

BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

SEPT. 27, 1929.

I.—GENERAL; PLANT; MACHINERY.

Economic factors in chemical plant location.

C. W. CUNO (Ind. Eng. Chem., 1929, 21, 738—740).—Attention is called to the continual migration of industry in the United States and to the fact that location is usually more important than technical or commercial efficiency. Factors affecting location are enumerated.

C. IRWIN.

Fundamental calculations for the flue-gas drum

dryer. K. D'HUART (Z. Ver. deut. Zucker-Ind., 1929, 79, 327—365).—An exposition of thermal calculations relating to revolving drum dryers in which the material is dried by direct contact with flue gas travelling in the same direction. Methods of calculating calorific values of solid fuels from easily obtainable analytical data are described, and also some simplified methods for calculating thermal efficiency.

J. H. LANE.

Spray drying and the drying of dairy products.

J. E. NYROP (J.S.C.I., 1929, 48, 136—139 r).—The statement that the dehydration in a spray dryer is so rapid, requiring only a fraction of a second, that time reaction can be neglected, is negated by calculations showing that the evaporation B_s in an efficient spray dryer, working under ordinary conditions as in a milk dryer, is $B_s = 0.9Sz$, where S is the surface in m^2 of 1 kg. of the sprayed product and z the drying time in hrs. When a Niro-atomiser is used it takes 20 sec. to evaporate 1 kg. The surface area of the sprayed product is without influence on the difference in temperature between the drying current and the particles of the product; a high velocity of the current in relation to the surface of the particles increases the difference in temperature, and this is decreased when the vapour pressure in the drying current is raised. Different types of atomiser are described. Nozzles give—up to a certain capacity and viscosity—a very fine spray, but reversible soluble powders are difficult to produce from concentrated emulsions. Rotating pipes do not give a fine spray, and a rotating funnel-shaped pipe (parallel with the axis) or a flat or bell-shaped disc is only able to atomise satisfactorily small amounts of not very viscous materials. With atomisers where the product is passed over rapidly rotating vanes a very large capacity and satisfactory results are obtained. The use of such dryers in preparing milk and cream powders, chocolate, etc. is discussed.

Incrustation of well-borings and its removal by chemical means. G. WIEGAND (Gas- u. Wasser-fach, 1929, 72, 741—744).—When the filter or metal lining of a deep well is corroded and encrusted by the action of hydrogen sulphide, the deposits can be removed by treatment with 30% hydrochloric acid. This acid

must be free from arsenic, and the hydrogen sulphide which is produced must be allowed to escape in such a way that no risk of poisoning can arise.

R. H. GRIFFITH.

Glass plates prolong life of distilling columns.

A. A. BACKHAUS (Chem. Met. Eng., 1929, 36, 429).—Glass plates of both the bubbling-hood and perforated types used in the distillation of anhydrous solutions of alcohol and hydrogen chloride are illustrated. The column is made of lead-lined steel or cast-iron flanged sections, the joint with the glass being made with a lead ring. In this case lead plates lasted only a few months, whilst the lead lining is durable.

Industrial measurements. I. Weighing. E. P. PARTRIDGE (Ind. Eng. Chem., 1929, 21, 740—744).—For the weighing of raw materials hopper scales which release a hopper charge when a required weight has been added are useful. The telepoise conveyor scale and conveyor weightometer automatically integrate weights passing over a conveyor. For batch compounding, as in a glassworks, a special truck which is really a container mounted on a platform scale may be used. The poidometer gives automatic control to a continuous feed as in cement manufacture. The conveyor scale may be modified to weigh continuously a sheet product, e.g., paper or rubber.

Plastometer. E. KARRER (Ind. Eng. Chem. [Anal.], 1929, 1, 158—160).—The construction and operation of an automatic plastometer for measuring the plasticity of rubber are described with reference to detailed drawings for particulars of which the original must be consulted.

A. R. POWELL.

See also A., Aug., 903, **Centrifugal filtration device (SKAU). Apparatus for fractional distillation under vacuum (ASHWORTH).**

Vaporisation of complex mixtures. PODBIELNIK and BROWN. **Waste-heat recovery.** GREGGON.—See II. **Drying and mixing viscous liquid.** JESSUP.—See XIII. **Filter cloths.** SANDERA.—See XVII.

PATENTS.

Regeneration of kieselguhr. A. M. DUPERU (U.S.P. 1,708,362, 9.4.29. Appl., 25.10.26).—Moist spent kieselguhr is mixed with dry regenerated kieselguhr and dried, pulverised, and calcined in air. The dust from the drying and burning kilns is collected in water, the dust water mixed with regenerated calcined kieselguhr, and the mixture filtered.

R. BRIGHTMAN.

High-pressure joint. F. H. BRAMWELL, Assr. to ATMOSPHERIC NITROGEN CORP. (U.S.P. 1,722,623, 30.7.29. Appl., 23.7.26. U.K., 23.7.25).—See B.P. 249,001; B., 1926, 472.

Apparatus for mixing, compacting, degassing, or grinding viscid material. A. SONSTHAGEN and G. M. POVERUD (U.S.P. 1,722,115, 23.7.29. Appl., 26.8.27. U.K., 6.4.27).—See B.P. 279,707; B., 1928, 41.

Production of intimate mixtures of substances and of chemical products therefrom. J. W. SPENSLY (U.S.P. 1,722,687, 30.7.29. Appl., 5.3.23. U.K., 4.4.22).—See B.P. 201,968; B., 1923, 962 A.

Centrifugal separator. E. B. MÖLBACH (U.S.P. 1,721,230, 16.7.29. Appl., 19.10.28. Nor., 29.10.27).—See B.P. 299,703; B., 1929, 498.

Manufacture of ultrafilter membranes. J. DUCLAUX (U.S.P. 1,720,670, 16.7.29. Appl., 30.8.23. Fr., 11.9.22).—See B.P. 203,714; B., 1924, 657.

Apparatus for charging furnaces, refuse destructors, producers, etc. WOODALL-DUCKHAM (1920), LTD., and F. A. HORNBY (B.P. 316,841, 15.12.28. Addn. to B.P. 305,451).

[Ejector] means for producing foam, more particularly for fire-extinguishing purposes. EXCELSIOR FEUERLÖSCHGERÄTE A.-G., Assees. of C. WAGENER (B.P. 289,444, 26.4.28. Ger., 27.4.27).

Absorption refrigerating apparatus. ELECTROLUX, LTD., Assees. of PLATEN-MUNTERS REFRIGERATING SYSTEM A.-G. (B.P. 292,480, 18.6.28. Ger., 16.6.27).

Adsorption refrigerating apparatus. ELECTROLUX, LTD., From PLATEN-MUNTERS REFRIGERATING SYSTEM AKTIEBOLAG (B.P. 315,292, 11.4.28).

Jaws of stone breakers or crushers. W. SOMERVILLE (B.P. 315,730, 12.4.28).

Mixing apparatus [for disinfecting grain etc.]. J. S. J. FRUERGAARD (B.P. 315,742, 17.4.28).

Screening plant [with mass-balanced screens]. BAMAG-MEGUIN A.-G. (B.P. 311,219, 17.7.28. Ger., 7.5.28).

Pumps for forcing under pressure liquefied gases at low temperatures. L'AIR LIQUIDE SOC. ANON. POUR L'ETUDE ET L'EXPLOIT. DES PROC. G. CLAUDE (B.P. 302,681, 30.11.28. Fr., 20.12.27).

Hermetic closures for pressure vessels. K. BRETSCHNEIDER (B.P. 292,614, 22.6.28. Ger., 24.6.27).

Apparatus for generating vapours (B.P. 298,905).—See X.

II.—FUEL; GAS; TAR; MINERAL OILS.

Terminology in coal research. R. THIESSEN and W. FRANCIS (Fuel, 1929, 8, 385—405).—The nomenclatures proposed, respectively, by Stopes in England (B., 1919, 452 A) and Thiessen in America (B., 1925, 433) for distinguishing the types of coal present in a seam have been correlated. Vitrain corresponds with anthraxylon and clarain with attritus. The thin bright streaks in clarain, however, are anthraxylon. Durain has no counterpart in American coals. Fusain corresponds with mineral charcoal or "mother of coal" in America. The terms anthraxylon, attritus, and fusain may be used irrespective of the rank or geologic age of the coal. The terms vitrain, clarain, and durain should be limited to coals of bituminous rank. Of the

German terms, Glanzkohle and Mattkohle, the former may have been used for vitrain or clarain or both, whilst the latter is probably more nearly equivalent to durain.

A. B. MANNING.

Accuracy in coal sampling. C. F. KINGDON (J. Inst. Fuel, 1929, 2, 361—363).—The gross sample should be crushed to a maximum size of about $\frac{1}{8}$ in. diam. and then reduced in quantity to about 6 lb. by quartering or riffing. Considerable variation in results may obtain from dividing and mixing by hand, and a sampling apparatus is recommended. This consists essentially of a rotating cylinder inside a larger container; the inner cylinder has a cone-shaped cover provided with a slot through which a proportion of the material passes during the rotation, the remainder being rejected into the outer container. Moisture should be determined before the final grinding.

C. A. KING.

Comparative measurement of the plastic state of coals. F. SCHIMMEL (Brennstoff-Chem., 1929, 10, 319—321).—The methods of Foxwell (B., 1924, 4, 737, 738, 896) and of Agde and von Lyncker (B., 1929, 462) have been compared with coals from the Ruhr, Saar, and Saxon districts. Curves are obtained which show the change in resistance of a standard column of coal as it is heated, and of the rate at which a weighted needle can penetrate the coal as the temperature rises. The plastic ranges determined in these two ways are in very close agreement if the maximum values obtained are always taken to indicate the end of this range; this is a modification of Foxwell's method in which the whole duration of resistance has previously been measured.

R. H. GRIFFITH.

Modification of Parr's total carbon determination in coal. R. E. BREWER and E. P. HARDING (Ind. Eng. Chem. [Anal.], 1929, 1, 145—148).—The residue from a fusion of the coal sample with sodium peroxide and potassium chlorate or perchlorate as accelerator is dissolved in gas-free distilled water and the solution transferred to a modified Parr apparatus in which the carbon dioxide is liberated with hydrochloric acid. The difference between the volumes of the combined gases before and after absorption with caustic potash solution gives the volume of carbon dioxide generated. Suitable corrections are made for the carbon dioxide in the reagents and in inorganic combination in the coal, and tables are given for facilitating the temperature and pressure corrections for gas volumes and for calculating the weight of carbon per c.c. of carbon dioxide.

H. S. GARLICK.

Combined water content of coals of different ages. D. J. W. KREULEN and B. L. ONGKIEHONG (Brennstoff-Chem., 1929, 10, 317—319).—Dehydration and hydration curves have been constructed for a number of coals, and the method of Rabinovitch and Fortunatov (B., 1929, 1) has been also applied to calculation of the size of pore which absorbs the moisture. The coals were treated, under standard experimental conditions, with sulphuric acid of varying concentrations, and the loss of water was determined by titration of the acid. It is found that the distribution of the water varies with the geological age of the coal; in a brown

coal, for instance, it is adsorbed far more evenly by pores of different sizes than in an older coal, where it occurs chiefly in the smallest pores.

R. H. GRIFFITH.

Determination of the moisture content of coal and similar substances. M. MANNHEIMER (Ind. Eng. Chem. [Anal.], 1929, 1, 154—156).—The coal, ground to pass 60-mesh, is weighed and shaken for at least $\frac{1}{2}$ min. with sufficient anhydrous methyl alcohol to give a final water concentration not greater than 2%. The alcohol is sucked through a filter into a test-tube containing a float and the equilibrium temperature of flotation in the aqueous alcohol determined. From the equilibrium temperature, the amount of coal, and the quantity of methyl alcohol, the moisture content can be determined, the whole procedure taking less than 5 min. The method shows a small but fairly constant higher value for water content than that obtained by extraction with xylene, this difference varying slightly with length of time of extraction, final concentration of water in the alcohol, and species of coal. The values obtained agree with one another at least as well as those obtained by other methods.

H. S. GARLICK.

Extraction of mineral substances from coal. N. M. KARAVAEV and I. B. RAPOPORT (Izvestia Teplotch. Inst. [Moscow], 1929, No. 5, 31—34).—It is shown that the usual methods of analysis of coals give results inaccurate with regard both to their mineral matter content and to the composition of the combustible material. Boiling a coal with dilute hydrochloric acid (1:10) extracts hardly any mineral matter, whilst hydrofluoric acid of the same dilution is much more effective, even in the cold, and dissolves any silicates present. Hydrofluoric acid has the additional advantage that there is greater certainty of the organic matter in the coal not being attacked. Any analytical errors due to the presence of moisture, which must not and cannot be removed by heating to high temperatures at which the organic matter may begin to decompose, can be corrected by treatment with hydrofluoric acid (1:10) in the cold for 24—48 hrs. Analyses of coal samples after heat treatment and hydrofluoric acid treatment showed differences in the carbon content up to 3% and of hydrogen up to 0.32%.

A. FREIMAN.

Fusain. J. D. DAVIS (Min. Congress J., 1929, 197—200; Fuel, 1929, 8, 375—379).—The literature on the occurrence, separation, physical and chemical properties of fusain is summarised.

A. B. MANNING.

Electrostatic method for determining fusain in bituminous coal. J. D. DAVIS and J. A. YOUNKINS (Ind. Eng. Chem. [Anal.], 1929, 1, 165—167).—The fusain in a 0.5-g. sample of 60-mesh air-dried coal is subjected to preliminary separation in an impure state by shaking with a mixture of gasoline and carbon tetrachloride of d 1.40—1.45, followed by centrifuging. The coal which floats is removed and the remaining impure fusain dried, weighed, and transferred to the tray of an electrostatic separator, where the fusain is removed from the electric field by a current of an inert gas, and the residue re-weighed. The completeness of separation is checked microscopically and the process

repeated if necessary. Practically complete separation is possible, although the results have a tendency to be slightly high due to mineral matter being carried over with the fusain. The electric field is produced by the output of a 500-watt high-tension transformer connected to a 110-volt supply, the secondary winding giving about 20,000 volts, rectified by a G.E.C. Kenotron valve. With electrodes $\frac{3}{4}$ in. apart a filament current of 4.5 amp. was adequate.

H. S. GARLICK.

Some properties of coal dust and pulverised coal. F. S. SINNATT (Fuel, 1929, 8, 362—370).—The utilisation of coal in the form of pulverised fuel has directed attention to certain properties, such as ease of grinding, proportion of fusain in the dust, the temperature of ignition and the speed and mechanism of combustion of the finely-divided material, the m.p. and behaviour of the ash, etc. Some recent investigations relating to these properties are summarised, and their bearing on practice is briefly indicated. Attention is directed to the possibility of a wide variation in the properties of the individual particles of the powdered coal.

A. B. MANNING.

“C.O.L.” chamber ovens at the works of the Wandsworth, Wimbledon, and Epsom District Gas Co. C. M. CROFT (Gas J., 1929, 187, 251—256).—The plant consists of five settings of six chambers, each holding 3 tons of coal. A detailed description of the plant and its auxiliaries is given, and the results of tests with Durham and Yorkshire coals are shown. In a 28-day test with Durham coal, containing 2.65% of moisture, 31.38% of volatile matter, and 7.93% of ash, 4277 tons of coal, 503 tons of breeze, and 399 tons of steam were used, whilst the producers consumed 710 tons of coke; 73,093,000 cub. ft. of gas of 485.6 B.Th.U./cub. ft. were produced, equivalent to 85.25 therms per ton, and 13.59 cwt. of dry coke remained from each ton of coal. A 4-day test with Yorkshire coal gave 83.3 therms of gas and 13.84 cwt. of dry coke per ton of coal.

R. H. GRIFFITH.

Low-temperature coking of Chelyaba brown coals. N. N. ROGATKIN (J. Chem. Ind. Moscow, 1928, 5, 1278—1279).—The yield of liquid products increases but little over 400° and is maximal at 470°. Above 450° the yield of gas rapidly increases at the expense of that of the coke. Data concerning the composition of the brown coal and gas and the yields are given.

CHEMICAL ABSTRACTS.

Primary tar of Chelyaba coals. I. Y. POSTOVSKI (J. Chem. Ind. Moscow, 1928, 5, 1279—1280).—Rogatkin's tar (cf. preceding abstract) contained C 73.36, H 7.86, N 1.42, S 0.25, O 17.11%, and had d^{26} 1.0350, f.p. below 0°, mech. impurities 4.6, moisture 12.3, ash 2.46, phenols 40.0%, calorific value 8873 g.-cal. The tar is low in paraffin and high in phenol, and the tar water contains 0.3% of ammonia.

CHEMICAL ABSTRACTS.

Spontaneous combustion of [Japanese] coal. I. MIYAGAWA, M. YAMADA, and J. INABA (J. Fuel Soc. Japan, 1929, 8, 81—85).—Experiments to determine the liability of a coal to spontaneous combustion by its examination in an adiabatic calorimeter are described, and it is shown that coals requiring less than 4½ hrs.

for the temperature to rise from 101° to 130° due to oxidation are the most liable to spontaneous combustion in the mine. It is also indicated that the α -compounds are the most spontaneously combustible. Examination of the oxidisable substance in coal by its reactions with iodine, chromic acid, sulphuric acid, hydrogen peroxide, ozone, and bromine show that, with the exception of the last-named, these reagents can be used to determine the liability to spontaneous combustion provided that conditions are carefully standardised.

C. B. MARSON.

Waste-heat recovery with particular reference to the carbonising and steel-making industries.

W. GREGSON (J. Inst. Fuel, 1929, 2, 329—344).—Surplus heat may be recovered either by direct return to the furnace by means of regenerative settings or by external means, e.g., waste-heat boilers. Regenerative recovery is limited by the volumes of ingoing air and outgoing products, and increase in the capacity of regenerators beyond this determined value is detrimental; further recovery can be obtained only by waste-heat boilers. In gas-works' retort practice both methods in conjunction are standard. The emission of heat from coke discharged from horizontal retorts represents as much as 25% of the total heat to the settings, and the steaming of vertical retorts has a distinct advantage in this respect. In steel-furnace work higher heat efficiency can be effected by feed-water heaters, but the capital and maintenance costs of the latter outweigh any advantage obtained by the additional heat recovery.

C. A. KING.

Action of hydrogen on coal. J. I. GRAHAM and D. G. SKINNER (J.S.C.I., 1929, 48, 129—136 T).—The early history of the hydrogenation of coal is outlined, and the work of Bergius is described. The paper records the results obtained by the authors on the hydrogenation of over thirty British coals in presence of phenol as a suspending medium. The products in each case have been separated into (A) portion insoluble in phenol, (B) portion soluble in phenol, insoluble in chloroform, (C) portion soluble in phenol and soluble in chloroform and boiling above 150°, (D) light fraction boiling below 150°, (E) water, (F) gases. In general it was found that coals of the parabituminous group (Seyler) give the highest yield of oil and smallest amount of residue. For comparison, the results of destructive distillation tests on each coal are given, and the increased yield of liquid products resulting from hydrogenation is clearly shown. Although Bergius has stated that any coal (of carbon content below 80%) may be hydrogenated almost completely, the authors consider that the composition and constitution of the coal are of considerable importance in regard to the degree of its conversion into oil by the action of molecular hydrogen. The properties of the products of hydrogenation are described in detail. The residue (a) is richer in carbon and usually poorer in hydrogen than the original coal. Decomposition of this product is observed at a temperature below 400°, and its stability is evidently dependent on the partial pressure of hydrogen in the surrounding atmosphere. On distillation to 600°, 3—4% by weight of gas is evolved, and of this 65—80% by vol. is hydrogen. Product B, which is an intermediate product in

the hydrogenation process, may contain 85—90% C, 4.3—4.7% H, and 0.8—6% O; the C/H ratio is in general about 19. The volatile matter is usually about 33%. On distillation it decomposes at a temperature considerably below that obtaining in the hydrogenation process; it is stable at temperatures above 250°, only in presence of a high concentration of hydrogen molecules, and is capable of further hydrogenation, when simpler products are obtained. Distillation at 600° yields 7—8% of oil and about 2—3% of gas very rich in hydrogen. Mol. wt. determinations by the b.-p. method using phenol as solvent gave values of the order of 3000 for this product. Considerable loss in weight occurs when heated in air at 150°, indicating oxidation of carbon and hydrogen, but with little fixation as a solid complex such as occurs with the parent coal. In no case has product C (the tar oil), been found to consist of hydrocarbons only, oxygen being usually present to the extent of about 4%, whilst the C/H ratio is about 11.5. The iodine values of the fractions of this product and also of product D show that these possess a fair degree of saturation. The water produced in hydrogenation depends on the oxygen percentage of the original coal. The quantity of gas produced in hydrogenation is rather larger than that from destructive distillation at the same temperature. Methane may be present in amount up to 13% of the original coal. Unsaturated hydrocarbons are never present. It is shown that the greater part of the hydrogen consumption takes place during pyrogenic decomposition of certain of the coal constituents, although some absorption also takes place by the direct action of hydrogen. In an attempt to discover which constituents of the coal are most amenable to the action of hydrogen, vitrain from the Slate Seam, Warwickshire, was extracted with phenol for a prolonged period, and the residue subjected to hydrogenation in the usual manner. Less residue (A) was yielded than in the case of the original coal, and thus it seems that the extract would not be readily hydrogenated. On the other hand, extraction of another coal with pyridine, and subsequent hydrogenation of the residue, left a residue, A, practically equal in amount to that obtained by direct hydrogenation of the coal, indicating that in this case the extract must be almost completely hydrogenated. The conclusion is reached that, in the application of catalysis to the hydrogenation of coal or its products, the prospect of the process becoming a commercial success is greatly enhanced. The use by Bergius of iron oxide paste is considered to have a catalytic effect. It has been found that other substances, such as nickel oxide and ammonium molybdate, have a greater effect than has iron oxide.

Calculations on a lignite dryer with psychometric chart. I. LAVINE and R. L. SUTHERLAND (Chem. Met. Eng., 1929, 36, 425—428).—A chart gives the relations between temperatures from 40° to 680° F. and humidity, latent heat, total heat, etc. for air and gases (e.g., flue gases) having similar specific heats. The application of these curves to the problem of drying lignite with 36% of moisture by hot flue gases is given in detail. This can be dried to a 20% moisture content, which amount is in equilibrium with the atmosphere

under average conditions. In making the calculation the operations of heating the lignite and adiabatic evaporation are considered separately. It is assumed that the gas on leaving the dryer is saturated. The relative humidity of the gas should be reduced along the dryer in the same ratio as the moisture in the lignite to maintain a uniform humidity gradient. This is obtained by the use of a countercurrent. The use of the minimum quantity would produce disintegration of the lignite, and a much larger quantity of gas must be recirculated to maintain desirable humidity conditions.

C. IRWIN.

Laboratory tests of the chemical activity of ashes of solid fuels in relation to refractories. O. V.

NEFEDIEVA and N. G. PACUKOV (*Izvestia Teplotech. Inst. [Moscow], 1929, No. 5, 20—30*).—Two methods of testing refractory bricks as to their behaviour towards the chemical activity of ashes and slags was used. One method was to determine the fusibility of mixtures of refractories and ashes; the other was a modification of Nesbitt and Bell's method (*J. Amer. Ceram. Soc., 1923, 6, 296*) of surface interaction. According to the first method the sample of solid fuel was finely powdered (900-mesh/sq.cm.) and burnt. The ash was then powdered and samples were taken for fusion determinations. From the refractories small samples were taken from different parts and the powder was moistened with water, and, after addition of a 10% dextrin solution, made up into small cones for fusion experiments. Mixtures of refractory and ash were next prepared (3:1, 1:1, and 1:3) and each was thoroughly rubbed together in an agate mortar; a portion was then subjected to the fusion tests, and the rest heated in a current of oxygen, again thoroughly powdered, and oxidised in an electric oven for 1 hr. Conical samples for fusion experiments of both the mechanical mixture and the heated mixture were prepared as described above. Curves showing the relation between constitution of the mixture and temperature of fusion exhibited in all cases, except one, a rapid decrease of fusion point to a 25% ash content, after which the decrease was more gradual and regular. It was also found that refractory bricks with a high silica content are more resistant. In the surface-interaction method a brick sample was weighed and measured, and the size of the hollow in one of its sides was determined by means of a volumometer, using pure sand. Its porosity was also determined. The hollow was then filled with ash and slag and the brick with the hollow upwards was heated for a known period at a known temperature. After being cooled, weighed, placed with the hollow downwards on a fire-resisting crucible, to allow any molten ash which might escape to collect in the crucible, it was placed in an oven and kept for the same length of time at the same temperature. After cooling it was again weighed and measured, and from the measurements of the hollow the degree to which the brick was attacked by the given ash sample could be determined.

A. FREIMAN.

Adsorptive characters of activated ash-free charcoals. E. LANDT and K. K. BHARGAVA (*Z. Ver. deut. Zucker-Ind., 1929, 79, 470—484*).—Inactive char produced from pure sugar at 250—300° was activated by heating for 7 hrs. at constant temperatures ranging

from 550° to 1050° in a regulated current of air in an electric tube oven. The yields of activated products ranged from 27 to 70% of the inactive carbon used, and for any given temperature of production the activities varied inversely with the yields. Towards iodine the products were as active as good commercial decolorising carbons. Their behaviour towards sodium hydroxide and hydrochloric acid varied widely according to the conditions of production. Propionic acid was adsorbed by all the products more readily than acetic acid, and the latter more readily than formic acid (Traube's rule). None of the products showed more than feeble adsorptive action on the colouring matters of molasses.

