; the lighter fractions pass through a purifier and dehydrating chamber to the top of a fractionating column. A. C. Monkhouse.

Cracking hydrocarbon oils. Sinclair Refining Co., Assees. of E. C. Herthel and H. L. Pelzer (E.P. 241,866, 26.8.25. Conv., 24.10.24. Addn. to 232,178; B., 1925, 907).—The method consists of a pressure distillation of the oil from a still containing a bed of filtering material such as asbestos, firebrick, kieselguhr, sand, glass wool, calcined bauxite, or finely ground petroleum coke. Oil is withdrawn from the base of the filter bed, and a portion is heated and returned to the top of the bed. Fresh oil is forced in as required, the concentration of pitch in the still contents being kept below the saturation point. It is claimed that the deposition of pitch on the still walls is by this means eliminated or very much reduced. The process is intermittent, and the filtering material may be regenerated either by burning off the adherent pitch or removing it by solvents. W. N. Hoyte.

Purification of liquids [hydrocarbon oils]. F. G. P. Remfry and A. E. Dunstan (E.P. 246,937, 13.11.24).—Mineral oils, their distillates, and the distillates of coal tar and shale oils are treated with mercuric sulphide. The process may consist in agitation of the oil with the freshly precipitated sulphide alone or in contact with some inert porous material. Treatment may be applied to the liquid or vapour phase and at any convenient temperature. The colour and odour of the oils are markedly improved. The effect is not due to chemical action. S. Bowman.

Apparatus for refining petroleum. W. H. Stilson, Assr. to Stilson Process Corp. (U.S.P. 1,564,984, 8.12.25. Appl., 20.1.20).—A still for the distillation of petroleum is connected with a horizontal vapour pipe, the temperature in which falls progressively with the distance from the still. Vertical draw-off pipes for the condensate are fitted at intervals to the underside of the vapour line, and by connecting two successive draw-off pipes together a dephlegmating by-pass is formed from which a condensate is obtained comprising material boiling between the temperatures corresponding to the distances of the pipes from the still. The outlet pipe for the condensed liquid is fitted with a trap to permit separation of any deposited carbon. T. S. Wheeler.

Conversion of hydrocarbons. H. R. Berry (U.S.P. 1,571,994, 9.2.26. Appl., 18.9.22).—Heavy liquid hydrocarbons and hot hydrogen-containing gas are caused to flow in counter current and in intimate contact under such conditions of temperature and pressure that chemical reaction takes place, the final products being lighter liquid hydrocarbons and a heavier gas containing gaseous hydrocarbons. S. Bowman.

Apparatus for separating hydrocarbons. W. C. Averill, jun. (U.S.P. 1,573,025, 16.2.26. Appl., 7.10.22).—The apparatus consists of a still connected to the lower end of a dephlegmator. Means are provided for withdrawing condensate from the lower end of the dephlegmator and introducing it again as a spray into the upper portion. W. N. Hoyte.

Condensation of hydrocarbon vapours. E. W Isom and J. E. Bell, Assrs. to Sinclair Refining Co. (U.S.P. 1,573,167, 16.2.26. Appl., 13.8.23).—The condensate obtained from the vapours from a pressure still are circulated through a cooler from and to a relatively large body of the condensate, the vapours from the still being injected into the circulating stream between the cooler and the large body of condensate. W. N. Hoyte.

Continuous treatment of natural gas gasolines. G. G. Oberfell, A. M. Ballard, R. C. Alden, E. L. Utsinger, and W. R. Lentz, Assrs. to Chestnut and Smith Corp. (U.S.P. 1,574,507, 23.2.26. Appl., 22.4.21).—The process consists in dissolving elemental sulphur in the gasoline, and passing this solution through a solution of sodium hydroxide in water. W. N. Hoyte.

Distilling oil. J. M. Wadsworth, Assr. to Pierce Petroleum Corp. (U.S.P. 1,572,584, 9.2.26. Appl., 27.12.21).—Oil is vaporised in a number of successive stages, and fractions of similar boiling point are combined and condensed to form primary distillates. These are continuously separately redistilled, the residues from the lighter distillates being added in series to the heavier distillates. H. Moore.

Transforming and distilling hydrocarbons and the like. A. A. F. M. Seigle (U.S.P. 1,572,691, 9.2.26. Appl., 16.7.20).—The space between two concentric cylindrical walls of a retort is divided by transverse partitions into a series of annular chambers. A longitudinal partition extends the length of the walls, and the transverse partitions have apertures alternately on opposite sides of the longitudinal partition. The material treated flows through each of the annular chambers in series in alternately opposite directions. Heat is applied to the inner wall of the retort. H. Moore.

Treating bituminous substances. [Desulphurising oils.] G. W. Acheson (U.S.P. 1,570,193, 19.1.26. Appl., 14.8.24).—Oil or other bituminous material is mixed with 6% of its weight of reflocculated clay prepared as described in U.S.P. 1,456,111–2 (B., 1923, 721 A; cf. also U.S.P. 1,223,350, 1,253,556, and 1,345,350–6, B., 1917, 586 A; 1918, 174 A; 1920, 564 A), 4% of concentrated sulphuric acid is added, and then a further 2% of clay. The acid transforms the sulphur present so that it is readily adsorbed by the clay, and on filtration a neutral oil containing only traces of sulphur is obtained. In place of clay other suitable adsorbents such as reflocculated carbon black may be used, and sulphuric acid may be replaced by other acid reagents, *e.g.*, chlorine. T. S. Wheeler.

Treating hydrocarbon [lubricating] oils. F. W. Hall, Assr. to Texas Co. (U.S.P. 1,570,890, 26.1.26. Appl., 20.9.21).—A process is described consisting of the upward filtration of lubricating oil through an adsorbent clay. W. N. Hoyte.

Lubricating oils. J. C. Black and J. W. Weir (U.S.P. 1,572,465, 9.2.26. Appl., 19.10.22).—Hydrocarbons are refined with sulphuric acid and the precipitated products separated. A neutralising and decolorising agent is added to the treated hydrocarbons, the mixture heated, and the hydrocarbons and admixed reagent are separated. H. Moore.

Separating wax from mineral oil distillates. S. H. Hall and C. H. Hapgood, Assrs. to De Laval Separator Co. (U.S.P. 1,571,943, 9.2.26. Appl., 8.9.21).—During the centrifuging of oil-wax mixtures, water is fed into the machine at the periphery at such a temperature that the solid wax collected there is melted and discharged with the water. S. Bowman.

Demulsification of oils etc. C. V. Zoul, Assr. to Celite Co. (U.S.P. 1,569,695, 12.1.26. Appl., 30.1.23).—An apparatus for demulsifying mixtures of petroleum hydrocarbons or the like and water comprises a tank in which demulsified oil is heated by indirect steam to 60° and dried by blowing with air. The dried oil is then circulated through a filter-press and back to the container until the temperature of the press reaches 60°. Finely divided diatomaceous earth is then added to the circulating liquid and forms a coating on the filtering material in the press. The material to be treated is passed through a heater in which its temperature is raised to 60° and is then led through the prepared filter-press in which demulsification is effected. The filtrate is run to a separating tank from which oil containing less than 1% of water is drawn off at the top and water at the bottom. In place of diatomaceous earth, wood pulp, sawdust or other granular material may be used. T. S. Wheeler.

Continuous process of demulsifying mineral oils. W. D. Leeper, Assr. to Amer. Demulsifying Co. (U.S.P. 1,573,321, 16.2.26. Appl., 7.12.21).—The oil to be treated is passed in a finely divided state through hot water and subsequently treated with live steam. W. N. Hoyte.

Apparatus for drying fuel or the like. Internat. Combustion Engineering Corp., Assees. of H. Kreisinger (E.P. 240,824, 25.9.25. Conv., 3.10.24).—See U.S.P. 1,564,361 ; B., 1926, 117.

Self-packing coke oven doors. A. Beckers (E.P. 248,328, 30.11.25. Conv., 25.2.25).

Construction of coke ovens. A. Beckers (E.P. 249,051, 9.12.25. Conv., 1.4.25).

Reduction of carbon dioxide to carbon monoxide (G.P. 423,945).—See VII.

Bituminous emulsions (E.P. 246,907).—See IX.

Cement from slag from gas producers etc. (G.P. 421,427).—See IX.

Treatment of waste (E.P. 247,284).—See XXIII.

III.—TAR AND TAR PRODUCTS.

Composition of coal tars. K. B. Edwards and E. S. R. Willmore (J.S.C.I., 1926, 45, 54—56 T).—Examination of high-temperature tar by methods previously used by Edwards (*ibid.*, 1924, 143—156 T) in investigating low-temperature tar, gave neutral oils 46·6%, phenols 3·6%, rhetinols 0·9%, acids (carboxylic) 0·026%, asphalts 29·4%, ulmins 15·1%, acid ulmins 0·7%, free carbon (including ash) 3·3%. Attention is called to the similarity of the phenols from high-temperature and low-temperature tar and to the presence of large amounts of asphalts, which is considered to be indicative of high-temperature carbonisation.

Desulphurising cresols and the acid fractions from various coal tars. G. Stadnikov, N. Gavrilov, and W. Rakovski (Brennstoff-Chem., 1926, 7, 65—68).—Crude cresols containing not more than 10—15% of neutral oils are almost completely freed from sulphur compounds of acid character (thiocresols) by treatment with formaldehyde and a condensing agent, and subsequent distillation in steam or *in vacuo*. As condensing agent a mixture of sulphonic acids from petroleum (Petroff's "Kontakt") is most effective. For example, a cresol of 2·25% sulphur content was heated for 15 hrs. in an autoclave at 120° with 1% of formalin and 1% of "Kontakt." On distilling the product *in vacuo* 85% of the cresol, with a sulphur content of 0·02%, was recovered. Equally good results were obtained when glucose syrup was used in place of the formalin. The method failed for cresols with a high content of neutral oil, and for the light oils from lignite tars. A. B. Manning.

See also A., April, 356, **System benzene–toluene** (Mitsukuri and Nakatsuchi). 381, **Hydrogenation of organic substances at high temperature under pressure** (Kling and Florentin). 389, **Cuprene tar** (Schläpfer and Stadler).

Recovery of phenols from crude ammonia liquor. Crawford.—See II.

Effect of tar and tar vapours on soil. Ewert.—See XVI.

Patent.

Purification of hydrocarbon oils (E.P. 246,937).—See II.

IV.—DYESTUFFS AND INTERMEDIATES.

Electro-capillary analysis of dyes. W. Kopaczevski (Rev. Gén. Mat. Col., 1926, 30, 34—45).—The experiments of Sahlbom have been repeated and his results verified. Electro-capillary measurements are also given for a large number of dyes, a number of electrosols, and substances such as the albuminates of iron and copper, etc. The colloidal dyes were first purified by dialysis and the non-colloidal ones by recrystallisation, the purity being controlled by electrical conductivity determinations. Physico-chemical properties, which might affect capillarity, were determined in each case. The surface tensions and viscosities of the solutions were measured. The electric charges were determined by the method of electric transport for a fall of potential of 1·6 volts/cm. The values in doubtful cases were controlled and corrected by observations on the action of alkalis and bases on the substances studied. According to experimental results the substances worked with are classed as I. rapidly, II. distinctly, III. slowly, and IV. non-dialysable. The following conclusions are drawn: assuming the dye solutions to be not stronger than 1 in 1000 and the dyes to be in the colloidal state, acid, basic, and amphoteric dyes may be differentiated by electro-capillary analysis. The acid dyes show a rise almost equal to that of pure water, the basic hardly rise beyond the level of the solution, whilst the amphoteric dyes (indicators) are characterised by differently coloured zones. The rapidity of the rise of electro-negative and amphoteric dyes is greater than that of electro-positive dyes. The degree of dispersion has a distinct effect on the rapidity of the rise; the greater it is, the more rapid and marked the rise. Other noticeable points in electro-capillary analysis which might be of use in practical dyeing are as follows: it allows of a comparison of the rapidity of the rise of water, salts, amd colloids with reference to each other; it shows that the rise is diminished with increase in viscosity, and increased with diminution of the surface tension. Dyes which lower the surface tension of water include cochineal, Paris Violet, and Brilliant Green. Dyes which raise the viscosity of water include Trypan Red, Paris Violet, Brilliant Green, Soudan G., Direct Black W., Trypan Blue, Direct Grey 4 B, Congo Red, etc.

A. Coulthard.

Effect of variations in concentrations of dyes in solution upon their quantitative determination spectrophotometrically. Methylene Blue. R. W. French (Ind. Eng. Chem., 1926, 18, 298—299; cf. Holmes, B., 1924, 167).—Variations within the usual limits of the concentrations of Methylene Blue used in spectrophotometric practice (2 to 10 pts. per million) are shown to have a very appreciable effect on the values of the extinction coefficient, and such effects must be taken into account in quantitative work. Values for the extinction coefficient, k, at 660 $m\mu$ have been determined for concentrations of 2, 4, 6, 8, and 10 pts. per million and found to be 2·49, 2·39, 2·30, 2·20, and 2·10 respectively. The concentrations plotted against these values of k give a straight line. As the maximum at 660 $m\mu$ increases, the slight secondary maximum at 610 $m\mu$ (cf. Holmes, *loc. cit.*) becomes progressively less. Certain oxidation products and lower homologues in the dye probably affect the maximum at 610 $m\mu$. The author agrees with Holmes that it is advisable to use alcohol as a solvent in quantitative spectrophotometric work, as in alcoholic solutions variations in absorption with changes in concentration are absent, and the maxima are more marked and easier of measurement.

A. Coulthard.

New dye intermediates. M. T. Bogert and R. L. Evans (Ind. Eng. Chem., 1926, 18, 299—302).—2:4-Dinitrophenyl oxide can be prepared without risk of fire or explosion by grinding dry potassium phenoxide in excess with small quantities of chlorodinitrobenzene and slowly grinding in additional amounts of the two reactants until 400 g. of the dinitro-compound have combined with 300 g. of the phenoxide. 2-*Nitro*-4-*aminophenyl oxide* m.p., 107—108° (corr.), garnet-red prisms or orange-red plates, is obtained by the reduction of the dinitro-compound in alcohol below 60° with stannous chloride in concentrated hydrochloric acid. Reduction with alkaline sulphides is unsatisfactory. The *acetyl* derivative, m.p. 118°, pale yellow needles, is formed by warming the nitroamine with acetic anhydride. It is accompanied by diamond-shaped prisms, m.p. 124° (corr.), which also yield the original nitroamine on hydrolysis. Removal of the amino-group by diazotisation in alcoholic solution gives 2-nitrophenyl ether (cf. Haeussermann and Teichmann, A., 1918, i., 549) showing the original nitroamine to be the 2-nitro-4-amino- and not the 4-nitro-2-amino-derivative. The amine diazotises smoothly to form 4-phenoxy-3-nitrophenyldiazonium chloride, the aqueous solution of which it is possible to boil for a short time without decomposition. It couples with α-naphthol to form a rich fuchsine-red dye and with β-naphthol a brown. Phenoxy Alizarin Yellow GG, the sodium salt of which dyes silk a clear lemon-yellow, is obtained by mixing aqueous solutions of the diazotised amine, salicylic acid, and sodium carbonate at 0°. 2:4-*Diaminophenyl oxide*, m.p. 67° (corr.), colourless or pale greyish diamond-shaped crystals, is obtained by reducing the dinitro- or nitroamino-compound with iron powder and hydrochloric acid at 80—100°; the *hydrochloride* softens at about 190°, and has m.p. about 210°, the *diacetyl*-derivative has m.p. 171° (corr.). Phenoxy Bismarck Brown, blue-brown crystals, was prepared by pouring a solution of sodium nitrite into a vigorously stirred solution of the diamine hydrochloride. It dyes silk a pale orchid-brown to a dark red-brown from dilute alcohol solution. Phenoxychrysoidine, reddish-brown crystals (from diazotised aniline and the diamine hydrochloride in the presence of sodium acetate), dyes wool and silk direct in brownish-yellow to brown shades. 2:4-Dinitrophenyl sulphide, m.p. 117°, pale yellow needles, was prepared from potassium thiophenoxide and chloro-2:4-dinitrobenzene by gradually grinding the reactants together. It was reduced to 2:4-*diaminophenyl sulphide*, m.p. 107°, yellowish prisms, by means of iron and hydrochloric acid in aqueous solution under a reflux. The diaminophenyl sulphide on coupling with diazotised aniline yielded Phenylthiochrysoidine, a deep red flocculent solid, which dyes wool and silk in orange-yellow shades. The hydrochloride is crystalline.

A. Coulthard.

Patents.

Production of colouring matter pastes [containing vat dyes]. J. Y. Johnson. From Badische Anilin- & Soda-Fabr. (E.P. 247,052, 29.5.25).—Sedimentation and the formation of a sticky deposit in vat dye pastes is retarded or prevented by the addition of soluble permanganates to the paste. For example, a concentrated solution containing 0·25 pt. or 1 pt. of potassium permanganate is added to 500 pts. of 10% Indanthrene Orange RRT paste, or of 40% Indigo RB paste, respectively.
L. A. Coles.

Ethylating amines. A. R. Cade, Assr. to Carbide and Carbon Chemicals Corp. (U.S.P. 1,570,203, 19.1.26. Appl.,17.7.23).–By the addition of an alkaline-earth hydroxide to a reacting mixture of an aromatic amine and ethyl sulphate the amine salt of ethyl hydrogen sulphate formed as an intermediate product is decomposed, thus rendering both the ethyl groups of the ethyl sulphate available for ethylation. For example, aniline (10 mols.), ethyl sulphate (11 mols.), and calcium hydroxide (12 mols.), heated under reflux at 145° for 5 hrs. give a good yield of diethylaniline calculated on both the aniline and ethyl sulphate consumed. T. S. Wheeler.

Preparation of 2-aminonaphthalene-1-carboxylic acid and its nuclear substitution products. Farbw. vorm. Meister, Lucius, & Brüning, Assees. of F. Mayer (G.P. 418,009, 19.4.23; F.P. 594,824, 2.3.25).—The products, which are of use in the manufacture of dyes and pharmaceutical products, are obtained by heating β-naphthisatin or its derivatives or substitution products with oxidising agents, preferably hydrogen peroxide, in the presence of alkalis. For example, 30% hydrogen peroxide or sodium perborate is added to a boiling aqueous solution containing β-naphthisatin and sodium hydroxide, until a red precipitate is no longer formed on acidifying a test portion of the solution with hydrochloric acid. After cooling, dilute hydrochloric acid is added to the solution until it gives an acid reaction with Congo-red, when 2-aminonaphthalene-1-carboxylic acid separates in a 90% yield. Bromo-β-naphthisatin, m.p. 297°, and dibromonaphthisatin yield respectively bromo-2-aminonaphthalene-1-carboxylic acid, m.p. 148—150°, and dibromo-2-aminonaphthalene-1-carboxylic acid. L. A. Coles.

Producing sulphur dyestuffs fast to chlorine S. Sokal. From Kalle & Co. (E.P. 248,424, 1.11.24).—See F.P. 588,874; B., 1926, 149.

Manufacture of bluish-green dyestuffs and colour lakes. O. Y. Imray. From Farbw. vorm. Meister, Lucius, & Brüning (E.P. 248,487, 9.12.24).—See F.P. 590,464; B., 1926, 149.

Preparing vat-dyestuffs. S. Sokal. From Kalle & Co. (E.P. 248,519, 30.12.24).—See F.P. 591,535; B., 1926, 149.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Use of the microscope in the textile laboratory. L. G. Lawrie (J. Soc. Dyers and Col., 1926, 42, 73—76).—The preparation of cross-sections of textile fibres by the "celloidin" and "paraffin" methods is described. In works laboratory practice, the fibres may be simply immersed in a strong solution of celloidin, then air dried, and cut in the ordinary way. In examining dyed fibres such as those of cellulose acetate silk, organic solvents should be avoided; a mixture of gum arabic water and glycerin is recommended for binding previous to section cutting. Microscopical tests are often free from the uncertainty of chemical tests when applied to fibres, and are of particular interest in the case of artificial silks. The cross-sections of viscose and copper silks show differences which easily distinguish them. Microscopical examination is of value in investigating the nature of variations in the dyeing properties of different silks and of peculiarities in the levelling powers of dyes; in identifying the various starches used in finishing; in ascertaining the condition of vat liquors; and in investigating defects caused by mildew in fabrics etc. For counting the particles in suspension in vat dyestuff pastes the hæmacytometer may be used.
A. Coulthard.

Advances in the knowledge of fibres. R. O. Herzog (Z. angew. Chem., 1926, 39, 297—302).—A review in which the present state of our knowledge of the structure of natural and artificial fibres is described (cf. B., 1925, 704) and an account given of the part played by the colloidal cementing substance and moisture in determining the mechanical and chemical properties of the fibre.
A. R. Powell.

Kapok and cotton: differentiation. A. Lejeune (Bull. Soc. chim. Belg., 1926, 34, 419—421).—A method of determining the percentage of kapok and cotton in mixed fabrics is based on the facts that cotton has little affinity for dyes of the triphenylmethane group whereas kapok is readily dyed, and on the other hand that kapok is scarcely tinted by substantive cotton dyes of the benzidine group. The mixed fabric is dyed at the boil in a neutral bath with Malachite Green, and then in a slightly ammoniacal bath with Oxamine Red. Comparison with shades obtained from known mixtures of kapok and cotton enables the approximate composition of the fabric to be determined. R. Brightman.

Particular properties of the sulphuric acid esters of cellulose. A. Caille (Chim. et Ind., 1926, 15, 189—192; cf. B., 1925, 280).—The fixation of basic dyes by cellulose derivatives is not due only to the presence of oxycellulose, but may be considerably influenced also by the presence of sulphuric acid groups. The sulphuric acid esters of cellulose, prepared under conditions excluding the formation of oxycellulose, show an affinity for basic dyes increasing proportionally with their sulphuric acid content, while their affinity for acid and direct dyes remains unchanged. Quantitative experiments on the adsorption of Methylene Blue and Auramine show that the presence of combined sulphuric acid groups plays an important rôle in the fixation of basic dyes by nitrocelluloses, whereas the influence of the nitro-group itself is negligible. Similar phenomena are shown by the cellulose acetates, although the proportionality between dye adsorbed and sulphuric acid content is here not so apparent.

A. B. Manning.

Utilisation of sulphite-cellulose waste liquors. S. Hilpert (Papier-Fabr., 1926, **24**, 145—148).—After treatment with chlorine, sulphite-cellulose waste liquors have tanning properties. Besides chlorination, oxidation occurs with the formation of hydrochloric acid, in which the product is insoluble. The more dilute the waste liquor the further the chlorination proceeds before it is interrupted by the precipitation of the product, which, from dilute solutions, may contain 30% Cl. The higher the chlorine content the more stable the product, and the best results are obtained when chlorate and hydrochloric acid are used. A product is then obtained which dissolves more or less readily in water and tans as well as vegetable tannins. When titrated with alkali hydrochloric acid is split off, and the alkali consumption is double the equivalent of this acid. It is concluded that chlorinated quinones are present. By the action of chlorine sulphonic acid groups are also split off. Chlorinated sulphite liquor is a disinfectant; its action is strongest on *Staphylococci* and weakest on *Bac. coli*. Chloranil is similarly a disinfectant, but not its hydrolysis product, chloranilic acid. The hydrolysis of chloranil is accelerated by amino-acids and polypeptides, and it is probable that its disinfecting action is due to acid thus produced in the immediate vicinity of the bacteria.

A. Geake.

Carbonising sulphite [-cellulose waste] liquors with mordant salt solutions. C. G. Schwalbe (Zellstoff u. Papier, 1926, **6**, 113).—Sulphite-cellulose waste liquor, preferably previously concentrated, is treated with ferric, aluminium, or chromium sulphate, and heated for 2 hrs. at 180° and 10 atm. The organic matter is completely carbonised, and the liquor is colourless and free from organic substances. The carbon obtained contains, however, 50% of ash and is almost incombustible.

A. Geake.

Removal of printers' ink from old paper. E. W. Albrecht (Chem.-Ztg., 1926, **50**, 33).—Processes previously described for the removal of printers' ink from old paper (cf. Berl and Pfanmüller, B., 1926, 000) are of theoretical interest only, as the cost is greater than the cost of production of new raw material for white paper. Old paper can be used for making dark paper without previous purification.

L. M. Clark.

See also A., April, 353, **Elasticity of jellies of cellulose acetate** (Poole). 387, **X-Ray investigation of cellulose and lichenin** (Ott). 441, **Sulphate content of leaf-tissue fluids of Egyptian and Upland cotton** (Harris, Hoffman, and Hoffman).

Dry cleaner's naphtha. Jackson.—See II.

Influence of soluble silicates on hypochlorite bleach. Carter.—See VI.

Arsenic in burner gases and its bearing on "Haff" disease. Glaser.—See VII.

Patents.

Deodorising hair, feathers, and the like. Treating apparatus. A. H. Gallagher, Assr. to Tanners Products Co. (U.S.P. 1,574,617–8, 23.2.26. Appl., 24.5.24).—(a) Animal tissues, such as hair, feathers, and the like, are deodorised by treatment with ozone. Intimate contact with the ozone is obtained by keeping the material in motion, and the resilient quality of the material is retained. (b) Apparatus for this treatment consists of a chamber into which the material is delivered in a current of gas. Means are provided for circulating the material within the chamber and for introducing ozone.

A. Geake.

Liquid treatment and subsequent pressing of pulp. J. Brandwood (E.P. 247,307, 16.8.24). Wood pulp is impregnated with a liquid, *e.g.*, an alkali in the preparation of viscose, and the excess liquid removed in a continuous process. The pulp travels on an endless band conveyor successively through a tank containing the liquid, and a press. During its passage through the tank the pulp is held on the conveyor by a second endless band above it. The upper plate of the press is lowered at regular intervals, and during its downward travel the motion of the conveyor automatically ceases. A. Geake.