J. H. LANR.

Mechanical separation and flotation of Koureika's graphite. V. I. TRUSHLEVITSCH (*Trans. Inst. Econ. Min. Met. Moscow, 1928, No. 39, 47 pp.*).—A study of the conditions for the elimination of sulphur and ash from graphite from Touroukhansk, Siberia.

CHEMICAL ABSTRACTS.

Gas from brown coal. F. FRANK (*Z. angew. Chem., 1929, 42, 773—776*).—The carbonisation and gasification of brown coal under varying conditions and the production of further quantities of gas by cracking the tar vapours evolved have been studied on a laboratory scale. The apparatus comprised an electrically-heated retort, through which could be passed an accurately-measured quantity of carbon dioxide, steam, or other gas or vapour, an electrostatic purifier for the precipitation of tar fog, ordinary gas purifiers, and a condensing system. The results indicate the possibility of producing town's gas by the gasification of brown coal, combined with the cracking of the volatile products evolved by passing them over the highly reactive brown coal coke at a suitable temperature. The process can also be made to yield appreciable quantities of motor spirit.

A. B. MANNING.

[Oxides of nitrogen] coke-oven gas. P. SCHULTAN (*Z. angew. Chem., 1929, 42, 757—760*).—The presence of nitrogen peroxide in coke-oven gas has been established and its concentration determined colorimetrically by using a solution of *m*-phenylenediamine. Nitric oxide, however, formed the greater proportion of the oxides of nitrogen present in the gas. This was determined by the addition of oxygen, whereby it is partly converted into nitrogen peroxide. From the volume of oxygen added, the time allowed for the reaction, and the amount of peroxide formed, the original concentration of the nitric oxide could be calculated. The concentrations found were of the order of 0.0001—0.003%. The results were confirmed by hydrogenation of the nitric oxide over copper and determination of the ammonia formed. The presence of the nitric oxide was traced to the flue gases, which may contain up to 0.2—0.4%, and are drawn into the chambers by the suction of the exhauster. The formation of Roussin's salts by the action of the nitric oxide on ferrous sulphide in the presence of alkali has been observed in coke-oven plants.

A. B. MANNING.

Carbon monoxide in gases. H. KEMMER (*Gas- u. Wasserfach, 1929, 72, 744—749*).—If the removal of carbon monoxide were necessary in order to make coal

gas non-poisonous, three methods might be available: (1) absorption, (2) catalytic process, or (3) condensation. The practicability of these alternatives and their costs are reviewed, and it is concluded that absorption with ammoniacal copper formate solution, catalytic conversion into methane, and fractional distillation are all technically possible.

R. H. GRIFFITH.

Separation and utilisation of the constituents of coke-oven gas. J. BRONN (*Z. angew. Chem.*, 1929, 42, 760—768).—The composition of coke-oven gas and the separation of its constituents by fractional condensation at low temperatures are discussed. The most recent form of Linde's apparatus is described in detail. In this the gas, freed from carbon dioxide by washing successively with water under 12 atm. pressure and with caustic soda, is subjected to a preliminary cooling to -30° to -50° by heat interchange with the gases issuing from the apparatus. After entering the actual gas separation apparatus it undergoes further cooling by the already separated gases, whereby all the constituents are condensed except the hydrogen, nitrogen, and part of the carbon monoxide. The residual gas, still under a pressure of about 10 atm., then passes through tubes immersed in a bath of liquid nitrogen boiling under reduced pressure. This brings about condensation of the carbon monoxide and almost all the nitrogen, leaving hydrogen of 98—99% purity. If the gases are required for the synthesis of ammonia the process is slightly modified, the residual mixture of hydrogen, nitrogen, and carbon monoxide being washed with a current of liquid nitrogen under conditions which completely remove the carbon monoxide and leave a mixture of hydrogen and nitrogen in the requisite 3:1 ratio. Various possibilities for the economical utilisation of the hydrocarbons, e.g., as motor fuels, in the synthesis of alcohols, oils, etc., are discussed.

A. B. MANNING.

Removal of sulphur compounds from gases and recovery of the sulphur. G. LORENZEN (*Z. angew. Chem.*, 1929, 42, 768—773).—The various processes for removing sulphur compounds from gases are briefly described and compared, and the present position of the problem is discussed. One of the most recent developments is that due to Petit, in which the gas is washed with a solution of potassium carbonate, this being regenerated by treatment with carbon dioxide to remove the hydrogen sulphide, and then by heating to remove the excess carbon dioxide. The hydrogen sulphide mixed with carbon dioxide is passed through an iron oxide purifier and the sulphur thereby recovered. With a sulphur content in the gas of 7—8 g./m.³ the value of the sulphur recovered just pays the cost of its removal.

A. B. MANNING.

Simplified iodine pentoxide apparatus for determination of carbon monoxide in flue gas. F. E. VANDAVEER and R. C. GREGG (*Ind. Eng. Chem. [Anal.]*, 1929, 1, 129—133).—The apparatus and procedure are described in detail; carbon monoxide is determined by titration of the iodine liberated, an accuracy of 0.002% being claimed. The gas sample passes successively through two chromic acid towers, solid potassium hydroxide, an iodine pentoxide tube, and a solution of potassium iodide. Carbon dioxide, oxygen, hydrogen,

methane, ethane, hydrogen sulphide, sulphur dioxide, nitrogen, and oxides of nitrogen when present in small quantities do not interfere. If small amounts of formaldehyde are present one of the chromic acid towers must be heated at 100° . Correct results cannot be obtained if ethylene is present.

J. S. CARTER.

Air-gas ratio apparatus. C. Z. ROSECRANS (*Ind. Eng. Chem. [Anal.]*, 1929, 1, 156—158).—Illustrations and wiring diagrams of a gas analysis apparatus of the thermal conductivity type for determining the proportion of fuel gas in air are given and briefly described. It comprises two thermal conductivity tubes, one for dry air as standard and one for the gas mixture, mounted in a constant-temperature block controlled by a bimetallic thermostat and combined in an improved Wheatstone bridge circuit. Readings are taken for pure air and pure fuel gas of varying compositions, and by joining these points on a graph by a straight line the composition of any fuel gas-air mixture may be quickly determined.

A. R. POWELL.

Nomography. O. LIESCHE (*Chem. Fabr.*, 1929, 305—306).—A nomogram for determining the heat lost by incomplete combustion from the analysis of the flue gases is reproduced.

A. R. POWELL.

Determination of the sp. gr. of asphalt by means of a hydrometer. H. R. BERRY, E. H. SMITH, and F. R. LANG (*Ind. Eng. Chem. [Anal.]*, 1929, 1, 164).—The asphalt samples are heated to a temperature slightly above that of an oil-bath, maintained within the range 143.3 — 148.9° ($\pm 0.56^{\circ}$), and poured into metal cylinders $6 \times 1\frac{1}{4}$ in. immersed therein. A thermometer is placed directly in the asphalt, and when a constant temperature is reached a 4-in. A.P.I. scale hydrometer is floated therein and the gravity and temperature are recorded. A table gives the conversion directly into sp. gr. The hydrometer method gives results which agree closely with those obtained by the pycnometer method.

H. S. GARLICK.

Base combination and base exchange with humic acids. H. HEIMANN (*Brennstoff-Chem.*, 1929, 10, 301—303).—Humic acids obtained from peat, brown coal, sucrose, or quinol exhibit base-exchange properties which differ slightly from those shown by zeolites or by permutits; this is due to the fact that the free humic acid can exist as such, but free "permutit acid" cannot. The behaviour of humic acid with a number of salt solutions is discussed, and the changes which take place are differentiated from those due to adsorption.

R. H. GRIFFITH.

Production of gaseous, liquid, and solid hydrocarbons from methane. II. Action of the spark discharge on methane. H. M. STANLEY and A. W. NASH (*J.S.C.I.*, 1929, 48, 238—242 T).—The action of the spark discharge between copper, aluminium, and iron electrodes on methane, at atmospheric pressure and higher, is found to result in a variety of processes the extent and course of which are influenced by a number of factors such as current, spark gap, electrode material, but above all by the duration of sparking. The main products of the reaction are: (a) Gaseous: acetylene (up to nearly 14% of reaction gas), and smaller quan-

tities of ethylene and some diacetylene; (b) liquid: light oil, highly unsaturated with a pronounced tendency to polymerisation to resins. Hydrocarbons containing the group CH: appear to be present with only comparatively small amounts of benzene; (c) chloroform-soluble tar, from which small amounts of naphthalene and acenaphthylene were isolated; (d) resinous substances, insoluble in chloroform; (e) free carbon which under certain conditions may be obtained in light, flocculent form, resembling carbon black, in yields of nearly 20%. Acetylene appears to be the main primary product of the reaction, the higher hydrocarbons being probably formed by the further action of the discharge on the acetylene-hydrogen mixture produced. Longer periods of sparking favour the formation of liquid and solid products, whilst higher current discharges tend to produce greater quantities of flocculent carbon. The use of different electrode materials as well as of increased pressures up to 5 atm. did not materially alter the course of the reaction or the type of products. The formation of long carbon rods on the electrodes, thus reducing the electrode distance, was one of the experimental difficulties encountered.

Thermal production of acetylene from methane. K. PETERS and K. MEYER (*Brennstoff-Chem.*, 1929, 10, 324—329).—The decomposition of methane has been studied in an apparatus consisting of a tungsten spiral, of 0.5-mm. wire, 3 mm. in width, which is heated electrically and carried by two iron tubes through which the gas is passed; the whole is mounted in a glass flask from which the products are drawn and examined. Temperatures are measured approximately by means of an optical pyrometer. The life of the wire is limited by the gradual formation of tungsten carbide, which is very brittle. Experimental data are summarised for 44 runs, showing temperature, pressure, gas velocity, time of heating, and production of oil and acetylene. It is found that as the yield of acetylene increases to a maximum, at the highest temperatures and under reduced pressure, the formation of oil falls to nil; similar results are obtained with coke-oven gas, and curves are given showing the range of conditions necessary for production of carbon, benzol, or acetylene from methane or from coal gas. A similar apparatus has been used to demonstrate the formation of acetylene by a single passage of methane through an electric arc, with a time-contact of less than 1/10,000 sec.; only very small amounts of acetylene are produced from naphthalene under the same conditions.

R. H. GRIFFITH.

Sulphur content of Transvaal oil shales. I. J. BLOM (*Brennstoff-Chem.*, 1929, 10, 307—309).—Oil shales from Ermelo and Wakkerstroom contained total sulphur 0.09—0.77%, sulphide sulphur 0.02—0.36%, and organic sulphur 0.07—0.53%; the results are, in general, lower than those for American shales (cf. Harding and Thordarson, *Ind. Eng. Chem.*, 1926, 18, 731). Determinations of sulphates and phenol-soluble sulphur are recorded, and other analytical data are tabulated in full.

R. H. GRIFFITH.

Vaporisation of complex mixtures [of petroleum hydrocarbons]. W. J. PODBIELNIAK and G. G. BROWN

(*Ind. Eng. Chem.*, 1929, 21, 773—779).—Computations have been made on the basis of Raoult's law to give comparisons between the efficiencies of continuous and batch distillation applied to petrol. If w is the amount of liquid in mols. and x and y are the compositions of the liquid and of the vapour in mol. fractions, then $\log w_2/w_1 = \int_{x_2}^{x_1} dx/(y-x)$, either in the case of a continuous distillation at fixed temperature or of an infinitesimal step in a batch distillation. For a complex mixture, integration can only be performed by giving final values to the steps. Experimental results were also obtained and compared with the calculations. It was found that the deviations from Raoult's law (for hydrocarbons up to hexane) were within the limits required for calculations for engineering practice. For continuous distillation a series of equations giving the relationship between mols. vaporised and partial pressure for each component are used. It is shown that the batch method gives the more efficient fractionation in most cases. The detailed conclusions summarised in this form are independent of the validity of Raoult's law.

C. IRWIN.

Colloid-chemical factors in the formation and separation of crude oil emulsions. A. LOTTERMOSER and N. CALANTAR (*Kolloid-Z.*, 1929, 48, 362—377).—The effectiveness of a number of substances in bringing about the separation of crude oil emulsions into their components has been examined by shaking the emulsion with a small quantity of the substance for 5 min. and observing the clarity of the oil layer after keeping it for a week. Among the best substances for this purpose are aniline, phenol, dihydroxystearic acid, carbamide, pepsin, and saponin. The effect of casein as an emulsifying agent has been studied, and the 0.2% of casein recommended by Seifriz (*B.*, 1925, 556) is found to be insufficient. Casein is not regarded as a good emulsifier. Generally oil-in-water emulsions are formed, but in the presence of hydrophobic colloids and also in the emulsification of unpurified oil at certain concentrations, both kinds of emulsions are produced. Hard asphalt and petroleum tar are hydrophobic colloidal emulsifiers in petroleum which favour the formation of a natural water-in-oil emulsion; they lower the interfacial tension between oil and water, and consequently accumulate at the boundary with the formation of an elastic membrane; in addition, they raise the viscosity of petroleum, thus increasing the stability of natural petroleum emulsions. Hard asphalt helps to produce more stable emulsions than petroleum tar. Natural petroleum emulsions can be separated into their components by extraction of the tar by means of alcoholic sodium hydroxide, by adsorption of the asphalt substances by means of fuller's earth, or by precipitation of the asphalt and tar by anhydrous stannic chloride. Fractions of petroleum of low b.p. are the least readily emulsified, owing to their poverty in colloidal emulsifiers and to the difference in the density of the two phases. Sapamine acetate, hydrochloride, and lactate are unsuitable for the emulsification of petroleum or for the separation of the emulsions.

E. S. HEDGES.

Purification of crude benzol by means of sulphur. R. ULOTH (*Brennstoff-Chem.*, 1929, 10, 297—301).—

A crude benzol from a coke-oven plant, which contained 0.324% S, was heated in an autoclave with sulphur. The liquid product thus obtained contained only traces of free sulphur, and the combined sulphur was only about 50% of that originally present, being almost entirely in a small quantity of pitch that is formed. As the temperature of the reaction is increased, the removal of unsaturated compounds, as measured by loss on washing with sulphuric acid, becomes more nearly complete; changes begin at 110°, and are almost ended at 270°. Differences in pressure have only a small effect on the reaction, but a minimum quantity of sulphur, generally 1–2%, is necessary. Experiments were carried out similarly with *cyclohexene*, thiophen, *cyclopentadiene*, and indene; all except the first became deeply coloured and produced hydrogen sulphide when heated with sulphur. *cyclohexene* is polymerised by heating in the presence of copper at 150° to a dark, viscous mass, no benzene being produced; in absence of copper, this reaction commences only at 200°. R. H. GRIFFITH.

Naphthenesulphonic acids [in oil refining].

S. PILAT and E. DAVIDSON (Przemysl Chem., 1927, 11, 141–146).—Compounds, having formulæ approximating to $C_{24}H_{33} \cdot SO_3H$, which do not lose the sulphonic group even on prolonged boiling with alcoholic alkali, are formed in the acid refining of oils. The sodium salts, even in fairly acid solutions, produce a foam in aqueous solution. CHEMICAL ABSTRACTS.

Volumetric determination of sulphur in crude petroleum. G. WOODWARD (Ind. Eng. Chem. [Anal.], 1929, 1, 117–118).—Enough oil is burned in the bomb to produce 0.03–0.25 g. of sulphuric acid. The contents are washed out using the minimum quantity of water, and a small amount of potassium iodide solution is added as indicator. The solution is evaporated to a volume slightly less than 50 c.c. with sufficient powdered aluminium (approx. 0.01 g.) to effect decolorisation, and then sufficient 95% alcohol added to bring it to a 50–70% alcohol solution. Lead nitrate solution (0.02N), previously standardised against 0.1N-sulphuric acid, is then run in until a permanent yellow colour is produced. With crude oil where the amount of sulphuric acid formed was 0.1–0.25 g. the deviation between the results of this and the barium sulphate methods did not exceed 1.8%. H. S. GARLICK.

Determination of sulphur in petroleum oils.

R. C. GRIFFIN (Ind. Eng. Chem. [Anal.], 1929, 1, 167–169).—In the usual bomb method for determining sulphur in petroleum oils part of the sulphur is in most cases oxidised to a sulphonic acid or similar substance, of which the barium salts are soluble in water, with consequent low results in the determination. The sulphur of the sulphonic acid may be recovered as sulphuric acid by refluxing with concentrated hydrochloric acid. Both the usual bomb and the lamp methods give low results with oils containing mercaptans, which in the bomb are largely oxidised to sulphonic acids. When burned in the lamp they form some other compound than sulphur dioxide or trioxide and are lost. The determination of sulphur in heavy crudes by the lamp method by diluting with kerosene and burning the mixture is unreliable.

For very heavy crudes the recovery of sulphur by this method may be as low as 65%. H. S. GARLICK.

Sp. heats of mineral oils. L. M. HENDERSON, S. W. FERRIS, and J. M. McILVAIN (Ind. Eng. Chem. [Anal.], 1929, 1, 148–151).—The sp. heats between 37° and 250° of a wide range of mineral oils were determined in a calorimeter in which the electrical energy required to raise the temperature of a given weight of oil a definite number of degrees in a definite length of time under controlled conditions was measured. The results show that the sp. heat at elevated temperatures can be calculated with the aid of the equation of Fortsch and Whitman (B., 1926, 810) with sufficient accuracy for engineering requirements. H. S. GARLICK.

Analysis of motor fuels containing alcohol.

A. NOLL (Z. Spiritusind., 1929, 52, 242–243, 247–248).—To 10 c.c. of the fuel in a flask graduated from 100 to 110 c.c. at the neck, calcium chloride solution (*d* 1.3) is added, the mixture shaken for 15 min., and made up with calcium chloride solution to 110 c.c. The volume of the hydrocarbons is measured on the graduated neck, and the water and alcohol are determined by difference. A further sample (100 c.c.) is twice extracted with calcium chloride solution in a separating funnel, the extracted alcohol determined by distillation, and the residual hydrocarbons are dried over ignited sodium sulphate and filtered. A portion (10 c.c.) is shaken in a 100–110-c.c. flask for 15 min. with 50 c.c. of a mixture of sulphuric acid and oleum or nitric acid (4:1 by vol.). The contents are made up to 110 c.c. with sulphuric acid and the proportion of paraffins is read, the benzene being obtained by difference. The method is shown to give consistent results with mixtures containing known proportions of benzene, petrol, and alcohol, but it is pointed out that since either hydrocarbon may be present in commercial samples of the other the method is less accurate in determining the proportion of commercial constituents in a mixed fuel. F. E. DAY.

Comparison of McIlhiney's and Rosenmund's methods for determining unsaturated linkings in vaselines. P. AGOSTINI (Annali Chim. Appl., 1929, 19, 241–253).—With the normal hydrocarbons, octylene and hexadecylene, these two methods (B., 1900, 176; 1902, 1542; 1923, 798, 1151; 1925, 214) give virtually identical bromine values. With amylene a small proportion, and with disobutylene a larger amount, of hydrobromic acid is formed by the McIlhiney method; with disobutylene, Rosenmund's procedure results in the formation of substitution products and gives values above the theoretical ones. With most vaselines, hydrogen bromide is formed by the McIlhiney method, which gives sensibly the same bromine values as the Rosenmund method, so that it seems that dibromopyridine sulphate solutions also yield substitution products in such cases. The McIlhiney method is preferred. T. H. POPE.

Use of mixtures of petroleum products and creosote for preservation of timber. A. I. VORONOV (J. Chem. Ind. Moscow, 1928, 5, 1227–1230).—The conditions of formation, particularly with Russian

heavy oils and mazouts, of the undesirable tarry precipitate on admixture with creosote were examined.

CHEMICAL ABSTRACTS.

Cylinder stocks of high quality from lubricating oil residues. V. L. GURVICH and M. A. PENGU (*Neft. Choz.*, 1928, 15, 55—64).

See also A., Aug., 903, **Apparatus for fractional distillation under vacuum** (ASHWORTH). 925, **Conversion of naphthenic acids into naphthenes** (KOMPPA). 948, **Determination of ethylene** (MORRIS).

Determination of phenols. SHAW. **Humic acids.** FUCHS and STENGEL.—See III.

PATENTS.

Fuels and firelighters. J. THIECKE, MINIMAX A.-G., and H. HERZOG (B.P. 315,232, 10.1.28).—A fuel or fuel-igniting substance is made by moulding into a suitable shape a mixture of ammonium nitrate and an organic substance, *e.g.*, charcoal, together with igniting means, *e.g.*, a mixture of potassium chloride, antimony sulphate, and lead peroxide, the whole being given a waterproof coating of paraffin or shellac. A. B. MANNING.

Fuel distillation. E. H. THIERRY and F. B. GRANT (B.P. 314,782, 2.4.28).—The fuel, *e.g.*, a briquetted mixture of anthracite duff and bituminous coal, is carried on trucks through a retort comprising two horizontal, parallel, and relatively long passages connected at the ends by bridging conduits and forming a closed circuit through which steam or other fluid medium is circulated in the direction opposed to the motion of the fuel. Two branch passages at one end of the loop formed by the retort are provided with chambers closed by trap doors through which the fuel enters and leaves the retort. At the other end of the loop the retort is provided with a superheating jacket in which the gaseous products obtained from the carbonisation of the fuel are burnt. These are withdrawn from the retort near the exit end and pass through a scrubber before being burnt. A. B. MANNING.

Apparatus for production of carbon black. R. H. UHLINGER, Assr. to THERMATOMIC CARBON Co. (U.S.P. 1,718,720, 25.6.29. Appl., 22.11.24).—A number of decomposing furnaces are connected to a conduit which conducts the mixture of gas and carbon black to a separating means and conveys the separated carbon black therefrom. The connexions from the furnaces to the conduit are provided with means for spraying the mixture of hot gases and carbon black with a cooling liquid. The arrangement is such that the mixture of gases and carbon black from at least one furnace enters the portion of the conduit containing separated carbon black and comes into intimate contact therewith. A. B. MANNING.

Production of coloured smoke clouds. J. C. SAVAGE (U.S.P. 1,716,797, 11.6.29. Appl., 3.4.24).—An oil-soluble colouring agent, *e.g.*, a dye, anthracene, or iodine, is incorporated with a light mineral lubricating oil, and the mixture ejected into the air, in the vapour state. Trichloroethylene or carbon tetrachloride may be added to the oily mixture. F. G. CLARKE.

Production of carbon monoxide. W. C. ARSEM, Assr. to COMMERCIAL SOLVENTS CORP. (U.S.P. 1,719,867, 9.7.29. Appl., 27.4.25).—A mixture of carbon dioxide and hydrogen is heated to 1000—1200° in the presence of a catalyst, and is then rapidly cooled to below 100° and the condensed water removed; the alternate rapid heating and cooling of the gaseous mixture is continued for the production of further quantities of carbon monoxide. A. B. MANNING.

Purification of gases in continuous working of plants for manufacture of light hydrocarbons. COMP. INTERNAT. POUR LA FABR. DES ESSENCES ET PÉTROLES (SOC. INTERNAT. DES PROC. PRUDHOMME-HOUDRY) (B.P. 295,272, 7.5.28. Fr., 8.8.27).—In processes for the hot purification of gases by passing over agents such as the oxides of nickel, which can be regenerated in known manner (cf. B.P. 274,846; B., 1929, 4), residual traces of sulphur are removed in a small supplementary purifier charged with a metallic purifying agent, *e.g.*, copper or its oxide, the sulphide of which is stable at the working temperature (approx. 250°). A. B. MANNING.

Apparatus for gas analysis. C. D. ZIMMERMAN (U.S.P. 1,719,864, 9.7.29. Appl., 17.1.27).—A number of gas burettes, each connected with its own series of absorption pipettes, are mounted on a stand and arranged to draw samples of gas simultaneously from different points of a gas passage or passages. A manifold connects the lower ends of the burettes to a liquid-levelling bottle, which, when raised, displaces gas simultaneously from each of the burettes into the corresponding pipette for the absorption of one of the constituents, and, when lowered, simultaneously withdraws the residual gas into its corresponding burette. A. B. MANNING.

Treatment of (A) tar or (B) pitch. O. D. CUNNINGHAM, Assr. to P. C. REILLY (U.S.P. 1,711,443—9, 30.4.29. Appl., 27.4.25).—Coal tar or pitch is heated to 160—170° with excess of sulphuric acid, run into water, and the product washed and neutralised to obtain material for decolorising or for use as filler in rubber or pigment mixes. R. BRIGHTMAN.

Emulsions of mixtures of pitch and bitumen. C. H. THOMPSON and W. J. MCGIVERN (B.P. 315,057, 23.5.28).—A mixture of bitumen and stearine pitch, containing a large proportion of the latter, preferably 40%, is emulsified with a dilute alkaline solution. A solution containing $\frac{1}{2}$ pt. of caustic soda in 15 pts. of water is suitable for the emulsification of 50 pts. of the mixture. China clay, ground limestone, etc. may be added as a filler. A. B. MANNING.

Manufacture of infusible asphalt masses of high elasticity. R. LICHTENSTERN (U.S.P. 1,720,487, 9.7.29. Appl., 28.4.28. Austr., 19.4.27).—Asphalt, to which not more than 10% of zinc, ferric, or aluminium chloride has been added, is heated to 300°, tung oil, not more than the amount of asphalt, is added, and the heating continued until coagulation occurs. T. A. SMITH.

Apparatus for mineral oil distillation. A. E. PEW, JUN., and H. THOMAS, Assrs. to SUN OIL Co. (U.S.P. 1,719,235, 2.7.29. Appl., 13.3.25).—Lubricating oil is distilled by means of mercury vapour which is used to

heat a thin wall over which the oil is flowing. Several mercury condensing chambers are supplied from one mercury vapour generator, and the oil is passed in series through the units heated by these chambers.

T. A. SMITH.

Cracking oil in liquid phase. J. C. BLACK (U.S.P. 1,720,070, 9.7.29. Appl., 26.10.26).—Oil is passed, under pressure, through tubes arranged in series in a furnace setting. The temperature of the oil is controlled by injecting additional oil at points along the tube, where pyrometer indicators show this to be necessary. Oil from the cracking tube is discharged into a space at the bottom of a dephlegmator column, whence the liquid fractions are passed through heat exchangers to preheat the cracking stock.

T. A. SMITH.

Cracking hydrocarbon oils. H. L. PELZER, ASSR. to SINCLAIR REFINING Co. (U.S.P. 1,718,375, 25.6.29. Appl., 11.4.28).—High-sulphur crude oil is cracked in the vapour phase. A mixture of caustic alkali with the crude oil is added to the resultant vapours during a scrubbing operation to separate tar. The remaining vapour mixture is refluxed and the vapours heavier than those suitable as components of gasoline are condensed and returned to the cracking operation. The tar separated from the product of the cracking and from the crude oil, including any unconsumed alkali and its reaction products, is discharged directly from the scrubbing operation.

H. S. GARLICK.

Cracking of hydrocarbon oils. H. L. PELZER, ASSR. to SINCLAIR REFINING Co. (U.S.P. 1,719,486, 2.7.29. Appl., 16.4.27).—In cracking stills in which the oil is circulated through a shell containing a bed of finely-divided material, and through a heating coil, the former rests on a screen, which is supported by a grating built of strips on the edges of which the screen rests.

T. A. SMITH.

Decomposition of hydrocarbons into hydrocarbons containing fewer carbon atoms. A. J. VAN PESKI (B.P. 315,193, 18.1.28).—The hydrocarbons are passed over metallic carbides, or metallic compounds which form carbides under the conditions of the reaction, at elevated temperatures and in the absence of hydrogen or gases capable of yielding hydrogen. Thus, by passing propane over granulated calcium carbide, or molybdenum mixed with pumice, at 600–800°, it is decomposed into ethylene and methane without deposition of carbon or loss of activity of the catalyst. Under similar conditions gas oil, b.p. 220–340°, gives a gas containing a high percentage of unsaturated hydrocarbons and a smaller or larger amount of a liquid condensate of b.p. 60–180°.

A. B. MANNING.

Refining of petroleum. E. B. PHILLIPS and J. G. STAFFORD, ASSRS. to SINCLAIR REFINING Co. (U.S.P. 1,709,149, 16.4.29. Appl., 7.8.23).—The oil is agitated with sulphuric acid, and the mixture is fed on the upper surface of a rapidly rotating disc, from the edge of which it is thrown in a thin, uniform film against baffles on the walls of the vessel. The sludge is separated by gravity and the oil agitated with clay or fuller's earth and filtered.

R. BRIGHTMAN.

Refining petroleum oil. R. CROSS, ASSR. to CROSS DEVELOPMENT CORP. (U.S.P. 1,718,218, 25.6.29. Appl.,

17.12.24).—A suitable hydrocarbon stock is treated successively with a sodium plumbite solution and with sulphuric acid before being cracked.

H. S. GARLICK.

Purifying hydrocarbon oils. L. LINK and M. B. AMIS, ASSRS. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,718,714, 25.6.29. Appl., 9.12.25).—An uncracked light hydrocarbon distillate containing difficultly removable corrosive sulphur is brought into intimate contact with the spent alkali from the treatment of a light fraction obtained from a cracking process.

H. S. GARLICK.

Preparing hydrocarbon products. J. SIMPSON, ASSR. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,781,713, 25.6.29. Appl., 30.1.24).—A naphtha distillate containing corrosive sulphur is subjected to the action of a sodium plumbite solution which has already been used for treating a sour naphtha distillate.

H. S. GARLICK.

Treating hydrocarbon oils. C. J. GREENSTREET, ASSR. to GASOLINE CORP. (U.S.P. 1,718,913, 25.6.29. Appl., 9.8.20).—Heavy hydrocarbon oils are mixed with steam and passed under pressure through a pipe extending backwards and forwards through a furnace and maintained at a substantially constant temperature sufficient to produce cracking. The vapours from the coils are brought directly into contact with a quantity of liquid sufficient to chill them suddenly below cracking temperature.

H. S. GARLICK.

Purifying and imparting a green fluorescence to lubricating oil. W. D. RIAL and W. R. BARRATT, ASSRS. to PAN AMER. PETROLEUM Co. (U.S.P. 1,708,592, 9.4.29. Appl., 7.6.27).—Lubricating oil, *e.g.*, "over-head stock," is treated with 1½% of coal-tar pitch and 2 oz. of hydrated lime per gal. at 120°, filtered, and clarified and decolorised at 110–160° with a decolorising clay.

R. BRIGHTMAN.

Reclaiming waste oil. R. R. ROSENBAUM (U.S.P. 1,708,488, 9.4.29. Appl., 1.6.27).—Used lubricating oil is heated under vacuum with sodium silicate and percarbonate, perborate, or persulphate, again agitated under vacuum with fuller's earth heavily impregnated with sulphur dioxide, and the gasoline and lighter fuel oils are then distilled off.

R. BRIGHTMAN.

Separating wax from mineral oils. R. E. WILSON, ASSR. to STANDARD OIL Co. (U.S.P. 1,719,350, 2.7.29. Appl., 18.7.22).—A low-viscosity oil containing wax is treated with an oil-miscible liquid, consisting essentially of an aliphatic alcohol and an agent for promoting the miscibility of the alcohol and oil, to precipitate the wax.

H. S. GARLICK.

Pressing of wax-containing oil. F. W. SULLIVAN, W. J. MCGILL, and H. L. WALKER, ASSRS. to STANDARD OIL Co. (U.S.P. 1,720,300, 9.7.29. Appl., 1.6.25).—Oil is removed from wax cake, formed in the filter press in the usual manner by forcing water, at a temperature below the m.p. of the wax, through the cake.

T. A. SMITH.

Preparing carbon dopes. H. W. A. DIXON (U.S.P. 1,718,949, 2.7.29. Appl., 23.3.27).—Colloidal mixtures containing oil and wax which are solid at ordinary temperatures are prepared in an apparatus consisting

of two containers and the necessary pumps and emulsifying mill. Oil is heated in one container and passed through the pumps and mill to the other container to heat the whole apparatus. It is then passed backwards and forwards through the mill, the necessary ingredients to form the emulsion being added. T. A. SMITH.

Recovery of entrained oils from clay. G. F. OLSEN (U.S.P. 1,720,144, 9.7.29. Appl., 22.1.27).—Lubricating oil having a viscosity greater than 150 sec. (Saybolt) at 100° F. is recovered from filter-press cake by forcing through the cake, while still in the press, a lubricating oil having a viscosity of 75–150 sec. (Saybolt). T. A. SMITH.

Lubricant. C. B. DE HART (U.S.P. 1,709,311, 16.4.29. Appl., 28.1.27).—Equal weights of jefferisite and aluminium stearate are mixed cold with lubricating oil, and the mixture is heated nearly to the flash point of the oil. R. BRIGHTMAN.

Method and apparatus for testing coal. R. GEIPERT (U.S.P. 1,721,813, 23.7.29. Appl., 7.10.26. Ger., 4.3.26).—See B.P. 267,082; B., 1927, 516.

Coking-retort oven. J. BECKER, Assr. to KOPPERS Co. (U.S.P. 1,721,763, 23.7.29. Appl., 13.10.22).—See B.P. 216,579; B., 1924, 625.

Low-temperature distillation of carbonisable material. K. W. J. H. JACOBS (U.S.P. 1,721,997, 23.7.29. Appl., 24.8.21. Ger., 28.7.19).—See B.P. 157,794; B., 1922, 578 A.

Apparatus for determining the calorific value of gases. O. DOMMER (U.S.P. 1,720,782, 16.7.29. Appl., 25.9.24. Holl., 1.10.23).—See B.P. 222,839; B., 1925, 616.

Continuous rectification of [hydrocarbons and other] liquids of high b.p. E. A. BARBET (U.S.P. 1,722,322, 30.7.29. Appl., 11.6.23. Fr., 11.12.22).—See B.P. 208,175; B., 1925, 533.

Fuel burners. BABCOCK & WILCOX, LTD. From DEUTS. BABCOCK U. WILCOX DAMPFKESSEL-WERKE A.-G. (B.P. 315,466, 14.4.28).

Pulverised fuel burner. E. C. R. MARKS. From RILEY STOKER CORP. (B.P. 316,341, 26.4.28).

Pulverulent fuel burners. GEN. ELECTRIC CO., LTD., and G. S. WOOLLATT (B.P. 316,242, 26.4.28).

Gas burners. J. P. AUTER (B.P. 315,918, 21.4.28).

Method and apparatus for burning liquid fuel. FILMA OIL BURNERS, LTD., and A. MARSDEN (B.P. 315,252, 10.4.28).

Apparatus for separating benzol from waste water. W. LINNEMANN, JUN. (B.P. 304,595, 16.1.29. Ger., 21.1.28).

Flotation agent (U.S.P. 1,709,447).—See X.

III.—ORGANIC INTERMEDIATES.

Rapid method for determination of phenols. J. A. SHAW (Ind. Eng. Chem. [Anal.], 1929, 1, 118 121).—The aqueous phenol sample (10 c.c., diluted, if necessary, to contain less than 1 g. per litre) is acidified and distilled from a pyrex test-tube by means of a

current of air saturated with steam by being first passed through hot water in a similar test-tube, both tubes being contained in a chamber through which live steam is passing. The volume of the sample thus remains approximately the same while 25 c.c. of distillate are collected. Aliquot portions of the distillate are successively diluted until the phenol content is between 30 and 35 pts. per million, and the turbidity produced by a few drops of bromine water is estimated by comparison with standards containing 30 and 35 p.p.m., respectively. Alcohols, amines, aldehydes, organic bases, oils, and inorganic salts interfere and must be removed, *e.g.*, by previous distillation from alkali or from acid and alkali in succession. The temperature of the standards and diluted distillate should be adjusted to 18–20°, and comparison be made within 15–20 sec. of precipitation. The sensitivity is about 30 p.p.m. C. HOLLINS.

Hydroxyl and carboxyl groups in humic acids. W. FUCHS and W. STENGL (Brennstoff-Chem., 1929, 10, 303–307).—Humic acids were isolated from two brown coals (Cassel and Rhenish) by treatment with aqueous hydrochloric acid, and extraction with a mixture of benzene and alcohol until bituminous substances were removed. Further reaction with dry methyl alcohol and dry hydrochloric acid gave a product which could be extracted with ether, and was finally completely methylated by means of diazomethane; the product contained 17–19% total OMe, 7–4% ester OMe, and about 3% of carbonyl groups. Oxidation of a humic acid was effected by the use of nitric acid, and the methylation of the oxidation products was also investigated; the completely methylated products in this case contained 19% total OMe, 8.5–9.5% ester OMe, and 2.4–2.8% CO. Analyses show that the substances are hydroxy-carboxylic acids, the oxidation products of which are very similar to the so-called "nitrohumic acid" (B., 1928, 555). Differences in the elementary composition of humic acids from various sources are attributed to alterations in the degree of reduction. R. H. GRIFFITH.

See also A., Aug., 874, **Salting-out of ethyl acetate** (SCHLESINGER and KUBASOWA). 886, **Electrolytic oxidation of organic substances** (MARIE and LEJEUNE). 923, **Catalytic reduction of nitro-compounds** (BUSCH and SCHULZ). 924, **Preparation of aminonaphthols** (BROWN and others). 930, **1:2-Phenanthraquinone and its derivatives** (FIESER). 934, **Condensation of di-*o*-thiobenzoic acid with aromatic hydroxy-compounds** (SEN and SEN-GUPTA). 948, **Micro-determination of methoxyl and ethoxyl groups** (FRIEDRICH).

Acetylene from methane. PETERS and MEYER. **Naphthenesulphonic acids.** PILAT and DAVIDSON.—See II. **Determination of formaldehyde.** HEIM.—See XX.

PATENTS.

Manufacture of polyalkylene glycol esters. O. LOEHR, Assr. to I. G. FARBENIND. A.-G. (U.S.P. 1,710,424, 23.4.29. Appl., 16.12.26. Ger., 18.12.25).—Organic carboxylic acids are treated with an olefine oxide in presence of an esterification catalyst; *e.g.*, acetic acid and ethylene oxide in presence of sulphuric

acid at 125° yield glycol diacetate, b.p. 90—120°/20 mm., and acetates of polyethylene glycols. R. BRIGHTMAN.

Condensation products [thioglycollic acids] from reaction products of sulphur chloride and primary arylamines. R. HERZ, Assr. to GRASELLI DYESTUFF CORP. (U.S.P. 1,699,432, 15.1.29. Appl., 16.5.28. Ger., 11.4.14).—The cyclic products from arylamines and sulphur chloride are treated with water and alkali and condensed with chloroacetic acid to give thioglycollic acids. C. HOLLINS.

Production of benzidine and derivatives. R. A. NELSON, Assr. to NAT. ANILINE & CHEM. CO., INC. (U.S.P. 1,718,373, 25.6.29. Appl., 22.6.20).—By the addition of sulphuric acid gradually to a solution of a hydrazo compound in a low-boiling solvent of the benzene series with vigorous stirring, the benzidine compound separates as sulphate in the form of a stiff paste. H. S. GARLICK.

Manufacture of benzyl phthalate. A. ZIMMERLI, Assr. to RHODIA CHEM. CO. (U.S.P. 1,708,404, 9.4.29. Appl., 28.2.26).—A solution of phthalic anhydride in an excess of benzyl alcohol is boiled for about 8 hrs., the solution is distilled to remove water, and the residue distilled in a vacuum. Benzyl phthalate has m.p. 42—44°, b.p. 260—285°/10 mm. R. BRIGHTMAN.

Catalytic oxidation of organic compounds. A. O. JAEGER, Assr. to SELDEN CO. (U.S.P. 1,722,297, 30.7.29. Appl., 26.8.27).—See B.P. 296,071; B., 1929, 236.

Manufacture of acetic acid. H. W. MATHESON, Assr. to CANADIAN ELECTRO PRODUCTS CO., LTD. (Re-issue 17,377, 16.7.29, of U.S.P. 1,410,207, 21.3.22).—See B., 1922, 347 A.

Conversion of cyanonaphthalenesulphonic acids. R. HERZ, F. SCHULTE, and W. ZERWECK, Assrs. to GRASELLI DYESTUFF CORP. (U.S.P. 1,721,882, 23.7.29. Appl., 24.2.27. Ger., 17.5.26).—See B.P. 296,010; B., 1928, 780.

IV.—DYESTUFFS.

See A., Aug., 930, 1:2-Phenanthraquinone and its derivatives (FIESER). 934, Colour and molecular strain (DEY and DUTT). 934, Condensation of di-*o*-thiobenzoic acid with aromatic hydroxy-compounds (SEN and SEN-GUPTA). 947, Alizarin and mercuric acetate (WHITMORE and LEUCK). 962, Pigments of red algæ (LEMBERG).

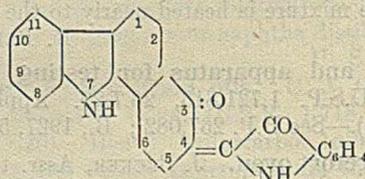
PATENTS.

Dyes [for domestic use]. E. R. SCHLATTER, Assr. to DIP-IT, INC. (U.S.P. 1,710,076, 23.4.29. Appl., 7.5.25).—The usual mixture of dyes (which may contain incompatibles) is dissolved in glycerin, e.g., to 2% concentration. The solution may be diluted largely without precipitation. C. HOLLINS.

Brown sulphur dyes. O. SPENGLER and R. WEIDENHAGEN, Assrs. to GRASELLI DYESTUFF CORP. (U.S.P. 1,705,840, 19.3.29. Appl., 31.10.25. Ger., 10.1.25).—Aldehyde or acyl derivatives of leucoindophenol, particularly 4-benzylideneamino-4'-hydroxydiphenylamine, are melted with sulphur at 200° to give benzthiazole compounds which are dark brown sulphide dyes. C. HOLLINS.

Disazopyrazolone colouring matters [chrome wool dyes] which contain a 1:5-dihydroxynaphthalene nucleus. L. W. GELLER, Assr. to NAT. ANILINE & CHEM. CO., INC. (U.S.P. 1,706,878, 26.3.29. Appl., 23.12.25).—A *p*-phenylenediamine is coupled on the one hand with a pyrazolone and on the other with 1:5-dihydroxynaphthalene; e.g., *p*-nitroaniline → 1-*p*-sulphophenyl-3-methyl-5-pyrazolone, reduced → 1:5-dihydroxynaphthalene dyes wool maroon, changing to brown on chroming. C. HOLLINS.

Vat dyes [of the indigoid series]. M. P. SCHMIDT and O. LIMPACH, Assrs. to GRASELLI DYESTUFF CORP. (U.S.P. 1,706,902, 26.3.29. Appl., 17.11.25. Renewed 12.2.29).—An isatin α -anil is condensed with a 3-hydroxy- α -naphthacarbazole to give black dyes (annexed formula). 3-Hydroxy-8-methyl- α -naphthacarbazole is thus con-



densed with isatin α -anil or 5-chloroisatin *p*-chloroanil. Improved fastness to chlorine results when the carbazole nitrogen is alkylated. C. HOLLINS.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Regain of stretched fibres and the porous structure of wool. A. T. KING (Trans. Faraday Soc., 1929, 25, 451—458).—The visible pores, after the scales had been removed from stretched wool fibres, were observed to have become elongated when examined microscopically, and this is believed to be the case of those pores that are too small to be so observed. Dry stretching of fibres was shown with the aid of a specially designed micro-balance to be accompanied by an increase in weight, whilst fibres which had been steamed in the stretched condition and having microscopic pores which tended to seal up and disappear decreased in weight. A theory of the pore structure of wool is advanced to account for these observations, namely, that the initial absorption of water, say up to 5%, consists of an adsorption layer on the internal surfaces of the pores, the subsequent addition, 5—25%, consisting of the filling up of the pores, and the final 25—33% being an osmotic absorption. The regain is determined by the dimensions of the pores that are filled with water, so that any alteration in the size of the pores should alter the regain. H. T. S. BRITTON.

Viscose. XXIV. Increasing the tensile strength of viscose silk. G. KITA, T. NAKASHIMA, J. ONOHARA, and K. MASUI. **XXV. Stretching of finished artificial silk in concentrated sulphuric acid.** G. KITA, S. IWASAKI, and S. MASUDA (J. Cellulose Inst., Tokyo, 1929, 5, 147—153, 175—177).—XXIV. Artificial silk of greater tensile strength is obtained by increasing the friction of the guides on the partly coagulated thread or by using a higher spinning velocity while maintaining the same pressure on the spinning liquid. Breaking of the thread will occur, however, if certain limiting values

for friction and spinning velocity are exceeded, which values depend on the properties of the viscose, viz., degree of ripeness, on the composition and temperature of the coagulating bath, and on the direction of spinning etc. Increased tensile strength may also be imparted by stretching the half-coagulated thread under the same conditions through a greater distance, preferably in the coagulating bath. Conditions and results are given numerically.

XXV. Artificial silk, after being wound on to a rotating glass cylinder, was passed through a bath of concentrated sulphuric acid and received on a second cylinder the speed of which was greater than that of the first, so that the thread could be subjected to varying degrees of tension depending on the relative speeds of the two cylinders. The effect of acid concentration, length of bath, temperature, and tension on the properties of the threads was thereby examined. By this treatment it was found possible to increase the tensile strength and elasticity of artificial silk by 20–50% and to make it more resistant to water.

F. R. ENNOS.

Viscosity of viscose. II. Structure viscosity of viscose. T. NAKASHIMA (*Kolloid-Z.*, 1929, 48, 326–328; cf. Kita and co-workers, *B.*, 1929, 713).—The measurements of the viscosity of viscose carried out by Tomihisa (*J. Soc. Chem. Ind. Japan*, 1928, 31, 866) are examined and shown to be in accordance with Wo. Ostwald's equation. The equation is also applicable to the spinning experiments, and it follows that the thickness of the thread bears no direct relation to the pressure.

E. S. HEDGES.

“Sthénosage” of viscose. L. MEUNIER and R. GUYOR (*Rev. gén. Colloid.*, 1929, 7, 53–66).—The swelling of natural and artificial cellulose has been studied, and it is inferred that the hydrophilic properties of cellulose are related to the number of free hydroxyl radicals present. A study has been made of the change in the degree of swelling produced by Eschallier's process of “sthénosage” (a kind of tanning effected by the simultaneous action of acid and formaldehyde): by this process the swelling is greatly reduced and the hydroxyl radicals are replaced in pairs by the group $\cdot\text{O}\cdot\text{CH}_2\cdot\text{O}\cdot$. The best conditions for this process have been worked out, (a) by soaking the fibre in acid, drying, and then subjecting to the vapours of formaldehyde, (b) by soaking the fibre directly in a mixture of acid and formaldehyde, drying, and finally heating at a moderate temperature. In each case the effect of variation of all the factors involved has been examined. The second method is considered to be the more advantageous and also the simpler in practice. Attempts have been made to replace the formaldehyde by acetaldehyde, paraldehyde, and acetone, but the reduction in swelling produced by these reagents was considerably less.

E. S. HEDGES.

Absorption of soda by cellulose. Y. KAMI and T. YAMASHITA (*J. Cellulose Inst.*, Tokyo, 1929, 5, 178–185).—The relation between the concentration of sodium hydroxide and its absorption by cotton is expressed by a stepped curve; in the case of tissue paper and wood cellulose the curve exhibits no sharp breaks. Yields of over 90% of regenerated cellulose (viscose)

may be obtained without difficulty, provided the sodium hydroxide absorption is over 0.17 g. per g. of cellulose, which requires the use of a solution containing more than 14.7% of sodium hydroxide. Higher temperatures tend to diminish the absorption, the most favourable steeping temperature being 20°. These results correspond very closely with practical experience in the viscose factory, where the average absorption is 0.18–0.23 kg. of sodium hydroxide per kg. of wood cellulose.

F. R. ENNOS.

Turpentine obtained as by-product in the manufacture of cellulose by the sulphate method. I. Y. POSTOVSKI and V. G. PLUSNIN (*J. Chem. Ind. Moscow*, 1928, 5, 1161–1165).—The turpentine is contaminated with methyl mercaptan and sulphide arising from interaction between by-product sodium sulphide and methyl alcohol. The contamination is partly prevented by liquefying the emitted gases; the sulphur compounds not otherwise removed from the oil are then oxidised with dilute aqueous bleaching powder.

CHEMICAL ABSTRACTS.

Weighing. PARTRIDGE.—See I. Viscosity of nitrocellulose solutions. MERZ. Nitrocellulose lacquers. WOLFF and ROSEN.—See XIII. Sugar-factory filter cloths. SANDERA.—See XVII. Cellulose from corn. LINK.—See XIX.

PATENTS.

Manufacture of moulded indurated-fibre articles. H. H. CLARK, Assr. to CLARK FIBRE PRODUCTS CORP. (U.S.P. 1,717,092, 11.6.29. Appl., 15.1.27. Fr., 4.6.26).—Old cotton cloth is digested in an aqueous solution containing about 5% of sodium hydroxide and 3% of sodium carbonate for about 4 hrs. under a pressure of 30–50 lb./in.² and the resulting pulp is run into a perforated mould. After drying, the mass is compacted by pressure to expel any entrapped air, impregnated with the indurating fluid (zinc chloride solution), and its walls are further compacted and shaped by moulding under pressure.

F. R. ENNOS.

Manufacture of cellulose pulp. J. J. DE LA ROZA, Assr. to BAGASSE PRODUCTS CORP. (U.S.P. 1,721,376, 16.7.29. Appl., 11.6.27).—Material containing cellulose is treated first with hot aqueous solutions containing sulphur, then with hot dilute alkaline solution (at 160–173° in both cases), and is finally refined and washed.

A. G. POLLARD.

Apparatus for spinning solutions of cellulose ethers or esters. M. KLEIN, Assr. to RUTH-ALDO CO., Inc. (U.S.P. 1,716,781, 11.6.29. Appl., 27.3.28. Fr., 24.6.27).—The spinning cell is provided with an inlet for cold air in its upper part where the downwardly directed spinning nozzle is situated, and the thread issuing therefrom passes down the vertical passage between a number of diaphragms set obliquely in the cell. Hot air and solvent vapours are withdrawn from the lower part of the cell.

F. R. ENNOS.

Apparatus for dehydrating viscose. S. A. NEIDICH (U.S.P. 1,717,118, 11.6.29. Appl., 21.6.26).—Fixed inside a retort having a removable lid is an annular spool seat coaxial with a conduit, which projects upwards into the bottom of the retort. A dehydrating fluid

(alcohol) is passed up the conduit, is vaporised by a heating arrangement surrounding it, and is condensed at the bottom of the retort by a refrigerant container below.
F. R. ENNOS.