Cooking wood chips. J. T. Jaeger (U.S.P. 1,572,723, 9.2.26. Appl., 1.4.22).—The vessel containing the chips is provided with a steam supply pipe, an acid conveying pipe, and an acid circulating pipe leading from one end and discharging into the opposite end of the vessel through a nozzle. The discharge nozzle consists of a length of pipe flared at the front end and covered with a perforated head which is fixed with regard to the flared end so that acid can be discharged through the side openings as well as through the perforations. B. W. Clarke.

Preventing froth on paper machines. J. A. de Cew, Assr. to Process Engineers, Inc. (U.S.P. 1,573,814, 23.2.26. Appl., 14.12.21).—Frothing of paper pulp sized with rosin and alum is prevented by adding a soluble iron salt, whereby the soluble substances which cause the frothing are precipitated.

A. Geake.

Conservation of pellicles of hydrate or of hydrated ethers of cellulose. J. Defaucamberge, Assr. to Soc. Franç. des Crins Artificiels (U.S.P. 1,576,631, 16.3.26. Appl., 12.1.24).—See E.P. 224,487; B., 1925, 126.

Regenerating sulphurous acid and waste heat from sulphite-cellulose boilers. C.

Hangleiter and A. Schneider, Assrs. to Zellstofffabrik Waldhof (U.S.P. 1,576,970, 16.3.26. Appl., 3.4.22).—See G.P. 350,471; B., 1922, 855 a.

Humidifying and impregnating textile and other materials. A. Manzoni and E. Muller (E.P. 243,359, 18.11.25. Conv., 18.11.24).

Apparatus for the manufacture of artificial filaments. L. A. Levy (E.P. 248,468, 4.12.24).

Decolorising carbon (E.P. 246,954).—See II.

Treatment of waste (E.P. 247,284).—See XXIII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Soluble silicates; their influence on hypochlorite bleach. J. D. Carter (Ind. Eng. Chem., 1926, 18, 248—252).—The addition of sodium silicate neither hastens nor retards the loss of available chlorine from hypochlorite solutions alone, but in the presence of a bleachable material the rate of loss is much reduced. The loss in strength of cheesecloth after bleaching with hypochlorite is reduced by the use of silicate, as is shown by determinations of bursting strength. The ash content of the cloth is considerably increased by silicate treatment, silica being deposited in the fabric. It is also claimed that the cloth is rendered brighter and whiter. In the bleaching of wood pulp the use of sodium silicate has no effect if added to sodium hypochlorite; with calcium hypochlorite, however, improved bleaching results, apparently an effect due to a flocculent precipitate of calcium silicate. The most alkaline sodium silicate of commerce gives the best results in this connexion, and it is recommended to add a quantity equal to 1% of the weight of air-dry pulp after the bath has been made up. C. Irwin.

Weighting of silk. R. O. Herzog and H. W. Gonell (Z. angew. Chem., 1926, **39**, 380—381).—The *X*-ray examination of silk fibres weighted with various materials, such as tin phosphate and water-glass, shows interference rings superimposed upon the original point pattern of the silk itself, except in the case of alumina treatment, where the silk diagram is obscured owing to separation of amorphous material. This shows that there is no chemical combination between the weighting material and the silk substance itself; probably the weighting material, which takes a crystalline form, penetrates into the inter-cellular spaces of the fibre and is fixed by the degradation products of the fibrous material.

B. W. Clarke.

Electrocapillary analysis of dyes. Kopaczevski.—See IV.

Sulphuric acid esters of cellulose. Caille.—See V.

Patents.

Bleaching textiles by means of ozone. E. Crespi and M. P. Otto (E.P. 247,738, 16.2.25).—Textile material is treated with weak acids, dried, and bleached by treatment with a current of moist, ozonised air at the ordinary temperature and pressure, after which it is preferably washed with water. Apparatus for the purpose is described.

L. A. Coles.

Dyeing and printing of textile materials. E. Knecht and E. F. Muller (E.P. 247,694, 16.12.24).—The fastness to washing of dyeings with direct cotton dyes is improved by dyeing with water-soluble zinc or magnesium compounds of the dyes, in the presence of ammonium salts together with ammonia or sodium bicarbonate in quantity insufficient to precipitate basic compounds. Zinc or magnesium compounds of the dyes are deposited in the fibres, where they are subsequently fixed by heating or steaming. Ammonia or sodium bicarbonate need not be added if ammonium salts of volatile acids, such as ammonium acetate, are used. For example, 100 lb. of cloth are dyed in a 200-gal. bath containing 3 lb. of dye, 75 lb. of magnesium sulphate, 18 lb. of ammonium sulphate, and 5 gal. of ammonia, *d* 0·880, the ammonia being added 15 min. after the other constituents of the bath. Compositions containing the water-soluble zinc or magnesium compounds may be used for printing.

L. A. Coles.

Resists for use in dyeing and printing. S. W. Clarke and J. R. Brown (E.P. 247,757, 11.3.25).—Liquid or paste for use as a resist, is prepared by stirring 2 pts. of flour into a mixture of 1 pt. of gum arabic and 2 pts. of glue in which the glue has previously been softened by heating with a suitable quantity of water. The resist is coated on to portions of the fabric and allowed to dry before dyeing, or, in the case of hanks, string or tape soaked in the resist is wound around portions of the hank to be protected from the dye liquor, or between two portions of the hank which are to be dyed in different baths. The resist is subsequently removed from the material by washing. L. A. Coles.

Manufacture of soluble vat dyestuff preparations. W. Carpmael. From Farbenfabr. vorm. F. Bayer & Co. (E.P. 248,811, 8.11.24).—See F.P. 589,914; B., 1926, 154.

Dyeing, washing and like apparatus. British-Amer. Laundry Machinery Co., Ltd. From Amer. Laundry Machinery Co. (E.P. 248,793, 8.9.24).

Yarn dyeing apparatus. W. J. Mellersh-Jackson. From Fuld & Hatch Knitting Co. (E.P. 249,369, 27.5.25).

Apparatus for dyeing or otherwise treating yarns and other materials. T. McConnell (E.P. 249,406, 9.9.25).

Machines for dyeing, scouring and washing wool and other fibrous materials. J. and R. Whitaker (E.P. 249,413, 21.9.25).

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

Presence of arsenic in burner gases and its bearing on "Haff disease." F. Glaser (Chem.-Ztg., 1926, 50, 185; cf. Biginelli, B., 1926, 302).—The presence of sodium chloride in pyrites used for the production of sulphur dioxide results in the formation of minute amounts of hydrogen chloride in the roasting operation; when these gases come into contact with strong sulphuric acid volatile arsenic trichloride is formed from any arsenious acid present and this is the probable cause of the poisoning of platinum contact masses. When the sulphur dioxide is used for the preparation of cellulose, it is probable that some of the arsenic trichloride or other volatile arsenic compound formed in the process escapes into the air or in the effluent waters in which, if they are salt as is the case at the Königsberg Haff, they are more stable than in fresh water. The presence of this arsenic in the air gives rise to the so-called "Haff disease."

A. R. Powell.

Production of hydrogen chloride from chlorine and steam in the presence of carbon. B. Neumann and R. Domke (Z. angew. Chem., 1926, 39, 368—374).—Chlorine reacts quantitatively with water vapour in the presence of wood charcoal above 600° with the formation of hydrogen chloride, an excess of steam being necessary to complete the reaction. The temperature for quantitative reaction is 450° with coke and 350° with active charcoal. The increased reactivity in the presence of coke is due to the ferric oxide in the coke; a mixture of wood charcoal and ferric oxide brings about the reaction at 350°. At 450° complete interaction is obtained after a contact of only 3 sec. The hydrochloric acid produced by cooling the gaseous products has a concentration of 32—35%; it is free from chlorine, arsenic, and, with the exception of the case of coke, from sulphur. A proportion of the chlorine is adsorbed by the carbon during the process and cannot be removed by steaming. The primary reaction is probably: $2H_2O+2Cl_2+C=4HCl+CO_2$. The carbon dioxide is then reduced to some extent by more carbon to form carbon monoxide, which is always present in the gaseous products. B. W. Clarke.

Production of hydrogen bromide from bromine and water vapour in the presence of carbon. B. Neumann, W. Steuer, and R. Domke (Z. angew. Chem., 1926, 39, 374—375).—The reaction between bromine and water vapour is complete at 600° in the presence of wood charcoal, and at 500° if ferric oxide is mixed with the charcoal. The concentration of the hydrobromic acid produced depends on the excess of steam employed in the process, and acid up to 60% (fuming hydrobromic acid) can be obtained. The concentrated acid is slowly decomposed on exposure to the air or by the action of light with the formation of free bromine. The use of this process avoids the formation of acid mists which are difficult to condense. B. W. Clarke.

Factors affecting the fixation of nitrogen as sodium cyanide. E. W. Guernsey, J. Y. Yee, J. M. Braham, and M. S. Sherman (Ind. Eng. Chem., 1926, 18, 243—248; cf. B., 1925, 669).—The equilibrium conditions of the reaction $Na_2CO_3+N_2+4C+Fe=2NaCN+3CO+Fe—138{,}500$ cal. were investigated on a laboratory scale. Under most conditions the conversion–time curve shows a maximum, the percentage conversion then decreasing. Silica introduced accidentally with the iron catalyst had a deleterious effect, 1 mol. SiO_2 reducing 2 mols. Na_2O and removing it from the desired reaction. The reaction being reversible, increase in the rate of nitrogen supply reduces the proportion of carbon monoxide in the gas and increases the conversion. Rise of temperature has the same effect and if only a reasonable excess of nitrogen is to be used a temperature not below 1050° is desirable. Under these conditions 1—2% of iron in the charge would be sufficient. The reactivity of metallurgical coke is only a small fraction of that of petroleum coke, wood charcoal, or lampblack. In all cases a portion of the charge sublimed and was recovered as a deposit consisting mainly of sodium carbonate. Too long treatment, high gas velocities, or the use of inactive coke or catalyst resulted in the occurrence of metallic sodium in the sublimate. It is concluded that sodium cyanide is partly dissociated in the vapour phase and cannot be recovered by distillation.

C. Irwin.

Titration of ammonium sulphate by the stearate method. H. Atkinson (Analyst, 1926, 51, 140—141; cf. A., 1926, 38).—The method previously described was found applicable to the determination of ammonium sulphate. Ten c.c. of a solution of ammonium sulphate approximately 0·1*N* strength were diluted to 40 c.c., and the indicator and 0·5 c.c. of stearate solution added. Excess of 0·1*N*-barium chloride solution was then added and the excess titrated with stearate solution. One or two drops of barium chloride changed the green colour to lemon-yellow, and this solution was used for comparison in the titration of solutions containing known quantities of the ammonium sulphate solution. The correction to be added to the titration results was thus found to be 0·22 for 10 c.c. of ammonium sulphate solution, and the error of the method was found to be less than 1 drop in 10 c.c. of solution. Weak acids such as hydrogen sulphide and carbonic acid must be removed by boiling the acid solution.

D. G. Hewer.

Determination of the acidity of commercial ammonium sulphate. H. M. Lowe (Gas World, 1926, 84, Coking Sect., 30—31).—The use of methyl-orange as an indicator in the titration of ammonium sulphate is discussed. It is suggested that acidity in this salt should be determined by matching the colour with methyl-orange against a range of standard solutions of the pure salt with known amounts of acid added. C. Irwin.

Neutrality of ammonium sulphate. T. B. Smith (Gas World, 1926, 84, Coking Sect., 26—28).

—The determination of free acid in ammonium sulphate by titration, using methyl-orange as indicator, gives results indicating a higher degree of acidity than the electrometric method. The error in the former method is due to the presence of pyridine sulphate which is acid to methyl-orange. A closer approximation to accuracy is given by the following procedure. Two 50-g. lots of the sample are weighed. One is mixed with excess of ammonia (*d* 0·88) and dried below 60°. Both lots are dissolved in an equal volume of water, filtered, and the unneutralised sample titrated with 0·1*N*-sodium hydroxide solution until the colour with methyl-orange matches that of the neutralised one.

C. Irwin.

Caking of ammonium sulphate. G. J. Greenfield (Gas World, 1926, 84, Coking Sect., 28—29).—The cause of caking is ultimately the alternate taking up and loss of atmospheric moisture by the salt. The crystal size is, however, important. A coarse salt offers less surface than a fine one, but if fines are present along with coarse crystals they fill the interspaces and promote caking. An even crystal size is desirable and hence processes which aim at allowing the crystals to grow in the saturator are of no advantage as the crop is irregular. The use of ammonium carbonate in place of sodium carbonate as neutralising agent gives a salt which dries more easily and with less breaking up of crystals. In all cases the crystals should be cooled immediately after drying and stored under constant atmospheric conditions. C. Irwin.

Analysis of silicates. O. Cantoni (Annali Chim. Appl., 1926, 16, 92—95).—In the evaporation of acid solutions containing silicic acid, to render it insoluble, the presence of the chlorides of iron, aluminium, calcium, and magnesium often causes the formation of tenacious pellicles, so that several days may be required to evaporate to complete dryness on the water bath. The addition of a few grams of sodium chloride (or other non-hygroscopic salt) is stated greatly to shorten this time of evaporation. The salt may be easily eliminated subsequently by washing. To render the hydroxides of the metals of the third group more easily filterable, it has been suggested to precipitate them with the aid of filter paper pulp, but this procedure may cause incomplete precipitation. Washed kaolin, of which the exact loss on heating to constant weight is known, is more satisfactory ; it should be added immediately after precipitation by ammonia, with strong agitation. In the fusion of iron and aluminium oxides with potassium bisulphate, the time required may be reduced from 24 hrs. to ½ hr. by increasing the proportion of bisulphate from the usual 10 pts. to 20 or 30 pts. A method which shortens the time of separation of the alkalis is also given (cf. B., 1925, 831), depending on the nearly complete removal of the other metals by heating the residue obtained after the removal of silicic acid with hydrofluoric acid to a low red heat, so as to drive off most of the sulphuric acid.

S. B. Tallantyre.

See also A., April, 331, **Mesothorium-2** (Yovanovitch). 332, **Chemical properties of mesothorium-2 and actinium** (Gleditsch and Chamie); **Highly emanating radium preparations** (Hahn and Heidenhain). 340, **Melting points of barium, strontium, and calcium oxides** (Schumacher). 345, **Solubility of double nitrates of praseodymium and neodymium with bivalent metals** (Prandtl and Ducrue) ; **Influence of citrates on precipitation of barium sulphate** (Nichols and Thies, jun.). 358, **Phase equilibria of sulphates** (Jänecke) ; **Equilibrium in system arsenic pentoxide–barium oxide–water** (Hendricks). 359, **Thermal dissociation of metal sulphates** (Marchal) ; **Explosion range of hydrogen–ammonia–air and hydrogen–ammonia–oxygen mixtures** (Jorissen and Ongkiehong). 362. **Oxidation of ammonia to nitrite in aqueous solution** (Müller). 363, **Velocity of hydrolysis of aqueous solutions of alkali cyanides** (Zawidzki and Witkowski) ; **Reaction between sodium sulphite and sulphur** (Watson and Rajagopalan).

Detecting small quantities of oxygen in gas mixtures. Schulek.—See XXIII.

Patents.

Manufacture of nitric acid from the nitrous gases arising during the catalytic combustion of mixtures of ammonia and oxygen. I. W. Cederberg (E.P. 246,889, 1.10.24).—A mixture of ammonia with the least possible excess of oxygen over that required by the equation, $NH_3+2O_2=H_2O+HNO_3$, is passed through a catalyst chamber under atmospheric pressure, or under just sufficient excess pressure to ensure the flow of gases through the chamber. The products subsequently pass through absorption apparatus, *e.g.*, U-tubes constructed of ferrosilicon, or towers filled with acid-resisting material, in which the gases and condensed liquid flow in the same direction, no water being added to the gases. Nitric acid of about 70% strength is obtained. L. A. Coles.

Lead chambers employed in the manufacture of sulphuric acid. W. G. Mills, and Packards and James Fison (Thetford), Ltd. (E.P. 247,644, 17.11.24).—A lead chamber of circular cross-section, in which the gas inlet is tangential to the chamber wall and comparatively near the bottom. The outlet is still nearer the bottom on the other side of the chamber. C. Irwin.

Recovering sulphur dioxide [from smelting furnace gases]. A. H. Eustis (Can. P. 248,607, 2.5.24).—Sulphur dioxide is absorbed either in a liquid or in a solution of some substance with which it will form an additive compound, and the partial pressure of the sulphur dioxide above the liquid is then reduced by introducing a large quantity of some other gas, so liberating the sulphur dioxide. This may be done by running the solution into another chamber and blowing in exhaust steam.

E. S. Kreis.

Purification of hydrocyanic acid [from hydrogen sulphide]. M. Walker, Assr. to Pacific R. and H. Chemical Corp. (U.S.P. 1,571,982, 9.2.26. Appl., 26.10.25).—Hydrogen sulphide present as an impurity in liquid hydrocyanic acid is removed by treatment with sulphur dioxide. L. A. Coles.

Manufacture of iron perchloride. D. Tyrer (E.P. 248,214, 6.5.25).—Ferric chloride is obtained by chlorinating crystalline ferrous chloride, and adding sufficient water to yield crystalline ferric chloride, or a solution of desired strength. L. A. Coles.

Manufacture of alkali phosphates. C. M. Hoff, Assr. to Grasselli Chemical Co. (U.S.P. 1,572,846, 9.2.26. Appl., 17.7.24).—Alkali phosphate solution is electrolysed in a diaphragm cell, and alkali phosphates are recovered separately from the anode and cathode solutions. L. A. Coles.

Separation and recovery of arsenic and/or antimony and tin. J. A. Lahey, Assr. to Vulcan Detinning Co. (U.S.P. 1,575,217, 2.3.26. Appl., 6.5.25).—A solution containing the arsenic and tin in the form of arsenate and stannate is evaporated and cooled to allow the arsenic salt to crystallise. Tin is recovered from the filtrate. A. R. Powell.

[Preparation of] silicofluorides and fluorides. Chem. Fabr. Griesheim-Elektron (F.P. 599,278, 9.6.25. Conv., 10.6.24).—Calcium fluoride is mixed with a salt of an alkali or alkaline-earth metal, the silicofluoride of which is of slight solubility, and also with silica and with an acid forming a soluble calcium salt. The silicofluoride produced is converted by alkali compounds into alkali fluoride. C. Irwin.

Decomposition of reducible substances [phosphates]. G. M. Lombardo (F.P. 599,285, 9.6.25).—Natural phosphates or the like are heated with carbon in absence of air and the volatile decomposition products are burnt by blowing with air in the proximity of the zone of reaction, their heat of combustion thus being utilised. C. Irwin.

Preparation of thenardite from sodium chloride and magnesium sulphate. Kali-Forschungs-Anstalt G.m.b.H. (G.P. 424,083, 21.4.21).—The double sulphate of sodium and magnesium is decomposed into Glauber's salt and anhydrous magnesium sulphate, and the former dehydrated with sodium chloride at a definite temperature. C. Irwin.

Preparation of pure aluminium sulphate. Chem. Fabr. Griesheim-Elektron (G.P. 424,129, 20.4.19).—Pure crystalline aluminium chloride prepared by the action of hydrochloric acid on alumina is decomposed at a temperature of 115° with concentrated sulphuric acid, a great excess of this being avoided. C. Irwin.

Preparation of concentrated colloidal arsenious sulphide solution. O. Faust (G.P. 424,141, 11.1.25).—Hydrogen sulphide is passed into a solution of arsenious oxide in pure or aqueous glycerin, preferably in presence of a protective colloid. C. Irwin.

Manufacture of zinc oxide. N. V. Handelmaatschappij Grikro (E.P. 225,833, 7.11.24. Conv., 3.12.23).—In the process of vaporising zinc and burning the vapour, condensation and oxidation of zinc fumes around the outlet-hole of the vaporising chamber cause the formation of accretions which obstruct the flow and reduce the yield of zinc oxide unless continually stripped off. To avoid this a current of "protective" gas, *e.g.*, producer gas, or coke-oven gas (preferably preheated), is directed against the edges of the fume outlet. S. S. Woolf.

Manufacture of zinc oxide. H. H. Utley and J. McCallum, Assrs. to River Smelting and Refining Co. (U.S.P. 1,574,317, 23.2.26. Appl., 7.6.23).—A fume product containing zinc and lead is treated with chlorine, the lead chloride removed by volatilisation, and the residue roasted with carbonaceous reducing material. C. Irwin.

Production of carbon disulphide from ammonium thiocyanate. J. A. du Bois (G.P. 423,860, 23.11.23).—Carbon disulphide is produced by heating ammonium thiocyanate with steam, *e.g.*, by dropping a solution of the salt into a heated vessel fitted with a reflux condenser to condense undecomposed ammonium thiocyanate. The uncondensed vapours are passed through hot sulphuric acid. L. A. Coles.

Apparatus for continuous distillation of sulphur. Raffineries Internat. de Soufre (F.P. 598,407, 5.9.24).—The apparatus consists of a melting pot, storage tank, and distillation chamber, connected in such a way that the level of sulphur in the distillation chamber is kept constant without the use of mechanical regulating devices. The flue-gases are used to melt the sulphur and also, playing around the feed pipe connecting the storage tank to the distillation chamber, raise the temperature of the feed sulphur to that of the sulphur in the distillation chamber. E. S. Kreis.

Mechanical salt-cake furnaces. Farbw. vorm. Meister, Lucius, & Brüning (E.P. 227,799, 27.11.24. Conv. 18.1.24. Addn. to 225,548).—See G.P. 414,971 ; B., 1925, 848.

Production of potassium salts. E. Niccoli (E.P. 247,405, 6.3.25).—See F.P. 594,904 ; B., 1926, 237.

Adsorbent materials (U.S.P. 1,570,537).—See I.

Distillation of coal (E.P. 243,665).—See II.

Hydrogen (F.P. 599,614).—See II.

VIII.—GLASS; CERAMICS.

Manufacture of transparent silica glass. H. George (Compt. rend., 1926, 182, 850—851).—Transparent silica, free from gas bubbles, is obtained by fusion of certain very pure natural quartzites which are built up of microscopic crystals of silica and contain no occluded gases. This quartz does not crack or disrupt on heating to fusion. S. K. Tweedy.

Ultramicroscopic motion picture study of the relation of colloidal content and plasticity in clays. W. G. France (J. Amer. Ceram. Soc., 1926, 9, 67—76).—The colloidal fractions of four clays were studied by the aid of the kinematographic camera and the ultramicroscope, the number and extent of the light areas on the photographic prints being taken as an indication of the quantity of colloidal matter present. The results obtained indicated a definite relationship between the colloidal content and the plasticity of the clays examined. Arranged according to decreasing plasticity (*i.e.*, colloidal content) the order of the four clays was: English china clay, S. Carolina kaolin, N. Carolina kaolin, fireclay. The effect of a deflocculating agent (sodium hydroxide) and of a flocculating agent (acetic acid) was also observed by this method.
F. Salt.

Minerals of bentonite and related clays and their physical properties. C. S. Ross and E. V. Shannon (J. Amer. Ceram. Soc., 1926, 9, 77—96).—The main object of the work was to determine whether the minerals of the bentonite group of clays could be studied and explained by ordinary mineralogical methods. Bentonite is defined as a rock composed essentially of a crystalline mineral formed by devitrification of a glassy, igneous material, usually a tuff or volcanic ash. The characteristic clay-like mineral is usually montmorillonite, less frequently beidellite; it has a micaceous habit, facile cleavage, and high birefringence. The structure of the original rock is retained to a remarkable degree in the clay. The high adsorptive powers of bentonite are due to its micaceous structure and easy cleavage, giving great surface area, and to its felt-like texture, and not to the presence of colloids; it contains no gel colloids and few of its crystalline particles can be included within colloidal dimensions. Chemical analyses of purified bentonites showed them to consist essentially of a mineral closely resembling the French montmorillonite. The amount of bivalent bases (magnesia and lime) is approximately constant; they are therefore assumed to form an essential part of the molecule. Hence, the suggested formula is: $R''O,R'''_2O_3,5SiO_2,5—7H_2O$. The water content varies from 16·10% to 25·67%, according to the temperature and humidity of the atmosphere. A large proportion is driven off at 120°, only 5% or less being retained above 450°. One clay was found, on analysis, to consist largely of beidellite, having the formula $Al_2O_3,3SiO_2,4H_2O$. Another, completely crystalline and micaceous, had a composition corresponding to halloysite, $Al_2O_3,2SiO_2,nH_2O$. The optical properties of the clay minerals are discussed. F. Salt.

Elimination of limestone from clays. R. A. Horning (J. Amer. Ceram. Soc., 1926, 9, 110—113).—After the removal of the larger stones by hand, the clay, with the smaller stones, is fed to a pair of conical rollers, one threaded, the other smooth, spaced about ¼ in. apart. All stones larger than one inch are thrown out by the threaded roller; smaller stones are crushed to pea-size or smaller. Finally, the clay, after being mixed with water and pugged, is passed through a set of smooth rollers, 18 in. in diameter, set less than 1/16 in. apart. The wet, smooth stones are not readily gripped by these rollers, and are removed by means of an oscillating finger, whilst the smallest stones are crushed to powder, which is intimately mixed with the clay in a final pugging operation. F. Salt.

Influence of ferric oxide and titanium oxide on pure clays. A. H. Kuechler (J. Amer. Ceram. Soc., 1926, 9, 104—109).—The effect of small additions of titania and of ferric oxide on the fusion temperature of kaolin and of fireclay was investigated. The binary graph showing the effect of additions of ferric oxide tends towards a straight line; the irregularities are accounted for by the fact that ferrous iron is a more powerful flux than ferric iron. Approximately 10% Fe_2O_3 lowers the fusion temperature of kaolin and fireclay by 6 and 6½ cones respectively. The corresponding graph for titania is a straight line in the case of kaolin, but slightly irregular in the case of fireclay, owing to the iron content. About 5% TiO_2 lowers the fusion temperatures by 2 and 3 cones respectively. The study did not reveal any eutectic. F. Salt.