Manufacture of cellulose products. H. P. BASSETT and T. F. BANIGAN, Asss. to MEIGS, BASSETT, & SLAUGHTER, INC. (U.S.P. 1,709,513, 16.4.29. Appl., 11.5.23).—The acetylating solution containing acetylnitrocellulose is treated, *e.g.*, with glacial or dilute acetic acid to reduce the consistency to a point just short of precipitation, and the ester is spun through a precipitating bath without removing it from the solution.
R. BRIGHTMAN.

Cellulose nitrate plastic. G. L. SCHWARTZ, Ass. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 1,710,078, 23.4.29. Appl., 16.6.21. Renewed 6.7.28).—*n*-Butyl phthalate, mixed with a non-solvent, *e.g.*, glycerides or esters of higher fatty acids and liquid petrolatum, is used as softener for nitrocellulose.
R. BRIGHTMAN.

Manufacture of no-glare writing paper. W. G. REYNOLDS (U.S.P. 1,721,576, 23.7.29. Appl., 12.3.27).—A calendered writing sheet consists of a filler having a coloured material worked therein containing sulphite-stock, auramine-double O, and soluble-blue.
A. G. POLLARD.

Treatment of highly-porous paper-like material. K. L. MOSES (U.S.P. 1,716,654, 11.6.29. Appl., 28.5.23. Renewed 4.8.28).—To enable the paper web to support its own weight while being impregnated with an aqueous filler, *e.g.*, rubber latex, a small quantity of a strength-giving element, *e.g.*, rubber, is incorporated with the pulp, either before or after the formation of the web. Latex is sprayed upon the latter, or the web is passed through a hydrocarbon solution of the rubber before impregnation with the filler. The minimum quantity of strength-giving element is used, so as not to diminish the porosity of the web.
F. G. CLARKE.

Apparatus for spinning solutions of cellulose esters or ethers. RUTH-ALDO Co., Inc., Asses. of (Miss) M. KLEIN (B.P. 292,608, 22.6.28. Fr., 24.6.27. Addn. to B.P. 292,561; B., 1929, 595).—See U.S.P. 1,716,781; preceding.

Manufacture of cellulose products. M. CUSIN (Ass. to Soc. LYONNAISE DE SOIE ARTIFICIELLE), and P. A. A. CHEVALET (U.S.P. 1,722,202, 23.7.29. Appl., 7.1.27. Fr., 22.2.26).—See B.P. 266,300; B., 1928, 520.

Manufacture of cellulose derivatives, and of artificial materials. L. LILLENFELD (U.S.P. 1,722,927—8, 30.7.29. Appl., 17.3.25. Austr., 4.4.24. Renewed [A] 1.6.29, [B] 29.6.28).—See B.P. 231,807—8; B., 1925, 913—4.

Pumps for viscose. W. CHATELAIN (B.P. 302,357, 10.12.28. Fr., 16.12.27).

Production of glazed and/or coloured paper. V. ANTOINE (B.P. 297,098, 11.6.28. Belg., 15.9.27).

[Machine for] treatment [printing and waxing] of paper etc. A. C. McMASTER (B.P. 315,925, 28.4.28).

Coating composition (U.S.P. 1,710,453).—See XIII. **Sulphite liquors** (U.S.P. 1,710,272).—See XVI.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Application of azoic colours to wool. A. E. EVEREST and J. A. WALLWORK (J. Soc. Dyers & Col., 1929, 45, 235—237).—Naphthols and arylides of hydroxy-naphthoic acid show a substantive affinity for wool and silk when applied from a soap solution. The impregnated wool is then coupled with the base, using a bath more dilute than that usually employed in cotton dyeing. The general fastness of these insoluble azo colours on wool is very good.
L. G. LAWRIE.

X-Ray studies of dyed cellulose. Theory of dyeing. F. BRON (Helv. phys. Acta, 1928, 1, 165—185; Chem. Zentr., 1929, i, 808).—Inorganic dyes are, in general, deposited as irregularly oriented crystals in the (ramie) fibre, whilst organic dyes appear to be adsorbed in the amorphous form at the micellar surfaces. Silver and gold appear to adopt an orientation in addition to the irregular arrangement. Iodine is adsorbed. In the dyeing process the size of the crystallites of the fibre appears to be altered by aggregate-crystallisation or coagulation, the increase being effected chiefly by the hot salt solution of the dye bath, and not by the dye solution itself.
A. A. ELDRIDGE.

PATENTS.

Process of dyeing. H. E. GRIER, Ass. to R. N. COMEY BROOKLYN Co. (U.S.P. 1,720,595—6, 9.7.29. Appl., 16.11.26).—(A) Loosely-woven articles are treated with a solution of wax with which a dye is incorporated. (B) A resin is added to the solution.
L. G. LAWRIE.

Loading of silk fabrics. R. CLAVEL (B.P. 303,129, 9.3.29. Ger., 29.12.27).—The fabric is passed continuously through a series of baths, being treated successively with at least two substances which yield insoluble compounds by reaction with one another. A suitable apparatus is described.
L. G. LAWRIE.

Loading and dull-lustering of silk. R. CLAVEL (B.P. 303,128, 1.3.28. Ger., 30.12.27).—Natural or artificial silk is alternately treated with solutions of heavy-metal salts such as stannic chloride or lead acetate and with disodium phosphate or other alkaline phosphate solution. The silk may first be treated with a small quantity of an acid reagent.
L. G. LAWRIE.

Preparation of effect threads. CHEM. FABR. VORM. SANDOZ (B.P. 295,936, 18.8.28. Ger., 20.8.27).—In the process of B.P. 195,619 (B., 1924, 128) the mercerised and esterified cotton is steamed to restore its lustre.
L. G. LAWRIE.

Protecting fabric. R. A. PHAIR, Ass. to H. KOHNSTAMM & Co., Inc. (U.S.P. 1,708,519, 9.4.29. Appl., 9.3.25).—To the final rinse waters in laundering textile fabrics protective agents are added, which will remain in the fabrics either to neutralise any sulphuric acid etc. absorbed from the atmosphere or to convert the acid into a harmless substance; chalk, calcium borate or hydroxide, magnesium hydroxide, sodium acetate or phosphate may be used.
R. BRIGHTMAN.

Colouring organic fibres or articles such as skins, furs, paper, etc. consisting of animal and vegetable fibres. N. WOROSHTZOW (U.S.P. 1,719,159, 2.7.29. Appl., 30.6.25).—See G.P. 402,503; B., 1926, 96.

Apparatus for dyeing textile materials. B. JOKL (B.P. 316,154, 23.1.28).

Dyeing jigs etc. J. LITHGOW (B.P. 315,536, 5.6.28).

Treating artificial fibres [in cake form] with liquids. DU PONT RAYON Co., Assees. of E. K. GLADDING (B.P. 293,767, 11.7.28. U.S., 11.7.27).

Winding and wet-treating of textile threads, particularly artificial silk threads. M. SCHOENFELD (B.P. 304,197, 10.1.29. Switz., 16.1.28).

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

Comparison of modern chamber sulphuric acid plants. T. R. HARNEY (Chem. Met. Eng., 1929, 36, 402—406).—In view of the difficulty of reducing comparisons between different plants to a basis of capital and operating costs the comparison is made between radiation surfaces relative to throughput. On various standard-type chamber sets this ratio varies from 1.0 to 1.6 sq. ft./lb. of sulphur/24 hrs.; with Pratt sets it is rather less, on the basis of similar nitre consumption. The Pratt system consists of a large first chamber, a small tower from which the gases are returned to the first chamber, and 2 or 3 small auxiliary chambers. With Mills-Packard chambers the ratio varies from 1.0 to 1.4. Gaillard tower chambers with turbo-dispersers have ratio 0.67—0.80, and the Schmiedel box 0.57—0.62. A system of water-cooled flues will operate at about the same figure. These ratios require further modification with variation in cost per sq. ft. of surface, maintenance cost, etc. No quantitative data for these are given, but a classification in order of merit based on a general allowance for these variables puts Pratt and Mills-Packard chambers first. The first part of an ordinary chamber set can, however, work at a ratio of 0.7 sq. ft./lb. of sulphur/24 hrs., and a combination of rectangular chambers in the forward part of the set with Schmiedel boxes or pipe systems at the rear appears attractive. C. IRWIN.

Safety in manufacture of sulphuric acid by the contact process. S. H. KERSHAW (Ind. Eng. Chem., 1929, 21, 762—763).—The use of gas-masks is desirable when treating the contact mass for revivification. Abundant safety showers should be provided. Acid valves are best placed not more than 18 in. above ground level, so that the operator can keep his face away. The usual precautions on entering storage tanks are described.

C. IRWIN.

Manufacture of potassium chlorate by double decomposition. C. MAZZETTI (Annali Chim. Appl., 1929, 19, 273—282).—The various aqueous ternary systems involved in the manufacture of potassium chlorate from calcium chlorate and potassium chloride are investigated, and the best conditions for the reaction determined.

T. H. POPE.

Determination of calcium carbide in technical calcium cyanamide. D. STROHAL (Arh. Hemiju, 1929, 3, 118—124).—50 c.c. of 50% alcohol and 150 c.c. of 10% sodium chloride solution are added to 100 g. of calcium cyanamide. A stream of nitrogen is passed first through the flask, and then through a red-hot

combustion tube packed with copper oxide, the resulting gases being absorbed in a weighed absorption U-tube. The reaction is complete after 3 hrs. The weight of carbon dioxide produced multiplied by 0.7821 gives the percentage carbide content.

R. TRUSZKOWSKI.

Manufacture of Epsom salts. N. N. EFREMOV and M. M. NARKEVICH (J. Chem. Ind. Moscow, 1928, 5, 1179—1183).—Whilst magnesium sulphate heptahydrate is unchanged at the ordinary temperature, the other hydrates (industrially preferable but not in demand) effloresce. For the preparation of the heptahydrate, solutions are concentrated at 80—82° to *d* 1.30, then cooled slowly, especially below 30—35°; stirring is discontinued below 35°. At 30° the liquid is seeded and the crystals are left in contact with the mother-liquor for several days.

CHEMICAL ABSTRACTS.

Hot and cold decomposition of carnallite, and Wilson's rule. W. ALTHAMMER (Mitt. Kali-Forschungs-Anst., 1928, 21—51; Chem. Zentr., 1929, i, 1139).—A mathematical study of the decomposition of carnallite under various industrial conditions. A. A. ELDRIDGE.

Influence of temperature on the precipitation of nickel carbonate. M. SERGEYEV (Oil Fat Ind. Russia, 1928, No. 11, 15).—Nickel carbonate for preparing nickel catalyst is preferably precipitated from nickel sulphate solution (6.47 g. Ni per litre) by 10% sodium hydroxide solution in slight excess at the b.p.

CHEMICAL ABSTRACTS.

Electrolysis of molten zinc chloride. (SIR) R. THRELFALL (J.S.C.I., 1929, 48, 210—223 T).—During the years 1903 to 1916 the manufacture of very pure zinc and chlorine by fusion electrolysis was developed by the author at the works of Messrs. Albright & Wilson, Ltd., at Oldbury, England. The original intention was to make use of both the zinc ash and "pickle" liquor (impure ferrous chloride) produced by the galvanising works of the district, but it soon appeared that it was better to dissolve the ash in crude hydrochloric acid, of which a supply was available within piping distance. A detailed account is given of the manufacture of pure dry fused zinc chloride on the large scale, and of its subsequent electrolysis. The various types of electrolytic cells investigated are described and illustrated by working drawings, as is the apparatus devised for the production of pure, dry, fused zinc chloride. Incidentally, the manufacture of large tanks and slabs of hard carbon is also described with all necessary detail. Some notes on the relation of the colour of ferric oxide paint to its mode of preparation are included, as well as notes on various pieces of apparatus which it is thought may have a wider application. The original paper must be consulted for further details.

See also A., Aug., 891, Synthesis of ammonia by the glow discharge (BREWER and WESTHAVER). Electrolytic preparation of ammonium permanganate (RAPIN). 892, Precipitation of manganese dioxide by electrolysis (ROLLET).

Sulphur compounds from gases. LORENZEN. Nitrogen oxides in coke-oven gas. SCHUFTAN. Separation of coke-oven gas. BRONN.—See II. Acid-resistant alloys. FIELD; BEDWORTH.—See X. Analysis of insecticides. HART.—See XVI.

PATENTS.

Production of calcium carbide and pig iron. H. ELDRIDGE, Assr. to M. E. MCGHEE, M. E. WALDRON, and M. K. ELDRIDGE (U.S.P. 1,719,970, 9.7.29. Appl., 8.3.27).—A mixture of calcium carbonate, carbon, and iron oxide is heated by an electric arc, and a current of air is injected above the mass to cause combustion of liberated carbon monoxide and to give a reduced pressure above the mixture. C. A. KING.

Recovery of iodine. J. W. TURRENTINE (U.S.P. 1,708,287, 9.2.29. Appl., 18.2.25).—Iodine vaporised with a current of steam is passed countercurrent with sodium or potassium hydroxide solution and the iodine is precipitated by acidifying. R. BRIGHTMAN.

Preparation of solutions of hydrofluosilicic acid. W. MÖLLER and W. KRETH (U.S.P. 1,720,965, 16.7.29. Appl., 22.12.26. Ger., 23.12.25).—See B.P. 263,779; B., 1928, 90.

Combustion of ammonia. H. PAULING (U.S.P. 1,722,339, 30.7.29. Appl., 29.12.27. Ger., 22.10.26).—See B.P. 279,511; B., 1928, 402.

Treating synthesis gases of synthetic-ammonia plants. W. H. KNISKERN, Assr. to ATMOSPHERIC NITROGEN CORP. (U.S.P. 1,721,455, 16.7.29. Appl., 13.12.23).—See B.P. 226,224; B., 1925, 713.

Drying process for ammonium nitrate solutions. C. TONIOLO (U.S.P. 1,721,798, 23.7.29. Appl., 27.1.26. Ital., 7.2.25).—See B.P. 247,229; B., 1927, 440.

Manufacture of calcium hypochlorite. L. MELLERSH-JACKSON. From MATHIESON ALKALI WORKS (B.P. 316,447, 18.8.28).—See U.S.P. 1,713,650 and 1,713,654; B., 1929, 643.

Decomposition of chlorides and sulphates of alkaline-earth metals in molten state by steam. J. KERSTEN (U.S.P. 1,721,485, 16.7.29. Appl., 18.11.24. Ger., 15.11.23).—See B.P. 243,104; B., 1926, 88.

Solutions from leaching ores (U.S.P. 1,720,138).—See X. **Sulphite liquors** (U.S.P. 1,710,272).—See XVI.

VIII.—GLASS; CERAMICS.

Ancient glasses. IV. B. NEUMANN (Z. angew. Chem., 1929, 42, 835—838. Cf. B., 1925, 992; 1928, 670).—Descriptions are given of a number of samples of ancient glassware, with analyses of pieces of Egyptian glass from Gorub Medinea (1500 B.C.), Babylonian-Assyrian from Nippur (1400 B.C.), and Roman "millefiori" glass from Sacrau (300 A.D.). Colouring oxides are those of iron, manganese, and copper, opalescence, in the older glasses, being produced by tin oxide. A. COUSEN.

Crystal growth in opal glass. J. F. HYSLOP (J. Soc. Glass Tech., 1929, 13, 129—130).—The inference previously drawn (cf. B., 1928, 192) that for equal times of heating of opal glass below the critical point, particle size is proportional to the viscosity of the glass, is shown to be incorrect. A. COUSEN.

X-Ray study of the zonal structure of silica brick from the roof of a basic open-hearth furnace. G. L. CLARK and H. V. ANDERSON (Ind. Eng. Chem., 1929, 21, 781—785).—By noting the diffraction of X-rays by a

fine powder and recording the reflexions from the various faces of the crystals on a photographic film, a reliable method of differentiating between the various forms of crystalline silica is afforded. Unused silica brick contains about 70% of cristobalite with about 25% of tridymite and unaltered quartz. Used silica brick was found to exhibit 7 zones, samples from each of which were subjected to X-ray analysis. The quartz lines were found still to exist in the hotter zones, with about an equal intensity to those in the cooler zones, though the cristobalite lines showed increased intensity in the former. Unidentified lines are considered to be reflexions of the atomic planes of low cristobalite. Probable cristobalite interplanar distances are indicated. C. IRWIN.

Colour problems of coloured potter's clays. G. GOGUEL (Kolloid-Z., 1929, 48, 305—318).—The origin of coloured clays is discussed. An attempt has been made to investigate the production of rhythmic layers in clays by allowing solutions of ferrous sulphate and ferric chloride to diffuse into pastes of aluminium hydroxide, magnesium carbonate, and calcium carbonate; lamellæ of basic iron compounds were formed behind the diffusion front, but rhythmic layers were not observed. Iron compounds are the most effective colouring agents in clays, producing mainly greens and reds. Artificial colours were made in silica gels by precipitation with solutions containing both ferrous and ferric iron in various ratios, and these were compared with the colours of natural clays. The conclusion is reached that the colouring agent in natural clays is of colloidal nature. By means of colour filters, a method has been developed for analysing the mixture of colours present in most natural clays. Analysis of 10 different coloured clays indicates that the colouring cannot be accounted for purely by chemical composition, but that the degree of dispersion of the colloidal matter is an important factor. E. S. HEDGES.

Making the glass disc for a 70-inch telescope reflector. A. N. FINN (Ind. Eng. Chem., 1929, 21, 744—750).

See also A., Aug., 877, **Suspensions of kaolin** (DUBRISAY and others).

Weighing. PARTRIDGE.—See I. **Activity of fuel ashes towards refractories.** NEFEDIEVA and PACUKOV.—See II.

PATENTS.

Means [rotary furnace] for melting glass, silicates, and like mineral substances. G. ZOTOS (B.P. 300,576, 24.10.28. Switz., 15.11.27).

Lehrs [for bottles etc.]. THERMAL ENGINEERING CORP., Assees. of O. SHACKELFORD (B.P. 289,790, 30.4.28. U.S., 29.4.27).

Manufacture of unsplinterable glass. D. G. and C. J. CARR (B.P. 316,496, 23.11.28).

[Composite] strengthened glass and the like. J. CHAMBERLAIN and H. PERIAM (B.P. 316,755, 11.7.28).

Manufacture of compound glass sheets. D. MOSELEY & SONS, LTD., and A. NIELD (B.P. 316,565, 26.4.28).

[Apparatus for] manufacture of reinforced or

compound glass, and coating and treatment of sheets of other material. G. B. RILEY (B.P. 316,238, 24.4.28).

Making sheets of glass wool or like vitreous material. S. G. S. DICKER. From GOULD STORAGE BATTERY Co., INC. (B.P. 315,498, 26.4.28).

Production of glass in strip form and apparatus therefor. PILKINGTON BROS., LTD., and E. B. LEMARE (B.P. 316,354, 1.5.28).

Apparatus for colouring [inside of] glass [bulbs]. BRIT. THOMSON-HOUSTON Co., LTD., Assees. of J. T. FAGAN and R. G. PHELPS (B.P. 301,841, 6.12.28. U.S., 6.12.27).

Manufacture of [moulded] pottery ware. W. J. MILLER (B.P. 308,836, 23.1.28. U.S., 24.2.27).

[Apparatus for] manufacture of [moulded] pottery. W. J. MILLER (B.P. 285,871, 23.1.28. U.S., 24.2.27).

IX.—BUILDING MATERIALS.

Unsoundness factor in Portland cement manufacture. A. J. BLANK (Rock Products, 1929, 32, 72—74).—Unsoundness of Portland cement can be attributed directly to the presence of excessive quantities of uncombined lime, which itself is due to faulty burning, poor chemical control, or insufficient grinding of raw mixtures. The composition of some materials produces inherent unsoundness in the product; e.g., a clinker containing 8.32% Al_2O_3 was 50% unsound initially, whilst one with 6.17% Al_2O_3 was comparatively easy to burn. No appreciable difference in cements containing 0.3—1.2% of free lime has been noted, and from comparative tests over a range of 0.34—1.68% of free lime it is not considered that more rigid specification of this factor is necessary. C. A. KING.

Action of acids on cement and mortar. S. NAGAI (J. Ceram. Ind. Japan, 1928, 36, 382—394).—Blast-furnace cement was more resistant than a Portland cement or "solidit" to the action of sulphuric or hydrochloric acid. CHEMICAL ABSTRACTS.

Effect of type and gradation of coarse aggregate on the strength of concrete. W. F. KELLERMANN (Rock Products, 1929, 32, 86—90).—The strength of concrete is affected appreciably by the character of the coarse aggregate to a degree equal in some cases to that produced by variation of the water-cement ratio. Calcareous aggregates give consistently higher tensile and flexural strength than siliceous aggregates, and, in general, rounded fragments result in lower strengths than aggregates composed of crushed or angular fragments. Variation in grading of coarse aggregates has little effect on strength apart from workability or uniformity of the concrete. There seems to be no relation between the quality of material as measured by the abrasive test and the strength of concrete. C. A. KING.

Corrosion of concrete. C. HARI (Kogyoshirjo, 1928, 16, 1340—1352).—A discussion of the causes and prevention of corrosion. CHEMICAL ABSTRACTS.

Tests of reagents used for preventing the decay of wood. III. K. TANAKA, S. SHOJI, and N. FUNAKOSHI (Bull. Reconstr. Bur. Tokyo, 1927, ii, 2, 125—127).

—Of the wood preservatives tested for corroding action on iron, creosote was least corrosive.

CHEMICAL ABSTRACTS.

Tests of fire-resisting reagents for wood. K. TANAKA and S. SHOJI (Bull. Reconstr. Bur. Tokyo, 1927, ii, 9, 111—118).—A mixture of ammonium phosphate and magnesium borate is effective; it is not removed by exposure to water as is a mixture of ammonium phosphate and boric acid.

CHEMICAL ABSTRACTS.

See also A., Aug., 884, System $CaO-CO_2-SiO_2$ and setting of mortar (HÜTTIG and ROSENKRANZ).

Weighing. PARTRIDGE.—See I. Preservation of timber. VORONOV.—See II.

PATENTS.

Lime-hardening composition. D. M. HARRISON, Assr. to MCKENZIE MORTAR Co. (U.S.P. 1,718,954, 2.7.29. Appl., 13.4.25).—Commercial lime mortars and plasters are hardened by the addition of pulverised shale, calcium chloride, and finely-divided iron sulphide.

T. A. SMITH.

Compound asbestos-cement sheets and slabs. E. C. R. MARKS. From E. RUYTER (B.P. 316,564, 31.1.28).

[Metal-coated] bituminous roofing or damp-proof course and its preparation. W. BRIGGS & SONS, LTD., and A. S. BRIGGS (B.P. 316,241, 26.4.28).

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

High-frequency fatigue [of metals]. C. F. JENKIN and G. D. LEHMANN (Proc. Roy. Soc., 1929, A, 125, 83—119).—Tests have been made on annealed copper, 0.11% carbon steel (both in the rolled and normalised conditions), 0.89% carbon steel (hardened), rolled aluminium, and normalised Armco iron to determine the effect on the fatigue limit of the frequency of alternation of stress, for frequencies varying from 600 to 20,000 periods per sec. An account is given of a number of preliminary investigations, and the apparatus finally used is described in detail. High frequencies are obtained by using fluctuations of air pressure acting directly on the test pieces, which consist of freely vibrating bars supported by means of two wires placed at each node, arranged so that they are also at the nodes for anticlastic bending. The apparatus consists essentially of the two blowers used to vibrate the specimen, each blower being a small, adjustable, resonating chamber into which air is admitted by a throttle valve at the back, while the front is closed by one face of the specimen. The position of the specimen is arranged so that as it vibrates to and fro it alternately releases the air pressure or allows it to mount up in the chamber. Measurements were made of the amplitude of vibration at the centre of the bar (to calculate the strains), the frequency, and the time of fracture. Brinell hardness tests were also carried out. Rayleigh's theory for the stresses in a long thin beam (cf. Jenkin, *ibid.*, 1925, A, 109, 119) is modified to allow for the anticlastic bending that takes place in short bars of moderate width, such as are used in the present investigation. Fatigue limit stress curves are

plotted both for the corrected (A) and uncorrected (B) formulæ, showing that the stresses calculated from (B), which neglects anticlastic bending, increase more rapidly with the frequency than those calculated from (A). The graphs show that the fatigue limits of all the metals rise as the frequency increases, but that a frequency is reached at which this rise ceases, and in the normalised Armco iron and the hardened high-carbon steel the fatigue limit actually fell again at the highest frequencies. The maximum rise in fatigue limit is about 60% above the value at 50 periods per sec., and the greatest drop about 9% of the maximum. The Brinell hardness of the metal near the fracture also rises with the frequency, and for normalised Armco iron shows a drop at the highest frequencies.

L. L. BIRCUMSHAW.

Hydrogen and carbon monoxide contents of some metals melted *in vacuo*. A. VILLACHON and G. CHAUDRON (Compt. rend., 1929, 189, 324—326).—Sheets 0.1 mm. thick of aluminium, electrolytic copper, nickel, and iron, and "Armco" nitrated iron, previously distilled or melted in a vacuum of 0.02—0.002 mm., yielded appreciable quantities of hydrogen and carbon monoxide when reheated at a temperature below the m.p. The amount obtained increased with increase in temperature, and, in the case of hydrogen at least, corresponded with the solubility of the gas in the neighbourhood of the m.p. at 760 mm. pressure.

J. GRANT.

Compression and drawing tests on hot metals and alloys. A. PORTEVIN and F. LE CHATELIER (Compt. rend., 1929, 189, 248—250).—Theoretical.

Properties of materials at high temperatures. Strength at elevated temperatures of low-carbon steels for boiler construction. R. G. BATSON and H. J. TAPSELL (Dept. Sci. Ind. Res. Eng. Res., 1929, Spec. Rept. No. 14, 41 pp.).—Comparative creep tests of steels with 0.17% and 0.1% C, from boiler and super-heater tubes and from steel drums, showed curves of two general types merging into one another. There was a decrease in the rate of strain resulting from strain hardening of the material, and in the second type the absence of such decrease was indicative of lack of strain hardening. Any stress therefore (at 647°) which gave rise to initial creep would eventually result in fracture. Some evidence of intercrystalline cracking was noted which would limit the use of such steels at higher temperatures. Corrosion of the steel may exert considerable influence on the "creep" due to the reduced section, and coatings of nickel and aluminium were effective in protecting the steel from corrosion without affecting the creep properties.

C. A. KING.

Occurrence of fractures in brazing steel. W. RIEDE (Stahl u. Eisen, 1929, 49, 1161—1162).—In joining two steel tubes together fractures sometimes occur around the joint after brazing, especially if the tubes are hammer-welded together previous to dipping the joint in the molten brass and if the temperature of the latter is allowed to exceed 1100°. These fractures appear to be due to local recrystallisation during hammer-welding setting up, in the parts adjacent to the recrystallised zones, internal stress which exceeds the

tensile strength at 1100°. The intercrystalline penetration of brass in steel may be detected by etching for 3 min. in ammonia, which colours the brass black; subsequent etching in a 2% alcoholic solution of nitric acid reveals the grain boundaries without affecting the black lines due to brass.

A. R. POWELL.

Determination of iron oxides in acid steel-furnace slags. G. T. DOUGHERTY (Ind. Eng. Chem. [Anal.], 1929, 1, 163).—For the determination of ferrous oxide 0.5 g. of the finely-powdered slag, freed from metallic iron by means of a magnet, is dissolved by heating with 10 c.c. of 1:1 sulphuric acid and 5 c.c. of 48% hydrofluoric acid in a lead test-tube through which a rapid current of carbon dioxide is passed. After cooling, the contents of the tube are poured into 250 c.c. of cold water, to which have been added 25 c.c. of 5% boric acid solution, and the solution is titrated with permanganate. For the determination of total iron, the sample is decomposed as before, and the solution poured into 50 c.c. of water and 15 c.c. of 1:1 sulphuric acid; 3 g. of 20-mesh zinc are added and, when all is dissolved, the solution is filtered and reduced again for a few min. with a zinc rod. The rod is removed and rinsed, and the iron titrated with permanganate after addition of 25 c.c. of 5% boric acid solution.

A. R. POWELL.

Acid testing in [iron]-pickling baths. F. EISENKOLB (Stahl u. Eisen, 1929, 49, 1162—1164).—The advantages and disadvantages of hydrochloric and sulphuric acid pickling baths for cleaning iron and steel are enumerated, and a simple, portable apparatus is described and illustrated for determining the free acid content of used baths by measuring the volume of carbon dioxide evolved when a known volume of the acid liquor is shaken with an excess of powdered limestone.

A. R. POWELL.

Influence of oxygen on corrosion fatigue [of steel]. A. M. BINNIE (Engineering, 1929, 128, 190—191).—The fatigue limit of a 0.9% carbon acid steel was reduced from a normal value of 17 tons/in.² to 7.5 tons by dropping a concentrated solution of sodium chloride on the point of maximum stress. No rust formed on the turned surface, but the areas in which cracks developed turned black. When tested in hydrogen an intermediate value (9.1 tons) was obtained. Similar tests on 0.33% carbon steel showed 18.3 tons/in.² in air, 9.2 tons under a salt drip, and 11.8 tons under a salt drip in an atmosphere of hydrogen.

C. A. KING.

Resistance of iron-nickel-chromium alloys to corrosion by acids. N. B. PILLING and D. E. ACKERMAN (Amer. Inst. Min. Met. Eng. Tech. Pub., 1929, No. 174, 3—33).—The metals and alloys contained Ni 0—100, Cr 0—30, Fe 0—100%. In non-oxidising acids the rate of dissolution of alloys containing less than 13% Ni is increased by chromium and decreased by nickel; alloys containing more than 13% Ni corrode at constant rates independently of the chromium or iron content. The rates, but not the critical nickel content, depend on the p_H and the acid employed. The critical nickel content is independent of microstructure or lattice structure, but heat treatment affects the location of the limit of attack. In nitric acid the points at which passivity is attained depend on the chromium content

only, this being a function of the concentration of acid. The solubility in sulphurous acid is influenced by the presence of dissolved salts. The results are incompatible with Tammann's theory relating corrosion resistance to lattice structure. CHEMICAL ABSTRACTS.

Resistance of copper-silicon-manganese alloys to corrosion by acids. H. A. BEDWORTH (Amer. Inst. Min. Met. Eng. Tech. Pub., 1929, No. 189, 14 pp.).—Addition of silicon (up to 3%) and manganese (up to 1%) increases the resistance of copper to corrosion by dilute hydrochloric or sulphuric acid. Hard-drawn wires containing more than 2% Si are more resistant than annealed wires, which, however, approach equality at 0.5% Si. CHEMICAL ABSTRACTS.

Acid-resistant alloys. B. E. FIELD (Amer. Inst. Min. Met. Eng. Tech. Pub., 1929, No. 191, 12 pp.).—Nickel-molybdenum alloys containing more than 15% Mo are resistant to 10% hydrochloric acid at 70°. In nickel alloys containing 20% Mo and 0–40% Fe, the corrodibility is maximal at 10% Fe, and is high above 25% Fe. Carbon decreases resistance towards acid. An alloy containing nickel, molybdenum, and iron is resistant to all cold mineral acids, except nitric acid; it is attacked by chlorine solution and other oxidising agents. Nickel-silicon (more than 10%) and -aluminium (more than 20%) alloys are resistant to acids, but brittle; alloys containing 10% Si and 5% Al are strong and resistant to acids. Copper (2.5–3%) gave finer-grained and stronger alloys. CHEMICAL ABSTRACTS.

Corrosion of metals as affected by stress, time, and number of cycles. D. J. MCADAM, JUN. (Amer. Inst. Min. Met. Eng. Tech. Pub., 1929, No. 175, 57 pp.).—The relationship between the variables is shown graphically. Local strengthening of the metal at the bottoms of corrosion pits is indicated. CHEMICAL ABSTRACTS.

Heat treatment of high-tensile aluminium alloys. A. R. PAGE (Chem. News, 1929, 139, 102–104).—The properties of forgeable aluminium alloys containing comparatively small quantities of copper, silicon, manganese, iron, etc. are improved greatly by suitable heat treatment. Quenching from a forging temperature does not appreciably influence the mechanical properties, which are only improved by subsequent tempering. Alloys of a certain type, of which duralumin was the first, harden spontaneously after quenching and attain a maximum hardness in about 7 days, due probably to the gradual precipitation of magnesium silicide, but other types with copper as an essential constituent require a temperature of about 150° to cause the copper-aluminium compound to precipitate. The temperature ranges are very narrow, the quenching temperature being 520–530° and the tempering range 149–156°. Automatically controlled electric furnaces are necessary for such treatment. C. A. KING.

Duralumin. E. SCHMID and G. WASSERMANN (Metall-Wirts., 1928, 7, 1329–1335; Chem. Zentr., 1929, i, 796).—X-Ray examination shows that artificial ageing of duralumin is accompanied by separation of crystals of the compound CuAl₂. A. A. ELDRIDGE.

Corrosion phenomena on aluminium sheet. R. WESENBERG (Chem. Fabr., 1929, 208).—Pinhole

perforations in corroded aluminium sheet containing 99.4% Al and 0.28% Si are attributed to the presence of aluminium suboxide, which appears blue on etching with alcoholic nitric acid. A. R. POWELL.

Corrosion of light and ultra-light alloys. "Cementation" [plating] of light and ultra-light alloys as a protection against sea-water corrosion. J. COURNOT and E. PEROT (Rev. Mét., 1929, 26, 367–374; cf. B., 1929, 721–2).—When copper is electro-deposited from an acid bath on aluminium, the current density, within wide limits, has no influence on the depth of penetration; deposition in a salt bath (a mixture of equal parts of sodium nitrite and potassium nitrate) causes deeper penetration than cementation in air, but the presence of salt in the superficial layers is very injurious to the adherence of the copper. "Cementation" with copper at a high temperature (900°) causes the interior of the metal to become brittle and easily powdered. Ferro-chrome alloys are ineffective for the cementation of aluminium, a notable absorption of iron taking place. With duralumin a eutectic constituent is precipitated in the interstices of the crystals which form the solid solution throughout the whole mass of the test-piece; at the same time crystals in the neighbourhood of the surface become disintegrated, and the metal becomes softer. The surfaces of test-pieces coated with a primary deposit of copper, followed by a secondary deposit of nickel, chromium, cobalt, or cadmium, and then heated in air in an electric furnace are generally much deformed, the more so at higher cementation temperatures; disintegration of the crystals takes place near the surface. Only a very imperfect deposit of copper could be obtained on a super-light alloy consisting of 94% Mg and 6% Al, the metal being insufficiently protected to resist oxidation at a low temperature. M. E. NOTTAGE.

Protection of aluminium and light alloys against corrosion by sea-water by electrolytic deposits of cadmium. J. COURNOT (Rev. Mét., 1929, 26, 374–376).—A deposit of pure cadmium is generally superior to binary cadmium alloys. On both aluminium and duralumin excellent films of cadmium may be obtained from a bath containing (per litre) cadmium carbonate 11.6, potassium cyanide 35, sodium phosphate 5, potassium ferrocyanide 7.5, and gelatin 2.5 g.; these films only crack with the metal support and give very satisfactory corrosion tests. Similar satisfactory results are obtained if a coating of chromium be superposed on a light cadmium coating. M. E. NOTTAGE.

p_H Values in the study of sea-water corrosion of light alloys. A. PETIT (Rev. Mét., 1929, 26, 285–286).—The change in the p_H value of sea-water after aluminium or one of its alloys has been immersed in it for periods of 15, 30, 45, and 75 days has been measured, but the results give no indication of the relative corrodibility of the alloys, the position of the various alloys in the series changing with the time of immersion. A. R. POWELL.

Micrographic study of the corrosion of some light alloys in sea-water. R. CAZAUD (Rev. Mét., 1929, 26, 274–281).—Micrographic examination of aluminium and its alloys after 6–24 hrs. immersion in

sea-water affords an idea of the relative rates of corrosion. Manganese and silicon appear to retard the corrosion, whereas magnesium accelerates it. Annealed alloys corrode more readily than alloys that have been age-hardened.

A. R. POWELL.

Rate of corrosion of magnesium and ultra-light alloys. A. PORTEVIN and E. PRETET (Rev. Mét., 1929, 26, 259—272; cf. Waché and Chaudron, B., 1929, 477).—The rate of dissolution of magnesium and its light alloys in 0.1*N*-hydrochloric acid and in 0.1*N*-citric acid solutions has been determined by measuring the rate of evolution of hydrogen. In the latter solution there is a distinct period of induction which is almost completely absent in hydrochloric acid solutions. The alloys tested may be classified as follows as regards rate of dissolution in hydrochloric acid: (a) magnesium and 4% aluminium-magnesium alloys, (b) magnesium containing up to 4% Zn, Cu, Pb, or Cd, and (c) alloys with 13% Cu or 5% Ni; in citric acid the classification is (a) magnesium and the 5% nickel alloy, (b) alloys containing 4% Al, Pb, or Cu, and (c) alloys with 13% Cu or with 4% Zn or Cd, where (a) indicates slowly soluble, (b) more soluble, and (c) rapidly soluble. Similar results are obtained by the thermal method of Mylius.

A. R. POWELL.

Influence of occluded gas on the corrosion of copper-aluminium alloys by hydrochloric acid.

R. CAZAUD and A. PETIT (Rev. Mét., 1929, 26, 281—285).—Removal of the occluded gas from copper-aluminium alloys by melting in a vacuum decreases appreciably the rate of corrosion by dilute hydrochloric acid. The gas evolved from an alloy with 4.5% Cu and 1% Zn cast in sand and remelted at 800° consisted of 15% H, 6.5% O, 27% N, 16.1% CO, 22% CO₂, 2% CH₄, 2.6% C₂H₄, and 1% C₂H₂.

A. R. POWELL.

Colloid theory of rusting. G. SCHIKORV (Korrosion u. Metallschutz, 1928, 4, 242—245; Chem. Zentr., 1929, i, 800).—The theory is criticised.

A. A. ELDRIDGE.

Value of X-ray examination in discovering fissures or inclusions in light alloys.

J. COURNOT and A. ROUX (Rev. Mét., 1929, 26, 272—274).—Tests on various light alloys show that X-ray examination is of value only for the detection of included particles of heavy metals and not for the detection of small fissures or intercrystalline cracks.

A. R. POWELL.

Zinc from sulphide ores. V. P. ILINSKI and A. F. SAGAJDACHNUI (J. Appl. Chem. Russia, 1928, 1, 109—112).—After calcination of zinc sulphide ores containing iron at 650—750°, 95% of the zinc is dissolved by treatment with concentrated sulphuric or hydrochloric acid, about 40% of sulphur being separated. 80% of zinc is obtained from calcined ores after treatment with alkali hydroxide, the solution being free from copper and iron.

CHEMICAL ABSTRACTS.

Nickel as a constituent of bearing metals. C. L. ACKERMANN (Metall-Wirtsch., 1928, 7, 752—753; Chem. Zentr., 1929, i, 1266).—In high-lead bearing metals addition of nickel markedly raises the resistance to wear in semi-fluid friction, and in high-zinc white metals it causes increased hardness and resistance to compression and corrosion.

A. A. ELDRIDGE.

Nickel [plating] solutions. G. A. HOGABOOM (Metal. Ind., N.Y., 1929, 27, 172—175).—An addendum giving a high-anode and low-cathode efficiency is of little value. Chlorides are beneficial. The behaviour of the electrodes on addition to the solution of sodium fluoride, sodium sulphate, or boric acid is described.

CHEMICAL ABSTRACTS.

Cadmium plating. C. M. HOFF (Metal. Ind., N.Y., 1928, 26, 475—476). O. H. LOVEN (*Ibid.*, 1928, 26, 476—477).—Polemical.

A. A. ELDRIDGE.

Iron in antiquity. T. A. RICKARD (Iron & Steel Inst., Sept., 1929. Advance copy. 20 pp.)

See also A., Aug., 874, **Distribution of austenite in quenched carbon steels** (HONDA and OSAWA). 883, **Aluminium-copper-nickel system** (NISHIMURA). 884, **Iron-molybdenum system** (TAKEI and MURAKAMI). **Aluminium-antimony-silicon and aluminium-antimony-copper systems** (MATSUKAWA). 896, **Purification of mercury** (ROLLER).

Waste-heat recovery. GREGSON.—See II. **Silica brick from basic open-hearth furnaces.** CLARK and ANDERSON.—See VIII. **Corrosiveness of soils.** HOLLER.—See XVI. **Metals in dairy equipment.** HUNZIKER and others.—See XIX.

PATENTS.

Smelting furnaces. P. MARX (B.P. 300,559, 14.11.28, and 301,739, 3.12.28. Ger., [A] 14.11. and [B] 3.12.27).—(A) In a cupola furnace the lower part is surrounded with a refining chamber communicating at its lower end with the hearth of the cupola and at its upper end with the space just above the molten metal in the well of the cupola. Air and fuel gas are supplied to the refining chamber from a series of burners radially disposed below a refractory hood in the centre of the lower part of the cupola shaft in such a position that the flames pass through the upper openings into the refining chamber, whilst the hood supports the mass of unmelted material in the shaft. (B) In a modification of the above the heat to the refining chamber is supplied by oil burners arranged outside the furnace so that the hot gases pass from the chamber into the shaft of the cupola, and the hood inside the latter is provided with a capping piece having radial roof-shaped arms adapted to discharge the molten material in thin streams through the hot gases.

A. R. POWELL.

Method of making ingot moulds. E. GATHMANN (U.S.P. 1,719,544, 2.7.29. Appl., 15.8.26).—The upper end of the core of a mould is treated with a metal which will alloy with iron and is resistant to the cutting action of liquid steel.

C. A. KING.

High-temperature casting compound. C. A. OVERMIRE, ASST. to WESTERN GOLD & PLATINUM WORKS (U.S.P. 1,719,276, 2.7.29. Appl., 23.5.28).—A mixture suitable for the casting of metals and alloys of high m.p. is composed of calcium sulphate with its own weight or more of magnesium oxide.

C. A. KING.

Forming briquettes from iron ore concentrates. P. GREDT (B.P. 285,040, 9.2.28. Ger., 9.2.27).—A portion of the concentrate is reduced to the metallic form, this is mixed with about 4 times its weight of

raw ore and with sufficient small coke or coal for reduction, and the mixture is moistened with dilute sulphuric or hydrochloric acid or with a dilute solution of magnesium chloride and formed into briquettes which harden within 48 hrs. owing to the oxidation of the reduced ore.

A. R. POWELL.

Iron alloy for milling tools. L. KLÜGER, and ÖESTERR. SCHMIDTSTAHLWERKE A.-G. (B.P. 315,502, 27.4.28).—An alloy for milling tools contains about 2% C, 10.7–25% (16%) Cr, 1.3–3% (2%) Co, 2–4.7% (3%) W, and 1–2.3% (1.5%) Mo, with or without up to 1% V as a deoxidiser, the balance being iron.

C. A. KING.

Heat-resisting [iron] alloys. L. KLÜGER, and ÖESTERR. SCHMIDTSTAHLWERKE A.-G. (B.P. 315,503, 27.4.28).—An iron alloy contains 1–1.9% C, 40–50% Ni, and 27–33% Cr.

C. A. KING.

Rendering iron-chromium-aluminium alloys ductile. V. B. BROWNE (B.P. 302,640, 10.4.28. U.S., 19.12.27).—Alloys containing 5–30% Cr, 3–10% Al, and the remainder iron are rendered ductile by a series of hot-rollings commencing at 1100° and finishing at 650°, followed or not by cold-rolling and annealing below 880°.

A. R. POWELL.

Deoxidation of oxidised metal surfaces and protection of metal surfaces against oxidation.

"KOLLOIDCHEMIE" STUDIENGES. M.B.H., J. B. CARPZOW, M. MARCH, R. LENZMANN, and H. SANDERS (B.P. 315,531, 30.5.28).—Metals are treated with a mud containing unsaturated silicon compounds or allied colloids (e.g., a fresh-water mud), and a binding agent. Before use the mud is preferably allowed to develop anaerobic bacteria culture.

C. A. KING.

Proofing of iron and steel against rust. W. H. COLE (U.S.P. 1,719,464, 2.7.29. Appl., 11.3.29. U.K., 29.1.29).—Solutions of the phosphates of iron, zinc, aluminium, and chromium are prepared each having d 1.33 and mixed in the proportion of 5:5:1:½, to form a proofing solution.

C. A. KING.

Production of resistant silver surfaces. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 315,460, 13.4.28).—To increase their resistance to chemical reagents, articles of silver are treated, at above 500°, with a metal less electropositive than silver, other than zinc, preferably in the form of powder. Suitable metals are copper, tin, cadmium, antimony, aluminium, thorium, magnesium, and in particular manganese and manganese-aluminium alloys, the process being preferably conducted in an inert atmosphere.

C. A. KING.

Apparatus for generating mercury vapour or other vapour having a low heat conductivity. BRIT. THOMSON-HOUSTON Co., LTD., Assees. of A. J. NERAD (B.P. 298,905, 15.10.28. U.S., 14.10.27).—A vaporising apparatus consists of a battery of parallel tubes contained in an outer casing. Mercury is circulated through the inner tubes, which may be connected to a drum at either end to aid the circulation, and a heating fluid is circulated around the tubes. The whole may be vertical or inclined.

C. A. KING.

Soldering composition. K. GEISEL, Assr. to ALUMINUM SOLDER CORP. (U.S.P. 1,721,814, 23.7.29. Appl., 21.9.28).—A mixture with a soldering temperature about 260° consists of zinc 200, aluminium 13, and tin 87 pts. by wt.

Welding rod. J. B. GREEN (U.S.P. 1,720,039, 9.7.29. Appl., 10.12.25).—An iron rod or wire in which the sulphur content is more than 0.025% in the centre and less than 0.025% in the surface portion is claimed.

C. A. KING.

Metal packing. G. VERDICKT (U.S.P. 1,720,065, 9.7.29. Appl., 22.10.27).—An alloy for joint packings is composed of lead (5 pts.), antimony (1 pt.), and zinc (¼ pt.).

T. A. SMITH.

Working-up solutions obtained by leaching ores which have been subjected to chlorination roasting. H. NEWMARK (U.S.P. 1,720,138, 9.7.29. Appl., 9.11.27).—Copper is removed from the solution by treatment with metallic iron, and sulphate is removed as gypsum by treatment with calcium chloride solution. Zinc is precipitated from the resulting solution of chlorides by means of gas containing hydrogen sulphide.

T. A. SMITH.

Flotation agent. B. R. TUNISON (U.S.P. 1,709,447, 16.4.29. Appl., 9.2.24).—Petroleum naphtha containing sulphur compounds is washed with dilute sodium hydroxide, and the aqueous solution neutralised to liberate the oily flotation agent.

R. BRIGHTMAN.

Apparatus for the recovery of metals by electrolysis. F. COLLINGRIDGE (B.P. 315,481, 18.4.28).—Scrap metal coated with zinc, tin, or lead is electrolysed in perforated containers which are supported upon an insulated grid which slides in a horizontal direction to and fro in the tank so as to keep the electrolyte continuously circulating through the scrap.

A. R. POWELL.

Anode for chromium plating. F. M. BECKET (U.S.P. 1,720,312–3, 9.7.29. Appl., 14.10.26).—(A) A cast chromium anode containing 0.5–7% C, or (B) a substantially carbon-free chromium anode containing 0.25–35% Si with an aqueous solution of chromic acid as electrolyte is claimed.

C. A. KING.

Electrodeposition of chromium. K. W. SCHWARTZ, Assr. to CHROMIUM CORP. OF AMERICA (U.S.P. 1,720,354, 9.7.29. Appl., 30.4.27).—For depositing chromium on hollow cathode articles an elongated anode having angularly placed parts is used, so that gaseous products released opposite one portion of the anode will not interfere with the deposition in the active area of adjacent portions.

C. A. KING.

Manufacture of commercially pure iron alloys. L. F. REINARTZ and J. H. NEAD (B.P. 315,444, 14.2.28).—See U.S.P. 1,665,146; B., 1928, 372.

Vanadium alloys. VANADIUM CORP. OF AMERICA, Assees. of B. D. SAKLATWALLA (B.P. 305,201, 20.12.28. U.S., 2.2.28).—See U.S.P. 1,715,867; B., 1929, 604.

Hard-metal composition. K. SCHRÖTER, Assr. to GEN. ELECTRIC Co. (U.S.P. 1,721,416, 16.7.29. Appl., 26.4.26. Ger., 7.5.25).—See B.P. 251,929; B., 1926, 635.

Tuyères for blast furnaces or the like. S. P. BOWEN (B.P. 316,244, 26.4.28).

[Burner for] heat treatment of metallic wire or strip. J. P. HALEY and J. H. PINDER (B.P. 316,720, 24.5.28).

[Apparatus for] electroplating [with chromium]. J. Q. MACDONALD and W. McL. SCOTT (B.P. 299,298, 20.3.28. U.S., 22.10.27).

Calcium carbide and pig iron (U.S.P. 1,719,970).—See VII.

XI.—ELECTROTECHNICS.

Production of emission from oxide-coated filaments: a process phenomenon. V. C. MACNABB (J. Opt. Soc. Amer., 1929, 19, 33—41).—The production of oxide filaments of barium and strontium in an emitting condition was investigated to determine the advantages of several commercial methods of producing this type of cathode, but no fundamental difference was found, the basis of each method being that the filament to become emissive must undergo a gaseous bombardment, probably causing a breaking down of the higher oxides or compounds such as the carbonate to the lower oxides or pure metal, caused or accompanied by a gaseous discharge to produce an active filament. The gas is most suitably obtained from the filament, and produced from a carbonate not reduced until put *in vacuo*, and is probably carbon dioxide. In every case the results favour filaments containing most uncombined coating.

N. M. BLYTH.

Inductor coils for the high-frequency furnace. C. N. SCHUETTE (Ind. Eng. Chem. [Anal.], 1929, 1, 141—144).

See also A., Aug., 886, **Electrolytic oxidation of organic substances** (MARIE and LEJEUNE). 891, **Synthesis of ammonia in the glow discharge** (BREWER and WESTHAVER). **Electrolytic preparation of ammonium permanganate** (RAPIN). 892, **Precipitation of manganese dioxide by electrolysis** (ROLLET). 896, **Purification of mercury** (ROLLER).