Influence of composition of body and glaze on the physical properties of a true porcelain. P. W. Lee (J. Amer. Ceram. Soc., 1926, 9, 97—103).—An attempt was made to develop a porcelain of high quality mainly from American raw materials; the only imported material was English china clay. The results are presented in three-phase diagrams. The best body mixture produced contained 47·5% of clay, 28·9% of flint, 22·7% of felspar, 0·6% of calcium carbonate, 0·2% of magnesium carbonate, and 0·1% of boric acid. The best colour for each body was produced at a definite temperature; the total content of alkaline-earth fluxes must not exceed 1%, or that of magnesium carbonate, 0·4%. The zinc content of the glaze improved the white colour, but decreased the translucency and produced a rough glaze. F. Salt.

Recent researches on porcelain. E. E. Urbschat (Z. angew. Chem., 1926, 39, 365—368).—The author gives a brief review of recent researches on the m.p. diagram for alumina–silica mixtures, in relation to the firing of clays and clay products; on the variations in physical (including optical) and mechanical properties of porcelain made with various types of quartz; on colours and glazes for ceramic products; and on the factors influencing the life and durability of the saggers for firing porcelain. B. W. Clarke.

Monograph and bibliography on terra cotta. H. Wilson (Bull. Amer. Ceram. Soc., 1926, 5, 94—145).—Summarised information is given on terra cotta, its uses, durability, methods of manufacture, physical properties, etc. A full bibliography gives 173 references, mainly to American literature.
F. Salt.

Silica bricks. Dilatometric analysis of raw materials. Travers and de Goloubinoff (Rev.

Mét., 1926, 23, 100—117 ; cf. B., 1926, 274).—A review of the various methods used to identify the allotropic forms of silica occurring in silica bricks. The usual method for determining the absolute density by means of a specific gravity bottle gives low results due to entrapped air and this error is increased with increased fineness of grinding. The use of petrol in place of water showed a complete elimination of air bubbles after shaking with the powder for a few minutes only at atmospheric temperature. The expansion curve of cristobalite showed a break at 210°, and that of tridymite at 440—450°. Above 450° the curve for the expansion of tridymite up to 1100° is a straight line with a very small value for the coefficient of expansion. The total expansion between 440° and 575° is given as quartz 0·77%, cristobalite 0·055%, tridymite 0·06%. In commercial bricks containing a mixture of the allotropic forms of silica, determinations by dilatometric methods enable cristobalite (35—70%) to be estimated with an error of 2—3%, and quartz (10—30%) and tridymite (25—30%) within 2—5%. The sum of the constituents thus found is generally from 80 to 85% and the difference to 100 is explained by the presence of fused impurities and also small quantities of amorphous silica. Contrary to the conclusions of Endell (cf. B., 1913, 426) β-cristobalite was not obtained by chilling from above the transition point of the α-form. C. A. King.

Coagulation of clay. Gallay.—See A., April, 354.

Patents.

Vitreous composition [resistant glass]. E. C. Buck (U.S.P. 1,570,202, 19.1.26. Appl., 26.2.24).—A glass comprising a complex metaphosphate of aluminium and an alkaline-earth metal, and having the composition, P_2O_5 73—78%, CaO or MgO 23—10%, and Al_2O_3 3—13%, and substantially free from silica, is resistant to the action of hydrofluoric, hydrofluosilicic, and phosphoric acids, and can be readily worked. Such a glass containing lime has a relatively high coefficient of thermal expansion which falls as the lime is replaced by magnesia ; by using suitable proportions of lime and magnesia a glass suitable for lining silica glass vessels can be prepared. For manufacture calcium hydrogen phosphate, aluminium phosphate, and phosphorus pentoxide are fused together in suitable proportions, silica being removed by addition of a small quantity of aluminium or calcium fluoride or by using an excess of phosphorus pentoxide. T. S. Wheeler.

Drying of clay products and other goods. A. E. Brown (E.P. 246,935, 12.11.24).—The goods to be dried, which are kept stationary throughout the process, are arranged in a series of chambers provided with longitudinal flues above the ceiling and below the floor. Hot air is admitted from above and distributed evenly through the chamber by openings in the flue arranged to deliver approximately equal amounts of air. The air, slightly cooled and containing some moisture, is withdrawn from the lower flue, after a relatively slow vertical passage through the chamber, and the air from the last of the series of chambers is passed in increasing quantities (to compensate for its lower heat content) through the chambers containing goods in a wetter state, *i.e.*, goods liable to be damaged by rapid drying. B. W. Clarke.

[Brick] kilns. Stoneware, Ltd., and H. Dean (E.P. 247,245, 13.6.25).—In kilns adapted for drying and burning bricks, tiles, etc. (particularly blue bricks), there are two groups of chambers, built in parallel and having a space between the groups to afford access to the chambers. The chambers are internally fired, and are interconnected by means of damper-controlled apertures in the partition walls ; they may be heated in series from a fire in one. A pair of interconnected chimney flues extends along the outer sides of the two parallel groups and each flue is connected by damper-controlled connexions with each chamber of its group. The two branches of the chimney flue are provided with dampers so that the flow of gases in the chambers may be reversed. Connecting ducts controlled by dampers are provided between each chamber and the flues, and by this means any of the chambers in either group may be put into communication with any other chamber and the heat extracted from one chamber or group of chambers may be utilised for the drying of goods in other chambers prior to burning. A. W. Hothersall.

Brick-making. H. M. Ridge (E.P. 247,325, 28.11.24).—In the kiln-burning of bricks, a portion of the evolved hydrocarbon gases is drawn off at a part of the kiln which is sufficiently hot to prevent condensation on the bricks. The whole or a part of the gases so drawn off is returned to the combustion zone of the kiln where it is burnt with the aid of added air. Where there is an excess of hydrocarbons over that required to heat the kiln, it may be utilised for other purposes, or it may be cooled in order to condense part or all of the hydrocarbons. A. W. Hothersall.

Drying refractory materials. W. E. Wilson and H. G. Lykken (U.S.P. 1,570,659, 26.1.26. Appl., 11.12.23).—The ware is subjected to rising temperature and decreasing humidity in passing through a heating and humidifying medium, which circulates in a general direction opposite to that in which the ware travels. At successive points the drying medium is forced in a vertical direction between the pieces of ware. F. Salt.

Dryer kiln [for ceramic ware]. H. R. Straight (U.S.P. 1,572,326, 9.2.26. Appl., 7.2.24).—A drying tunnel is provided with a series of upper and lower compartments through which air is circulated. The roof of each upper compartment is formed of a horizontal portion and a curved portion which approaches asymptotically to the line of travel of the ware being dried, so that the air is reflected downwards through the ware. The lower compartments are staggered with regard to the upper, and the floor is formed horizontally with a curved portion

which approaches asymptotically to the line of travel of the ware towards the delivery end and directs the air upwards through the ware.
B. W. Clarke.

Continuous kiln. H. R. Straight (U.S.P. 1,572,327, 9.2.26. Appl., 17.3.24).—The ware is moved on cars through a tunnel designed so that the space between the cars and the walls of the tunnel may be sealed, dividing the tunnel into two compartments above and below the floor line of the cars. Both ends of the lower compartment and the inlet end of the upper compartment may be sealed, and the upper compartment is heated by the products of combustion of a furnace. The air necessary to maintain combustion is drawn mechanically through the lower compartment. B. W. Clarke.

Batch for making ceramic material. F. M. and F. J. Locke (U.S.P. 1,572,730, 9.2.26. Appl., 17.10.24).—The raw batch for making a refractory material is made up of a relatively small amount of a compound of manganese and a relatively large amount of clay. B. W. Clarke.

Manufacture of refractory material. Ateliers de Construction Oerlikon (F.P. 596,461, 8.4.25. Conv., 22.5.24).—Mixtures of grog, graphite, and clay for the manufacture of crucibles, muffles, and the like are moistened with a solution containing borax and boric acid in the proportions $Na_2B_4O_7$ to $4H_3BO_3$.
B. W. Clarke.

Forming sheet glass. E. C. R. Marks. From Libbey-Owens Sheet Glass Co. (E.P. 248,943, 8.4.25).

IX.—BUILDING MATERIALS.

Refractory hydraulic cement. J. Arnould (Chim. et Ind., 1926, 15, 184—188).—Attempts have been made to prepare a cement with good setting properties, and capable of withstanding high temperatures without deterioration, using mixtures based respectively on Portland cement, magnesia cements, and aluminous cements. The last alone proved suitable as a basis for a refractory cement, the mixture most nearly satisfying the requirements consisting of 1 pt. of aluminous cement (*ciment fondu*) and 2 pts. of calcined and powdered bauxite. This gives a cement which sets slowly and hardens rapidly, and undergoes only slight shrinkage on heating. It softens, however, at 1350—1400° and melts at about 1600°. Mixed with crushed refractory material in the proportion of 1—3 pts. of crushed refractory to 3 pts. of cement, it gives a concrete which is not affected by rapid changes of temperature. After heating to 1000° the cement and concrete exhibit a certain degree of friability, but this disappears again on heating to 1250°. The manufacture of this cement (*ciment Kestner*) is now being undertaken in France.
A. B. Manning.

Patents.

Impregnating wood. Gebr. Himmelsbach A.-G. (E.P. 241,155, 16.4.25. Conv., 11.10.24).—Timber to be impregnated by the "kyanising" process is placed in tanks through which the mercuric chloride is circulated continuously from a supply tank at 40°, even distribution being ensured by transverse wooden grids in the steeping tanks. A comparatively short time is necessary for impregnation, and uniform and complete impregnation is obtained. B. W. Clarke.

Bituminous emulsions. Asphalt Cold Mix, Ltd., and F. Levy (E.P. 246,907, 3.11.24, 30.4 and 29.7.25).—Hot molten or liquid bituminous material (at a temperature of 90—110°) is agitated with up to 10% of a tanning agent, *e.g.*, tannic acid, as an emulsifier, and up to 100% of hot water, with or without the addition of an alkali. The addition of a dilute aqueous solution of an alkali increases the stability of the emulsion and enables a higher proportion of water to be used. The emulsion formed is stable and durable and can be readily poured and used in the cold state. B. W. Clarke.

Manufacture of cement. K. P. Billner. From M. Lantz (E.P. 247,097, 22.8.25).—Gypsum, or other suitable material containing calcium salts, is incorporated with cement clinker in two or three stages, 2—3% being added at each stage and ground thoroughly with the clinker. In this way a comparatively high percentage of gypsum can be added, reducing the setting time and increasing the compressive strength and yet reducing the volume expansion (Le Chatelier test). B. W. Clarke.

Manufacture of Portland cement from molten slag from gas producers and furnaces fired by pulverised coal. G. Polysius (G.P. 421,427, 20.4.22).—Lime, silica, ferric oxide, alumina, and gypsum are added, in the proportions required to form Portland cement, to the molten slag before it is tapped off from the slag chamber. The added substances may be introduced, together with fuel and air, through nozzles provided with several concentric outlets or through simple nozzles.
B. W. Clarke.

Binding together blocks for pavements, roads and the like. L. S. van Westrum (E.P. 247,238, 12.8.24 and 9.5.25).—A mortar for binding road or building materials together is composed of 20 pts. of cement, lime, plaster of Paris, or the like, mixed with 80 pts. of a bituminous soap which contains at least 50% of bitumen and which is made by saponifying fatty material in presence of bitumen (cf. E.P. 233,371 ; B., 1926, 14). The mortar may also contain 10—20 pts. of pulverised rubber (if rubber paving is being dealt with) or 10—20 pts. of sand or stone dust. A. W. Hothersall.

[Magnesium oxychloride cement] railroad tie. H. G. Jaeger (U.S.P. 1,568,507, 1.5.26. Appl., 4.10.22).—Railroad ties specially suitable for tropical climates are prepared by saturating a loose fibrous organic material with a phenolic preservative. The product is saturated with magnesium chloride solution and calcined magnesite added, and then a separately prepared finely powdered mixture of

silica and calcined magnesite is incorporated, the whole mixture being moistened to a plastic consistency with magnesium chloride solution.
S. Binning.

Manufacture of magnesia from crystalline magnesites for the production of Sorel cement. Austro-Amer. Magnesite Co. (Oesterr.-Amer. Magnesitges.) (Austr. P. 101,328, 22.5.23).—Definite proportions of finely ground and lump magnesite are mixed and heated for a prolonged period at a definite temperature above the decomposition temperature of magnesite. The product contains, in addition to highly basic magnesium carbonate which sets rapidly with solutions of magnesium chloride or magnesium sulphate, dead-burnt magnesia which sets very slowly and increases the stability of the cement.
B. W. Clarke.

Manufacture of porous building material for insulating purposes from coal slack etc. W. Neuhaus and E. Opderbeck (G.P. 412,071, 20.1.24, and 421,072, 16.2.24).—A mixture of coal washings, shale, etc. is ignited and burnt in specially constructed chambers without the addition of further fuel or the application of external heat. In order to maintain a sufficient temperature, oxygen or oxygen mixed with air is introduced under pressure. For the purpose of quick building the mixture is charged into the annular space between outer and inner refractory walls, and fired as described.
B. W. Clarke.

Manufacture of porous bricks or bricks containing metals or metal oxides. C. Ehrenberg, H. Wiederhold, C. Krug, M. G. Holsboer, K. Fischer, and Studienges. für Ausbau der Ind. (G.P. 422,715, 20.3.24).—The mass from which the bricks are formed is mixed with ammonium salts of humic acid, dried, and fired, a reducing atmosphere being used when it is desired to obtain bricks containing metals. B. W. Clarke.

Process for preparing cement. W. Kirchner, Assr. to Chem. Fabr. Grünau, Landshoff & Meyer A.-G. (U.S.P. 1,578,139, 23.3.26. Appl., 1.2.24).—See G.P. 405,844 ; B., 1925, 209.

Impregnation of wooden posts. Établ. P. Noé & Co. (E.P. 214,550, 12.10.25. Conv., 16.10.24).

Heating of heavy tars and bitumens in connexion with the treatment of roads. A. E. Ridgway (E.P. 249,304, 5.3.25).

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

Balanced reactions in steel manufacture. A. M'Cance (Trans. Faraday Soc., 1925, 21, 176—201).—The equilibrium constants of several reactions occurring in the manufacture of steel have been derived theoretically and the equations for iron and iron oxides have been evaluated. The Nernst heat theorem and Einstein's equation for the atomic heats of solids deduced from the quantum hypothesis have been applied in considering other elements, such as manganese and silicon, where experimental data and information on specific heats of many compounds involved are lacking. The percentage deoxidation of liquid steel at four different temperatures between 1500° and 1800° in the presence of varying amounts of manganese from 0·10 to 2·00% is given, and similar calculations have been made in the case of silicon. A steel originally saturated with FeO at 1500° is deoxidised to the extent of 81·7% if manganese is added in such amount that 0·5% remains in the mixture. The ratio of the deoxidising powers of manganese and silicon obtained theoretically agrees well with Brinell's figure of 5·2. Ordinary deoxidised steel contains 0·04—0·05% O, and it would be difficult to reduce this further by means of manganese or silicon. Only very small amounts of aluminium in excess of that required to effect deoxidation are required to maintain the deoxidised state, and for practical purposes the amount can be regarded as independent of temperature. Aluminium removes the whole of the free ferrous oxide, and the most economical method is to use a low-grade alloy containing about 5—10% Al. Silicon can be reduced from the slag by iron, but more is reduced by carbon. In open-hearth practice carbon is oxidised during the boil period through the intermediate action of ferrous oxide in the slag, and as soon as this falls silicon is reduced. On increasing ferrous oxide by the addition of ore the reduced silicon is oxidised and a cloud of minute inclusions is produced throughout the bath. To minimise the amount of non-metallic inclusions the total quantity of ore should be added at one time, and the slag allowed gradually to exhaust itself. In passing from slags of high silica content to slags high in ferrous oxide the number of inclusions tends to diminish, this difference being less marked in cold than in hot charges.
M. Cook.

Effect of other elements on the migration of carbon in steel. E. G. Mahin, R. C. Spencer, and C. R. Hayner (Proc. Indiana Acad., 1925, 34, 177—180 ; Chem. Abstr., 1926, 20, 571).—An introductory paper. Cementation experiments are held to prove that solid carbon can dissolve in and migrate through iron. Cementation is more rapid from grey than from malleable iron into ingot iron, and the differences in the effect are ascribed to differences in carbon, manganese, or silicon content. Increasing the amount of silicide or of ferromanganese in a carburising mixture of grey iron drillings increased the tendency of iron to absorb carbon.
A. A. Eldridge.

Metallographic etching reagents. III. For alloy steels. E. C. Groesbeck (Sci. Papers U.S. Bur. Standards, 1925, 20, [518], 527—586).—Etching with acid reagents does not distinguish between any of the constituents found in alloy steels and ferro-alloys. By the ordinary immersion method with solutions containing an alkali two distinct etching effects are obtained, a chemical attack of the constituent by the alkali and oxidation of the constituent by nascent oxygen generated in the solution.

The oxidised compound is generally etched out, and the iron matrix remains bright in both cases, having been rendered passive by the alkali or the nascent oxygen. Iron carbide, iron tungstide, and the complex constituent of high-speed steels are attacked by the alkali, the other constituents remaining undarkened, while all are affected and darkened by nascent oxygen. The first three are distinguished from chromium carbide, tungsten carbide, or vanadium carbide by etching with a hot 10% solution of sodium or potassium hydroxide, alkaline sodium picrate, or alkaline potassium copper cyanide. Iron tungstide or the high-speed steel constituent are distinguished from carbides by etching in 10% sodium or potassium hydroxide or a mixture of 10% sodium hydroxide and hydrogen peroxide. In a hot sodium picrate solution iron tungstide is darkened in 1 min., whereas all the other constituents remain undarkened for at least 10 min. In electrolytic etching, using solutions of weakly dissociated acids and both alkali and metal salts of these acids, the iron matrix remains unattacked while the other constituents are etched. With an etching period of 3 min. the carbides of chromium, tungsten, and vanadium are attacked, while iron tungstide, iron carbide, and the high-speed steel constituent remain unaffected. Oxygen is formed at the anode, which is the specimen being etched, through a secondary reaction between water and the acid formed in the first stages of electrolysis and also by the discharge of hydroxyl ions at the anode. The various constituents, excepting iron carbide which is darkened by this treatment, cannot be distinguished from each other by heat tinting. By suitable etching methods and solutions it is possible to identify any of the constituents, but tungsten carbide and chromium carbide cannot be distinguished from each other, although the crystalline form of tungsten carbide, which usually occurs as triangular or rectangular shaped particles, aids in its identification.

M. COOK.

Heat-treatment of steel rails. L. THIBAUDIER and H. VITEAUX (Rev. Mét., 1926, 23, 65—81).—At the Neuves-Maisons works steel rails are subjected to intermittent quenchings in cold water. The volume of water in the quenching bath is regulated according to the weight of metal, and means are provided above the bath for lowering or raising the rail (cf. E.P. 195,147 ; B., 1923, 505 A).

C. A. KING.

Cementation of ferrous alloys with aluminium. J. COURNOT (Compt. rend., 1926, 182, 696—698).—Different methods of cementation were tested, and the powdered ferro-aluminium process found the most satisfactory, ammonium chloride being used as a flux. Steel low in carbon content was used. Two layers were formed, viz., an outer one less than 0·1 mm. thick (composed of a solid solution containing $FeAl_3$), which is irregular, porous, and brittle, and an inner layer of composition ranging from 65 to 100% Fe, which forms a good protecting layer. The variation of efficiency of covering with temperature and time of cementation was tested by heating in an oxidising atmosphere. Micrographical examination was also carried out. A specimen cemented for 1 hr. at 900° had an inner protective layer 0·02 mm. thick, and resisted oxidation in an oxidising atmosphere at 1000° for 81 hr. After cementation for 8 hr. the inner layer was 0·37 mm. thick, and resisted oxidation for 240 hr. The constants in the equation of Weiss (Thèse, Paris, 1923, 85) representing the rate of formation of the inner layer of solid solution were calculated. For a layer 0·32 mm. thick, if $\theta =$ time in hours, and $T =$ absolute temperature, $1/\theta = 6{\cdot}323 \times 10^{-4} + 1{\cdot}0059^{T}$.

W. THOMAS.

Specific electrical resistance of tungsten wires. J. TSUKAMOTO (Nagoka Anniv. Vol., 1925, 409—412 ; Chem. Zentr., 1926, I., 1701).—The specific electrical resistance of drawn tungsten wire containing 1% Th is dependent upon the fineness of the tungsten powder from which the wire was made, on the time of sintering, and on the temperature of drawing. At 20° the specific resistance of a rod, 0·47 cm. square, is 6·1 microhms, which falls to a minimum of 5·7 microhms on drawing down to a diameter of 4·5 mm. Further drawing increases the resistance to 6·0 microhms at 0·35 mm. diameter, and to 7·1 microhms at 0·015 mm. diameter.

A. R. POWELL.

Tensile strength of tungsten wires at high temperatures. R. TAJIME (Nagoka Anniv. Vol., 1925, 413—416 ; Chem. Zentr., 1926, I., 1701).—The tensile strength of tungsten wires containing 1% Th and having a diameter of 0·076 mm. is as follows in kg. per sq. mm. : 310 at 300° abs., 200 at 800° abs., 70 at 1600° abs., 20 at 2000° abs., 9 at 2400° abs., 4·5 at 2800° abs., and 1·5 at 3150° abs. All the determinations were carried out *in vacuo*.

A. R. POWELL.

Differential dilatometer with mechanical registration [for metals]. P. CHEVENARD (Rev. Mét., 1926, 23, 92—99).—The differential dilatometer designed for automatic registration by optical means (Rev. Mét., 1917, 14, 610) has been modified by replacing the concave mirror of the optical lever by a pointer placed perpendicularly to the plane of the three contact points. A pen attached to the end of this pointer marks the curve of differential expansion on a sphere, and mechanical means are used to translate this movement on to a single plane.

C. A. KING.

Porosity and intensive corrosion. Experiments on commercial sheet zinc and other metals. U. R. EVANS (J.S.C.I., 1926, 45, 37—44 T). The corrosion of commercial sheet zinc in chloride or sulphate solutions is of four types :—(1) Regional corrosion of the lowest portion (where oxygen soon becomes exhausted and which becomes anodic towards the part above) ; a sharp horizontal boundary separates this region from the unchanged area above and moves steadily upwards. (2) Point corrosion starting in pores opening on to the surface, which represent ideal "unaerated" (anodic) places. (3) Line corrosion along scratches. (4) Edge-point corrosion from points or edges. Corrosion along pre-existing capillary channels, which are known to penetrate even ordinary sound metals, often causes marked internal rottenness. In rolled metal corrosion produces a great tendency to flaking owing to the undermining of the surface layers.

Effect of cyanogen compounds on the floatability of pure sulphide minerals. E. L. Tucker, J. F. Gates, and R. E. Head (Min. and Met., 1926, **7**, 126—129).—The addition of lime to the pulp prevents almost completely the flotation of pyrites and reduces considerably the flotation of chalcocite, but in no way influences the flotation of bornite or chalcopyrite when a mixture of pine oil and potassium xanthate is used as the frothing agent. Addition of sodium cyanide in an amount not exceeding 0·5 lb. per ton of mineral further decreases the amount of pyrites floated but increases the amount of chalcocite floated when the alkalinity is relatively high. The "deadening" of pyrites by lime and cyanide is more efficient and lasting than that caused by lime alone and is caused by the adherence of agglomerated particles to the surface of the pyrites. Microchemical examination of treated pyrite particles showed the presence of ferric iron on the surface.

A. R. Powell.

Rate of solution of base metal amalgams in acids. W. Fraenkel (Korrosion u. Metallschutz, 1925, **1**, 203—206; Chem. Zentr., 1926, I., 1703—1704).—The rate of solution in acids of the alkaline-earths metals, aluminium, magnesium, and beryllium from amalgams is expressed by the equation $dv_t/dt=K(v-v_t)$, where v is volume of hydrogen disengaged by complete solution of the metal and v_t is the volume disengaged in time t. There appears to be no relation between the coefficient of diffusion and the constant K or the potential for any of the metals tested. The concentration of the above metals in the amalgam has a distinct influence on the rate of dissolution of the metal in acid, but with alkali metals this is not the case. The difference is probably due to the presence of dissolved and slightly dissociated intermetallic compounds in the latter case.

A. R. Powell.

Crystal growth in recrystallised cold-worked metals. W. Feitknecht (Inst. Metals, Mar., 1926. Advance copy, 35 pp.).—Crystal growth in recrystallised cold-worked aluminium sheets is faster the more severe the deformation prior to recrystallisation. Crystals attain only a moderate size in severely worked material but the size increases with decreasing deformation, 30% reduction in thickness yielding very large crystals. Growth only commences after heating for a certain period, during which time little change takes place. This period is longer the less severely the material has been worked. Large crystals commence to grow from the surface. No marked change takes place below a certain limit of deformation and the limit below which no large crystals grow is about 30% at 550° and 10% at 630°. The minimum grain size is practically the same in sheets of different thickness and mechanical treatment which have been heated to the same temperature and in which growth is completed. A short heat treatment at a higher temperature causes growth to be much slower on annealing at a lower temperature, and if the temperature of the first annealing is sufficiently high no considerable growth occurs at the lower temperature. A short previous annealing at a higher temperature or a longer one at a lower temperature raises the limit of deformation below which no large crystals can grow. Grains which have grown can subsequently decrease in size and remain stable at a smaller size or disappear entirely. Growth is not confined to large grains and the process is very discontinuous. The grain size after complete recrystallisation is much larger in very pure aluminium than in a less pure variety and growth is much faster. As in pure aluminium, crystal growth in very pure silver is faster the more severely the sheets have been worked, but the final grain size is much finer than in aluminium heated at a corresponding temperature. Difference of internal energy of crystal grains is considered to be the main cause of crystal growth. Insoluble impurities greatly raise the resistance to growth. The two main conditions necessary to cause growth of very large crystals are a not too great amount of remaining strain and a certain amount of resistance which is slowly removed on heating for long period.

M. Cook.

Softening of strain-hardened metals and its relation to creep. R. W. Bailey (Inst. Metals, Mar., 1926. Advance copy, 14 pp.)—An examination of data of various authors on the softening of several strain-hardened non-ferrous metals and alloys supports the view that the relation between the time T to produce a specific softening and the temperature θ at which it takes place is of the form: $T=T_0e^{-b\theta}$, where T_0 is the time required to soften at zero temperature, b a constant varying with different metals. This law gives a straight line upon the log (time)te–mperature diagram and the curvature of the line plotted from experimental data is due to the influence of the heating up period and is much more marked at high than at low temperatures. The three stages of creep in the failure of a test-piece in tension under prolonged application of stress at a constant temperature are explained on the balance of the rate of production of strain-hardening by distortion and the rate of its removal by thermal action. If the test is made at two different temperatures, and assuming the physical properties of the metal to be the same at these temperatures, the times to failure should be proportional to the times for softening of strain-hardened material, and thus the duration would be connected with the temperature by the same law as that for the softening of a strain-hardened metal, *i.e.*, the value of L, the length of life at temperature θ, would be $L=L_0e^{-b\theta}$.

M. Cook.

Malleability and metallography of nickel. P. D. Merica and R. G. Waltenberg (Tech. Papers U.S. Bur. Standards, 1925, **19**, [281], 155—182).—See B., 1925, 175.

Physical chemistry in steel making. R. HADFIELD (Trans. Faraday Soc., 1925, 21, 172—175). —See B., 1925, 550.

Reactions of basic open-hearth [steel] furnace. T. P. COLCLOUGH (Trans. Faraday Soc., 1925, 21, 202—223).—See B., 1925, 550.

Chemical reactions of the basic electric [steel] process. F. T. SISCO (Trans. Faraday Soc., 1925, 21, 224—239).—See B., 1925, 550.

Equilibria in systems involving ferrous oxide. J. B. FERGUSON (Trans. Faraday Soc., 1925, 21, 240—242).—See B., 1925, 551.

Slag reactions. P. M. MACNAIR (Trans. Faraday Soc., 1925, 21, 243—248).—See B., 1925, 551.

Function of ferric oxide in acid and basic open-hearth slags. J. H. WHITELEY (Trans. Faraday Soc., 1925, 21, 249—254).—See B., 1925, 551.

Physico-chemical phenomena from melt to ingot. A. L. FEILD (Trans. Faraday Soc., 1925, 21, 255—267).—See B., 1925, 550.

See also A., April, 340, **Effect of rolling on crystal structure of aluminium** (OWEN and PRESTON). 344, **Gold–nickel alloys** (FRAENKEL and STERN); **Metal-pairs forming a continuous series of mixed crystals** (VAN LIEMPT); **Solubility of hydrogen in tin and aluminium at high temperatures** (BIRCUMSHAW). 349, **Permeability of nickel to hydrogen** (LOMBARD). 356, **Inter-metallic compounds. Calcium–tin and magnesium-tin alloys** (HUME-ROTHERY); **Diagram of state of calcium and mercury** (EILERT). 357, **System iron–chromium–carbon** (MEIERLING and DENECKE). 358 **Phase equilibria of sulphates** (Jänecke); **Reduction equilibria for system zinc oxide–carbon monoxide** (MAIER and RALSTON).

Combustibility of blast-furance coke. SHERMAN and KINNEY.—See II.

Overcoming plating troubles. BERNARD.—See XI.

Colloidal metals. HUGOUNENQ and LOISELEUR. —See XX.

PATENTS.

Manufacture of alloys [containing silicon, titanium, or zirconium]. R. W. STIMSON and W. BORCHERS (E.P. 247,634, 6.11.24).—Alloys of silicon, titanium, and zirconium with any number of miscible metals, *e.g.*, iron, chromium, manganese, are produced by smelting in an electric furnace a mixture of carbonaceous reducing agent, slags or natural products rich in alumina, sand or slags rich in silica, zirconia, and/or titania, calcareous materials, such as fluorspar or limestone, and metalliferous ores or by-products containing metals of the iron group, manganese, chromium, copper, or the like, the mixture being so apportioned that the resulting slag contains silica, alumina, and lime and magnesia in such proportions that the chemical equivalent of the silica exceeds that of the other acid components, the sum of the chemical equivalents of the alumina, lime, and magnesia exceeds 75% of that of the silica, and the chemical equivalent of the alumina exceeds 85% of the sum of those of the lime and magnesia. For producing a chromium-silicon-iron alloy an aluminous slag is melted on the carbonaceous hearth of an arc furnace and briquettes of low-grade chromium slag and chromite bonded with petroleum tar are fed in alternately with briquettes of silicious material, lime, and tar; the temperature is maintained at 1700—1750° until a grey slag of the above nature is produced containing less than 1% Cr_2O_3 and 1% FeO. The resulting alloy contains for example, 24% Si, 43% Cr, 0·4% C, and the remainder iron, and is suitable for the direct production of low-carbon chromium steel (non-rusting steel); to this end it is added together with chromite to a steel bath fused under a calcareous flux in an arc furnace with a non-reducing hearth, whereby further chromium is reduced from the ore and the silicon enters the slag as silica, together with much chromic oxide. The steel so produced is practically free from sulphur and phosphorus, while the slag comprises a low-grade source of chromium and silicon for the production of further quantities of silicon-chromium alloy for use again in the process. The poor slag produced in the first step is useful for the production of cement. Low-grade manganese ores containing much phosphorus and iron are smelted with a silicious flux to produce an iron alloy rich in phosphorus and a highly manganiferous slag which is smelted as above for the production of a silicon-manganese-iron alloy for use in steel making and a slag for cement manufacture. The iron-phosphorus alloy is refined by the basic open-hearth process to obtain steel and a slag rich in phosphorus for fertilisers. Cuprosilicon alloys for use as deoxidisers may be made in a similar manner to the chromium-iron-silicon alloys except that copper oxide replaces the chromium material in the charge. A. R. POWELL.

Manufacture of [steel] alloys. R. W. STIMSON (E.P. [A] 247,635, 6.11.24, and [B] 247,876, 6.11.24, and 23.2.25).—(A) Alloy steels of the non-rusting type containing more than 50% of iron with nickel and/or cobalt and more than 3% of an additional alloying element are made in the following way. Clean open-hearth steel scrap is fused in a basic-lined arc furnace with lime and sufficient manganese ore to give a strongly basic slag and oxidise the sulphur and phosphorus, but not all the carbon in the metal; from time to time further lime with borax and/or fluorspar are added to render the slag very fluid. The slag is removed, the metal covered with lime and fluorspar, and a mixture of iron–chromium–silicon alloy (containing, for example, 22% Si and 51% Cr, cf. E.P. 247,634, preceding), magnetic iron ore or roll scale sufficient to oxidise the silicon, and lime sufficient to combine with the silica formed is added, suitable fluxes being charged in as required. The slag is again removed when the reaction is finished and replaced by a desulphurising slag containing less than 2% C as calcium carbide, after which a small amount of ferromanganese is added to ensure thorough deoxidation of the metal and efficient removal of gases. If an addition of copper is required it is made prior to the calcium carbide slag wash, whereas nickel, cobalt, molybdenum, etc. should be added to the original bath of fused metal, or scrap containing these elements may be used instead of plain carbon steel. (B) The alloying of the desired element (*e.g.*, chromium) is effected by adding to the molten steel bath, after removal of the phosphorus, a mixture of an ore of the desired element, a non-carbonaceous reducing agent, and a flux, *e.g.*, a mixture of chromite, ferrosilicon containing 90% Si, and burnt lime, together with suitable additions of borax, fluorspar, iron, manganese and titanium oxides to maintain a fluid slag. After removal of the slag the bath is purified as described under (A). A. R. Powell.

Preventing adherence of cast metal [steel] to the mould. F. von Bichowsky (U.S.P. 1,570,802, 26.1.26. Appl., 22.4.24).—Finely divided titanium, silicon, aluminium, boron, or zirconium nitride, preferably in the crude state mixed with iron, as obtained by the method described in U.S.P. 1,391,147–8 1,408,661, and 1,415,280 (B., 1921, 770 A; 1922, 294 A, 463 A) is made into a paste with water, with or without addition of a binding agent, such as molasses or sodium silicate, and used to coat moulds for steel or the like. The dried lining is permeable to gases from the molten metal, and the casting readily comes away from the mould and requires only simple sand-blasting before machining. T. S. Wheeler.

Manufacturing open-hearth steel. J. D. Jones and E. E. Litz (U.S.P. 1,573,004, 16.2.26. Appl., 6.12.21).—A bath of metal in an open-hearth furnace is heated by high-velocity flames from a number of burners spaced equal distances apart around a circle and radiating from the furnace wall towards the centre of the furnace. C. A. King.

Manufacture of cast-iron. J. C. Henderson, Assr. to Driver-Harris Co. (U.S.P. 1,573,937, 23.2.26. Appl., 22.4.25).—Cast-iron containing a definite amount of chromium and nickel is made by adding to a molten mass of iron in a ladle the requisite amount of a solid alloy containing nickel with a smaller amount of chromium and iron and sufficient carbon to give a low melting point. A. R. Powell.

Process for treating iron. W. J. Diederichs and A. Hayes (U.S.P. 1,574,374–7, 23.2.26. Appl., [A] 21.8.22, [B—D] 6.8.25).—Castings made from white iron are subjected to the following heat treatment:—(A, C). The casting is heated above the critical temperature for a period between 15 min. and 5 hrs. or more, but only until the iron carbide is practically all absorbed into solid solution, which in practice means that combined carbon is reduced to 0·9%; the casting is then cooled to a temperature near the critical point, and finally, in (A), cooled to room temperature, or in (C), cooled at a rate not less than 7° per hr. (B, D). The casting is heated above the critical temperature, then cooled considerably below that temperature, reheated sufficiently to allow structural and chemical changes to take place, and finally in (B), cooled at an extremely slow rate, about 5° per hr., or in (D), cooled sufficiently to prevent further chemical and structural changes. B. M. Venables.

Reduction of iron ore. P. Farup, Assr. to Norsk Hydro-Elektrisk Kvaelstof-A./S. (U.S.P. 1,574,382, 23.2.26. Appl., 10.5.22).—Iron ores are reduced in an atmosphere of carbon monoxide, and the product is cooled in an atmosphere containing only a relatively small proportion of this gas. A. R. Powell.

Non-magnetic steel. E. Becker, Assr. to Poldihütte (U.S.P. 1,574,782, 2.3.26. Appl., 25.5.25).—An alloy steel containing 6—15% Mn, 17—4% Ni, and an appreciable quantity, not exceeding 10%, of a metal having similar properties to chromium, has a high yield point and elongation in its normal condition. A. R. Powell.

Furnace for the production of iron sponge. Höganäs-Billesholms Aktiebolag (F.P. 599,185, 8.6.25).—The material is charged into a number of honeycombed retorts which are placed in a reverberatory furnace so that the heating gases play around and between them. A. R. Powell.

Removal of oxides from ferrous metal. R. Porter and J. C. Whetzel, Assrs. to Amer. Sheet and Tin Plate Co. (U.S.P. 1,572,848, 9.2.26. Appl., 27.8.24).—Articles of ferrous metal are immersed in an alkaline solution to break down the resistance of the oxide to acids, and then in an acid pickling bath to remove the oxide. L. A. Coles.

Welding processes [using atomic hydrogen] and apparatus therefor. Brit. Thomson-Houston Co., Ltd., Assees. of R. Palmer (E.P. 237,901, 23.7.25. Conv., 30.7.24; cf. E.P. 237,898; B., 1926, 198).—A stream of hydrogen is passed through an electric arc and thereby dissociated into atomic hydrogen, and the heat of re-formation of molecular hydrogen is utilised to weld metals. The welding torch comprises inclined electrodes with a nozzle for a localised stream of hydrogen within the angle between the electrodes. In addition to the localised stream of dissociated hydrogen, additional hydrogen may be supplied through a " welding head " or cover, to exclude air entirely from the weld. Electrodes of refractory metals such as tungsten may be used, and the reducing action of the atomic hydrogen is so great that easily oxidised metals or alloys, such as ferro-chrome, may be used in the weld.
B. M. Venables.

[Bearing metal] alloys containing lead and tungsten. H. Falkenberg (E.P. 247,687, 8.12.24). —Tungsten is melted with an equal weight of lead-antimony alloy and a small amount of iron, the mixture is further diluted with lead-antimony alloy, and then melted with a tin-antimony-copper-lead alloy or a lead-iron-zinc alloy. For example, a mixture of 50% of tungsten, 49·5% of antimonial lead, and 0·5% of iron is melted, diluted with three times its weight of antimonial lead, and cast. One part of this alloy is then melted with 100 times its weight of an alloy containing 67·2% Pb, 18% Sb, 13% Sn, and 1·8% Cu, or of an alloy containing 91·5—96% Zn, 0·5—5% Fe, and 3·5% Pb with, if desired, small amounts of copper and aluminium. The antimonial lead used contains 18—20% Sb.

A. R. Powell.

Aluminium-copper alloy. Z. Jeffries and R. S. Archer, Assrs. to Aluminum Co. of America (U.S.P. 1,572,487, 9.2.26. Appl., 29.4.24).—Castings of an aluminium alloy containing between 3 and 5·5% Cu are heated to 500—540° for at least 7 hr. and then cooled. M. Cook.

Aluminium-silicon alloy. Z. Jeffries and R. S. Archer, Assrs. to Aluminum Co. of America (U.S.P. 1,572,488, 9.2.26. Appl., 29.4.24).—Castings of an aluminium alloy containing substantial amounts of silicon and zinc are heated at a temperature slightly below the melting point of the eutectic until the silicon particles have altered sufficiently to improve the physical properties of the alloy.

M. Cook.

Aluminium alloy. A. Pacz, Assr. to Aluminum Co. of America (U.S.P. 1,572,502, 9.2.26. Appl., 12.9.19).—An alloy containing aluminium, copper, and silicon in the proportion of 70, 15—27½, and 2½—15 pts. by weight respectively is claimed.

M. Cook.

Composition of matter. [Die-casting alloy.] A. Pacz, Assr. to Aluminum Co. of America (U.S.P. 1,572,503, 9.2.26. Appl., 31.5.21).—A die-casting aluminium alloy contains nickel and between 2·5 and 10% Si. M. Cook.

Nickel alloy. P. D. Merica, Assr. to Internat. Nickel Co. (U.S.P. 1,572,744, 9.2.26. Appl., 26.6.23).—In the manufacture of nickel alloys the principal melt is deoxidised and then mixed with molten aluminium. M. Cook.

Dental alloy. C. C. Vogt, Assr. to L. S. Smith and Sons Manuf. Co. (U.S.P. 1,574,714, 23.2.26. Appl., 26.12.22).—A dental alloy comprises silver and tin in amounts which will readily form a suitable hardening amalgam with mercury, together with a small amount of tungsten. A. R. Powell.

Removing silica from [acid] ore leaches. M. Hosenfeld, Assr. to Siemens & Halske A.-G (U.S.P. 1,571,054, 26.1.26. Appl., 16.1.25).—Acid leaches from zinc ores or the like containing precipitated silica, which tends to gel and prevent filtration, are treated with calcium or barium sulphate or other pulverulent insoluble substance in the proportion of 5 g. per litre, and heated to 70°. The mixture can then be readily filtered. A portion of the insoluble residue can be used in the treatment of another batch of leach liquor, while the remainder may be mixed with phosphates and used as a fertiliser; the finely divided silica interacts with the phosphates converting them into soluble compounds.

T. S. Wheeler.

Continuous ore-treating furnace. W. P. Jobson, Assr. to H. S. Souder (U.S.P. 1,572,291, 9.2.26. Appl., 15.8.24).—Ore is fed and removed from a retort intermittently and fumes which are drawn off are washed to precipitate suspended solid matter. M. Cook.

Smelting ores of volatile metals. Smelting volatilisable metals. W. A. Ogg (U.S.P. 1,573,013–5, 16.2.26. Appl., [A] 7.2.25, [B] 18.5.25, [C] 25.5.25). —(A) A mixture of crude zinc-bearing material and reducing fuel is distilled in a retort in excess of the capacity of the condenser. Vapours discharged from the condenser, representing a considerable fraction of the total metal values, are recovered by deposition, while spelter is recovered in the condenser to its full capacity. (B) In the chloridising reduction of zinc ores under similar conditions to those specified in (A), fumes leaving the condenser are deposited, leached with water, and the solution mixed with a fresh charge of crude material and fuel to make briquettes for a subsequent volatilising operation. (C) The process is similar to that described under (B), but the solution obtained by leaching the fume product is treated to precipitate the zinc, the residual chloride solution being used with a further charge of ore. C. A. King.

Separation and recovery of copper, tin, and lead content of brass or bronze secondary metals [scrap] and residues. T. Lewin (U.S.P. 1,574,043, 23.2.26. Appl., 24.8.25).—The material is smelted to remove iron and non-metallic impurities, zinc oxide being recovered in a bag plant. The metal is cast into anodes and electrolysed for the production of cathode copper and lead-tin anode slimes, the latter being subsequently smelted for the recovery of the constituent metals.

A. R. Powell.

Collecting, refining, and utilising by-products from metals treated in retorts. H. W. Tuttle (U.S.P. 1,574,137, 23.2.26. Appl., 5.9.22).—The fumes are passed through a filter and passageway closed to the admission of air, and means are provided for removing the solids precipitated on the filter and for collecting and utilising the gases without oxidation taking place. A. R. Powell.

Protective coating for magnesium. L. J. Keeler, Assr. to Amer. Magnesium Corp. (U.S.P. 1,574,289—90, 23.2.26. Appl., 22.1.23).—Magnesium and its alloys are coated (A) by bringing the metal into contact with nascent fluorine, or (B) by using the metal as an anode in a solution of alkali chromate.

A. R. Powell.

Depositing silver. B. Bart (U.S.P. 1,574,544, 23.2.26. Appl., 23.9.21).—A solution of a silver salt is mixed with a reducing agent and set aside in absence of air until part of the silver is precipitated in a metallic form. The mixture of solution and finely-divided metal is then sprayed on the surface to be silvered. A. R. Powell.

Separation of metals [copper and nickel]. S. Giertsen, Assr. to Kristiansands Nikkel-raffineringsverk (U.S.P. 1,575,160, 2.3.26. Appl., 26.9.21).—Copper is precipitated from solutions of copper and nickel salts by treatment with bessemerised copper-nickel matte containing less than 10% S. A. R. Powell.

Recovery of zinc from ores. P. J. Leemans (F.P. 598,090, 23.8.24).—Low-grade zinc ores are heated with a reducing agent such as coal, and, if they contain sulphur, also with copper, to such a temperature that the zinc and part of the lead are volatilised and collected as oxides. The product is separated by treatment with ammonium carbonate solution, which dissolves the zinc. A. R. Powell.

Preparation of gold [from mercury]. Siemens & Halske A.-G. (F.P. 598,140, 7.5.25. Conv., 8.5.24).—A high-tension discharge is passed between two mercury electrodes one of which forms an annular ring around the other. In the presence of catalysts such as silver, part of the mercury (probably the isotope of at. wt. 197) is said to be converted into gold (cf. E.P. 233,715, B., 1925, 996). A. R. Powell.

Production of steel. A. Brüninghaus (E.P. 249,186, 10.12.24).—See U.S.P. 1,551,465; B., 1925, 885.

Reduction of oxide ores. Y. A. Dyer (E.P. 248,633, 10.8.25).—See U.S.P. 1,556,316; B., 1925, 963.

Wet magnetic separation. G. Ullrich, Assr. to F. Krupp Grusonwerk A.-G. (U.S.P. 1,576,690, 16.3.26. Appl., 28.9.23).—See E.P. 220,196; B., 1924, 875.

Manufacture of thin sheets of tungsten, tantalum, molybdenum, and other refractory metals. Gen. Electric Co., Ltd., Assees. of Patent Treuhand Ges. für Elektrische Glühlampen m.b.H. (E.P. 247,507, 27.5.25. Conv., 11.2.25).

Penetrators for testing penetration hardness [of metals]. C. H. Wilson (E.P. 249,446, 7.12.25).

Separating arsenic and/or antimony and tin. (U.S.P. 1,575,217).—See VII.

Recovering sulphur dioxide from smelting furnace gases. (Can. P. 248,607).—See VII.

XI.—ELECTROTECHNICS.

Overcoming plating troubles. H. C. Bernard (Abrasive Ind., 1925, 6, 380—381; Chem. Abstr., 1926, **20**, 552).—An alkaline bath produces dark and clouded deposits of nickel; when the bath is too acid, the deposits are hard and brittle. Pitted deposits may arise from the use of a bath in which sedimentation of any solid material has not first taken place, or from the presence of insufficient metal in solution. Too high current densities give a dark, rough deposit, whereas that obtained with too low current densities is easily cut through when buffed. Copper yields a blistered or peeled deposit if too much cyanide is present, whereas with insufficient cyanide the anodes become coated and the deposit has a dark, muddy appearance. The various appearances of a brass deposit are considered in relation to the conditions of deposition. Operating conditions are given for the above and for silver baths. A. A. Eldridge.

Effect of atmospheric humidity on the dielectric losses and power factors in fibrous insulating materials. S. Setoh and Y. Toriyama (Sci. Papers Inst. Phys. Chem. Res., 1926, **3**, 283—323).—In order to measure the dielectric losses in insulating materials, a quadrant electrometer free from electrostatic controlling force was used as an electrostatic wattmeter and details for its adjustment and calibration are given. Samples of insulating materials comprising different kinds of paper, calico, cloth, silk, some impregnated, others not, were tested. The humidity of the atmosphere was regulated by suspending the samples in a desiccator containing pure sulphuric acid of known concentration, the whole apparatus being placed in a thermostat kept at 30°. The dielectric losses increase at first slowly and then more rapidly with increasing humidity. Impregnated materials show generally smaller variations of losses with humidity, probably because the pores are more or less closed. The power factor, *i.e.*, the power losses in the samples, reaches a value of unity at about 70—80% humidity for untreated and also for imperfectly treated materials. Proper impregnation reduces the losses at high humidity. Hysteresis phenomena are observed when the humidity is increased from a low value and then decreased again, the dielectric losses when the humidity is decreasing being greater than when it is increasing. The dielectric losses under high humidity increase with the frequency first slowly, then a little more rapidly, and then again slowly as the frequency is increased. When the humidity is low, the change of losses with frequency follows a straight-line law. The power factor under high humidity decreases as the frequency is increased, while it remains almost constant under low humidity. The change of losses with time is much smaller for alternating than for direct current, and the final value is attained more rapidly. The losses vary with a definite power (varying between 1·9 and 2·45 for different humidities) of the voltage applied to the material for a constant humidity. The various ways in which moisture may affect the dielectric characteristics of the insulating materials are discussed, and an equivalent circuit, consisting of a high resistance connected in parallel with series-connected resistance and capacity, is shown to represent the actual variations of losses and power factor with frequency. M. E. Nottage.

Electrical resistance of tungsten wires. Tsukamoto.—See X.

Patents.

Carbons or electrodes for the formation of ultra-violet rays for therapeutical purposes. M. A. and V. Arnone (E.P. 247,831, 11.7.25).—Carbons for producing arcs emitting ultra-violet rays for therapeutic purposes contain the following constituents in the proportions stated :—graphite 80 pts., retort carbon 5, lampblack 1, vegetable carbon 4, calcium (Ca) 5, magnesium (Mg) 3, strontium (Sr) 0·9, iron (Fe) 0·9, rare earths (thorium and uranium) 0·09, fluorine (F) 2·50, silica (SiO_2) 0·1 pt., aluminium (Al), sodium (Na), and potassium (K) traces. Constituents giving these elements are pulverised, mixed well by shaking, enough benzol added to form a thick paste, and the paste worked for some hours until it is homogeneous, after which it is strained and compressed into sticks at 200 atm. The sticks are dried by exposure to the air and afterwards baked, preferably in a Hoffman's oven. The baked carbons are cleaned, soaked in gum arabic as a protection against humidity, and dried by exposure to air. M. E. Nottage.

Thermoelectric element. O. Hermann, Assr. to Thermo Electric Battery Co. (U.S.P. 1,572,117, 9.2.26. Appl., 4.5.25).—An alloy of Ni 81%, Mo 17%, and V 2%, for use as the negative element of a thermo-couple, possesses the advantages of high e.m.f., low temperature coefficient of resistance, and a relatively small thermal conductivity. E. S. Kreis.

[Removing air bubbles from electrodes of] electrolytic apparatus. R. D. Mershon (U.S.P. 1,572,403, 9.2.26. Appl., 18.9.19).—An electrolytic cell is connected with an external pump which withdraws electrolyte and air from the cell and discharges these again into the cell beneath the electrodes, thus causing rapid movement of the electrolyte. If the electrodes are placed close together, or, where this is not feasible, are separated by perforated non-conducting plates, the agitation is increased. This may also be brought about by heating the electrolyte or allowing it to become heated by virtue of its own internal resistance. In such a case a layer of non-volatile paraffin is spread over the surface so that ebullition takes place regularly within the body of the electrolyte. The evolved vapours are condensed and returned to the cell. E. S. Kreis.

Composition for storage-battery electrodes. H. G. Weir, Assr. to Prest-O-Lite Co. (U.S.P. 1,572,586, 9.2.26. Appl., 6.11.23).—A paste is prepared with lead-containing sulphatable material and a lead compound of lower density than the active material to be prepared, the proportion of this compound being varied in accordance with the physical and chemical characteristics of the sulphatable material. The composition is placed on a support and converted into active material. H. Moore.

Electrical purification of gases. H. Edler (U.S.P. 1,574,237, 23.2.26. Appl., 9.2.25).—Bars of angular shape in cross-section serve as collecting electrodes and flat bands arranged with their narrow edges facing these are used as sparking electrodes. D. G. Hewer.