Electrostatic determination of fusain. DAVIS and YOUNKINS. **Air-gas ratio apparatus.** ROSECRANS. **Production of hydrocarbons from methane.** STANLEY and NASH.—See II. **Electrolysis of molten zinc chloride.** THRELFALL.—See VII. **Protection of light al oys.** COURNOT and PEROT; COURNOT. **Cadmium plating.** HOFF; LOVEN. **Nickel-plating solutions.** HOGABOOM.—See X.

PATENTS.

Electric furnaces. WILD-BARFIELD ELECTRIC FURNACES, LTD., and L. W. WILD (B.P. 315,246, 10.4.28).—Instead of regulating the rate of heating by means of a variable resistance, a fixed ballast resistance, equal to 50—100% of the furnace resistance, is placed in series with the bars. For furnaces using alternating current an impedance (a non-variable choke coil) is substituted. The carborundum bars are made with enlarged ends around which the contact wire is wound.

H. T. S. BRITTON.

Electric furnace. C. L. IPSEN and A. N. OTIS, Assrs. to GEN. ELECTRIC Co. (U.S.P. 1,719,888, 9.7.29. Appl., 10.10.25).—Across the top of an electric furnace horizontal bars of refractory insulating material carry flat sinuous resistors; the bars are so shaped that the

resistors are in contact with them to a relatively small extent.

H. T. S. BRITTON.

Electric arc furnace. O. L. MILLS, Assr. to MILLS ALLOYS, INC. (U.S.P. 1,719,558, 2.7.29. Appl., 5.3.29).—Two electrodes, one of which is of carbon of large cross-section, move relatively to one another. At the lower end of the carbon electrode is a projection of smaller cross-section, constructed so as to provide an annular surface from which heat rays are reflected and are thereby confined to the space between the electrodes.

H. T. S. BRITTON.

Semi-solid electric conductor. H. N. MILLER, Assr. to FANSTEEL PRODUCTS Co., INC. (U.S.P. 1,720,371, 9.7.29. Appl., 29.8.27).—The conductor is composed of gelatin and an electrolyte, and hardened by formaldehyde; when employed in electrical apparatus, it is surrounded by a hardened conducting gel that is not liquefied by heat.

H. T. S. BRITTON.

Electrodes for contact rectifiers. SIEMENS-SCHUCKERTWERKE A.-G. (B.P. 304,748, 15.8.28. Ger., 27.1.28).—Rectifiers, of lower resistance and of increased efficiency, are prepared by compressing superposed layers of powdered metal and powdered sulphide, *e.g.*, copper and copper sulphide, in thicknesses in the respective ratio of 2:1 to the extent of several thousand kg. per sq. cm., and then applying the counter electrode, of either aluminium or magnesium, by means of a pressure substantially less than one tenth of the previous pressure. The area of the rectifier should be less than 1 sq. cm. Perfectly dry copper sulphide is obtained by mixing the precipitated sulphide with powdered sulphur, and subliming the free sulphur at 250°.

H. T. S. BRITTON.

Storage battery. H. B. TEFFT, Assr. to H. C. McNAMER (U.S.P. 1,719,204, 2.7.29. Appl., 23.12.22).—Water, for use after mixing with sulphuric acid as electrolyte and in the preparation of pastes of red lead and litharge, is prepared by electrolysis at a high voltage a suspension of a metallic ore in undistilled water.

H. T. S. BRITTON.

[Electric] battery plate. W. H. GRINDITCH, Assr. to PHILADELPHIA STORAGE BATTERY Co. (U.S.P. 1,718,139, 18.6.29. Appl., 1.12.21).—Recently prepared negative battery plates are treated with a sugar, preferably sucrose, before being rapidly dried, in order to prevent oxidation of the active metal. The plates are immersed in an aqueous bath of the sugar, or the latter is sprinkled upon them.

F. G. CLARKE.

Electric discharge tubes. INTERNAT. GEN. ELECTRIC Co., INC., Asses. of ALLGEM. ELEKTRICITÄTS-GES. (B.P. 287,138, 12.3.28. Ger., 16.3.27).—One or more of the following metals: chromium, manganese, titanium, zirconium, hafnium, thorium, silicon, aluminium, and rare-earth metals (the last may be used in the form of misch-metal) may be advantageously included to the extent of 0.5—1.0% in alloys of tungsten or molybdenum to be used as refractory alloys in the internal metal parts, including anodes but not cathodes, of discharge tubes. Without such additions, the two metals tend to retain occluded gas and to liberate it while in use. The essential property of the added metals is that they must be at least

as easily vaporisable as is molybdenum. They may be incorporated either by melting together, or by mixing the ingredients in powder form, pressing, and sintering.

H. T. S. BRITTON.

Photo-electric cell. S. WIEN, Assr. to RADIO PATENTS CORP. (U.S.P. 1,720,654, 9.7.29. Appl., 13.5.25).—The metallic hydride, which constitutes the light-sensitive coating of an electrode, is formed by subjecting the electrode and a metallic salt mixed with an organic reducing agent to an electric brush discharge in the presence of hydrogen.

H. T. S. BRITTON.

Diaphragms for electrolytic cells. K. WOLINSKI (B.P. 315,551, 20.6.28).—Stronger and more durable diaphragms, particularly for use in the electrolysis of water, may be prepared from a fabric of asbestos interwoven with metal threads, preferably of non-corrosive metal. Composite threads of asbestos and metal may also be used. The increased strength afforded by the metal permits the use of lower-grade asbestos.

H. T. S. BRITTON.

Gas accumulator. R. OPPENHEIM, Assr. to SOC. LE CARBONE (U.S.P. 1,717,244, 11.6.29. Appl., 6.6.25).—One or both of the electrodes, which are unattacked by the electrolyte, are surrounded by a porous vessel containing a mixture of a porous, finely-divided conductor, *e.g.*, charcoal, a concentrated solution of the electrolyte, *e.g.*, ammonium or zinc chloride, and colloidal starch or similar colloid which will immobilise the electrolyte and render the finely-divided conductor impermeable to liquids while preserving its porosity to gases.

F. G. CLARKE.

Vibration- and sag-resistant filament. J. H. RAMAGE, Assr. to WESTINGHOUSE LAMP CO. (U.S.P. 1,720,000, 9.7.29. Appl., 28.7.26).—A non-sagging filament is made from a solid-solution alloy of tungsten and tantalum that has been heated so as to oxidise the latter. The rigidity is caused by the large interlocking action of the metal crystals between which tantalum oxide is evenly distributed.

H. T. S. BRITTON.

Magnetisable element. C. L. SEYMOUR (U.S.P. 1,719,564, 2.7.29. Appl., 4.4.27).—In order to reduce the effect of heat on the soft iron element of an electromagnet, it is heated to red heat and cooled in contact with turpentine.

H. T. S. BRITTON.

High-frequency induction furnace. W. ESMARCH, Assr. to SIEMENS & HALSKE A.-G. (U.S.P. 1,721,073, 16.7.29. Appl., 12.10.27. Ger., 10.6.27).—See B.P. 291,774; B., 1929, 101.

Manufacture of oxide cathodes. K. M. VAN GESSEL, Assr. to RADIO CORP. OF AMERICA (U.S.P. 1,721,169, 16.7.29. Appl., 6.4.27. Holl., 6.4.26).—See B.P. 274,233; B., 1927, 705.

Manufacture of oxide cathodes. G. L. HERTZ, Assr. to N. V. PHILIPS' GLOEILAMPENFABR. (U.S.P. 1,720,675, 16.7.29. Appl., 25.7.24. Holl., 18.2.24).—See B.P. 229,622; B., 1925, 663.

[Movable] tapping device for electrical furnaces. SIEMENS & HALSKE A.-G. (B.P. 302,305, 11.8.28. Ger., 14.12.27).

Electric accumulators. CHLORIDE ELECTRICAL STORAGE CO., LTD., and B. HEAP (B.P. 315,556, 22.6.28).

Electric accumulators. H. DEAN, and CHLORIDE ELECTRICAL STORAGE CO., LTD. (B.P. 315,571, 17.7.28).

Positive electrode for electrical accumulators, particularly for use in miners' lamps. O. SCHNEIDER (B.P. 313,553, 25.7.28. Ger., 14.6.28).

Selenium and like cells. H. J. KÜCHENMEISTER (B.P. 294,108, 12.7.28. Ger., 16.7.27).

Photo-electric cell systems. GEN. ELECTRIC CO., LTD., and N. R. CAMPBELL (B.P. 315,598, 16.8.28).

Gaseous glow lamps. BRIT. THOMSON-HOUSTON CO., LTD., Assees. of A. W. HULL (B.P. 298,906, 15.10.28. U.S., 15.10.27).

[Corrugated] anodes for electrolytic baths [for cleaning silver ware]. G. MONAGHAN (B.P. 316,446, 9.8.28).

Recovery of metals by electrolysis (B.P. 315,481).
Electrodeposition of chromium. (U.S.P. 1,720,354).
Anodes for chromium plating (U.S.P. 1,720,312—3).—See X.

XII.—FATS; OILS; WAXES.

Effect of various driers on linseed oil films during ageing. P. E. MARLING (Ind. Eng. Chem., 1929, 21, 594—596).—Films of linseed oil containing two concentrations of each of lead, manganese, or cobalt acetate, and subjected to indoor ageing, showed increased acid value and decreased iodine value. The films containing manganese and cobalt were more plastic at the end of the ageing period than were those containing lead. The aged films containing the lower percentages of drier were less soluble in a toluene-alcohol mixture than were those containing the higher percentage. Linseed oil films with and without the addition of cobalt drier were exposed to the mercury-vapour lamp, and the relative effect of the drier showed concordance with the normally aged films.

S. S. WOOLF.

Mechanism of the wrinkling of wood oil. A. V. BLOM (Chem. Umschau, 1929, 36, 229—235).—The theory developed by Eibner and Rossmann (*cf.* B., 1928, 934) of preliminary cracking of the drying tung oil film followed by wrinkling due to expansion is adversely criticised. From experiment and theoretical reasoning it appears that the surface (haptogen) membrane is under pressure rather than tension, and that contraction is very improbable; moreover, a decreasing volume of the liquid oil could only cause a wrinkling of the relatively inelastic skin. The drying of thin droplets of wood oil was studied under the microscope; fan-like groups of wrinkles are formed at the edges of the drop, which radiate until they meet and interfere, causing ridges; these interference zones spread backwards in straight lines, giving the appearance termed "preliminary cracking" by Eibner and Rossmann. By gently pulling with a dissecting needle, the skin can be pulled out leaving no trace of these cell-like markings, which therefore can only be (introverted) folds and not cracks. A similar appearance can be produced artificially on the smooth-skinned film obtained by allowing wood oil to dry in darkness. The formation of crystals was found to depend entirely on the conditions of exposure, and was greatest in direct sunlight, and only very slight or

absent after 8 days' drying in darkness; no crystals were observed after 12 hrs.' irradiation by ultra-violet light (screened by a nickel oxide-glass filter), so that the change from α - to β -elaeostearic glyceride apparently depends on the longer wave-lengths. The crystals always appeared in the liquid phase underlying the skin, and the author contends that the drying and characteristic wrinkling proceed independently of, and undisturbed by, crystal formation. The first signs of change in the drying film, which precedes the formation of any detectable film, is shown by the production of irregular patches when the film is breathed upon; it is suggested that this may be caused by orientation in the surface of less soluble polar molecules. Further ageing of a dry film is regarded as the squeezing out of the solvate sheaths (cf. Blom, B., 1927, 371) and a facilitation of condensation processes by the concentration of active colloid complexes in the pressure zones of the haptogen membrane; these changes cause strains which are evidenced experimentally by the typical (strain) double refraction which can be observed in a wood oil film after 2–3 weeks.

E. LEWKOWITSCH.

Olive oil analytical method. II. Use of ultra-violet ray in detection of refined in "virgin" olive oil. S. MUSER and C. E. WILLOUGHBY (Oil & Fat Ind., 1929, 6, [8], 15–16; cf. B., 1929, 137).—As little as 5% of refined olive oil in virgin oil could be detected by the fluorescence in ultra-violet light; below this limit the results were doubtful (cf. Stratta and Mangini, B., 1928, 646) and it was difficult to determine the composition of a mixture containing over 65% of refined oil without a spectrophotometer. Crude cottonseed oil showed a yellow fluorescence comparable with that of virgin olive oil, but all refined olive and other vegetable oils gave a bluish-violet colour, which is attributed to a change in the chlorophyll constituents due to the refining process; a virgin oil which had been heated at 300° for $\frac{1}{2}$ hr. showed a fluorescence equivalent to that of a mixture containing 5–10% of refined oil.

E. LEWKOWITSCH.

Theory unifying drying and heat-polymerisation of fatty oils. B. SCHEIFELE (Z. angew. Chem., 1929, 42, 787–790).—Theories of gel-formation in drying oils are discussed. The tendency of unsaturated compounds to polymerise increases with the number of double linkings and the closeness of their grouping; hence, wood oil, owing to the three conjugated double linkings of elaeostearic acid, has a greater tendency to polymerisation, and consequently depends less on oxygen absorption for the formation of a film than does linseed oil. The small effect of driers in the drying of wood oil is thus explained.

E. LEWKOWITSCH.

Oil from grape kernels. N. KOZIN (Oil Fat Ind. Russia, 1928, No. 8, 24–26).—The kernels of white muscat grapes contained moisture 8.59, fat 13.58, crude protein 11.08, epidermis 35.25, and ash 2.92%. The oil (cold-pressed) had d_{15}^{20} 0.9220, n_D^{40} 1.4678, acid value 3.33, saponif. value 192.57, iodine value 131.24, unsaponifiable matter 0.92%. The oil, which has poor drying qualities, is edible.

CHEMICAL ABSTRACTS.

Piqui-a fruit oils. C. D. V. GEORGI (Malayan Agric. J., 1929, 17, 166–170).—Piqui-a fruit (*Caryocar villosum*)

yields two oils: (a) from the inner layer of the pericarp—a reddish-orange oil which resembles palm oil, has an agreeable odour, and is easily bleached (6.2% on fresh fruit), and (b) kernel oil (0.8% on the fresh fruit, 61.4% of dry kernel), which is yellowish in colour and semi-solid at ordinary temperatures and resembles Sawarri fat (from *Caryocar tomentosum*). The extracted oils had, respectively d_{15}^{20} 0.8622, 0.8617; m.p. 27–28°, 31–32°; saponif. value 204.9, 202.9; iodine value (Wijs) 46.6, 52; acidity 1.1, 0.2%; unsaponif. matter 0.7, 1.3%. The fatty acids of the pericarp oil had titer value 48°, mean mol. wt. 274, iodine value (Wijs) 48.5. Both oils are suitable for edible purposes, but in order to obtain oils of high quality it is necessary to treat the ripe fruits without delay. The outer layer of the pericarp contains 9% of a tannin of a pyrogallol type.

E. LEWKOWITSCH.

Oil from *Hydnocarpus anthelmintica*. C. D. V. GEORGI and G. L. TEIK (Malayan Agric. J., 1929, 17, 171–174).—The fresh seeds contained 31.8% of kernel (26.5% of moisture), which yielded on expression 13.5% (calc. on fresh seed) of a pale yellow, pleasant-smelling oil having d_{15}^{20} 0.9429, n_D^{27} 1.4726, saponif. value 206.4, iodine value (Wijs) 81.5, acid value 1.0, $[\alpha]_D^{25}$ +47.9° in chloroform; the fatty acids had titer value 39.1°, mean mol. wt. 260.5, neutralisation value 215.3, iodine value (Wijs) 84.8, $[\alpha]_D^{25}$ +49.7° in chloroform.

E. LEWKOWITSCH.

Benzine and alcohol as solvents for castor oil. A. SLASHCHEV (Masloboino Zhir. Delo, 1928, 15, No. 7).—Benzine is a satisfactory solvent for the extraction (12 hrs. at 30–55°) of castor oil, giving the same yields as benzene and carbon disulphide. Oil extracted with ethyl alcohol is impure. Addition to the benzine of 2.5–10% of benzene is advantageous.

CHEMICAL ABSTRACTS.

Spontaneous decomposition of butter fat. E. MUNDINGER (Milchwirt. Forsch., 1929, 7, 292–331; Chem. Zentr., 1929, i, 1162).—Bacterial decomposition of butter fat affords free acids, chiefly of high mol. wt. Such acids are formed in unimportant quantities by chemical decomposition, apparently through the influence of light and air. Small quantities of copper and iron have a similar effect. Rancid butter contains substances which give a precipitate with 2:4-dinitrophenylhydrazine.

A. A. ELDRIDGE.

American reindeer fat. W. F. BAUGHMAN, G. S. JAMIESON, and R. S. MCKINNEY (Oil & Fat Ind., 1929, 6, [8], 11–12).—Five samples of fat from various parts of the carcass of reindeer produced under the usual Alaskan conditions were examined; the characteristics are given having the following limiting values: softening point 40–41°, m.p. 45.8–48.6°, d_{25}^{40} 0.8981–0.8993, n_D^{80} 1.4510, acid value 2–8.6, saponif. value 197.3–199.2 (194.3, kidney fat), unsaponif. matter 0.4%, iodine value (Hanus) 33.7–39.4, acetyl value 5–8, Reichert–Meissl value 0–0.3, Polenske value 0.3–0.5, saturated acids 53.6–59.9%, unsaturated acids 35.2–41.4% (iodine value 90). The saturated fatty acids, separated by the lead salt-ether method and analysed by fractionating their methyl esters, showed the fat to contain the glycerides of the following acids: oleic 36.8, myristic 6.7, palmitic 35.0, stearic 20.5,

arachidic 0.7%, and unsaponifiable matter 0.4%. The presence of arachidic acid and the large amount of myristic acid are noteworthy. E. LEWKOWITSCH.

Naturally occurring saturated fatty acids of high mol. wt. I. So-called arachidic acid and other [higher] saturated acids of arachis oil. D. HOLDE, W. BLEYBERG, and I. RABINOWICZ (Chem. Umschau, 1929, 36, 245—253).—The acids obtainable from the "crude arachidic acid" fraction of an arachis acid oil were rigorously examined and purified by distillation in high vacuum of the esters, and especially of the acids themselves, by fractional crystallisation from solvents, and by fractional precipitation of the lithium salts. A C_{22} -acid, m.p. 75.5—76°, corresponding to the acid described by Ehrenstein and Stuewer (B., 1923, 1031A) as "isobehenic acid," was found to be impure; on very painstaking distillation in a high vacuum the m.p. of the product rose to 79—80°, without change of mol. wt., and the acid was identified (mixed m.p.) as *n*-behenic acid. The "isohexacosic acid" recorded by Holde and Godbole (A., 1926, 268) was also found to be susceptible to fractionation, a product of m.p. 78—79° being obtained, the composition of which approximated to $C_{25}H_{50}O_2$, but which is considered to be probably a mixture of hexacosic and *n*-tetracosic acids. No C_{20} -acid was isolated, but indications of its presence were obtained in the fractions of lowest mol. wt. and in the mother-liquors from the separation of "crude arachidic acid." E. LEWKOWITSCH.

Standard method for the analysis of soap. ANON. (Ann. Falsif., 1929, 22, 325—333).—Instructions are given in detail for sampling, and the determination of moisture, fatty acids, total and free alkali, chloride, glycerol, resin, and foreign (insoluble) matter in "72% soap" (28% moisture content). The methods were drawn up at the request of the Chambre Syndicale of soap manufacturers of Marseilles, and are in accordance with common practice. E. B. HUGHES.

Gelatinising power of soaps. J. HERITES (Z. phys.-chem. Seifenforsch., 1928, 1, 70—72; Chem. Zentr., 1929, i, 1063).—Lüers' pectinometer was employed in comparative determinations, and variations in the results according to the conditions are recorded. A. A. ELDRIDGE.

See also A., Aug., 952, Variation of characters of animal oils (MARGAILLAN). 961, Influence of malting on fat of barley (TÄUFEL and RUSCH). Bonducella nut oil (GODBOLE and others).

Adulteration of butter and ghee. SANYAL.—See XIX.

PATENTS.

Soap paste. J. M. WEISS and C. R. DOWNS, Assrs. to WEISS & DOWNS, INC. (U.S.P. 1,709,294, 16.4.29. Appl., 27.8.27).—An alkyl ester of a dibasic organic acid, e.g., phthalic, maleic, or fumaric acid, is mixed with soap and water, a colloidal clay, and a highly absorptive mineral filler. R. BRIGHTMAN.

Extracting the non-saponifiable and difficultly saponifiable matter from fatty material. J. K.

MARCUS (B.P. 289,798, 30.4.28).—See U.S.P. 1,960,091; B., 1929, 529.

Soap [cakes etc. with antiseptic cores]. A. M. Low (B.P. 315,997, 17.7.28).

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Reflection factors of white paint. F. H. RHODES and J. V. STARR (Ind. Eng. Chem., 1929, 21, 596—599).—The effects of the addition of small amounts of dark pigments on the brightness and hiding power of typical white paints were examined quantitatively. Brightness of film was determined directly by a Taylor reflectometer, and "ultimate brightness" obtained by extrapolation. As criterion of hiding power is taken the amount of paint per unit area to bring the brightness to within 2% of the "ultimate brightness" for the paint. Small amounts of carbon black or Prussian blue increase the hiding power markedly with only slight decrease in brightness, but on increasing the amount of dark pigment the decrease in brightness becomes more pronounced, particularly so with carbon black. The extent to which Prussian blue can be used is, however, limited by its effect on the tint of the paint. The use of aluminium powder in this connexion, whilst greatly increasing the hiding power, lowers the brightness excessively and in addition gives a "flecked" film; it is therefore unsuitable for use in finishing coats, but should be of advantage in white paint undercoats. S. S. WOOLF.

Torsion viscosimeter for paints. W. BECK (Farben-Ztg., 1929, 34, 2515—2518).—A modified Couette concentric-cylinder torsion viscosimeter is described, and its application to paint material is discussed. S. S. WOOLF.

Oil absorption and particle size [of pigments]. H. WAGNER and H. PFANNER (Farben-Ztg., 1929, 34, 2513—2514).—Contrary to the views of Klumpp (B., 1929, 609), increase of surface involved in grinding a pigment leads to increase in oil absorption. Apparent anomalies are explained by the production, in intensive grinding, of agglomerates or "secondary particles" (illustrated by photomicrographs). It is suggested that the three stages, wetting, smearing, and flowing, be recognised in the determination of oil absorption. S. S. WOOLF.

Influence of light on "toning down" [of colours]. O. MERZ (Farben-Ztg., 1929, 34, 1117—1119).—The dependence of colour on illumination is discussed with special reference to variation in colour shades when viewed by direct and diffused sunlight and by the light of a new sunlight-lamp ("Naturlicht-lampe"). The use of the latter for colour-matching purposes shows satisfactory agreement with midday sunlight, but marked divergence from diffused sunlight. S. S. WOOLF.

Synthetic amyl products as lacquer solvents. M. M. WILSON and F. J. WORSTER (Ind. Eng. Chem., 1929, 21, 592—594).—The properties of synthetic amyl alcohol and acetate ("Pentamol" and "Pentacetate") indicate their suitability for use in nitrocellulose lacquers. Data on distillation and evaporation rates, dilution ratios, viscosity of nitrocellulose solutions, and resin

solvent powers are tabulated. Types of apparatus for determining rate of evaporation of solvents and resistance to "blush" of lacquer films are described.

S. S. WOOLF.

Influence of plasticisers on viscosity and susceptibility to light of nitrocellulose lacquers. H. WOLFF and B. ROSEN (*Farben-Ztg.*, 1929, 34, 2564—2566).—The effect of adding tolyl phosphate, butyl phthalate, "Sipalin MOM," and "Sipalin AOM" to nitrocellulose solutions was examined. With one or two exceptions, progressive decrease in viscosity and increase in dilution ratio (toluene and light petroleum being the diluents used) occur with increase in plasticiser content. Addition of plasticiser is also found to increase progressively the tendency of a nitrocellulose solution to yellow under the influence of actinic rays, tolyl phosphate being the most harmful in this respect, but in all cases plasticised solutions showed better general film properties than a plasticiser-free solution.

S. S. WOOLF.

Viscosity of nitrocellulose solutions. III. O. MERZ (*Farben-Ztg.*, 1929, 34, 2566—2570; cf. B., 1927, 810).—Difficulties arising out of variation in nitrocellulose content of supplies of alcohol-damped nitrocellulose are indicated. The following equation correlating dry nitrocellulose content of a solution of 60 pts. of damp nitrocellulose in 40 pts. of butyl acetate with viscosity of the solution as measured either by efflux or by falling-sphere methods is developed: $t = K_A \cdot K_L^{(0.5p-10)}$, where t is time, K_A and K_L are constants for apparatus and solution respectively, and p is concentration of dry nitrocellulose in the solution. The results of the application of this equation to 120 samples of nitrocellulose are tabulated. The presence of more than 1% of water in the solution is shown to exert a marked influence on the viscosity.

S. S. WOOLF.

Viscous liquid [rosin solution] mixed and dried in 80% less time. R. D. JESSUP (*Chem. Met. Eng.*, 1929, 36, 413—414).—A rosin insulating compound was being prepared by melting lump rosin in rosin oil and heating to remove moisture, the two operations requiring 24—36 hrs. This procedure was improved by arranging continuous circulation between two tanks (into one of which the solid rosin was fed) by an automatic air lift. Melting then required only 2—3 hrs. Dehydration was accelerated by applying a gradually increasing vacuum, and the whole treatment was complete in 5—6 hrs.