Electrical precipitation [of suspended particles from gases]. E. Hopkinson (U.S.P. 1,575,165, 2.3.26. Appl., 4.6.24).—The gas is passed through a long vertical flue containing an active electrode suspended in the middle throughout its length and two movable collecting electrodes one on each side of the central electrode. These are arranged on an endless band and move upwards from the bottom nearly to the top of the flue. A. R. Powell.

See also pages 346, **Preventing deposition of scale** (F.P. 599,188). 360, **Alkali phosphates** (U.S.P. 1,572,846). 368, **Welding processes** (E.P. 237,901). 369, **Recoving copper, tin, and lead** (U.S.P. 1,574,043); **Coating magnesium** (U.S.P. 1,574,290). 370, **Gold from mercury** (F.P. 598,140).

XII.—FATS; OILS; WAXES.

Chemical nature of fats. III. Significance of the difference between the upper iodine value and iodine value of a fat ; differential iodine value. B. M. Margosches and H. Fuchs (Ber., 1926, 59, 375—376 ; cf. B., 1925, 410, 600).—The iodine value of an oil or fat varies with different specimens of the same material between certain limits. The upper iodine value varies in an exactly parallel manner, so that the difference between the two values (differential iodine value) also varies only within narrow limits and is characteristic of the oil or fat. The oils examined included olive, arachis, rape seed, almond, sesamé, cottonseed, linseed, tung, soya bean, sunflower, poppy, castor, whale, liver, fish, sardine, porpoise, coconut, and palm kernel oils. H. Wren.

Tung oil. E. Fonrobert and F. Pallauf (Chem. Umschau, 1926, 33, 41—51).—The numerous researches on tung oil have failed to give satisfactory reasons for the gelatinisation which occurs on heating and for the characteristic cloudy " matted " or " webbed " surface, resembling crocodile skin, formed on dried films of this oil. Reference is made to the work of Eibner, Merz and Munzert (B., 1925, 477), Marcusson (B., 1923, 938A), and Wolff (B., 1924, amongst others, but the authors do not consider that the characteristic properties of this oil are due solely to colloidal phenomena. Tung oil consists largely of the triglyceride of elæostearic acid and it is in the very reactive double bonds of this acid that the authors seek the clue to the properties of the oil. Graphic formulæ are set out showing the possibilities of intramolecular and extramolecular polymerisation of the glycerides of this acid, and a conclusion, supported by much experimental data, is reached that the reactivity of the partial valencies of elæostearic acid leads to the formation of molecular complexes. According to their graphical arrangement four isomerides for elæostearic acid are possible, a bi-trans, a bi-cis, trans-cis and a cis-trans form ; one of these may be the β-form of the acid, one is probably an unknown liquid acid, and the other two, which differ but slightly, are probably the α-form of the acid. The recently published work of Böeseken and Ravenswaay (B., 1925, 813) indicating that elæostearic acid is an isomeric linolenic acid with 3 conjugated double bonds is briefly referred to by the authors who point out that such a view of the constitution of elæostearic acid allows of more than 4 isomers. H. M. Langton.

Oil-containing seeds of *Datura alba*, Nees. H. Dieterle (Arch. Pharm., 1926, 264, 140—164).—The seeds of *Datura alba*, Nees (found in Florida), an illustrated anatomical description of which is given, yield about 13% of oil on extraction. The oil has d^{15} 0·9250; n_D^{40} 1·5144; acid value, 20·35; saponif. value, 192·8; Reichert-Meissl value, 2·41; Polenske value, 0·41; iodine value, 98·36; Hehner value, 93·6; acetyl value, 10·2. The oil has been exhaustively examined using, among others, the methods of Farnsteiner (B., 1898, 804) and Heiduschka and Lüft (B., 1919, 426A), with the following results: 2·9% of the oil is unsaponifiable; the remainder contains glycerides of the following acids, the proportions of which are given as percentages of the original oil. Palmitic and other saturated acids, 6·18%; caproic acid 1·00%; α-linoleic acid, 23·55%; β-linoleic acid, 2·92%; oleic acid, 60·86%. A fraction was obtained (m.p. 55—56°, magnesium salt, m.p. 136—140°) which corresponded in all respects with daturic acid (Gérard, B., 1890, 1137); it was found impossible to decide whether or not this was a mixture (cf. Heiduschka and Lüft, *loc. cit.*). W. A. Silvester.

Oxidation and polymerisation of vegetable oils and their fatty acids. G. Petrov and A. Danilovitsch (Z. Deuts. Oel- & Fett-Ind., 1925, **45**, 669—671, 688—689, 733—705, 723—724).—In the course of an investigation on the preparation of oils of high viscosity the influence of blowing and heating on sunflower oil was particularly studied. By the distillation of the oil at 270—310°, about 20% of clear yellow fatty acids pass over, the highly viscous residue being likewise yellow, but free from any resinous substances. The conclusion is reached that sunflower oil is particularly suitable for the preparation of highly viscous lubricants. Polymerisation is effected with greatest rapidity at about 300°, in practice by the use of superheated steam under diminished pressure. The oil thereby also suffers partial hydrolysis and fatty acids are removed. The thickened oil is practically free from fatty acids and has an Engler viscosity of 6·44 at 100°.
H. M. Langton.

Determination of fatty acids in fats for customs purposes. H. Heller (Z. Deuts. Oel- & Fett-Ind., 1926, 46, 148).—The Czecho-Slovakian customs imposes a duty on oils and fats containing more than 50% of free fatty acids as determined by the following test. Five g. of fat are melted and shaken with 50 c.c. of alcohol, and a few drops of phenolphthalein are added to the alcoholic extract, followed by 5 c.c. of potassium hydroxide solution (65·45 g. per litre). Samples which give a pink colour persisting for at least 15 sec. are admitted duty-free. It is pointed out that, taking the mol. wt. of oleic acid as a mean of that for the various fatty acids in commercial oils and fats, this method passes samples that contain less than 33% of free acid only, instead of the 50% allowed. A. R. Powell.

Perfumed Marseilles soaps. G. de Belsunce (Bull. Mat. Grasses, 1925, 288—293.)—The characteristic odour of coconut oil persists clearly even after saponification, and the author has studied the effects on Marseilles toilet soaps, made from coconut oil as a base, of various essential oils and perfumes added to the soap with the object of masking this odour. Samples of such soap were perfumed and the cakes examined after an interval of one week and again after an interval of three years. At the end of this latter period the original odour of coconut fat had not returned and the samples had not suffered rancidity, notwithstanding exposure to air and to temperature changes. Tables are given showing the amounts of the various natural perfumes necessary to mask completely for three years the coconut odour and the changes undergone in that time by the perfumes themselves are tabulated. Apparently the perfumes have a specific reaction different for different species and generally they act somewhat as resin in hindering rancidity. H. M. Langton.

Lubricating oils. Swoboda.—See II.

Lubrication problem. Von Dallwitz-Wegner.—See II.

***X*-Ray spectrographic investigations on lubricants.** Trillat.—See II.

Patents.

Extracting fat from bones. J. Hjort (E.P. 247,058, 4.6.25).—The fat from the bones of whales and other large marine annimals is extracted by breaking the outer layer of the bones, whereby the inner spongy mass of bone is reduced to a pulpy condition and the fat can be drained off or separated by pressing or other meçhanical means. The process can be operated at ordinary temperature without previous boiling of the bones. The best results are obtained at low temperature, when the formation of oil emulsion in glue solution is avoided.
H. M. Langton.

Catalysts for hydrogenation (G.P. 424,067).—See I.

Extracting fat from bones (E.P. 247,347).—See XV.

Glycerophosphates (G.P. 421,216).—See XX.

Theobromine from cacao waste (G.P. 423,761).—See XX.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Error introduced by the presence of bismuth in the colorimetric determination of iron in red lead. Colorimetric determination of bismuth. H. Heinrichs and M. Hertrich (Glastech.

Ber., 1924, 2, 112—115; Chem. Abstr., 1926, 20, 561).—Bismuth should be removed as sulphide before colorimetric determination of the iron with thiocyanate, or 5—10 c.c. of concentrated hydrochloric acid for 10 g. of red lead should first be added. The bismuth may be determined by dissolving the sulphide in dilute nitric acid, precipitating with ammonia, redissolving the precipitate in dilute sulphuric acid, adding 50—100 c.c. of 20% ammonium thiocyanate solution, and comparing the yellow colour produced with that of a similar mixture containing standard bismuth solution (1 c.c.=0·0002 g. of bismuth trioxide). Using 100 c.c. of ammonium thiocyanate, 0·00005 g. of bismuth trioxide may be detected. A. A. Eldridge.

Oxidation of metallic iron by a current of air in presence of iron salts. P. Fireman (Ind. Eng. Chem., 1926, 18, 286—287).—Scrap iron was placed in a receiver within a large tank containing ferrous sulphate or chloride solution and air blown through the whole after the temperature had been raised to about 60°. Hydrated ferric oxide was rapidly formed, at first of a yellow colour, then deepening to brown and finally to red-brown or purple-brown. A sample of this red-brown pigment, after drying on the water bath, contained 13·6% of moisture, and a study of the dehydration curve suggests that it may be ferric oxide monohydrate. The value of *d*, corrected for excess moisture, was found to be 4·376, which is in fair agreement with that of natural monohydrate. C. Irwin.

Cellulose nitrate lacquers. A. E. Lain (J. Oil and Colour Chem. Assoc., 1926, 9, 33—44).—The modern lacquers that are in demand for motor body finishes and other purposes that have hitherto been served by oil varnishes owe their superiority over the older metal lacquers to their relatively high content of solids. This has been made possible by the advent of "low viscosity cellulose nitrate." A lacquer containing 26% of solids (say 16% of cellulose nitrate and the remainder resins and plasticisers) can be sprayed and rubbed to a satisfactors finish. The advantages claimed for lacquer coatingy are rapid drying and hardening to a permanent film, resistance to water, petrol, etc., and absence of "bloom." Resins differ greatly in their power to impart adhesion, gloss, and rubbing qualities, and the author discusses the resins of commerce from these angles. He also reviews lacquer solvents, methods of manufacture, application and pigmenting of lacquers. S. S. Woolf.

Need for research in the oil and colour industry. H. H. Morgan (J. Oil and Colour Chem. Assoc., 1925, 8, 255—268).—A general survey and analysis of various problems of the paint and varnish industry requiring investigation, including the following:—storage and keeping qualities of paints, enamels, and varnishes; changes occurring during application, drying, and weathering; properties of the raw materials, their influences on the dried film, and the changes which take place during manufacture; structure and adhesive properties of the film; polymerisation and drying of linseed and tung oils; viscosity and plasticity of paint and varnish films; effect of solvents; methods of measuring fundamental properties of pigments (particle size and shape, oil absorption, staining power, opacity, and colour) and of dried films (gloss, opacity, hardness, flexibility, tensile strength, and water absorption), and relationship between these properties and behaviour in practice.

Leather japanning. Lattey.—See XV.

Patents.

Titanium pigments. C. Weizmann and J. Blumenfeld (E.P. 247,296, 12.7.22).—Colloidal titanium compounds with desired physical characteristics for various purposes are produced by the peptisation of precipitated titanium compounds; *e.g.*, titanium oxide or hydroxide precipitated by hydrolysis, before being dried, is submitted to a dispersion process using small quantities of acid, alkali, salts of titanium, or any substance which diminishes the surface tension of the liquid phase. The product when dried forms clots which are easily reduced to powder; this with linseed oil gives a paste containing ultra-microscopic particles. Films obtained by drying this paste are very adhesive and are permanent in colour. Fillers may be introduced into the titanium pigment, before, during or after the peptisation process. D. F. Twiss.

Carbon products [pigments]. H. H. Ward (E.P. 247,364, 22.1.25).—A mixture of dried ground peat and bone meal is heated in a closed retort at about 300° until carbonisation is complete. The charcoal is quenched while incandescent, dried, and mixed with gas carbon black and a small amount of ground soap powder. The whole, when ground to a fine powder, is suitable as a filler for rubber goods, and for making printing inks etc. S. S. Woolf.

Manufacture of varnish. F. Schwartz and E. Gil-Camporro (Assee. of L. Leach) (E.P. 231,457, 9.3.25. Conv., 26.3.24).—A varnish completely soluble in water, easy to apply, and imparting to objects coated therewith a brilliant, hard, resistant, elastic surface is prepared by saponifying gums or resins in the presence of ammonium "ricinate" (ammonium soaps of castor oil fatty acids) and then mixing the product with an oil saponified with ammonia, a certain amount of albumin, casein, or similar substance dissolved in water being also added. The ammonium "ricinate" is prepared by saponifying castor oil with caustic soda, decomposing the soap by means of hydrochloric acid, and treating the liberated fatty acids with aqueous ammonia The saponification of the gums and resins by ammonia is facilitated by the ammonium "ricinate." The following proportions may be used for preparing the ammonium soap of the resin: sandarach 100 kg., ammonium "ricinate" 15 litres, ammonia 30 litres, water 300 litres. For the final varnish mixing the following proportions are given: soap of resin 100 pts., ammonium soaps 15 pts., water 100 pts., casein (30% ammoniacal solution) 15 pts.

H. M. Langton.

Resinous compositions suitable for building and analogous purposes. W. H. Boorne and C. C. L. G. Budde (E.P. 247,620, 11.10.24).—By heating ordinary rosin with formaldehyde in the presence of a catalytic substance, *e.g.*, a metal oxide or hydroxide, such as calcium hydroxide, a reaction product is obtained which when dry and mixed with fillers, such as sawdust, asbestos, or sand, will yield "moulding powders." The primary resinous product is fusible when heated and at 120° gases and vapours are copiously evolved; the residual product does not melt when further heated and may likewise be made to give moulding powders by the addition of fillers.

D. F. Twiss.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Weber's dinitrocaoutchouc and a nitrosate $C_{10}H_{16}N_2O_6$. F. Emden (Kautschuk, Feb., 1926, 31—33).—Doubt is thrown on the existence of the dinitrocaoutchouc $C_{10}H_{16}N_2O_4$ recorded by Weber and other workers. The action of nitrogen tetroxide in carbon tetrachloride on a solution of purified rubber near 0° yields a product $C_{10}H_{16}N_2O_6$; this primary product, the formation of which must involve an oxidation process, is the same whether from *Hevea brasiliensis* or from guayule rubber; on keeping it appears to undergo intramolecular change being at first insoluble and later becoming soluble in acetone.

D. F. Twiss.

Determination of quality of raw rubber. W. Greiner and J. Behre (Kautschuk, Feb., 1926, 29—31).—Investigation of the surface tension characteristics of rubber solutions by comparing the rate of rise of a solution of 0·5 g. in 100 c.c. of benzene in a strip of filter paper, shows that the rate of rise of the solvent is most reduced by pale crêpe rubber, the effect of smoked sheet rubber, plain sheet, *Ficus* crêpe, guayule, and native remilled crêpe being increasingly feebler in the order stated. If the height of the ascent is plotted against the logarithm of the time, the result is a straight line. Mastication of the rubber increases the rate of ascent.

D. F. Twiss.

Stress-strain relationship of rubber under compression. C. H. Birkett (Trans. Inst. Rubber Ind., 1926, 1, 368—374).—Progressive vulcanisation causes an alteration in the compression-load curve for rubber similar to that observed in the ordinary stress-strain curve; the alteration in "slope" is negligible. The compression-load curve shows also other analogies with the stress-strain curve, but the initial inflexion is absent.

D. F. Twiss.

Absorption of water by rubber. C. R. Boggs and J. T. Blake (Ind. Eng. Chem., 1926, 18 224—232).—The absorption of water by rubber is analogous to the swelling of rubber in rubber solvents and of other colloids in water. There is no change in total volume and the rate of absorption is not appreciably affected by pressure although increased by rise of temperature. The rate of absorption follows no simple mathematical law. Substances dissolved in the water may have a marked effect on the absorption, salt, sugar, glycerol and, in particular, sodium hydroxide, decreasing the rate whereas ammonia, aniline, and acetic acid increase it. No great increase in the resistance to water resulted from the use of other coagulants than acetic acid or the presence of additional chemicals during coagulation. The resistance of pale crêpe rubber to water increases with age or with progressive vulcanisation; smoked sheet and Para rubber are comparable with crêpe, but "sprayed" rubber is exceptionally absorptive. The presence of water-soluble constituents increases the absorptive capacity of rubber and the washing of rubber increases its resistance to water. The absorption of water is due to the non-rubber constituents and the removal of the resinous, protein and other ingredients yields rubber with a very low absorption. Gutta-percha is somewhat more resistant than pale crêpe rubber to water, but less so than purified rubber.

D. F. Twiss.

Plasticity of unvulcanised rubber. R. W. Griffiths (Trans. Inst. Rubber Ind., 1926, 1, 308—341).—A review of the methods for the measurement of the degree of plasticity of rubber. The "recovery" of rubber from the effect of milling is more marked above 55° than below and to prevent hardening from this cause rubber should be cooled as rapidly as possible after mastication. A formula is deduced indicating the relation between the results obtained with the parallel plate plastometer (Williams, B., 1924, 480) and the magnitude of the absolute viscosity.

D. F. Twiss.

Blending of compounding ingredients [for rubber]. T. R. Dawson (Trans. Inst. Rubber Ind., 1926, 1, 359—367).—The results of Wiegand (B., 1925, 816) as to the reinforcing action of various ingredients were affected by the presence of litharge in his parent mixing; with rubber and sulphur without litharge, whiting can exert distinct reinforcing effect. This is a special case of the general absence of simple additive relationship in the joint effect of various rubber ingredients.

D. F. Twiss.

Low-temperature vulcanisation [of rubber]. F. Thomas (Trans. Inst. Rubber Ind., 1926, 1, 375—386).—Mainly a review of the activation and application of ultra-accelerators. Litharge activates the dithiocarbamate and thiuram disulphide accelerators, although to a less extent than zinc oxide; towards the zinc alkylxanthates litharge has a retarding effect. Antimony sulphide impairs the activity of certain organic accelerators, *e.g.*, the xanthates, and its colour is often affected. Carbon black also exerts a retarding influence and so tends to check the pre-vulcanisation of ultra-accelerated mixtures.

D. F. Twiss.

Acceleration of vulcanisation [of rubber] by alkaloids. B. J. Eaton and R. O. Bishop (Malay. Agric. J., 1926, 14, 8—12).—Small quantities (0·01—0·1%) of emetine exert a distinct accelerating effect but nicotine, cocaine and hyoscine in similar proportion are ineffective. Powdered ipecacuanha root and root bark also accelerate vulcanisation; the residues from the extraction of emetine may therefore be of value in this direction.

D. F. Twiss.

Patents.

Manufacture of rubber. L. le W. Hamon (E.P. 247,712, 5.1.25).—Rubber (100 pts.) is compounded with carbonised peat (25—35 pts.); the product is adapted for use in tyres and floor coverings.

D. F. Twiss.

Age-resisting rubber compound. E. W. Fuller, Assr. to Fisk Rubber Co. (U.S.P. 1,573,928, 23.2.26. Appl., 27.4.25).—Products with improved ageing properties are obtained by adding an alkali or alkaline-earth salt of α-nitroso-β-naphthol to the rubber mixture before vulcanisation.

D. F. Twiss.

Carbon pigments (E.P. 247,364).—See XIII.

XV.—LEATHER; GLUE.

South American quebracho extracts. W. Vogel (Collegium, 1926, 66—73).—The quebracho growing area is about 675,000 sq. km. included in latitudes 21—30 and longitudes 57—64. For the manufacture of quebracho extracts only red quebracho (Span., *Quebracho colorado*), the heartwood of *Quebracho Lorentzii* and *Schinopsis Balansae* is used; white quebracho (*Aspidosperma Quebracho*) contains scarcely any tannin. Distinction is also made between quebracho from different districts, quebracho Chaqueno and quebracho Santiagueno. The quebracho Chaqueno ("chaco") is preferred. The composition of the heartwood, sapwood, and bark respectively of *Quebracho colorado*, Chaqueno, by the filter-bell method of analysis is: tans 20, 2·2, 4·5; non-tans 1·5, 2·0, 1·7; insoluble matter 59·5, 53·3, 81·4; water 19, 42·5, 12·4%. The quebracho logs are sawn into thin boards, rasped, leached with hot water in wooden or copper vats, the liquor is settled and concentrated to *d* 1·165—1·210 in double- or triple-effect evaporators. Cold-soluble extracts are prepared by treating the ordinary extract with a mixture of sodium sulphite and bisulphite at 90—95° until it is entirely soluble in cold water. The yield of extract is 27—28% of crude and 30—31% of sulphited. The composition of crude and sulphited extracts respectively by the shake method is: tans 63%, 66·5%, non-tans 8%, 11·5%, insoluble matter 7%, 0%, water 22%, 22%. Sulphited extracts penetrate and tan the pelt quickly, but do not give weight. The nature and degree of sulphiting have an important bearing on the quality of the extract. The non-tans are greatly affected by the quality of the wood used, the temperature of the leach liquors, and the amount and composition of the water used in leaching. The higher the temperature and the greater the amount of water, the greater the amount of non-tans in the extract. The insoluble matter in crude extracts varies from 3 to 11%, and consists chiefly of phlobaphens; it possesses tanning properties, and is useful in drum tanning, especially at higher temperatures, and in combination with other tanning materials, when a large portion enters the leather and imparts weight and solidity. The moisture content should be determined on a sample taken from the inside of the package. It is usually 10—12%. All analytical results should be calculated to the same percentage water content, viz., 22%. The insoluble matter should be determined for practical purposes by making solutions of *d* 1·014, 1·029, and 1·045, respectively. These solutions should be clear for sulphited extracts and remain clear for 1 day. The total annual production is 222,000 tons in Argentina and 46,000 tons in Paraguay. The annual consumption of wood is 1,300,000 tons. There are reserves of 55,000,000 tons which will last 40 years at the present rate of consumption.

D. Woodroffe.

Insoluble matter in oakwood extract. P. Pavlovitsch (Collegium, 1926, 78—81).—In experiments on solutions of oakwood extract of different strengths, the insoluble matter was taken as the difference between the total solids determined immediately after making up and again after allowing to settle for 8 hrs. at 15°. The insoluble matter increased with increase in solution strength up to *d* 1·064 and diminished above that strength. A rise of temperature from 20° to 40° reduced the amount of insoluble matter by half. The determination of insoluble matter by filtering through filter paper gives 30% higher figures owing to adsorption by the paper. Oakwood extracts should be clarified at a strength of *d* 1·064 by cooling, then adding 1 pt. of ox blood per 1000 pts. of liquor, or lead acetate, alum and bisulphite, or other coagulants. One of the best coagulants is cellulose (1 pt. to 15,000 pts. of liquor) which has previously been converted into a paste by boiling with hydrochloric acid (1 pt. HCl to 30 pts. of cellulose).

D. Woodroffe.

Synthetic tanning materials. E. Wolesensky (Tech. Papers, U.S. Bur. Standards, 1925, **20**, [302], 1—45).—A preliminary study has been made, chiefly qualitative, of the methods of preparation and of the tanning properties of a number of synthetic materials prepared by condensation of sulphonated products of benzene, toluene, naphthalene, phenol, cresol, and α- and β-naphthols with formaldehyde (and in a few cases also with acetaldehyde and furfuraldehyde), and of naphthalenesulphonic acid with naphthalene, phenolsulphonic acid, and glycollic acid respectively, together with a few non-sulphonated condensation products of resorcinol and pyrogallol with the same aldehydes. Most of the products studied possess tanning properties. The simple sulphonic acids of the aromatic hydrocarbons or the corresponding phenols possess no tanning properties.

Sulphonated condensation products derived from the hydrocarbons were generally unsatisfactory as tanning agents. The resins obtained by condensing naphthalene or toluene with formaldehyde were found to be too difficult of sulphonation by direct treatment with sulphuric acid, and the condensation products of the sulphonic acids of toluene and naphthalene with formaldehyde had poor tanning properties. The products obtained by condensing the sulphonic acids of the monohydric phenols with formaldehyde possessed true tanning properties and produced light weighing, soft, pliable and strong leathers. The condensation can be carried out in dilute solutions at higher temperatures, or in concentrated solutions with or without cooling. The products from the condensation of phenol- or cresol-sulphonic acids with formaldehyde in dilute hot solutions give a nearly white leather, but condensation in concentrated solutions gives a coloured synthetic tannin which darkens the leather. Synthetic tannins from naphtholsulphonic acids produce dark coloured leathers. Resins from phenol or cresol and formaldehyde, if not too highly condensed, can be readily sulphonated by means of strong sulphuric acid, but more care is required than in the sulphonation of the original phenol or cresol. These sulphonated resins are good tanning agents and possess better filling properties than the products mentioned above. Formaldehyde was replaced by acetaldehyde in a sulphonated phenol–aldehyde resin and the product had good tanning properties and better filling properties than any other product, but the yield of condensation product was low. The condensation products obtained from resorcinol or pyrogallol and formaldehyde or acetaldehyde possessed greater filling properties than any of the sulphonated products and are capable of producing a very good quality of leather for some purposes. Furfuraldehyde reacts less readily but under proper conditions will also yield satisfactory results.

D. WOODROFFE.

Chrome tanning. III. Tanning effect of some complex chromium compounds. E. STIASNY and L. SZEGÖ (Collegium, 1926, 41—65; cf. B., 1925, 139, 559, 560).—A chromium sulphate solution of 33·3% basicity was mixed with sodium sulphite in amounts ranging from 0·25 to 10 mols. of sulphite per 1 mol. $Cr(OH)SO_4$. The solutions were diluted to a strength of 2·5 g./litre Cr, and kept for 24 hrs. before testing. Additions of sodium sulphite above 0·5 mol. prevented precipitation of the chrome liquor by weak solutions of ammonia. The resistance to precipitation was lost if the excess sulphite was removed. The sulphite–chromium complex was therefore stable only in presence of excess sodium sulphite. With small additions of sodium sulphite, the chromium migrated to the cathode, but to the anode with 1 mol. of sulphite or more. The p_H value increased from 2·7 with no sulphite, to 8·1 with 10 mols. The maximum amount of SO_3 combined with 1 mol. Cr was 0·47 mol. and the compound formed is probably $[Cr_2(OH)_2(SO_3)(SO_4)_2]''Na_2$. The liquor containing this compound, on keeping, yields a precipitate which contains no sulphate and has 3 Cr atoms to 2 SO_3 radicals. The tanning properties of the liquor increase considerably with additions of sulphite up to 1½ mols. and decrease rapidly with further additions. Gustavson (B., 1923, 65) obtained similar results with sodium acetate and formate, as also did Burton (B., 1924, 880). The tanning velocity—which has usually been considered as a measure of astringency—increases with additions of sodium sulphite although the solution contains chromium in the anion, and it is concluded that the laws which govern the ordinary basic chromium sulphates do not apply to these chromium complexes which manifest anodic migration. With ordinary basic chromium sulphates, the velocity of tannage and the amount of chromium absorbed increase as the precipitation number diminishes. The proportion of chromium combined with hydroxyl groups is not the important factor in these chromium complexes because the increase of the negative radicals combined with the chromium still more increases their negative charge and their resistance to alkali. The results show there is no connexion between the ionic migration of the chromium complexes and the tanning properties. Experiments with sodium oxalate give similar results to those obtained with sodium sulphite. The behaviour of "permutit" is not always analogous to that of hide, as Gustavson claims.

D. WOODROFFE.

Sulphur tannage. A. W. THOMAS (Ind. Eng. Chem., 1926, 18, 259—260).—Sulphur hydrosol was prepared by the slow addition of 3*N*-sodium thiosulphate to 17*M*-sulphuric acid in an ice bath. The colloidal sulphur was precipitated by sodium chloride, and repeatedly redissolved and reprecipitated until a clear yellow solution of colloidal sulphur was obtained. Portions of hide powder were shaken with the sulphur hydrosol, then washed with a large volume of water, dehydrated, dried, and weighed. The increase in weight was due to sulphur and was very small, 0·191% or less. Practically all the sulphur was extractable by carbon disulphide. The sulphur fixation was slow and increased with the amount of colloidal sulphur present. Colloidal sulphur does not precipitate gelatin. Acidified hide powder fixed more sulphur. A decrease in acidity was accompanied by a decrease in the fixation of the sulphur, which was in accordance with the Procter–Wilson theory of tanning. The sulphur-treated hide powder was more resistant to the action of cold water than raw hide substance, but readily decomposed in hot water. The combination of the colloidal particles and the collagen apparently does not result from a mere deposition of the sulphur owing to the coagulation of the sulphur hydrosol. It is due to the combination of the collagen cations and the anion, xS,yS_5O_6H' of the complex xS, $yS_5O_6H_2$, which forms the disperse phase of the hydrosol. The results are contrary to Apostolo's (cf. B., 1913, 877). D. WOODROFFE.

Effect of splitting on the tensile strength of leather. J. A. WILSON and E. J. KERN (Ind. Eng.

Chem., 1926, 18, 312—313).—Rectangular pieces of leather were cut on either side of, and 10 cm. from, the backbone of each of a number of representative skins of finished vegetable- and chrome-tanned calfskins. The pieces were cut into 25 strips of equal size, numbered consecutively, and the odd-numbered pieces tested for tensile strength. The even-numbered pieces were split into two layers. The thickness varied with the different numbers. The tensile strength of each split was measured and compared with the calculated strength of the unsplit strips. The results show that the tensile strength is not uniform throughout the thickness, the grain layer being relatively weak. The strength of the leather is in the reticular layer (" flesh "). Splitting always causes a loss in strength per unit width and the sum of the strengths of the two splits is always less than the strength of the unsplit strip. Chrome leather loses 60% of its total strength, whereas vegetable-tanned leather loses 48% only. Cutting away the grain layer to a depth less than 48% for vegetable-tanned leather or 22% for chrome leather, increases the strength per unit cross section of the remaining flesh layer. D. Woodroffe.

Leather japanning. W. T. Lattey (J. Oil and Colour Chem. Assoc., 1926, 9, 44—49).—The leather finish is comprised of filler coats, colour coats, and varnish coats, the hardness increasing progressively from the primer to the finishing coat, whereas the reverse is the case in the painting of timber and metal, when the finishing coat is the most elastic. Linseed oil heated with iron and aluminium driers for 4—5 hrs. at 300° gives a stiff jelly which is spread in a thick coat on the leather (previously rendered supple by the rubbing in of not more than 10% of a semi-drying oil). Further priming coats of a like nature are applied, each coat being dried for 24 hrs. at 70°, and the tackiness that is apparently inevitable at this stage is removed by exposure to direct sunlight. An alternative to the stoving process is the use of sunlight throughout, but this is dependent on the weather in general, the temperature (which must be relatively low to keep the linseed jelly stiff enough to prevent it from sinking in), and the relative humidity. The last factor is of importance in connexion with the swelling of the fibres, on which depends the elasticity of the skin. A qualified success only is attained by the use of artificial light to replace sunlight. For the subsequent coats almost any good quality paint or varnish may be used. Cellulose nitrate compositions also are now used in leather treatment. S. S. Woolf.

See also A., April, 351, **Influence of hydrogen-ion concentration on viscosity and elasticity of gelatin solutions** (Freundlich and Neukircher). 409, **Tannin in kino of** ***Eucalyptus calophylla*** (McGookin and Heilbron).

Variations in absorptive power. Effront.—See XVIII.

Physical method for examination of gelatin. Thorne Baker and Davidson.—See XXI.

Patents.

Depilating hides and skins. M. Bergmann (E.P. 247,826, 6.7.25).—Hides and skins are treated first with inorganic and organic bases, *e.g.*, ammonia, ethylenediamine, piperidine, pyridine, or carbamides or compounds of these bases, especially the sulphides, or further with soluble silicates, separately or mixed, and afterwards treated with the ordinary depilating agents. For sheepskins a solution containing 10 litres of ammonium sulphide solution or 10 litres of 25% ammonia per cub. m., and for calf skins a solution containing 10 litres of ammonium sulphide solution and 10 litres of commercial water-glass per cub. m. are recommended. D. Woodroffe.

Extraction of glue and fatty matters from bones and the like. C. H. Shearman (E.P. 247,347, 6.1.25).—Bones and the like are extracted with hot water in a vertical cylinder furnished with a charging and discharging orifice at its upper and lower ends respectively, each orifice being fitted with a steam- and water-tight lid. A perforated inverted cone extends from the lower orifice about halfway up the cylinder to facilitate discharge of the solid contents. One or more external pipes fitted with injectors connect the lower end of the cylinder with a horizontal perforated ring within the upper part to maintain circulation of the liquor. Discharge pipes are arranged near the top and bottom of the cylinder, and means provided for heating and injecting steam into the cylinder. A colloid coagulant, *e.g.*, $\frac{1}{2}$—1% of alum, is added to the water. After simmering with hot water for 4 hrs. water or weak glue liquor is introduced into the bottom of the cylinder and the fatty matter and strong glue liquor are discharged at the top. The cylinder is closed and the contents are subjected to a steam pressure of 5 lb. per sq. in. for 2 hrs., the liquor is discharged as before and, the cycle of operations is repeated at pressures of 10, 15, 20, 25, 30, and 35 lb. per sq. in. A series of cylindrical vessels may be used and weak liquors obtained at high pressures used on fresh material. D. Woodroffe.

XVI.—AGRICULTURE.

Distribution of ***Azotobacter*** **in Bavarian soils with reference to the reaction of the soils and the content of calcium carbonate and phosphoric acid.** H. Niklas, H. Poschenrieder, and A. Hock (Zentr. Bakt. Parasitenk., Abt. II, 1925, 66, 16—28; Chem. Zentr., 1926, I, 1876).—The relation between the p_H of the soil and the distribution of *Azotobacter* differs according to whether the extract is made with water or with potassium chloride solution. With water, no development is found at a p_H less than 5·6 and growth is best at a p_H greater than 6·5; the corresponding figures with potassium chloride solution are 4·5 and 6·0. A high calcium content favours development; grass land conditions are less suitable than arable land. *Azotobacter* may occur in soils deficient in phosphoric acid but, even with favourable reaction and high calcium content, does

not develop or fix nitrogen. In some soils it fails to develop even when the conditions in regard to reaction, calcium, and phosphoric acid are suitable.
C. T. Gimingham.

Determination of the potassium and phosphoric acid requirements of soil from the molecular composition according to Ganssen. Hunnius (Landw. Jahrb. Schweiz, 1926, 63, 145—156; Chem. Zentr., 1926, I, 1698).—The manurial requirements of the soil calculated by the method of Ganssen from the molecular composition of the aluminium silicates extracted from the soil by boiling concentrated hydrochloric acid do not correspond to the requirements determined in field experiments and by the methods of Mitscherlich and Neubauer. A better indication is obtained by the total content of nutritive elements and the proportion of colloidal silica. As the molecular composition is not directly related to the soil reaction, the degree of saturation of the soluble aluminium silicates is not an exact measure of the exchange acidity. B. W. Clarke.

Determination of manurial requirements of soils by laboratory methods. (1) Densch (Z. Pflanz. Düng., 1926, **B5**, 97—104; cf. B., 1925, 858).—Critical experiments on Neubauer's seedling method for determining the phosphoric acid and potassium requirements of soils are recorded. The amount of phosphoric acid or potassium per 100 g. of soil as determined by this method was compared with the actual response of the soil to these nutrients in field or pot experiments with a variety of cultivated plants. The results were irregular and there was no general agreement between the two methods. Further, the figures obtained by Neubauer's method on the same soils in different laboratories were, in many cases, widely divergent. Possible variations in technique, which may account for such divergencies, are discussed. It is considered that further work on the method is required in order to define more precisely the optimum conditions.

(2). O. Lemmermann (*ibid.*, 105—117).—Neubauer's method is discussed. The assumptions involved in the calculation of the limiting values per 100 g. of soil, which are taken to indicate lack or sufficiency of phosphorus and potassium, are criticised, and numerous experiments are described in which the phosphoric acid requirements of soils determined by the Neubauer and by the citrate method are compared with the results obtained in field and pot experiments. The three methods are in general agreement in many cases but by no means in all. The Neubauer method needs considerable refinement before it can give results of certain value.

(3). E. Blanck (*ibid.*, 118—125).—Experiments on the use of various acid solvents for determining "available" nutrients in soil are described (cf. B., 1926, 70). The relative solubility of the phosphoric acid of soils in 0·5% citric acid is in agreement, in a number of instances, with the response of the soil to phosphate manuring. Results obtained by Neubauer's method agree in some cases but not in others.

(4). H. Neubauer (*ibid.*, 126—129; cf. B., 1925, 220).—A reply to the criticisms of the author's seedling method contained in the papers by Densch and Lemmermann referred to above.

(5). E. A. Mitscherlich (*ibid.*, 132).—Some criticisms of Neubauer's method from the standpoint of plant physiology.

(6). Densch (7). O. Lemmermann (*ibid.*, 130—131, 133—143).—Further discussion of Neubauer's method and comparison of the results with those obtained by other methods. C. T. Gimingham.

Carbon dioxide and plant yield. A. Rippel (Z. Pflanz. Düng., 1926, **B5**, 49—64).—A crictical discussion of recent work bearing on the possibility of increasing crop yields by artificially regulating the amount of carbon dioxide in the atmosphere. It is considered that the raising of this question has added to our knowledge from the point of view of plant physiology but that it is of little or no practical importance as regards plant growth in the field.
C. T. Gimingham.

Carbon dioxide manuring. Gerlach (Z. Pflanz. Düng., 1926, **B5**, 65—69; cf. B., 1925, 684).—In field experiments, slightly lower yields of yellow lupins and of potatoes were obtained on plots where the air was enriched by additional carbon dioxide during the growing period than on plots not so treated. A comparison of stable manure with artificial fertilisers gave results with potatoes in favour of the former, but reasons are given why this cannot be explained as due to an increased content of carbon dioxide in the air. C. T. Gimingham.

Importance of soil carbon dioxide for the nutrition of plants and the action of some humus or carbon dioxide manures. O. Lemmermann (Z. Pflanz. Düng., 1926, **B5**, 70—84; cf. B., 1925, 110, 182).—Vegetation and field experiments show that soil receiving dung and green manure in addition to mineral fertilisers produced about 35% more carbon dioxide than the same soil with minerals only. In spite of this, the average percentage of carbon dioxide in the air over the dunged plots was no higher than over the undunged plots. The increased yields obtained with organic manures are not thought to be due to carbon dioxide. Several so-called "humus" or "carbon dioxide" manures were tested on potatoes with inconclusive results. C. T. Gimingham.

Carbon dioxide [and plant growth]. P. Ehrenberg (Z. Pflanz. Düng., 1926, **B5**, 85—86).—Experiments are referred to indicating that, at all events on highly cultivated soils, additional carbon dioxide is ineffective for promoting plant growth.
C. T. Gimingham.

Effect of tar and tar vapours on the soil. Ewert (Landw. Jahrb. Schweiz, 1926, **63**, 103—127; Chem. Zentr., 1926, I., 1698).—The lower-boiling constituents of tar are harmful to plant roots and to bacteria in the soil; radishes are especially sensitive to the influence of tar. Where the air contains a relatively high proportion of tarry vapours, *e.g.*, in the neighbourhood of tar distilleries, the amount of tar absorbed by the soil is insufficient to produce a harmful effect, although the vapours themselves are very harmful to the parts of the plant above the ground. Tar therefore does not act as a soil poison in the same way that silica does. Very small quantities of tar vapour in the air, however, are sufficient to poison the leaves. B. W. Clarke.

Fundamental investigations on basic slags. McArthur (Scottish J. Agr., 1925, **8**, 72—73; Chem. Abstr., 1926, **20**, 470).—Under particular soil conditions the dicalcium silicate present in open-hearth, fluorspar basic slag can function as an ingredient for the correction of soil acidity. The molecular composition of a slag is of greater significance than its percentage composition. A. A. Eldridge.

Experiments with calcium nitrate. E. Blanck and A. Hahne (J. Landw., 1926, **74**, 51—64).—Pot experiments with oats and field trials with sugar beet show little difference between the efficiency of sodium nitrate and of a proprietary brand of calcium nitrate ("B.A.S.F. Kalksalpeter") as sources of nitrogen. Preliminary laboratory experiments indicate that the effect of the calcium nitrate on the physical properties of soil was not unfavourable. C. T. Gimingham.

Surophosphate or Dasag manure. E. Blanck and F. Alten (J. Landw., 1926, **74**, 39—49).—Dasag manure (Surophosphate or Surogatphosphate) is prepared from sewage and all kinds of town refuse by addition of peat and sulphuric acid; it contains about 0·7% N, 1·0% K_2O, and 4·0% P_2O_5. Pot experiments on several soils show that this material has little or no effect on the growth of maize even when used in amounts much greater than could be employed in practice. C. T. Gimingham.

Utilisation of disinfectants containing mercury in disinfecting baths [for seeds]. G. Hilgendorff (Z. angew. Chem., 1926, **39**, 377—379).—The loss in disinfecting power, *i.e.*, diminution in mercury content, of solutions of various disinfectants (Uspulun, Germisan, Urania disinfectant) used for treating seeds, cereals, etc., was determined, the results differing somewhat from those obtained by Krauss (B., 1926, 30) under slightly different conditions. The absorption of the disinfectant by the seeds and the effect of the extractive matter (carbohydrates, proteins, etc.) which collect in the bath, are the most important factors influencing the change in mercury concentration of the solution. Temperature has only a slight effect. No comparative figures are yet available for large-scale operations as distinguished from laboratory-scale experiments. B. W. Clarke.

Soil core sampler. E. B. Powell (Soil Sci., 1926, **21**, 53—57).

Effects of various methods of applying fertilisers on crops and on certain soil conditions. D. G. Coe (Soil Sci., 1926, **21**, 7—21, 127—141).

See also A., April, 347, **Quantitative adsorption analysis by Wislicenus' method** (Lorenz). 352, **Relation between properties and chemical composition of soil colloids** (Anderson and Mattson). 354, **Coagulation of clay** (Gallay). 358, **Equilibrium in system arsenic pentoxide–barium oxide–water** (Hendricks). 377, **Wiegner's elutriation apparatus** (Gessner). 438 **Manganese and plant growth** (McHargue); **Physical and chemical factors in growth of asparagus** (Working).

Patents.

Manufacture of nitrogenous fertilisers from calcium cyanamide. Chem. Fabr. Heppes & Co., and J. B. Carpzow (G.P. 422,623, 7.7.23).—Calcium cyanamide mixed with sewage sludge, sapropel, saprocoll, etc., is dried and granulated. A non-corrosive, non-dusting product is obtained, which is not washed away from the soil by rain water. B. W. Clarke.

Production of urea. Norsk Hydro-Elektrisk Kvaelstofaktieselskab (Nor. P. 39,744, 13.11.22).—Urea is obtained by passing carbon dioxide at 80—160° (preferably at 130—140°) under pressure, over compounds of ammonia with salts such as ammonium chloride, calcium chloride, zinc chloride, aluminium chloride, or calcium nitrate. The product is used direct as a fertiliser, or is worked up into urea salts. L. A. Coles.

Insecticidal composition. C. N. Hand, Assr. to Rubber Service Laboratories Co. (U.S.P. 1,573,490, 16.2.26. Appl., 25.3.25).—A dusting composition, comprising a thiourea, is claimed for destroying insects. C. T. Gimingham.

Improving the adhesion of spray powders to plants. Farbenfabr. vorm. F. Bayer & Co. (G.P. 412,516, 26.6.21).—The powder, *e.g.*, sulphur, is mixed or saturated with a powdered alkali soap or soap solution and powdered lime or magnesia added. This prevents the washing away of the insecticide by dew or by rain, owing to the formation of a calcium soap which fixes the sprayed powder on the plant. The process may be applied to pumice stone, nicotine, Paris green, copper sulphate, etc., in the powdered form. B. W. Clarke.

Production of hydrocyanic acid for use as an insecticide. Chem. Fabr. H. Stoltzenberg (G.P. 420,729, 21.10.24).—Hydrogen cyanide is produced by heating the salts of organic bases such as trimethylamine, betaine, hexamethylenetetramine, etc. (preferably the hydrochlorides). The salts are less hygroscopic than the free bases and a higher yield of hydrogen cyanide is obtained, *e.g.*, 70—80% with betaine hydrochloride compared with 50—60% with free betaine. B. W. Clarke.

Manufacture of solid calcium nitrates. J. Y. Johnson. From Badische Anilin & Soda-Fabr. (E.P. 249,370, 29.5.25).—See U.S.P. 1,564,410; B., 1926, 139.

Removing silica from acid ore leaches (U.S.P. 1,571,054).—See X.

XVII.—SUGARS; STARCHES; GUMS.

Patents.

Purification of sugar solutions. K. Urban, Assr. to S. Elbogen (U.S.P. 1,577,389, 16.3.26. Appl., 2.6.24).—See E.P. 240,253; B., 1925, 1005.

Electro-osmotic purification of saccharine juices. K. Wolf and E. Langstein, Assrs. to Amer. Electro-Osmosis Corp. (U.S.P. 1,577,669, 23.3.26. Appl., 29.3.24).—See E.P. 214,578; B., 1924, 921.

Feeding stuffs (Swiss P. 95,512).—See XIX.

XVIII.—FERMENTATION INDUSTRIES.

Stream-line filter and its applications to brewing and bottling. H. L. Hind and J. A. Pickard (J. Inst. Brew., 1926, 32, 97—102).—Beer for bottling can be dealt with by the stream-line filter (Hele-Shaw, J.S.C.I., 1923, 353 t). Protein hazes are removed without loss of colour of the beer or removal of colloids associated with body, flavour, and head retention, and the beer, so filtered, is rendered sterile and remains bright for almost any length of time. Arrangements can be made for the liquid undergoing filtration to remain under a positive pressure of carbon dioxide. The quantity of beer left in the filter is reduced to a minimum and is less than with pulp filtration. With slight modification the filter can be applied, more efficiently than the ordinary filter-press, to the separation of yeast from beer, with the advantages of cleaner working, elimination of filter cloth troubles, greater ease of sterilisation, lower cost of running, and fewer renewals. It is easily cleaned and can be sterilised without damage to the paper by passage of live steam. C. Ranken.

Variations in the absorptive properties of yeast. J. Effront (Compt. rend. Soc. Biol., 1925, 93, 1248—1250; Chem. Zentr., 1926, I., 2013—2014).—The properties of yeast depend upon its method of nutrition. A modified fermentation process in which carbon dioxide in the usual quantities, but no alcohol is produced, is brought about by adding yeast to a very dilute nutrient solution, and gradually adding the nutrient so as to maintain it at constant concentration. Under these conditions, the "vegetative" function of the yeast prevails, whereas in the usual method of fermentation, the action of the zymase is predominant. The two varieties of yeast can be separated by the difference between their absorptive capacity for sodium hydroxide and hydrochloric acid, preferably the latter, as they both absorb sodium hydroxide, whereas only the usual variety absorbs acids. On the addition of 12 to 41 c.c. of $0{\cdot}1N$-acid per 100 g. of dry yeast, the solution separates into two layers. Variations in the method of nutrition indicate that the cell membrane is impervious to hydrochloric acid. L. A. Coles.

Variations in absorptive power. J. Effront (Monit. Sci., 1926, 16, 3—11, 29—36; cf. B., 1923, 67 a, 287 a; 1924, 763; 1925, 144).—A review of our knowledge on the subject of absorption especially by organised substances. The action of invertase is explainable by the assumption of a specific absorbent capable of fixing both sugars and hydrogen-ions so as to create a medium favourable to hydrolysis, while the products enter into solution and the catalyst once again becomes available. Vegetable materials differ widely in their water-absorbing powers. 1 g. of elder pith absorbs 60—80 g. of water, while vegetables and fruit pulps also absorb considerable quantities. Gelatin absorbs a maximum proportion of water at p_H 3·2, the amount diminishing as the p_H increases. At the isoelectric point absorption is relatively small. Further, the amount absorbed is less in the presence of alkali than of acid, but the p_H of the gelatin grains is more important than that of the medium. The consistence of yeast depends more upon the state of the contained water than on its amount, that is the relative proportions absorbed by the cells and that held between them. Vegetable juices appear to contain a substance which retards the action of diastase and of which the physical state is altered on warming, whereby it is retained on a filter, so that filtration will frequently increase the activity. Although yeasts absorb colouring matter from caramelised worts, when cultivated under certain conditions in the presence of calcium chloride this power is lost, probably owing to the selective development of those cells having no power of absorption. A modification of the absorptive powers of living cells may eventually explain the specific action of certain serums. It has been shown that diastase can change its function of analysis to that of synthesis and the formation of anti-bodies appears analogous. The augmentation of the specific toxicity of an antiseptic may well be the result of an increase in its power of absorbing a given parasite. D. G. Hewer.

Effect of sun on the ripening of the grape and the composition of the wine. E. Hugues (Ann. Falsif., 1926, 19, 40—43).—The must from grapes damaged by over-exposure to sun, and characterised by their small size and red colour, and that from undamaged grapes, contained, in the first case, 115 g. of sugar, as dextrose, per litre, and in the second, 164 g., and the total acidity per litre as tartaric acid was 11·25 g. and 9 g. respectively. A smaller total quantity of wine was produced from the damaged grapes (6 litres less from 100 kg.), but the weight of marc was greater. Analysis of the two wines showed the first (from the damaged grapes) to be about 3 deg. inferior in alcohol content, of a poorer colour, but of higher acidity. D. G. Hewer.

Tannins for use in wine making. F. Levallois (Ann. Falsif., 1926, 19, 15—28).—It is suggested that definitions of the various types of tannins used in wine making in France should be formulated, together with some analytical limits, particularly for tannin content, to prevent the widespread adulteration now prevailing. Methods for the differentiation and determination of tannin are critically reviewed. D. G. Hewer.

Dickinson alcohometer. E. A. Vuilleumier (Ind. Eng. Chem., 1926, 18, 261).—The small portable instrument consists essentially of a still and condenser to condense the alcohol in a sample to a fractional volume (1 c.c. is sufficient) and a graduated cylinder. Heat is supplied by a candle, and a hollow glass bead of definite density is put into the distillate, and water added until the bead floats. The density of the alcohol is then determined from tables. D. G. Hewer.

Detection of methanol [methyl alcohol] in alcoholic beverages. F. R. Georgia and R. Morales (Ind. Eng. Chem., 1926, 18, 304—306).—A modification of the Chapin method (B., 1921, 712 A) is recommended. Five c.c. of the alcoholic solution, previously diluted to 5% by volume of alcohol, are oxidised for 10 min. with 2 c.c. of a solution containing in 100 c.c. 3 g. of potassium permanganate and 15 c.c. of 85% phosphoric acid. The excess of permanganate is destroyed by 2 c.c. of a solution of 5 g. of oxalic acid in 100 c.c. of 1:1 sulphuric acid, and 5 c.c. of modified Schiff's reagent are immediately added, and after mixing the solution is kept for 10 min. for production of the characteristic colour due to formaldehyde. (Modified Schiff's reagent: 0·2 g. of rosaniline hydrochloride is dissolved in 130 c.c. of hot water, the solution cooled, treated with 2 g. of anhydrous sodium sulphite in 20 c.c. of water and 2 c.c. of concentrated hydrochloric acid, diluted to 200 c.c., and stored in well filled glass-stoppered amber bottles.) It is necessary to remove interfering substances: formaldehyde by pyrogallol, amyl alcohol, essential oils (except oil of angelica), fluid extracts of arnica and of ipecacuanha by a modified method of Thorpe and Holmes by shaking petroleum spirit with the 5% by volume distillate to which sodium chloride solution has been added; cinchonine, glycerol, liquorice, methyl-violet, quinine sulphate, resorcinol, strychnine sulphate, and tannic acid by distillation. D. G. Hewer.

Yeast preparation. Stern and Becker.—See XIX.

Patents.