C. IRWIN.

Turpentine from sulphate-cellulose. POSTOVSKI and PLUSNIN.—See V. **Water content of turpentine.** NICOL. See XX.

PATENTS.

Nitrocellulose coating composition. M. V. HITT, Assr. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 1,710,453, 23.4.29. Appl., 13,10.23).—Pyroxylin coating composition having a viscosity of 100—300 centipoises at 28° and containing 7—9% or more of nitrocellulose and above 15% of total solids, excluding pigment, is prepared by mixing 6 pts. of nitrocellulose of viscosity below 1500 centipoises in ethyl acetate at 28° with about 1—4 pts. of acetyl-laurin, benzyl butyl phthalate,

butyl phthalate, or other solvent softener, less than 3 pts. of resin, about 6 pts. of a low-boiling alcohol, 6—18 pts. of a high-boiling ketone or ester, and 3—5 pts. of a pigment.

R. BRIGHTMAN.

Drying method and device, particularly for drying lacquered articles [by ozonised air]. HUNDT & WEBER GES.M.B.H. (B.P. 303,875, 12.7.28. Ger., 12.1.28. Addn. to B.P. 297,411, 21.9.27).

Manufacture of linoleum or like material. LINOLEUM MANUF. CO., LTD., and A. A. GODFREY (B.P. 316,646, 2.5.28).

Manufacture of plates from resins etc. [reinforced by metal sheets]. "HEROLD" A.-G. (B.P. 303,103, 27.9.28, Ger., 28.12.27).

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Vulcanisation [of rubber] without sulphur. L. ECK (*Gummi-Ztg.*, 1929, 43, 2481—2482).—A critical review of the claims made by Ostromyslenski as to the possibility of satisfactory vulcanisation without the use of sulphur (cf. B., 1916, 59). D. F. TWISS.

Weighing. PARTRIDGE. **Plastometer.** KARRER.—See I.

PATENTS.

Impregnation of permeable substances with rubber latex. P. H. HEAD (B.P. 316,335, 29.3.28).

Surface coatings of ebonite, hard rubber, or the like. H. F. W. MENZEL (B.P. 316,353, 1.5.28).

Paper-like material (U.S.P. 1,716,654).—See V.

XV.—LEATHER; GLUE.

Chrome tanning. G. A. BRAVO (*Boll. Uff. Staz. Sperim. Ind. Pelli*, 1929, 7, 166—181, 192—205).—Experiment shows that the insolubilisation of skins by the action of sunlight or ultra-violet light after treatment with potassium dichromate is similar to that of dichromate-gelatin, although, as would be expected from the different chemical and physical structural characteristics of gelatin and collagen, the two phenomena follow different quantitative courses. T. H. POPE.

Dextrin from corn. LINK.—See XIX.

XVI.—AGRICULTURE.

Microbiological investigation on the virgin and arable volcanic soils from Sakura-jima, Japan. A. ITANO and S. ARAKAWA (*Ber. Ohara Inst. Landw. Forsch.*, 1929, 4, 27—33).—Results of bacteriological investigations made of the various soils from a volcanic island off Kyushu, Japan, are given. E. A. LUNT.

Soils in rice fields. II. General microbiological investigation. III. Microbiological analyses in rice fields and dry farm soils. A. ITANO and S. ARAKAWA (*Ber. Ohara Inst. Landw. Forsch.*, 1929, 4, 35—54, 55—66; cf. B., 1927, 611).—II. Quantitative determinations have been made on the soil taken from a typical Japanese rice field, which is flooded for certain portions of the year, with reference to the variation with season of the following: total number of fungi and of bacteria, and of each of the following bacteria classi-

fied functionally: ammonifying, nitrifying, denitrifying, nitrogen-fixing, and cellulose-fermenting.

III. The soil from a Japanese rice field was found to have a higher C:N ratio than that from a typical unflooded farm soil, and to contain less bacteria capable of reducing nitrates to nitrites. The rice field contained some indole-producing strains, whilst the dry soil contained none. Details are given of the numbers of the various groups in all the strata examined. E. A. LUNT.

Corrosiveness of soils with respect to iron and steel. H. D. HOLLER (Ind. Eng. Chem., 1929, 21, 750—755).—It is theoretically probable that the rate of corrosion of iron in soil is related to the rate at which hydrogen is produced at, and removed from, the surface of the iron. The only factors affecting the production of hydrogen and capable of separate control are acidity and salt content, it having been found that particle size is unimportant. Attempts to establish a relationship between these two factors and corrosiveness on 47 samples of soil from all over the United States lead to no very clear result, but there is a general tendency towards increased corrosion with increased acidity. The acidity in turn tends to vary directly with the annual rainfall. A low p_H value will not necessarily mean long-continued corrosion unless there is sufficient colloidal matter present to "buffer" it at its low value. A method of determining total acidity by titrating the soil in a 5% solution of potassium chloride with a hydrogen electrode was worked out. Consistent results are only obtained with the addition of potassium chloride. This in many cases lowers the p_H value through base exchange, and the results so obtained are considered to be a fair measure of total acidity. The end-point of the titration is taken as p_H 9.4, at which point iron ceases to corrode. A general relation is also shown to exist between amount of hydrogen evolved in contact with iron and acidity determined as above.

C. IRWIN.

Buffering, acid density, soil zones, and a single-value unit describing soil conditions. IV. S. GOY, P. MÜLLER, and O. ROOS (Z. Pflanz. Düng., 1929, 14A, 220—240. Cf. B., 1928, 796; 1929, 335).—Buffer values of soils increase considerably as the neutral point is approached. To clarify the meaning the term "general acid density" is introduced and is defined as the ratio of buffer value to base equivalent. The value is independent of the nature of the base used in the titration. To eliminate the possible effect of changes of acidity on the nature and condition of the soil colloids the term "specific acid density" is utilised to express the above relationship for a definite range of p_H values, and as a means of expressing acidity conditions in soils. The general classification of soils and the significance of the electrometric measurements previously described are discussed in the light of the above values.

A. G. POLLARD.

Elution and decomposition of synthetic urea in the soil with reference to climatic conditions. R. BUS (Fortschr. Landw., 1929, 4, 1—4; Chem. Zentr., 1929, i, 789).—Urea (0.33, 1.66, or 3.33%) was added to a sandy or loamy soil in pots exposed to natural conditions. With small applications, the nitrogen was completely washed out of the sandy soil

in 6 weeks; with loam the large applications were most quickly removed. The nitrate ion was, in both soils, more completely although more slowly removed than the ammonium ion. In sandy soils the amounts of urea applied are parallel to the production of nitrate. Hence nitrification, but not ammonification, and elution are parallel. A. A. ELDRIDGE.

Changes in the solubility of the phosphoric acid of soils in different biological conditions. L. VON KREYBIG (Z. Pflanz. Düng., 1929, 14A, 240—251).—The phosphate manuring of acid soils without appropriate liming is seldom profitable. The Neubauer values for phosphorus in weakly acid or non-acid soils are high and their true significance depends on a consideration of the biological conditions of the soil. A. G. POLLARD.

The phosphate question [in soils]. II. Phosphate analysis. O. ARRHENIUS (Z. Pflanz. Düng., 1929, 14A, 185—194).—The molybdenum-blue method for the determination of phosphates, involving the reduction with sodium sulphite, is examined, and the following details are prescribed for its satisfactory working:—The portion of soil extract (usually citric extract) for analysis is diluted with water to about 80 c.c., and to it are added 10 c.c. of molybdate solution, 1 c.c. of sulphite solution, and 1 c.c. of quinol solution. The volume of the mixture is adjusted to 100 c.c. and the whole placed in a water-bath at 55° for 6 hrs. After keeping at ordinary temperature overnight the colour is compared with those of standard solutions similarly prepared. The latter should contain phosphate in quantities of not more than 0.03 mg. P_2O_5 difference in consecutive members of the series. Solutions containing more than 0.6 mg. are not easily compared by this means. The adverse effect of citric acid on the production of the blue colour is eliminated by heating to 55°. The ammonium molybdate solution contains 25 g. dissolved in 825 c.c. of water, followed by 175 c.c. of sulphuric acid added slowly, with cooling. The sodium sulphite solution contains 20 g. in 80 c.c. of water. The quinol solution (0.5%) is acidified with one drop of sulphuric acid. (Cf. B., 1929, 756.) A. G. POLLARD.

Favourable action of sulphur [on soils]. Colloidal sulphur. M. J. BOREAS (Ann. Sci. agron. franç., 1929, 45, 128; Bied. Zentr., 1929, 58, 357—358).—Crop increases are recorded following the application to soil of colloidal sulphur obtained by the treatment of solutions of sulphur in sulphur compounds with weak acids, e.g., carbon dioxide from the air.

A. G. POLLARD.

Mechanical analysis of soils. IV. M. KÖHN (Z. Pflanz. Düng., 1929, 14A, 268—280).—The criticisms of Köttgen and Heuser (B., 1929, 369) are answered. The use of glycerin and glycerin-water mixtures by these authors in the pipette method of mechanical analysis is condemned as unsound in theory, cumbersome, and tedious. A. G. POLLARD.

Improved form of Schulze apparatus for [soil] elutriation. E. RAUTERBERG (Z. Pflanz. Düng., 1929, 14A, 261—268).—The Schulze-Harkort elutriator (cf. B., 1928, 506) is adapted for use in soil analysis. Details of soil preparation and comparative results are recorded.

A. G. POLLARD.

Determination of the fertiliser requirement of soil. J. HIRSCH (Fortschr. Landw., 1928, 3, 1118—1121; Chem. Zentr., 1929, i, 1043).—A comparative study. Neither the chemical nor Neubauer's method gave useful results, although these were attained by Mitscherlich's pot experiments. A. A. ELDRIDGE.

Determination of the phosphoric acid requirement of soil. F. SCHEFFER (Fortschr. Landw., 1929, 4, 37—40; Chem. Zentr., 1929, i, 1043—1044).—Niklas' *Azotobacter* method is modified; a simpler method consists in shaking the soil with calcium hydrogen carbonate solution and determining colorimetrically the phosphate in the filtrate. A. A. ELDRIDGE.

Exchangeable potassium [in soils]. K. BAMBERG (Z. Pflanz. Düng., 1929, 14A, 177—184).—In peat soils saturated with potassium, the latter is more easily displaced by calcium and magnesium than by sodium or ammonium. Ammonium chloride displaces more potassium than does ammonium acetate. The reaction of the soil plays little part in this displacement. In the same soils after the destruction of organic matter the potassium is most easily displaced by ammonium, followed in order by calcium, magnesium, and sodium. The greater part of the potassium in natural peat soils is held by the clay complex. The result of varying the concentration and nature of the leaching solution in the determination of the displaceable potash is examined. Comparison is made of the displaceable and assimilable potash as determined by Hissink's method. A. G. POLLARD.

Potash-iron antagonism in plants as the basis of a method for the determination of the potash requirement of soils. O. ECKSTEIN and A. JACOB (Z. Pflanz. Düng., 1929, 14A, 205—220).—Examination is made of Hoffer's reaction (Purdue Univ. Bull., 298, 1926) in which the inverse relationship of the iron and potash contents of the nodes of maize stems is utilised to determine the potassium requirement of soils. Trials are described with varying soil types and fertiliser treatment, and results are compared with those obtained by the Neubauer method. In general, Hoffer's work is confirmed but some exceptional cases remain unexplained. Similar phenomena occur with other plants. The antagonism between certain ions in plant nutrition is not an isolated phenomenon, but is interrelated with the numerous other factors concerned. A. G. POLLARD.

Determination of total replaceable bases in soils. R. H. BRAY and F. M. WILLHITE (Ind. Eng. Chem. [Anal.], 1929, 1, 144).—The soil is leached with a solution of ammonium acetate and the filtrate evaporated to dryness. After ignition to convert acetates into carbonates or oxides an excess of standard acid is added and the excess titrated with standard alkali. The method is satisfactory for sodium, potassium, calcium, magnesium, barium, and manganese. Iron and aluminium give no titration values. J. S. CARTER.

Determination of the unsaturation and lime requirement of soils on the basis of their hydrolytic acidity. J. VON CSIKY (Z. Pflanz. Düng., 1929, 14A, 281—294).—The numerous recent processes for

determining the lime requirement of soils are discussed. Comparison with field trials shows that the lime required to produce the maximum yield frequently exceeds that calculated from the hydrolytic acidity. The extent to which this occurs varies to some extent with the crop. More satisfactory results are obtained by increasing the proportion of *N*-calcium acetate solution used in determining the hydrolytic acidity to the order of 1:60, and revising the empirical factor introduced into the calculation. Even with this modification agreement between field trial and laboratory calculation is not entirely satisfactory. A. G. POLLARD.

Preparation of humus extracts with neutral agents. K. SIMON (Z. Pflanz. Düng., 1929, 14A, 252—257).—Humus may be extracted from soil without decomposition by treatment with ten times its weight of cold 1% sodium fluoride solution. On evaporation the dark brown, water-soluble alkali humate is obtained. The humic acid obtained by the acidification of the above extract differs in certain points from acidum huminum (Merck). It may be used with advantage as a standard material for comparative soil examination. A. G. POLLARD.

Respiration of sorghum grains. D. A. COLEMAN, B. E. ROTHGEB, and H. C. FELLOWS (U.S. Dept. Agric. Tech. Bull., 1928, No. 100, 1—16).—At high humidities damaged kernels respire more vigorously than do normal kernels. Storage of the grains is discussed. CHEMICAL ABSTRACTS.

Saltpetre [fertiliser] question. K. NEHRING (Fortschr. Landw., 1929, 4, 40—42; Chem. Zentr., 1929, i, 1042).—Spraying with potassium iodide is injurious to oats. Relative grain yields were: German sodium nitrate 100, Chile saltpetre 98, Leuna saltpetre 96, "Kalksalpeter" 94, ammonium sulphate 95, sodium nitrate (0.5 g. N) with potassium iodide (5 mg.) 104. A. A. ELDRIDGE.

Method for comparing the value of ammoniacal-nitrogen and nitrate-nitrogen [for plants]. W. G. FRIEDEMANN (Science, 1929, 70, 43—44).—Details are given for the preparation of water culture media suitable for the comparison of the nutrient values for plants of ammoniacal and nitrate-nitrogen. Adjustments in the pH values of the solutions are easily made. A. G. POLLARD.

Effect of dark and light periods on the nutrition of plant roots. M. K. DOMONTOVITSCH and A. J. GROSCHENKOV (Z. Pflanz. Düng., 1929, 14A, 194—205).—The growth of plants in water cultures was compared under controlled conditions of light and darkness and in solutions alternately lacking and containing one of the principal plant nutrients. Such "differential" nutrition in the case of phosphate had no detrimental effect on the dry matter production of plants. Nutrition was increased by a small but definite extent by light. The effects of differential feeding with potassium were slight, and light was practically without influence on the assimilation of this element. During the differential feeding of the plants with calcium growth practically ceased. The assimilation of inorganic radicals was affected by light in the order calcium (greatest), magnesium, nitrate, sulphate, ammonium, phosphate,

potassium. Light increased the absorption of water by plants. The transpiration process and the absorption of inorganic matter are not closely related.

A. G. POLLARD.

Analysis of insecticides containing fluorine compounds. L. HART (Ind. Eng. Chem. [Anal.], 1929, 1, 133—135).—Methods are described for the analysis of preparations containing (a) alkali silicofluorides and boric acid; (b) fluorides with arsenic trioxide or soluble arsenic compounds; (c) fluorides, bifluorides, and silicofluorides. (a) Total acidity with respect to 0.2*N*-sodium hydroxide solution is first determined and then acidity due to boric acid after removal of silicofluoride by precipitation as the potassium salt in the presence of 1:2 alcohol (cf. Katz, B., 1904, 562; Dinwiddie, B., 1916, 1216). (b) Arsenic is precipitated by 10% silver nitrate solution and the precipitate distilled with hydrazine sulphate, followed by titration of the distillate with 0.05*N*-iodine solution. After removal of arsenic, fluorine is determined by precipitation with 10% calcium chloride solution, ignition of the calcium fluoride, and confirmation by converting into calcium sulphate. (c) Total acidity due to bifluorides and silicofluoride is determined by titration with 0.2*N*-sodium hydroxide solution, and bifluoride acidity by titration at 0° with 0.2*N*-sodium hydroxide in the presence of potassium chloride and 1:1 alcohol. The difference is the silicofluoride equivalent. Total fluorine is determined by precipitation, as the calcium salt, and hence the sodium fluoride content is found by deducting the fluorine equivalent of the bifluoride and silicofluoride present (cf. Flisik, B., 1925, 353).

H. J. DOWDEN.

Competition between cultivated plants and soil micro-organisms for mineral food; action of dried blood on phosphate fertiliser. D. CHOUGHAK (Compt. rend., 1929, 189, 262—264).—In confirmation of earlier work (*ibid.*, 1927, 185, 82) in which it was suggested that the effect of micro-organisms in the soil in decreasing the yield of crops was due to the removal of phosphates by these organisms, the effect of the addition of varying doses of organic nitrogen in the form of dried blood on soils to which different amounts of disodium phosphate had been added, has been investigated. With small, insufficient doses of phosphate a large amount of dried blood destroys the crop. By successive exhaustions of soils, in atmospheres of different humidity (35% and 25%), to which the same quantity of phosphate but different amounts of dried blood were added, it was shown that in the first series (humidity 35%) addition of large quantities of dried blood completely removes the phosphate, whilst in the second series (25% humidity, good aeration) the phosphorus is found almost entirely in an organic form in which it is less readily assimilated by the plant. Addition of traces of chloroform destroys the micro-organisms and the phosphate content then diminishes slowly and regularly, the ratio of mineral to organic phosphorus remaining constant.

J. W. BAKER.

Effect of fluorine in dairy cattle ration. G. E. TAYLOR (Mich. Agric. Exp. Sta. Quart. Bull., 1929, 11, 101—104).—Fluorine (0.125% of ration) is detrimental; raw rock phosphate (containing 3% F) was inferior to steamed bone meal.

CHEMICAL ABSTRACTS.

See also A., Aug., 876, **Wetting power [of insecticides]** (GREEN). 899, **Colorimetric determination of phosphoric acid** (LEVITZKI). 958, **Fungicidal action of sulphur** (MARSH). 960, **Micro-detection of germinable seeds** (NIETHAMMER). **Translocation of potassium in tomato plants** (JANSSEN and BARTHOLOMEW). **Determination of inorganic nitrogen in plant extracts** (SESSIONS and SHIVE). **Moisture in wheat grown under constant conditions** (VAN DE SANDE-BAKHUYZEN). 961, **Catalase and oxidase of tomatoes and the soil reaction** (HABER). 962, **Occurrence of chlorates in tomato soil** (OWEN).

Plant nutrient content of mud from beet-sugar factories. NOVÁK.—See XVII. **Nitrogen in tobacco.** VICKERY and PUCHER.—See XX.

PATENT.

Recovery of products [fertilisers] from spent sulphite liquors. G. A. RICHTER, Assr. to BROWN Co. (U.S.P. 1,710,272, 23.4.29. Appl., 6.1.27).—Spent sulphite liquors containing ammonium salts are neutralised with ground basic calcium phosphate rock, evaporated to 5% concentration, dried, and used as fertiliser. A potassium salt may be added to the spent lye or to the original digesting solution to increase the fertilising value.

R. BRIGHTMAN.

XVII.—SUGARS; STARCHES; GUMS.

Drying of beet slices and its influence on sugar content. B. ZIMMERMANN (Z. Zuckerind. Czechoslov., 1929, 53, 554—558).—On exposure to the air for 2 hrs. piles of fresh beet slices and beet pulp, weighing 500 g. each, lost 1.3—4.0% of their weight by evaporation of moisture. Evaporation during the pulping of slices in a Keystone pulping apparatus did not exceed 0.5%. It is concluded that, in factory control, errors of 0.1% in the sugar content of beet slices may easily arise owing to evaporation before analysis.

J. H. LANE.

Heating of [sugar] thin juice under pressure. E. THIELEPAPE and P. MEIER (Z. Ver. deut. Zucker-Ind., 1929, 79, 316—326).—The practice of boiling-up thin juice under pressure, e.g., for 10 min. at 116—120°, before evaporation (cf. B., 1928, 831) does not cause any appreciable decomposition of sugar. Its chief advantage is that it avoids evolution of carbon dioxide in the evaporating plant, the condensate from which thus becomes much less liable to cause corrosion when used as boiler feed water than under present conditions. Experiments indicate that about 0.1—0.3 g. of carbon dioxide may be evolved per kg. of thin juice. By far the greater part of this is derived from organic non-sugars. Under practical conditions the boiling of the thin juice lowers the alkalinity very slightly, and may also produce a slight precipitate containing calcium carbonate which can be removed by a pressure filter. Satisfactory factory trials have been made using two old evaporator units for the pressure boiling.

J. H. LANE.

Microscopical investigations on the carbonatation process. T. BREDT (Z. Ver. deut. Zucker-Ind., 1929, 79, 285—315).—On the lines of an earlier study by Claassen (B., 1920, 554 A) the precipitate produced in

beet juices by carbonatation under various conditions and at different stages was examined, a special solution of fuchsin being used as a stain for coagulable colloids. The precipitate contained flocks of colloidal impurities, besides soft, porous spherules, 1–16 μ in diam., consisting of crystal aggregates more or less optically anisotropic and interpenetrated with colloids, and also individual crystals. With the progress of carbonatation the colloidal matters showed increasing intensity of staining, indicating progressive dehydration and coagulation. This process appears a more important subject for further study than the mechanism of precipitation of calcium carbonate. The ease of filtration of carbonatated juice is not always correctly indicated by the rate of deposition of the precipitate in a test cylinder. Colloidal matters in a highly hydrated form may remain invisible in the supernatant juice and yet be capable of dehydration and coagulation under suitable conditions, e.g., by liming and carbonatating at higher temperatures.

J. H. LANE.

Behaviour of phosphoric acid during liming and carbonatation in relation to the natural alkalinity [of beet juices]. O. SPENGLER and A. TRÄGEL (Z. Ver. deut. Zucker-Ind., 1929, 79, 457–462).—Experiments with diffusion juice, and with pure sugar solutions of like contents of sucrose and phosphoric acid treated with varying quantities of sodium hydroxide to produce different natural alkalinities (B., 1928, 421), showed that, given natural alkalinities of 0.004–0.1%, phosphoric acid is almost completely eliminated from beet juice by carbonatation. The presence of large proportions of phosphate in incrustations from the first evaporator unit, which has been observed, is probably attributable to incomplete decomposition of calcium glycerophosphate during liming, this compound then remaining in solution after carbonatation and undergoing decomposition in the evaporator. Given a sufficient natural alkalinity of the juice, however, the liberated phosphoric acid should remain in solution as sodium phosphate and not be deposited as calcium salt.

J. H. LANE.

Clarification of diffusion juice in relation to the possible inversion of sucrose and influence of micro-organisms. V. MAREŠ (Z. Zuckerind. Czechoslov., 1929, 53, 728–732).—Comparative laboratory experiments with a diffusion juice of normal composition showed that if, instead of heating the juice before addition of lime, $\frac{1}{2}$ of the total quantity of lime is added before heating and the rest afterwards, in order to reduce risk of inversion of sucrose, the purification effected by carbonatation may be somewhat impaired; e.g., in the present case, the final thin juice contained 0.067% instead of 0.057% of total nitrogen. In cases of infection of the raw juice with yeasts or moulds, however, it is advisable to add about $\frac{1}{2}$ of the total quantity of lime to the juice in the measuring vessels, as very considerable inversion may otherwise occur.

J. H. LANE.

Sugar-factory filter cloths. IV. K. ŠANDERA (Z. Zuckerind. Czechoslov., 1929, 53, 569–576; cf. B., 1929, 572).—Laboratory tests were made on the effect of varying pressures on the strength of different types of filter-cloth as used in beet-sugar factories. A pressure of

55 kg./cm.² distinctly diminished the strength on new jute cloth, whilst that of used cloth of the same material was considerably weakened. Cotton cloth commenced to weaken after having been submitted to pressures of 110 kg. Cotton cloth which had already been used in filter-presses retained its strength fairly well after pressure in a single layer, but folded pieces easily broke. Contact with a rusting surface greatly diminishes the strength of all types of cloth. Resistance to the blows of a hammer is best borne by new cotton, jute and linen cloths being, in general, much weakened. Permeability in all types of cloth was much diminished by the presence of incrustation (artificially produced), most of all in the case of jute, but also to a marked extent in that of a mixture of cotton and linen. Cotton cloth, on the other hand, showed a relatively good rate of flow through incrustated cloth under the experimental conditions (in which solutions of molasses of 15° and 26° Bg. were filtered).

J. P. OGILVIE.

Determination and nature of the alkalinity of raw [beet] sugars. V. PREININGER (Z. Zuckerind. Czechoslov., 1929, 53, 617–629).—Conductometric titration and chemical analysis of raw beet sugars indicate that their alkalinity is due mainly to basic substances of the buffer class, carbonates accounting for about $\frac{1}{3}$ – $\frac{1}{2}$. The suitability of raw sugars for storage is better ascertained by determinations of p_H value than by titration, sugars having p_H 7–8 being unsuitable for long storage, whilst those having p_H < 7 are specially liable to inversion. The p_H value can be determined with sufficient accuracy (to within 0.3 of the electrometric value) by colorimetric methods, two of which are described. The first consists in comparing the colour produced by 10 drops of a 0.5% solution of phenolphthalein or a 0.04% solution of bromothymol-blue, in a solution of 8 g. of sample in 20 c.c. of water (complete dissolution of the sugar is not essential), with that produced in standard borate buffer solutions, by means of the Walpole comparator. The second method is based on the use of Šandera's photocolorimeter (B., 1928, 344).