Preserving yeast. L. Lindemann, Assr. to T. P. Hodge (U.S.P. 1,574,494, 23.2.26. Appl., 3.8.23).—The yeast is washed in water at 33—43° until the glycogen is completely or almost completely removed. D. G. Hewer.

Yeast preparation. R. Willstätter and H. Sobotka (U.S.P. 1,574,776, 2.3.26. Appl., 16.1.25).—A product rich in vitamins and enzymes, and suitable for use in baking and brewing, is obtained by mixing yeast with a disaccharide other than sucrose, in quantity sufficient to induce plasmolysis and to cause liquefaction but not to cause fermentation, *e.g.*, at least one-third of the weight of the yeast, plasmolysis being completed by heating the mixture. L. A. Coles.

Pasteurising liquids [beer]. F. Lassen (E.P. 249,377, 23.6.25).

Feeding stuffs (Swiss P. 95,512).—See XIX.

Oxalic acid from wood (G.P. 419,911).—See XX.

XIX.—FOODS.

Effects of fine grinding upon flour. C. L. Alsberg and E. P. Griffing (Cereal Chem., 1925, 2, 325—344).—Flours of various origins were overground either in a laboratory ball mill with flints or on the smooth rolls of an experimental mill, the whole of the flour being reduced to a given fineness. The cold water extract of flour increased progressively with the overgrinding and the percentage of ash and nitrogen in the extracts decreased, so that increase in extract was due mainly to substances that after acid hydrolysis reduce alkaline copper solution, presumably starch. In studying the increased diastatic activity of overground flours it was found that loss of carbon dioxide early in the fermentation was more rapid than for normal flours. If overgrinding was carried to extremes the water absorbed per g. of gluten protein was reduced and the quality of the gluten apparently adversely affected. The glutens washed out from overground flours tended to be freer from non-protein matter, and their rate of swelling in 0·04 *N*-acetic acid was lessened. From the most severely overground flours no gluten at all could be washed out. Although severely overground flour had increased absorptive powers, mainly due to swelling of starch granules, the baking strength was very distinctly injured, and practically no rising of the dough occurred after "punching," some weak flours even being found incapable of doughing. The exact effect of moderate overgrinding upon absorption has not yet been fully worked out, but it may prove possible to increase absorption without adversely affecting baking strength. D. G. Hewer.

Determination of moisture in wheat and flour. IV. H. Snyder and B. Sullivan (Ind. Eng. Chem., 1926, 18, 272—275; cf. B., 1925, 374).—The flours were dried in an evenly flowing stream of very carefully dried hydrogen, and 58 tests showed an average of 0·54% more moisture by this method than was obtained with the vacuum oven at 100° and 600 mm. or more pressure. Nitrogen and preheated air gave results very slightly lower than hydrogen. The degree of dryness of the medium in which the flours are dried is always of the greatest importance, and any method thus far developed for flour and wheat is a relative rather than absolute expression of moisture content. D. G. Hewer.

Phytin content of foodstuffs. H. P. Averill and C. G. King (J. Amer. Chem. Soc., 1926, 48, 724—728).—The phytin contents of 57 samples of foodstuffs, determined by extracting the finely ground air-dried material (8 g.) with 2% aqueous hydrochloric acid (200 c.c.) for 3 hr. (cf. Rather, A., 1918, ii, 88) and titrating the filtered extract, diluted to a hydrochloric acid concentration of 0·6%, with ferric chloride solution (0·00195 g. of iron per c.c.), using ammonium thiocyanate as indicator (cf. Heubner and Stadler, A., 1914, ii, 690), are listed. In the case of soya beans and nuts an extraction with ether was carried out prior to the acid extraction, in order to remove oils, the presence of which renders determination of the end-point difficult owing to turbidity. The phytin content of different samples of nuts shows fair uniformity, but that of grains and flours shows considerable variation. Hard and winter wheat flours contain generally more phytin than soft and spring wheat flours, whereas very little difference was observed between wheat and rye in this respect, both for the whole grain and for the flour. The course of purification of phytin by Anderson's method (A., 1920, i, 801) was followed by the above titration procedure; the final product had a phytin content of 99·00%. The phytin content of wheat is lowered appreciably by heating at 105° for 2 hrs., by steaming for ½ hr., by treating with excess of water for 5 hrs., or by moistening for 10 hrs. F. G. WILLSON.

New yeast preparation. E. STERN and H. BECKER (Chem.-Ztg., 1926, **50**, 185—186; cf. U.S.P. 1,574,776, p. 381).—Carefully purified and pressed yeast is plasmolysed with Soxhlet's nutritive sugar at room temperature until the mass is completely liquefied, whereby the whole of the nutritive matter in the yeast cells is converted into an assimilable form; the water content of the yeast is sufficient for plasmolysis without adding further water. The product is heated at 45—50° for 1 hr. to destroy the zymase and subsequently evaporated to dryness at a temperature below 60° and a pressure of 12 mm. The dry residue ("Katazyman") contains 66% of the nutritive sugar carbohydrates and 33% of yeast substance and is rich in lipoids, vitamins, and enzyme carriers. A. R. POWELL.

Vitamins in canned foods. V. Peaches. S. F. KOHMAN, W. H. EDDY, V. CARLSSON, and N. HALLIDAY (Ind. Eng. Chem., 1926, **18**, 302—303; cf. B., 1925, 81).—Experiments with guinea pigs showed that the minimum antiscorbutic dose of raw and canned peaches was about 5 g. per day, but somewhat more gives better growth. The removal of oxygen from the peaches previous to canning gave only an insignificant protection to vitamin-C. Cooking in a covered kettle diminished the vitamin-C content to an estimated proportion of one-quarter to one-fifth. Canned peaches appear to be about one-third as potent in vitamin-A as butter fat. The vitamin-B content was too low to determine owing to the upset of general nutrition by the large quantities required. D. G. HEWER.

Inactivation of vitamin-A by rancid fat. W. C. POWICK (J. Agric. Res., 1926, **31**, 1017—1026).—Feeding experiments with rats are described in which rations containing a large proportion of very rancid lard were used. While the rancid lard did not show actually toxic properties, experiments indicated that its inferiority to fresh lard as a foodstuff was due to its ability to destroy vitamin-A in admixed foods. This destruction of vitamin occurred over a period of several days and is ascribed to oxidation by organic peroxides in the rancid lard. A. G. POLLARD.

Preserved peas in relation to their diameter. E. LASAUSSE (Ann. Falsif., 1926, **19**, 28—40).—The ratio of cellulose and nitrogen to dry extract diminishes as the peas mature, and that of soluble hydrolysable substances to dry extract increases, while that of hydrolysable insoluble substances to dry extract decreases. Thus old dry peas may be distinguished from young green ones (cf. Muttelet, B., 1926, 296). In some cases preserved peas of the same average diameter as green peas contain different proportions of starch and cellulose and absorb different amounts of water on boiling, but peas passing through a sieve of one size may have analytical values very similar to those passing a different size. The district of origin has an effect on the data. Chemical methods of analysis, including those of Muttelet, can only afford an approximate idea of the original sizes of the peas.
D. G. HEWER.

Rapid determination of copper in preserved vegetable products. R. BIAZZO (Annali Chim. Appl., 1926, **16**, 96—98).—The method is based on Spacu's colour reaction (cf. B., 1925, 831). 5 g. of the food are ashed, the residue is treated with a few c.c. of 50% hydrochloric acid, evaporated, and made up to 20 c.c. with water in a separator. Sodium hydroxide solution is added till just alkaline, then the solution is made just acid with acetic acid, and treated with a few drops of concentrated potassium thiocyanate and pyridine solutions. After extraction with 5 c.c. of chloroform, the green colour of the chloroform layer is compared with that obtained from a standard food containing the maximum permissible amount of copper salt.
S. B. TALLANTYRE.

Black currant juice and the reactions of orchil. M. FRANÇOIS and L. SEGUIN (J. Pharm. Chim., 1926, **8**, 241—248).—Natural black currant juice contains about 4% of citric acid and a colouring matter similar to that of red wine. A product sold as "extract of black currant syrup" was found to contain no citric acid, and some 15% of tartaric acid, and was coloured by orchil.
B. W. ANDERSON.

Influence of gases on the conservation of fodder. K. SCHMIDT (Leopoldina, 1926, **1**, 69—72).—The gas drawn from a silo consisted of carbon dioxide, nitrogen, hydrogen, and traces of oxygen and methane. When lucerne was kept in an atmosphere of carbon dioxide below 6° the fermentative production of gas, acetic and butyric acids, and ammonia was much less than in an atmosphere of oxygen or nitrogen. This result was confirmed on a silo. R. K. CANNAN.

Revised net energy values of feeding stuffs for cattle. E. B. FORBES and M. KRISS (J. Agric. Res., 1926, **31**, 1083—1099).—The net energy values of a number of feeding stuffs are corrected

in accordance with the most recent developments of the work of Armsby (1903—1918).
A. G. Pollard.

Variations in absorptive power. Effront.—See XVIII.

Patents.

Milk product. D. D. Peebles (U.S.P. 1,574,165, 23.2.26. Appl., 24.12.23).—Non-fatty solids are removed from milk until the fats and non-fats are in approximately equal proportions and the product (pasteurised or not) is condensed to a content of 20% of water.
D. G. Hewer.

Manufacture of powdered milk. N. H. Christensen (U.S.P. 1,574,233, 23.2.26. Appl., 23.4.25).—Sodium oxalate is added to milk to precipitate a proportion of the calcium, which is then removed. Sodium citrate and an alkali are subsequently added, and the milk is desiccated by passing it in a thin film over a heated roller.
D. G. Hewer.

Casein solids and process of making them. A. A. Dunham, Assr. to Casein Manuf. Co. (U.S.P. 1,575,155, 2.3.26. Appl., 14.2.23).—Casein which has been precipitated by acids, and which contains more than 0·75% of free acid, is treated with substances capable of neutalising acids, in quantity sufficient to reduce the acidity to within the limits of 0·75 and 0·25%.
L. A. Coles.

Fermenting or curing cocoa [cacao] beans. W. B. McLaughlin (U.S.P. 1,575,372, 2.3.26. Appl., 28.12.23).—Cacao beans are maintained out of contact with the air, at a temperature above that at which organised ferments propagate, and below that at which the enzyme of the bean is injured, until the purplish-red colour of the bean changes to a reddish-brown shade, which on drying turns cinnamon brown.
L. A. Coles.

Preservation of foods, beverages, feeding stuffs and the like. T. Sabalitschka (F.P. 596,843, 16.4.25. Conv., 17.4.24).—The esters of carbocyclic acids, *e.g.*, the esters of *p*-hydroxybenzoic acid, are used as preservatives.
H. M. Langton.

Production of bread [containing silica]. G. Senftner (G.P. 423,225, 16.11.24).—Soluble silica is added to the dough used for making bread for patients suffering from arterial sclerosis. The comparatively slow digestion following on the use of such bread promotes intimate contact with every digestive organ and complete resorption of silica results.
H. M. Langton.

Preparation of feeding stuffs. A. Vasseux (Swiss P. 95,512, 4.7.21).—Cellulose-containing substances, particularly such waste materials as brewers' grains, malt combs, exhausted beet slices, are treated with acids, such as hydrochloric or sulphuric, or acid salts, such as bisulphites or bisulphates, whereby carbohydrates contained therein are converted into water-soluble assimilable products.
H. M. Langton.

Stabilising the iron in mineral waters. A. E. Gerard (F.P. 598,364, 19.5.25. Conv., 10.7.24).—The iron generally exists in solution as ferrous bicarbonate which gives rise to deposits in the bottle. This is prevented by adding a small quantity of an organic acid, citric, tartaric, and acetic acids being mentioned.
E. S. Kreis.

Processes of making butter substitutes. Milk Oil Corp., Assees. of C. E. North (E.P. 232,916, 16.12.24. Conv., 23.4.24).—See U.S.P. 1,530,511; B., 1925, 470.

Storage of vegetable produce. J. McL. Thompson (U.S.P. 1,578,218, 23.3.26. Appl., 5.12.25).—See E.P. 240,507; B., 1925, 968.

Cheese. Emulsification and pasteurisation of cheese. Pasteurising cheese. W. J. Mellersh-Jackson. From Swift & Co. (E.P. 249,238–41, 30.12.24).

Yeast preparation (U.S.P. 1,574,776).—See XVIII.

Theobromine from cacao waste (G.P. 423,761).—See XX.

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

Application of micro-methods to control work in pharmaceutical manufacturing. W. Figdor (Amer. J. Pharm., 1926, 98, 157—162).—Alkali salts of organic acids are determined by heating 0·04—0·08 g. from above in a covered platinum crucible, after moistening with strong sulphuric acid. The residue is re-moistened and reheated till it is white, ammonium carbonate is added, and the crucible ignited to dull redness for several minutes. The ammonium carbonate treatment is repeated till constant weight is attained. The ash in drugs is determined by igniting 20—40 mg. of the finely ground drug in a Pregl micro-muffle in a small platinum boat for 2 min. Residues in tinctures and fluid extracts are determined by evaporating 2 c.c. of the preparation on the steam bath for 5 min., and then drying at 110° for about 3 hrs. to constant weight. Esters and menthol in oil of peppermint are determined in 2 c.c. of oil by the U.S.P. method, and methyl sulphide may be detected by pouring 0·5 c.c. of the oil on to 2 c.c. of Nessler's reagent, a yellow zone or precipitate being formed. The U.S.P. method is applied to the determination of non-volatile extractives soluble in ether or light petroleum by taking 1 g. of substance and 150 c.c. of solvent, using a special Soxhlet extractor in which the thimble is heated by the vapour of the solvent. The method of Dieterle (Arch. Pharm., 1923, 261, 77) for the determination of alkaloids in drugs and alkaloid preparations is thus modified, *e.g.*, in the case of ipecacuanha root: 0·5 g. of finely ground root is shaken for 10 min. with 10 c.c. of sodium carbonate solution and 15 c.c. of ether. 0·3—0·4 g. of tragacanth is added and the liquid exhaustively extracted with ether. The extract is evaporated, treated with

5 c.c. of 0·1 *N*-sulphuric acid, and titrated with 0·1 *N*-potassium hydroxide, using methyl-red as indicator.
B. Fullman.

Separation of the cinchona alkaloids. J. Messner (Pharm. Zentr., 1926, 67, 146—147).—A theoretical discussion of the author's method of distinguishing the cinchona alkaloids (B., 1903, 712), which has recently been made the basis of a method for the quantitative separation of quinine from other cinchona alkaloids (David, B., 1926, 172). On treatment with monosodium phosphate quinine salts give a precipitate of quinine phosphate. The precipitates obtained from solutions of salts of the cinchona alkaloids on treatment with disodium hydrogen phosphate consist presumably of the free bases, since they are soluble in ether.
B. Fullman.

Evaluation of podophyllin. R. Eder and W. Schneiter (Pharm. Acta Helv., 1926, 1, 15—24; Chem. Zentr., 1926, I., 2027).—Podophyllin (about 0·5 g.) is shaken repeatedly with 15 c.c. of chloroform during ½ hr., 10 c.c. of the filtered solution are poured into 50 g. of light petroleum contained in a weighed Erlenmeyer flask, and the precipitate is collected on an air-dried, tared, flat filter paper of 8 cm., diam., and washed with 20 c.c. of light petroleum. After drying for 1 hr. at about 70° and keeping for 1 hr. in the air, the flask and filter are weighed. The proportion of residue, the weighed amount corresponding to two-thirds of the podophyllin taken, should not be less than 40%. A glass filter funnel may be used instead of the filter paper, this being dried at 70° as before, and cooled in a desiccator. Alternatively, the precipitate is returned to the flask, the last traces being washed in with 10 c.c. of acetone; the acetone is then distilled off, the residue dried by blowing dry air through the flask for ½ hr. while it is heated on a water-bath, and the flask cooled in a desiccator before weighing. L. A. Coles.

Evaluation of commercial vanilla oleoresins. J. B. Wilson and J. W. Sale (Ind. Eng. Chem., 1926, 18, 283—285).—Authentic vanilla oleoresins for use as standards were prepared by extraction of Mexican, Bourbon, and Tahiti beans with 47·5% ethyl alcohol, and concentrating to d^{25} 1·3. Other samples were prepared from Bourbon beans by extraction with 65% alcohol, and 65% alcohol plus 12% glycerol, and the partially extracted beans were then exhausted with 47·5% alcohol to furnish yet another sample. A portion of the standard Bourbon oleoresin was also mixed with caramel, vanillin, coumarin, and glycerol, and the other samples used for analysis were commercial oleoresins. Analytical data are tabulated for all these samples. The following determinations are recommended—on the well-mixed oleoresin, ash and total alkalinity of ash; on a 95% alcohol extract, non-volatile solids at 100°, vanillin (caramel interferes with the Folin and Denis method on 47·5% alcoholic extract), glycerol; on the water extract of the oleoresin after 95% alcohol extraction, non-volatile solids at 100°, and caramel; and on a 47·5% alcoholic extract, vanilla resin and the Wichmann lead number.
D. G. Hewer.

Odour and chemical constitution in the benzthiazoles. M. T. Bogert and A. Stull (Amer. Perfumer, 1925, 20, 453; Chem. Zentr., 1926, 97, I., 668; cf. B., 1922, 664 A; A., 1926, 183, 310).—The 2-*p*-tolyl, *a*-furyl, and *a*-tolyl derivatives of benzthiazole have a similar odour (resembling that of tea-roses) to 2-phenylbenzthiazole (Hofmann, A., 1880, 386). The vanillin and piperonal derivatives have a weaker odour and *p*-phenylenebisbenzthiazole is practically odourless.
E. H. Sharples.

Instability of the sodium salt of benzoyl hydroperoxide. A. J. Gelarie and F. R. Greenbaum (Amer. J. Pharm., 1926, 98, 163—166).—An aqueous solution of pure benzoyl hydroperoxide decomposes to the extent of 95% in 24 hrs., decomposition being complete in 48 hrs. Carbamide, copper sulphate, hexamethylenetetramine, sodium cinnamate, and the sodium soaps of castor oil, cod liver oil, olive oil, and chaulmoogra oil accelerate the decomposition. B. Fullman.

Acidimetric determination of both components in *Hydrargyrum oxycyanatum*. E. Rupp (Pharm. Zentr., 1926, 67, 145—146).—Mercury oxycyanide may be thus determined: 0·3 g. of oxycyanide and 0·5 g. of sodium chloride are dissolved in 40—50 c.c. of lukewarm water and the solution is cooled, and titrated with 0·1 *N*-hydrochloric acid in the presence of 2 or 3 drops of methyl-orange till the first change from yellow to orange occurs. This gives the oxide component. On addition of 1·5—2 g. of sodium thiosulphate the mercury cyanide reacts giving sodium cyanide, which is titrated with 0·1 *N*-hydrochloric acid to a pink end-point. Commercial preparations do not give equal molecular quantities of both components, the oxide being in defect and the cyanide in excess. The second titration is only necessary when foreign substances such as sodium chloride are present. B. Fullman.

Use of glycogen in the preparation of colloidal metals. L. Hugounenq and J. Loiseleur (Compt. rend., 1926, 182, 851—852).—Colloidal solutions of the oxides of many metals (*e.g.*, manganese, copper, iron) are readily prepared by adding the nitrate of the metal to an alkaline glycogen solution. In the cases of gold, platinum, palladium, mercury, silver, and rhodium, the solutions on boiling yield colloidal solutions of the metal. Colloidal solutions of bismuth in gum arabic have no advantage over other bismuth preparations in the treatment of syphilis. S. K. Tweedy.

Production of pure absolute alcohol. R. E. Lyons and L. T. Smith (Science, 1925, 62, 224—225).—To 100 g. of the alcohol (95·02 vol.-%) are added 17·5 g. of granular (20-mesh) calcium carbide (81·1%) and the mixture is boiled on a water-bath for 30 min. under a reflux condenser, 0·5—1 g. of anhydrous copper sulphate then being added to remove dissolved

acetylene and sulphur compounds. After boiling for a further 15 min. the alcohol is removed by distillation. Alcohol (99·86 vol.-%) in 98·66% of the theoretical yield, free from acetylene, sulphur compounds, aldehyde, and free acid, was obtained in an example.
A. A. Eldridge.

Arsenobenzenes, their composition and toxicity, the nature of the substitution, the value of the DM index. F. De Myttenaere (Boll. chim. farm., 1925, 64, 641—649).—The work of Valeur and Launoy (J. Pharm. Chim., 1924, 366; B., 1925, 113) and of Patta (B., 1925, 826) is criticised, and suggestions are made concerning the particulars which should be stated on the labels of pharmaceutical preparations of arsenobenzenes.
T. H. Pope.

See also A., April, 350, **Colloid chemistry of bismuth** (Gutbier). 351, **Preparation of colloidal silver by electrolysis** (Lottermoser and Bausch). 375, **Determination of nitrogen in organic compounds by Kjeldahl's method** (Andersen and Jensen). 381, **Methyl and ethyl iodides from the corresponding toluenesulphonates** (Peacock and Menon). 394, **2:4-Dinitrophenylhydrazine as a reagent for aldehydes and ketones** (Brady and Elsmie). 404, **Syntheses of *o*-vanillin and *o*-veratraldehyde** (Mauthner). 405, **Purification of xylene for use as solvent for catalytic reduction** (Zetzsche and Arnd); **Utility of various solvents for catalytic synthesis of aldehydes from acid chlorides** (Zetzsche and others).

Patents.

Manufacture of oxalic acid from wood. R. Falck (G.P. 419,911, 20.9.22; cf. Falck and van Beyma thoe Kingma, B., 1924, 649).—Oxalic acid is produced by subjecting mixtures of wood with calcium carbonate, or with calcium oxide and cheap vegetable material, to the action of wood-destroying fungi. For example, mixtures of spruce shavings or sawdust with calcium carbonate, which may also contain chopped straw or may be worked up with dextrin and water into briquettes, are decomposed by the action at 15° of the fungus, *Coniophora cerebella*. After one month, the calcium carbonate is converted almost entirely into calcium oxalate.
L. A. Coles.

Preparation of acetylsalicylic acid. Deutsche Gasglühlicht-Auer-Ges., Assees. of S. Merzbacher (G.P. 421,021, 23.6.20).—The compound is prepared by heating salicylic acid with ethylidene diacetate, without the addition of catalysts. For example, a solution of salicylic acid in ethylidene diacetate is heated for 5 hrs. under a reflux condenser maintained at such a temperature that ethylidene diacetate and acetic acid condense and flow back into the solution, whilst acetaldehyde escapes as vapour. The product, after removal of acetic acid and a portion of the excess ethylidene diacetate by distillation, sets to a crystalline mass of acetylsalicylic acid, which is purified by draining and crystallisation, a yield of about 70% being obtained. The acetaldehyde can be oxidised to acetic acid, which is then worked up to ethylidene diacetate by treatment with acetylene.
L. A. Coles.

Pharmaceutical compound. Farbenfabr. vorm F. Bayer und Co., Assees. of H. Hahl (U.S.P. 1,561,535, 17.11.25. Appl., 27.6.25.).—A solution of thiosalicylic acid is neutralised with sodium carbonate and saturated with freshly precipitated antimony oxide, and the solution evaporated to dryness. The resulting antimonysodium salt $Sb(S{\cdot}C_6H_4{\cdot}CO_2Na)_3$, is of value as a spirillocide. An analogous compound is obtainable from thioglycollic acid.
T. S. Wheeler.

Preparation of 2-phenyl-4-aminoethylquinoline. Chem. Fabr. auf Actien (vorm. E. Schering), Assees. of M. Dohrn and C. Zöllner (G.P. 421,087, 19.11.22).—2-Phenyl-4-methylquinoline is condensed with chloral, the product is hydrolysed, yielding a substituted acrylic acid, this is converted by treatment with reducing agents into the corresponding propionic acid derivative, which is converted into 2-phenyl-4-aminoethylquinoline, *e.g.*, after intermediate conversion into the hydrazide or acid amide. For example, on heating 2-phenyl-4-methylquinoline (flavoline) for several hours at 100° with chloral in the presence of xylene, the methyl group is converted into the $-CH_2.CH(OH).CCl_3$ group, yielding 2-phenyl-4-γ-trichloro-β-hydroxypropylquinoline, m.p. 202°, which on hydrolysis with 20% alcoholic potassium hydroxide and subsequent acidification yields 2-phenylquinolyl-4-acrylic acid, m.p. 205—206°, and this is converted into 2-phenylquinolyl-4-propionic acid, m.p. 215—216°, by heating with acetic acid, concentrated hydriodic acid, and red phosphorus. The propionic acid derivative is converted successively into the ethyl ester; the hydrazide, m.p. 158—159°, by heating with hydrazine and absolute alcohol; the azide, by treatment with nitrous acid; the urethane, m.p. 89—90°, by heating with ether and absolute alcohol; and into 2-phenyl-4-aminoethylquinoline hydrochloride (decomp. at 235°), by heating for several hours with concentrated hydrochloric acid. Alternatively, the propionic acid derivative is converted successively into the acid chloride, by treatment with sulphuryl chloride; the amide, m.p. 197°, by treatment with 25% ammonia; and the amine by the action of bromine and aqueous potassium hydroxide. The 2-phenyl-4-aminoethylquinoline is of therapeutic value.
L. A. Coles.

Preparation of glycerophosphates. J. D. Riedel A.-G., Assees. of R. Rosenbusch (G.P. 421,216, 20.12.22).—Material extracted from soya-bean press cake by means of organic solvents, is treated, preferably after removal of the solvent and before or after removal of lecithin and oil, with alkalis or alkaline-earths. After neutralisation and separation of fatty acid salts, and neutralisation of excess basic material, which is preferably converted into insoluble salts, glycerophosphates are recovered from the residual solution by the usual method. The product is chemically pure and optically active.

For example, the product obtained by extracting the cake with alcohol and removing the solvent is stirred for several hours at 50—70° with saturated barium hydroxide solution. After filtration, excess barium hydroxide in the solution is precipitated by passing in carbon dioxide, the barium carbonate is removed, the solution is concentrated, and the barium glycerophosphate is converted by the addition of calcium sulphate into the corresponding calcium salt, which separates as white crystals on boiling the solution. L. A. COLES.

Preparation of codeinone. E. MERCK, CHEM. FABR., Assees. of W. KRAUSS (G.P. 421,217, 19.10.23; Swiss P. 111,996, 30.7.24).—The compound is prepared by treating methylcodeine, obtained as described in G.P. 418,391 (cf. B., 1926, 216), with chromium trioxide in the presence of weak acids, *e.g.*, acetic acid. For example, aqueous chromium trioxide solution is added to a solution of methylcodeine in 20% acetic acid, whereby the temperature rises to 40—50°. On cooling strongly, codeinone chromate crystallises out, and is decomposed by treatment with ammonia, codeinone being obtained by extraction with ether and evaporation of the solvent. L. A. COLES.

Preparation of phenylsulphur chloride [chlorothiolbenzene] and its homologues. H. LECHER and F. HOLSCHNEIDER (G.P. 423,232, 23.3.24; cf. A., 1924, i, 728).—The compounds are prepared by the action of chlorine upon the corresponding arylmercaptans or diaryl disulphides, preferably in the presence of inert solvents. L. A. COLES.

Preparation of theobromine from cacao waste. E. TIEDE (G.P. 423,761, 31.5.24).—Cacao waste, after extraction of fat, is heated for about 3 hrs. at 200—300° with stirring, preferably with the addition of heat-conducting material such as finely-divided copper, and is then extracted, *e.g.*, with acetylene tetrachloride, theobromine being precipitated from the extract by the addition of ether. L. A. COLES.

Preparation of a stable product containing acetylsalicylic acid. NYEGARD & Co. A./S. (Nor. P. 39,863, 14.12.23).—The product consists of an intimate mixture of finely-powdered acetylsalicylic acid with a quantity of lithium carbonate at least sufficient to neutralise acetic acid liberated by hydrolysis. L. A. COLES.

Manufacture of methylals. H. WADE. From S. KARPEN & BROS. (E.P. 249,039, 23.10.25).—See U.S.P. 1,566,819; B., 1926, 217.

Manufacturing acetic anhydride. CONSORTIUM FÜR ELEKTROCHEM. IND. G.M.B.H., Assees. of R. MEINGAST and M. MUGDAN (U.S.P. 1,570,514, 19.1.26. Appl., 6.3.23).—See E.P. 194,719 and G.P. 410,363; B., 1924, 34; 1925, 1013.

Production of alcohols from halogenated aldehydes. FARBENFABR. VORM. F. BAYER U. CO., Assees. of H. MEERWEIN (U.S.P. 1,572,742, 9.2.26. Appl., 28.5.25).—See E.P. 235,584; B., 1925, 738.

Recovering oxalate from tree barks. W. A. FRAYMOUTH, Assr. to BHOPAL PRODUCE TRUST, LTD. (U.S.P. 1,577,573, 23.3.26. Appl., 30.11.23).—See E.P. 208,684; B., 1924, 577.

Ethylating amines (U.S.P. 1,570,203).—See IV.

Bread containing silica (G.P. 423,225).—See XIX.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Nature of optical sensitisation and desensitisation. G. KÖGEL and A. STEIGMANN (Z. wiss. Phot., 1926, **24**, 18—31).—The view that sensitising dyes function by acting as halogen acceptors is not in accord with the fact that Eosin, Flavinduline, Methylene Blue, etc., are reduced on exposure to light and that this bleaching is accelerated by "sensitisers" which may be powerful reducing agents with at least one labile hydrogen atom. Bleaching is due to hydration (reduction) of the dye. Methylene Blue–gelatin is very sensitive to light, giving an invisible latent impression which can be developed by bathing in silver nitrate followed by physical development. Exposure of Eosin, Erythrosin, Rhodamine B, Pinachrome, Pinaflavol, and Phenosafranine gives nothing which will reduce silver nitrate, but these dyes are probably more sensitive to long wave-lengths than is ripened silver bromide, which they can affect by a primary reaction. With chlorobromide papers and fast iodobromide plates bathed in Methylene Blue, on exposure to yellow or red light, only the dye and not the silver halide was affected; the latent image was on the dye alone. The bathed fast plate was much more sensitive than the paper, a fact which is due to ripened silver bromide reacting more readily to traces of nuclei (formed from the exposed dye and silver nitrate) than does the unripened salt. It is confirmed that silver bromide accelerates the bleaching of Methylene Blue in light, but only in short wave-lengths. Silver bromide in short wave-length light can activate hydrogen, thereby being reduced and also reducing the dye which takes up part of the activated hydrogen. In long-wave-length light, the dye activates the hydrogen of the sensitiser (*e.g.*, gelatin) and is thereby bleached, independently of silver bromide. Panchromatic sensitisation is explained as follows: Under the influence of light of long wave-length the labile hydrogen of the sensitiser (gelatin) is photochemically activated by the dye which absorbs these wave-lengths, and the activated hydrogen is taken up partly by the silver bromide and partly by the dye adsorbed to it, both being reduced. In short wave-lengths the silver bromide activates the hydrogen. Desensitisers are easily reduced and probably take up hydrogen more readily than sensitisers. Desensitisation is ascribed to the fact that the hydrogen (from the gelatin) activated by the silver bromide is all taken up by the dye, so that reduction of the silver halide cannot occur. Leuco-bases of desensitisers cannot desensitise. Free silver has only a slight effect in accelerating the photochemical oxidation of metol, as compared with the effect of silver bromide. Silver bromide is thus inferior to silver in its power of activating hydrogen in short-wave-length light. It is suggested that ripening reduction nuclei and exposure nuclei can sensitise silver bromide if there are chemical forces between the silver of the nuclei and the silver halide which loosen the silver bromide molecule, giving weak points where light or the activated hydrogen can act readily. Gelatin owes its strong sensitising power to the fact that it contains hydrogen capable of activation. W. Clark.

Determination of silver in photographic emulsions. (A) A. Steigmann, (B) W. Meidinger (Z. wiss. Phot., 1926, **24**, 15—16, 16—17).—(A) The author was the first to recommend the use of Liebig's cyanometric method for the determination of silver in photographic emulsions (cf. Eggert, B., 1924, 235; Meidinger, B., 1925, **23**, 282). (B) Reply to Steigmann, quoting historical data. W. Clark.

Influence of strong heating on the properties of photographic dry plates. H. M. Kellner (Z. wiss. Phot., 1926, **24**, 63—78).—In general, heating a plate results in an increased density of the developed negative. Heating during exposure has an especially strong action; heating before exposure gives a marked speed increase with plates of low sensitivity; heating after exposure gives roughly the same effect with all plates, but less marked than heating before exposure. The most pronounced effect is obtained with the emulsion side in contact with the heating surface, except in the case of thinly coated plates, with which the reverse holds. In most cases rise of temperature gives an increase in speed, up to about 90°, above which speed falls again and fogging occurs. Some plates show no such maximum. There seems to be an optimum on increased heating at constant temperature. The effect of heating is decreased if plates are previously dried over phosphorus pentoxide. Under some conditions heating produces a change in spectral sensitivity. In general the position of the sensitivity maximum, and the sensitivity range, are unaltered, but the shape of the curve may be changed. No appreciable alteration in size of the silver bromide grains occurs on heating. The thickness of the emulsion layer appears to increase on heating, during the time that sensitivity is increasing. The number of developed silver grains per unit area is increased by heating, especially for low light intensities. Heating results in a closer packing of the developed silver grains in the surface layers of the emulsion. A theory of ripening is proposed, according to which the valency electron of a bromine ion in the silver bromide lattice is normally present in the innermost orbit, corresponding with the lowest energy content. Exposure shifts the electron from this orbit to one of a higher energy state, and sufficient light energy can cause complete dissociation, the electron going to a silver ion as acceptor, and forming a latent image nucleus. Heating can bring about the same effect, so that ripening consists in the formation of activated bromine ions; if ripening is too prolonged, the bromine ions lose their electrons to silver ions and fogging occurs. Heating could possibly also dissociate a bromine ion activated by exposure. W. Clark.

Topographical relations in development. Lüppo-Cramer (Z. wiss. Phot., 1926, **24**, 1—12).—Grain surface development, grain depth development, and film depth development are considered. The explanation that slow-working developers are suitable for strong over-exposures owing to their having time to diffuse into the depth of the film before the surface layer has been appreciably reduced, is not entirely correct, because slowing development by adding bicarbonate, dilution, etc., instead of using bromide, does not give correct development of over-exposures. With solarised and over-exposed images there is no difference in the appearance of the image whether exposure is made from the glass or from the film side. Local distribution of image in over-exposures does not play such a big part as to explain the difference in action of rapid and slow developers. The image on physically developed silver iodide–gelatin plates is on the surface, but with silver bromide–gelatin this is not so. This difference is explained as due to the latent image on silver iodide consisting of smaller, more numerous and more active amicrons than on silver bromide. With a certain fine-grain diapositive silver bromide emulsion, solarisation was obtained on physically developing after fixing. That this is not observed with coarse-grained emulsions is supposed to be due to nuclei in the grain interiors which are set free on fixing, while with small grains the nuclei are all on the surface. Solarisation depends less on grain size than on the inner structure of the grain and the kind of development. W. Clark.

Development paradoxes. Lüppo-Cramer (Z. wiss. Phot., 1926, **24**, 13—15).—A 0·05% solution of pure diaminophenol hydrochloride (amidol) develops much more rapidly than 0·5%, 1%, and 2% solutions. With 1% solution the image appears first on the back side of the film, while the dilute solution develops normally from the front side. The "depth development" is explained as due to the gelatin absorbing the hydrochloric acid of the developer so that in the depth of the film the developer is relatively less acid and so more active. Diluted amidol develops more quickly than the concentrated with collodion as well as gelatin plates, and the hydrochlorides of triaminobenzene, triaminotoluene, and diaminoresorcinol, and metol act like amidol. With 1 : 100,000 amidol, which normally develops a good image, addition of sulphite or sulphite–carbonate retards development. Triaminobenzene and triaminotoluene show the same effects, but although these developers with no additions develop powerfully, in presence of bromide they destroy the latent image. Concentrated (1%) amidol containing 1% of potassium bromide has a more powerful destructive action than the same developer diluted a hundredfold. Similar results were obtained with triaminobenzene and metol, but to a less degree. 1% ferrous sulphate solution develops fully exposed silver bromide diapositive plates more quickly and more strongly than a 30% solution. W. Clark.

Theory of the Carbro process. F. J. Tritton (Phot. J., 1926, 66, 126—133).—The reactions occurring in all stages of the single-bath and combined-bath Carbro process are considered in detail. Potassium ferricyanide is not regarded as a catalyst for the reaction between silver and chromic acid. When the bromide and tissue are squeegeed into contact, if an acid bath has been used, the gelatin of the tissue will continue swelling, while that of the bromide will not have much tendency to swell, so that there will be a general direction of diffusion from the bromide print into the tissue. The ferrocyanide formed in the reactions will thus diffuse normally into the tissue, so that sharp images will be obtained. The effects of varying times of treatment in and temperature of the different baths, and the thickness of tissue, and hardness of the bromide, are discussed in relation to the theoretical considerations advanced. W. Clark.

New physical method for the examination of gelatin. T. Thorne Baker and L. F. Davidson (Phot. J., 1926, 66, 120—125).—The ultra-violet absorption of 1% gelatin sols was studied at p_H values of 3·5, 10·0, and 6·1. If the p_H of an ash-free gelatin is made more or less than 4·7, the absorption curve lies for the most part to the long wave-length or short wave-length side respectively of the absorption curve of the ash-free gelatin; *i.e.*, for a given thickness of gelatin, a p_H on the acid side of the isoelectric point gives greater transparency to the ultra-violet. A gelatin extracted by the centrifuge from a silver bromide photographic emulsion gave an absorption curve identical in shape with that of the original gelatin. A simplified photographic method for determining absorption spectra is described. W. Clark.

Patents.

Compensating the copying intensity of kinematograph films. E. Lehmann (U.S.P. 1,568,511, 5.1.26. Appl., 27.6.24).—Kinematograph films are compensated for differences in density by impregnating the gelatin covering of the film with a colouring agent which is incapable of yielding fast colorations with it. S. Binning.

Manufacture of gelatin suitable for [photographic] emulsions. A. Jenny and J. Angerstein, Assrs. to Amer. Electro-Osmosis Corp. (U.S.P. 1,577,642, 23.3.26. Appl., 13.3.24).—See E.P. 210,748; B., 1924, 655.

XXII.—EXPLOSIVES; MATCHES.

Determination of tetryl in explosives. K. Lehmstedt (Z. angew. Chem., 1926, 39, 379—380).—Tetryl mixed with other explosives, *e.g.*, trinitrotoluene, is determined by measuring the volume of nitric oxide evolved in a nitrometer by the reduction of the nitroamino-group to the amino-group by mercury and strong sulphuric acid. This method is more rapid and satisfactory than the reduction by ferrous chloride and hydrochloric acid, which gives high results in the presence of tetranitroaniline. B. W. Clarke.

Deflagration products of smokeless powder. H. C. Knight and D. C. Walton (Ind. Eng. Chem., 1926, 18, 287—291).—Experiments were made at Edgewood Arsenal for the U.S. Navy Department to détermine the composition of the gases formed when smokeless powder was burnt in a gun turret where excessive pressure could not develop and complete combustion was prevented by lack of sufficient air. The toxicity of the products and the length of time during which the toxicity lasted were also investigated. Charges of 32 kg. of a single-base powder were ignited in a horizontal cylindrical steel tank, 8 ft. in diam. and 18 ft. long. Samples of the combustion gases were withdrawn for analysis and measurements of the temperature and pressure within the cylinder were recorded. The burning took place in two stages. The first consisted of the combustion of the powder, resulting in a temperature of about 750°, and a pressure of 3·5—4 in. of water in the cylinder; the second comprised the burning of the combustible gases in the cylinder by air drawn in when the cylinder contents cooled. Analyses of gases showed that there was a period when no oxygen was present, and the percentages of carbon monoxide and nitric oxide might be as much as 30% and 10%, respectively. The products of the direct deflagration reached their greatest concentration in 15—20 sec. after ignition, and the secondary combustion began after another 10—15 sec. Toxicity of the gases was due to carbon monoxide and oxides of nitrogen. Animals which escaped carbon monoxide poisoning often developed pulmonary œdema from breathing the nitrous fumes. The only effect of a water spray inside the cylinder was to reduce the temperature, the amount of carbon monoxide and nitrous fumes remaining unaltered. S. Binning.

Patents.

Explosive. T. L. Davis (U.S.P. 1,568,502, 5.1.26. Appl., 8.3.24).—The explosive contains hexanitrocarbanilide as one of its constituents. S. Binning.

Preparation of liquid-air blasting cartridges for use in presence of coal dust and firedamp. Sprengluft Ges.m.b.H. (G.P. 420,218, 17.11.23).—Stoichiometric proportions of two dissociable salts, *e.g.*, ammonium chloride and calcium carbonate, are added to the carbonaceous material. As a result of the detonation ammonium carbonate and also an undissociable salt, calcium chloride, are formed. S. Binning.

XXIII.—SANITATION; WATER PURIFICATION.

Removal of dissolved oxygen from liquids [water]. Detection of small quantities of oxygen in gas mixtures. E. Schulek (Z. anal. Chem., 1926, 68, 22—24).—The liquid to be freed from oxygen is placed in a glass cylinder provided with a stopcock at the top and bottom, and with a plate of porous sintered glass just above the lower stopcock. By connecting the upper stopcock to the vacuum pump a stream of hydrogen or nitrogen is drawn through the liquid for 3 min. in which time all trace of oxygen is removed owing to the fineness of the gas bubbles produced in the liquid by drawing the gas through the porous plate. In order to detect a trace of oxygen in a mixture of gases an air-free solution of manganous chloride is prepared as above, and after addition of sodium hydroxide and iodide, the gas to be tested is drawn through the solution as slowly as possible. On the addition of hydrochloric acid and starch a blue colour indicates that the gas contained oxygen. The method will detect 0·02 c.c. of oxygen in 100 c.c. of gas. A. R. POWELL.

Preparation and comparative performance of base-exchange water-softening materials. E. B. HIGGINS and J. P. O'CALLAGHAN (Water and Water Eng., 1925, 27, 392—394).—The natural zeolite "permutit B," prepared from glauconite, possesses practically unlimited base-exchange capacity and is free from the tendency to disintegrate which is inseparable from introduction of large quantities of replaceable sodium into artificial zeolites. Its extremely rapid action in both softening and regeneration allows of the production of an enormously increased amount of water of zero hardness from a given quantity of zeolite by regenerating at shorter intervals. Even the most carefully prepared synthetic materials are much less stable, physically and chemically, than natural base-exchange minerals. The former are, without exception, particularly susceptible to the action of dissolved carbon dioxide, which removes the more soluble portion of the molecule, *i.e.*, that portion responsible for base-exchange property. Natural zeolite under similar conditions is not affected, and completely resists water fully saturated at atmospheric pressure with carbon dioxide for several months. The acid-resistance of natural zeolite is important where corrosive water is to be treated, and also where the water is first partially softened by treatment with lime, in which case deposits of calcium carbonate may be removed by washing with dilute hydrochloric acid without injuring the softening material. The base-exchange activity of natural zeolite contaminated with oil and tar can be fully restored by roasting.

R. E. THOMPSON.

Chlorination of the Manila water supply. E. TAYLOR (Water and Water Eng., 1925, 27, 409—412).—Chlorination of the Manila water supply was commenced in 1914, a dosage of about 0·6 p.p.m. being used. The results obtained were not satisfactory and the practice was adopted of maintaining a residual chlorine content, as determined by the *o*-tolidine test, of 0·05—0·1 p.p.m. throughout the distribution system. This method has given excellent results, maintaining a low bacterial count and almost complete absence of *B. coli*. The chlorine-consuming power of the water varied between 0·4 and 1·4 p.p.m., with a contact period of 4 hr. When the water was turbid the chlorine consumption usually increased.

R. E. THOMPSON.

Iodoform taste of chlorinated water. B. ADAMS (Water and Water Eng., 1925, 27, 435—436).—A concentration of 1 pt. of iodoform in 1000 million pts. of water was found to give a decided taste which was indistinguishable from that due to chlorinated phenol. A trace of alcohol or acetone with iodine in an alkaline solution will give the iodoform reaction, and addition of 0·2 p.p.m. of iodine to water containing 1 p.p.m. of alcohol or acetone will give rise to tastes, predominantly iodoform, on keeping. Therefore, if a water contains the necessary organic matter, and iodides from which iodine will be liberated, an iodoform taste will develop on chlorination. Experiments with water derived from deep chalk wells are described in which an iodoform taste resulted, after appreciable lapse of time, from chlorination (0·25 p.p.m.) after addition of 0·05—0·25 p.p.m. of potassium iodide (expressed as iodine), the water apparently normally containing the necessary organic matter for the production of iodoform. As in the case of taste due to phenol, super-chlorination and dechlorination prevented the development of the taste. Potassium permanganate, prior addition of ammonia, and addition of ammonia with the chlorine were ineffective. Further experiments showed that potassium permanganate would reduce and prevent the taste with lower concentrations of iodide. A distinct taste was given by 1 pt. of iodide in 200 million pts. of water. Potassium bromide did not produce an abnormal taste. R. E. THOMPSON.

Chlorine in sewage and waste disposal. J. C. BAKER (Water and Water Eng., 1925, 27, 440—441).—Domestic sewage can usually be treated satisfactorily with 5 to 10 p.p.m. of chlorine to give a reduction of 95 to 99% in bacterial count. The germicidal power of chlorine is not due to direct oxidation, but to the formation of some substance toxic to the organism. Substances of greater oxidising potential than chlorine, *e.g.*, permanganate and peroxide, have much lower germicidal power. The oxidising power of chlorine can be considerably reduced by combination with ammonia to form either nitrogen trichloride or chloramine, without loss of sterilising power and very little alteration in sterilising rate. Chloramine, particularly, has a relatively low oxidising potential. The chloramine probably acts by attacking the lipoid protein surface of the cellular organisms and forming there some substance which interferes with further cell division, thereby stopping regeneration and resulting in death of the organisms. R. E. THOMPSON.

Nitrate determinations [in water and sewage]. G. W. BURKE (J. Amer. Water Works Assoc., 1926, 15, 169—170).—When using the Amer. Publ. Health Assoc. phenoldisulphonic acid standard method for determining nitrates, samples can be accurately matched by one of the standards, when the same amount of phenoldisulphonic acid is added to each of the Nessler tubes containing the standards, as is used to moisten the evaporated residue of the sample. In the reduction method in which the nitrite value (otherwise determined) is subtracted from the nitrate plus nitrite value obtained by nesslerisation it is necessary to know accurately the value of the nitrite standard solution in terms of ammonia, and this is best determined by reducing a sample of the nitrite standard solution.

W. T. Lockett.

Use of chinic [quinic] acid in the differentiation of the colon-aerogenes group. B. H. Butcher (J. Amer. Water Works Assoc., 1926, 15, 171—173).—Beijerinck observed that some strains of *B. aerogenes*, under aerobic conditions, produced a red to black coloration in a medium containing quinic acid and a ferric salt, but that no coloration was produced by *B. coli*. The medium used by the author contained 0·5 g. K_2HPO_4, 0·5 g. NH_4Cl or peptone, 0·1 g. $FeCl_3$, and 10·0 g. of calcium quinate per litre of water. It was found preferable to inoculate agar agar slants or plates rather than a liquid medium. At 37° some strains of *B. aerogenes* produced colour within 24 hr.; other strains, which did not give a distinctly positive Voges-Proskauer reaction required 3—4 days. Observations indicated the possibility of using the test to differentiate organisms within the aerogenes group as well as between the coli and aerogenes groups. Of 18 organisms of the aerogenes section, six strains of *B. aerogenes* and five strains of *B. oxytocum* checked with the Voges-Proskauer reaction, whereas six strains of *B. cloacae* and two strains of *B. levans* produced no coloration in the quinate medium. Of twenty-three strains of the coli section tested, none gave any coloration.

W. T. Lockett.

Determination of thallium in mouse poisons. F. Mach and W. Lepper (Z. anal. Chem., 1926, 68, 36—45).—10 g. of the material are heated with nitric and sulphuric acids to destroy organic matter and, after expulsion of the nitric acid and dilution, the thallium is reduced to thallous salt with sulphur dioxide. An excess of ammonia is added to the filtered solution, followed by 25 c.c. of ferric citrate solution and 25 c.c. of magnesia mixture to remove phosphoric acid. The solution is diluted to 400 c.c. and 100 c.c. are filtered off and treated with 25 c.c. of 4% potassium chromate solution. The precipitate is collected next day on a Gooch crucible, washed first with 1% potassium chromate solution, then with 80% acetone, dried for 1 hr. at 120—130° and weighed as Tl_2CrO_4. Precipitation of thallous iodide from acetic acid or ammoniacal solutions is not quite complete. The most accurate method of determining thallium in pure solutions of its salts consists in precipitation of thallic hydroxide by the addition of potassium hydroxide and ferricyanide; the hydroxide is converted into thallic oxide for weighing by heating at 200° to constant weight. A. R. Powell.

Determination of dust in the atmosphere. D'Arsonval and F. Bordas (Compt. rend., 1926, 182, 823—825).—Preliminary determinations of the atmospheric dust with a modified Owens' gauge are recorded. The analysis of a dust collected in Paris is given and the detrimental influence of its constituents on the public health is considered.

S. K. Tweedy.

Arsenic in burner gases and its bearing on Haff disease. Glaser.—See VII.

Utilisation of disinfectants containing mercury. Hilgendorff.—See XVI.

Patents.

Purification of hard water by base-exchanging bodies. E. M. E. Fréchou (E.P. 244,713, 23.9.25. Conv., 19.12.24).—Water is passed through a number of beds of base-exchange material connected in series and provided with means to allow for the methodical circulation of the water through the beds and the regeneration of the material of each of the beds in turn. W. T. Lockett.

[Base-exchange] bodies for the purification of water. E. M. E. Fréchou (E.P. 247,431, 29.4.25). —Base-exchanging substances are prepared by fusion of a mixture of the ashes of mineral fuels, *e.g.*, bituminous or semi-bituminous coals, which yield ashes of relative fusibility, and sodium carbonate. The substances may be readily obtained by projection of a pulverised mixture of coal and sodium carbonate against a non-horizontal wall of a combustion chamber, the wall being previously heated to 1000—1200° so as to obtain combustion of the fuel and fusion of the ash and the soda.

W. T. Lockett.

Separating, washing, and discharging comminuted solid material [zeolite] immersed in liquids. C. H. Nordell (U.S.P. 1,570,854, 26.1.26. Appl., 12.9.22).—An apparatus for washing regenerated zeolite material comprises a chamber fitted at the bottom with a check valve giving admission to a chamber below. Zeolite material mixed with water enters the upper chamber from which it displaces water through an opening in the top. When the pressure in the chamber has risen sufficiently the valve at the bottom opens and the solid falls into the lower chamber from which it displaces water, which passes up through the valve in the opposite direction and washes the solid. The valve then closes and the cycle is repeated.

T. S. Wheeler.

Treatment of household and street waste. K. Gerson (E.P. 247,284, 11.11.24).—Refuse, separated from metallic material and ashes, is fed, without previous drying, to a rapidly running disintegrating device, *e.g.* a beating mill, wherein the fibrous constituents of the garbage are converted into a fluffy fibrous mass (garbage wool), and the non-fibrous constituents are reduced to a powder. The products are then separated. The garbage wool is utilised in the manufacture of pasteboard, paper and the like, or used as a fuel, or is submitted to dry distillation in order to obtain tar and other products. The dust, mixed with water, in which it remains in suspension, is admitted to the sewers. W. T. Lockett.

Insecticides (U.S.P. 1,573,490).—See XVI.

Hydrocyanic acid (G.P. 420,729).—See XVI.