J. H. LANE.

Denaturing of raw sugar. K. ŠANDERA (Z. Zuckerind. Czechoslov., 1929, 53, 561–567).—Raw beet sugars can now be used (in Czechoslovakia) as fodder, free from tax, if denatured with 2% of salt and 1% of spent vegetable char or 3% of spent animal char in the case of first runnings, or 0.75% of vegetable or 2% of animal char in the case of second runnings. The admixed carbon is not injurious to the animals.

J. H. LANE.

Speed of crystallisation of sucrose from beet products. M. I. NAKHMANOVICH and I. F. ZELIKMAN (Nauch. Zapiski, 1928, 6, 109–122).—For materials of high (but not low) purity the rate of crystallisation increased rapidly with increasing supersaturation; increase in the concentration of non-sugars lowered the speed of crystallisation of sucrose. Differences in laboratory and factory results are attributed to insufficient diffusion in the crystallisers.

CHEMICAL ABSTRACTS.

Cane molasses and solid sugar-cane juice. L. ROSE (Z. Spiritusind., 1929, 52, 254–255).—The polarisation, inversion, and Fehling's solution, and fermenta-

tion methods of evaluating these raw materials for alcohol production are compared. The usually employed inversion-copper reduction method gives 2–3% higher results than the fermentation method with molasses, but only slightly higher results with dried juices. Exceptions occur when the juices have been overheated, as shown by browning. With molasses the polarisation + invert figures are slightly higher still, probably owing to over-determination of the invert. For the latter determination an unclarified solution is preferred. With solid juices the double polarisation figure is low, owing to the formation of inactive but fermentable sugars during drying. The differences between all three methods increase as the quality of the products examined deteriorates. The results of duplicate determinations of five typical examples of each are tabulated, the alcohol yields from the molasses being 31.9–37.9 litres/100 kg., and from dried juices 52.6–56.3 litres/100 kg. The technical process employed is described, and the yield for each raw material is given as molasses (60.2% of sugar) 32 litres, dried juice (89% of sugar) 50 litres of alcohol per 100 kg. over a typical period. F. E. DAY.

Relation of the amides to alkalinity decrease during beet-sugar manufacture. J. VONDRÁK (Z. Zuckerind. Czechoslov., 1929, 53, 537–542).—Beets grown under dry conditions yield juice the alkalinity of which decreases during manufacture, particularly in evaporation. Such juice contains more total nitrogenous substances including amides than that obtained from normal roots. The proportion of glutamin, however, is smaller. J. P. OGILVIE.

Plant nutrient content of mud from clarifying basins of [beet-]sugar factories. J. NOVÁK (Z. Zuckerind. Czechoslov., 1929, 53, 717–718).—Analysis of the mud from the effluent clarifying basins gave: total nitrogen 0.03, phosphoric acid 0.28, potash 0.14, calcium oxide 1.06, water 14.4%. Pot cultures by Mitscherlich's method showed that of the total plant nutrient present in the mud the following percentages were taken up by oats during their growth: total nitrogen 13, potash 33%, phosphoric acid none.

J. P. OGILVIE.

Graphical method for calculating the composition of a sugar mixture [sucrose, dextrose, lævulose]. J. DUBAQUÉ (Ann. Falsif., 1929, 22, 352–353).—Instructions are given for the drawing of curves and the preparation of a movable triangle from which the amounts of sucrose, dextrose, and lævulose in a mixture of these are readily calculated. The analytical determinations necessary are polarisation before and after inversion, and the total reducing sugars (Fehling) after inversion. E. B. HUGHES.

Determination of the solubility of white dextrans and soluble starches. O. WOLFF (Z. Spiritusind., 1929, 52, 248–249).—Though the solubility of dextrans should strictly be determined under the actual conditions of their employment, this is often impossible owing to difficulties of dissolution, filtration, etc. For comparative purposes a solution containing 2% by wt., prepared by stirring for 30 min. with water at exactly 20°, is recommended. The temperature is important, and in an example a rise of 2° raised the solubility from 53.8%

to 57% on a 1-hr. extraction. An aliquot part of the filtered extract is carefully evaporated and the residue weighed. For rapid working a refractometric or pycnometric method might be calibrated from a series of such determinations. For the characterisation of a dextrin a viscosity determination on a warm aqueous extract is also necessary. F. E. DAY.

New starch tables. SPROCKHOFF (Z. Spiritusind., 1929, 52, 238).—An extension of the author's previous tables (*ibid.*, 1922). The amount of starch per 100 litres and per 100 kg. of suspension, and the volume and weight of suspensions containing 100 kg. of starch, are given for each degree to 24° B. The figures are given for dry starch and for wet starch containing 20 and 50% of water. F. E. DAY.

See also A., Aug., 914, **Potato starch** (HESS and SMITH). 948, **Iodometric determination of dextrose** (TOSCANI). 957, **Alcoholic fermentation of amino-acids** (PARISI and others).

Adsorptive characters of charcoals. LANDT and BHARGAVA.—See II. **Cane-molasses fermentations.** HILDEBRANDT. **Dextrin-fermenting yeasts.** STAIGER and GLAUBITZ.—See XVIII.

PATENTS.

Increasing the efficiency of mash tubs for massecuite and the like. A. RÖLZ (B.P. 297,054, 10.9.28. Ger., 13.9.27).—A mixing vessel for massecuite, provided with stirring blades attached to a rotating horizontal shaft, has a fixed perforated pipe extending along its lower part, through which a liquid can be extruded into the massecuite intermittently, the valve controlling the flow of the liquid being actuated by a cam on the rotating shaft. J. H. LANE.

Crystallisers for sugar manufacture. DUNCAN, STEWART & Co., LTD. From J. E. R. HERISSON (B.P. 313,290, 21.5.28 and 1.1.29).—In a crystalliser for massecuite, with stirring arms mounted on a horizontal rotating shaft extending longitudinally through the apparatus, horizontal tubes through which cooling liquid flows are mounted on the shaft in radial sets, thus serving as means for stirring and cooling the massecuite at the same time. J. H. LANE.

Decolorisation and purification of saccharine materials. H. B. WOOLDRIDGE and P. G. CLARK (B.P. 312,705, 6.3.28).—To improve the quality of low-grade cane or beet syrups or molasses, for yeast manufacture, for use in sugar refining, or for alimentary purposes, they are diluted to about *d* 1.07, passed through a filter press the cloths of which have previously been coated with a filter aid such as Celite, and then allowed to percolate through filters containing some form of bauxite or precipitated alumina, or mixed therewith and filtered. The original syrup may first be defecated by heating with phosphoric acid, neutralising with lime, and removing the precipitated sludge.

J. H. LANE.

Revivification of used kieselguhr [from sugar refineries]. R. CALVERT (U.S.P. 1,717,661, 18.6.29. Appl., 25.10.24).—The used kieselguhr, in the form of

wet filter cake, is disintegrated by means of a blower in a current of hot gas containing oxygen, and then blown into a chamber at a higher temperature, e.g., 400°; after exhaustion from this chamber the dry dust is separated from the gas.

J. H. LANE.

XVIII.—FERMENTATION INDUSTRIES.

Sinker test in malt analysis. L. C. WILSON (*J. Inst. Brew.*, 1929, 35, 414—415).—If the percentage of sinking corns is high, the malt will be irregular in growth and show many badly modified and hard-ended corns. Analyses of the sinking corns, which have been separated from the bulk of the malt, give values for the extract, cold-water extract, and diastatic power which are considerably lower than those obtained with the original malt. It is considered that the sinking corns are responsible for the variations in the extract values returned by different chemists. C. RANKEN.

Formation of buffer substances in malting. R. H. HOPKINS and H. E. KELLY (*J. Inst. Brew.*, 1929, 35, 402—409).—About one half of the buffer substances preformed in barley are removed during steeping, with a resultant fall in the p_H value. During the first few days of germination a rapid increase both in phosphate and protein buffers occurs along with a pronounced rise in the p_H . Comparatively little change in the content of buffer substances occurs during the subsequent days on the floor, but the p_H almost invariably falls during kilning. The amount of buffer substances is not affected by "stewing" the withered green malt at 32° and 46° for 48 hrs. There appears to be no relationship between the p_H or the buffer content of the malt on the one hand and the ordinary analytical results on the other. The precise condition of growing may affect the p_H more readily than the buffer content.

C. RANKEN.

Staining of bottom-fermentation beer yeasts with methylene-blue. H. HAEHN and M. GLAUBITZ (*Woch. Brau.*, 1929, 46, 315—320).—Not only dead cells, but those which, though weak, are capable of reproduction, are stained by methylene-blue and other dyes. By treatment for about 24 hrs. with 0.5% lactic or 0.1% sulphuric acid, preparations can be made in which all the cells stain, though fermentation and reproduction occur on adding the yeast to wort. The proportion of stained cells in normal yeasts, which may have been weakened by storage in an ice chest, depends on the concentration of the staining solution and the duration of its action. Methylene-blue of 0.05% concentration gives in most cases nearly twice as many stained cells as a 0.01% solution, and the latter concentration gives approximately the same number of deeply stained (dead) cells as are judged to be dead from examination of an unstained sample. The lightly stained cells are to be regarded as weakened. The stained preparations should be examined without delay, since a 15-min. contact with the dye increases the number of stained cells by a large but irregular amount. Sampling is important, as in one case different parts of the mass gave from 7% to 52% of stained cells. The decrease of fermentative power during storage is greater than the proportional increase of weak cells as shown by

staining; thus, 3.18 g. of a yeast containing 26.5% of stainable cells produced only 3.9 c.c. of carbon dioxide in 2 hrs., whereas 2.5 g. of the original yeast produced 14.8 c.c. Though the proportion of stainable cells is not directly related to fermentative power, it is a useful guide to the fitness of yeast. F. E. DAY.

Dextrin-fermenting yeasts. STAIGER and GLAUBITZ (*Z. Spiritusind.*, 1929, 52, 243).—The yeasts Logos, Race 12, and *Schizosaccharomyces Pombe* were compared as regards their fermentative powers on dextrin, dextrinous wort, and wort containing diastase. All fermented at similar rates and to similar alcohol yields, *S. Pombe* being slightly the weakest, but none fermented dextrin except in presence of diastase. The authors' previous conclusion (*B.*, 1925, 936) that Logos and Pombe yeasts are not capable of fermenting or hastening the fermentation of dextrin is confirmed.

F. E. DAY.

Determination of fermentative power of pressed yeasts from the point of view of bread-making. E. and L. ELION (*Bull. Soc. Chim. biol.*, 1929, 11, 724—730).—The best method of comparing yeasts as to suitability for bread-making is by measurement of the carbon dioxide evolved by a flour cake made with the yeast in question.

J. H. BIRKINSHAW.

Sediment yeast and pumping off in the fermenting cellar. F. WINDISCH (*Woch. Brau.*, 1929, 46, 308—310).—The superiority of the sediment yeast over that in suspension during primary fermentation is more marked when weak yeast (e.g., deposit from the secondary fermentation) is used for pitching. Dead and weak cells tend to remain in suspension to the end of the primary fermentation, and when weak pitching yeasts are used are present in an excessive proportion in the raw beer. Pumping off of the fermenting wort is considered to be of value in some cases, but is to be avoided where weak yeasts are used. F. E. DAY.

Boiling of wort in relation to the primary and secondary fermentation. R. HORCH and SCHULTEIS (*Woch. Brau.*, 1929, 46, 295—298).—An auxiliary boiling apparatus, consisting of a cylindrical casing, open below and containing steam-heated tubes, covered with a loose cap carrying three outlet tubes, was fitted in a steam-heated copper. By its vigorous boiling in the casing the wort is driven through the outlet tubes, which are so arranged that a rotation is imparted to the cap. The wort so ejected maintains an active agitation of the contents of the copper and breaks down any excessive froth. By its use the authors find that the time of boiling can be reduced from 2 to 1½ hrs., and that the evaporation rate is increased from 4—5% to 8—9% per hr. On the cooler 10—20% more sludge was collected, and this was denser and less voluminous than when the apparatus was not used. On reboiling the worts, the former yielded 0.81 g., the latter 0.93 g., of further coagulam per kg. of extract. The difference appears to be mainly due to increased precipitation of calcium phosphate, but the reaction and buffering of the worts during boiling and fermentation were not appreciably affected. The chief effect on the primary fermentation was that the yeast deposited during the first four days was coated with a brownish slime, and

had to be washed in an apparatus which removed this by mechanical attrition before a good press-cake was obtainable. The yeast which separated during the secondary fermentation was also darker than usual. The beers finished paler, had a fuller, cleaner flavour, and were in no way inferior to those boiled without the apparatus. It was found necessary to use 2–3% more hops, and to add these after the wort had boiled for 30 min. No comparisons have been made with wort boiled in fire-heated coppers, but it is suggested that the possibly well-founded objection of many brewers to steam-heated coppers could be overcome by designing them to permit of more vigorous boiling. F. E. DAY.

Adjustment of acidity of cane-molasses fermentations for maximum alcohol yields. F. M. HILDEBRANDT (Ind. Eng. Chem., 1929, 21, 779–781).—Maximum yields are obtained when the initial acidity is such that during fermentation the p_H shows no shift towards the acid side. This is generally, but not invariably, at about p_H 5, and may be attained by suitable addition of sulphuric acid. F. E. DAY.

Colorimetric determination of acidity in wort and beer. P. KOLBACH (Woch. Brau, 1929, 46, 305–308).—The usual colour-matching difficulties due to change of turbidity and colour with change of reaction and colloid and salt effects are eliminated by using a standard buffer solution which has the desired reaction when diluted to three times its volume, and diluting 10 c.c. of this with 20 c.c. of the wort or beer. To another 20 c.c. of wort or beer 10 c.c. of water are added, then a suitable indicator. The two mixtures are examined in a colour comparator, and standard alkali or acid is added to the unbuffered liquid until the indicator colours match. To the buffered portion an equal volume of alkali or acid is added, plus 10% to allow approximately for the extra amount which the wort or beer will require to obtain a match to the slightly altered tint. The wort is again adjusted by the further addition of reagent, and to a fresh buffer-wort-indicator mixture a volume equal to that used by the wort titration is added. The buffer can now be considered as being diluted with wort or beer of its own reaction, *i.e.*, its p_H is unaltered, and a fresh portion of 20 c.c. of wort with indicator and 10 c.c. of water is titrated to a colour match. For example, in the titration of the alkalinity of a wort to p_H 4.27, 10 c.c. of an acetate buffer solution, of that reaction when three times diluted, with 20 c.c. of wort and 2 c.c. of 0.15% chlorobromophenol-blue was compared against 20 c.c. of wort with 10 c.c. of water and 2 c.c. of indicator solution. The latter required 1.10 c.c. of 0.1N-hydrochloric acid, hence 1.21 c.c. of standard acid were added to the buffer mixture; the wort then required a further 0.13 c.c. of acid. To a fresh buffer mixture 1.23 c.c. of 0.1N-acid were added, and a fresh portion of 20 c.c. of wort required 1.22 c.c. of acid, equivalent to 6.10 c.c. per 100 c.c. of wort. The method is particularly applicable to the titration of worts to p_H 4.27, since the salt error due to the buffer compensates the dilution error of the wort. In the case of beers, the error introduced by dilution is less, and, if allowance is made for the salt error, the method is accurate to 0.05 p_H unit. Details

of the titration of wort acidity have yet to be worked out. F. E. DAY.

Clarification of wine by potassium ferrocyanide. E. COUERBE (Ann. Falsif., 1929, 22, 354–362).—It is claimed that potassium ferrocyanide can safely be used in the clarification of wine (removal of iron), there being no danger of formation of hydrocyanic acid if the correct quantity is employed. Excess of the ferrocyanide is readily detectable by taste, and produces blue precipitation and colour alteration in the wine after filtration. It is recommended that this process should be legalised in France, as it is in Germany, in place of the present method of treating with oxygen and then with tannin. E. B. HUGHES.

Raisin wine. L. CHAUVEAU and A. VASSEUR (Ann. Falsif., 1929, 22, 340–351).—The authors prefer the term “raisin piquette” rather than “raisin wine.” The chemical characteristics of raisin wine are discussed, and it is shown that for carefully-prepared raisin wines these may not differ, in general, from those of ordinary wine. The main distinctions to be relied on are odour and taste of the wine and its distillate, and the luminescence in Wood's light. E. B. HUGHES.

Determination of the p_H of wines. A. QUARTAROLI (Annali Chim. Appl., 1929, 19, 253–254).—A question of precedence. T. H. POPE.

Detection of ethyl phthalate in spirits. H. SZANCER (Pharm. Zentr., 1929, 70, 502–503).—A modification of the method of Utz (B., 1924, 687) is described. A few drops of the brown reaction mixture (sulphuric acid, resorcinol, and sample) are mixed with about 500 c.c. of water and then a few drops of ammonia are added. The fluorescence, if any, is very distinct, and, by comparison with the colour of the lower part of the liquid, easily recognised. In a similar way, if phenol instead of resorcinol and potassium hydroxide instead of ammonia be used, the violet-red colour due to the formation of phenolphthalein is easily distinguished. E. H. SHARPLES.

Determination of sulphurous acid in apple juice and cider. WARCOLLIER and LE MOAL (Ann. Falsif., 1929, 22, 333–340).—The methods of Haas and of Ripper are discussed. The former gives correct results. The latter gives high results with high percentages of sulphurous acid, and low results with low percentage. Ripper's method will, however, give satisfactory results, for rapid work, if the liquid after addition of caustic potash is allowed to remain alkaline for only 5 min. instead of 15 min. Caustic potash oxidises sulphur dioxide in presence of the tannins of the juice or cider. This modified method should apply equally well to wine. E. B. HUGHES.

See also A., Aug., 956, Preparation of diastase (WINKLER and KÖCK). 957, Proteolytic enzymes in green malt (MILL and LINDERSTRÖM-LANG). Alcoholic fermentation of amino-acids (PARISI and others). 959, Vitamin-B from brewer's yeast (SEIDELL).

PATENTS.

[Butyl alcohol-acetone] fermentation. E. R. WEYER (U.S.P. 1,696,022, 18.12.28. Appl., 4.3.27).—

Higher yields are obtained in the fermentation of carbohydrate mash by treating the mash during or after sterilisation with an antiseptic, such as resorcinol butyl or phenyl butyl ether, which is non-toxic towards the butyl alcohol-acetone-producing cultures but toxic to the contaminating organisms. R. BRIGHTMAN.

Manufacture of yeast. E. KLEIN, Assr. to FLEISCHMANN Co. (U.S.P. 1,722,803, 30.7.29. Appl., 17.8.23. Austr., 29.8.22).—See B.P. 205,813; B., 1924, 273.

XIX.—FOODS.

Composition of corn (*Zea mays*) seedlings.

I. Isolation of xylan and cellulose from cell walls. II. Isolation of a dextrin similar to the trihexosan obtained by thermal depolymerisation of potato starch. K. P. LINK (J. Amer. Chem. Soc., 1929, 51, 2506—2516, 2516—2522).—I. The seedlings are produced at 12° and 24° and the sprouts (radicle and plumule) killed with alcohol. Extraction of the finely-divided tissue with 90 and 99% alcohol and light petroleum (removal of fats etc.), subsequent digestion with 1% ammonia, and repeated treatment with chlorine dioxide and sodium sulphite (removal of proteins, pectin, lignin, etc.) affords an amorphous powder containing 0.33% of ash and 0.67% N. Extraction of this powder with 5% sodium hydroxide solution and treatment of the extract with alcohol precipitates xylan-A (8.5—9% of dry tissue), purified by reprecipitation from ammoniacal copper hydroxide solution. This is soluble in hot water, giving when cooled a thin gel, which swells when treated with alcohol. Hydrolysis first with 72% sulphuric acid at 15° and then with boiling 2% acid (by dilution) affords xylose. The residue after removal of xylan-A is extracted with 10% sodium hydroxide solution at 60°, whereby xylan-B is obtained (3—4% of dry tissue). The residue from this after extraction with 15% sodium hydroxide solution at 30° (to remove substances, not true pentosans, which give furfuraldehyde when distilled with 12% hydrochloric acid) consists of cellulose (14—18% of dry seedlings). This resembles cotton cellulose; it gives a triacetate, $[\alpha]_D^{20} = -22.1^\circ$ in chloroform, simultaneous acetylation and hydrolysis affords 46—48% of α -cellobiose octa-acetate, and dextrose is the only recognisable sugar produced by hydrolysis with sulphuric acid. There is a quantitative difference in the distribution of the xylans in the seedlings grown at 12° and at 24°, xylan-A predominating at the lower temperature. The total amounts of xylans are approximately the same in each case.

II. The sugar- and fat-free, dried tissue is extracted with 20% alcohol. The alcohol content of the extract is increased to 40%, when a dextrin (colour with iodine) is obtained. At a subsequent alcohol concentration of 85% a second dextrin (no colour with iodine), decomp. 220—230° without melting, $[\alpha]_D^{20} +163.6^\circ$ in water, is isolated. This is similar to the trihexosan described by Pictet and Jahn (A., 1922, i, 987), yields a nona-acetyl derivative, m.p. 152—153°, $[\alpha]_D^{20} +125.9^\circ$ in chloroform, and when hydrolysed with 2.5% sulphuric acid affords 92% of dextrose. Hydrolysis of its monomethyl derivative with 5% hydrochloric acid gives 6-methylglucose. The mol. wt. of the dextrin varies from 510 to 639 in water. H. BURTON.

Colour of wheat flour. A. C. HARDY, P. I. COLE, and C. W. RICKER, JUN. (Ind. Eng. Chem. [Anal.], 1929, 1, 151—152).—Spectrophotometric observations have been made on a number of grades of bleached and unbleached flour and their reflecting powers, referred to magnesium carbonate as standard, are represented graphically in an attempt to correlate colour with other known properties. Bleaching was found to raise the reflecting power in the blue end of the spectrum. To simplify the procedure measurements were made of brilliance at 556 m μ in the green, and of yellowness at 440 m μ in the blue region of the spectrum. It was observed that brilliance tends to decrease, and yellowness to increase, with increase of ash content. H. J. DOWDEN.

Effects of wheat drying on milling and baking properties. R. C. SHERWOOD (Bull. State Dept. Agric., Minnesota, No. 66, 1929, 35 pp.).—Comparison is made of direct and indirect methods for wheat drying, in which the air current is heated by means of coke furnaces and by steam radiators, respectively. In neither process was the milling or baking value of the wheat affected by the drying. Processes involving a continuous flow of grain are preferable to drying in batches since temperature control is more certain. In the indirect heating process the utilisation of air from the cooling section did not damage the wheat. The use of coke containing 0.56% S in the direct process did not lead to the absorption of appreciable amounts of sulphur dioxide by the grain. A. G. POLLARD.

Application of the bromate differential test in the estimation of baking quality of Canadian hard red spring-wheat flour. R. K. LARMOUR and A. G. MACLEOD (Sci. Agric., 1929, 9, 477—490).—The addition of potassium bromate (0.5 mg. per 100-g. loaf), to afford stimulation approximately proportional to the protein content, is preferred to the "basic standard baking test." Results with wheat containing 11.2—17.4% of crude protein are recorded.

CHEMICAL ABSTRACTS.

Effect of [feeding with] lupin-fish meal on the quality of milk and butter fat. O. MROZEK, H. SCHLAG, and A. EICHSTÄDT (Milchwirt. Forsch., 1929, 7, 495—501; Chem. Zentr., 1929, i, 1162).—The proportion of large fat particles is reduced. The iodine value of the fat tends to rise and the Polenske value to fall, whilst the saponification and Reichert-Meißl values remain unchanged. A. A. ELDRIDGE.

Adulteration of butter and ghee with animal fat and vegetable ghee, and its detection. P. SANXAL (Mem. Dept. Agric. India, 1929, 10, 143—155).—One gram of the melted filtered fat is dissolved in 3 c.c. of dry ethyl acetate, warmed to 30°, 4 c.c. of 93% alcohol at 30° are added, with mixing, and the liquid is kept at 30° for 30 min. With genuine butter and ghee no precipitate forms, but if foreign fat is present (5% upwards of animal fat, and 12% upwards of vegetable fat) a precipitate proportional to the amount of adulterant (up to 25%) separates. Butter or ghee from buffaloes fed on cotton-seed cakes gives a precipitate, but none in a similar test using 4 c.c. of ethyl acetate and 3 c.c. of 93% alcohol, though with reagents in

these proportions the test is less sensitive, indicating not less than 12% of foreign animal fat.

E. B. HUGHES.

Blue milk. W. STOCKER (Milchwirt. Forsch., 1929, 7, 332—339; Chem. Zentr., 1929, i, 1161).—Conditions leading to the production of blue milk (due to the presence of Beijerinck's *Acetomyces*) are described.

A. A. ELDRIDGE.

Determination of f.p. of milk. J. KRENN (Milchwirt. Forsch., 1929, 7, 436—445; Chem. Zentr., 1929, i, 1163—1164).—Of 188 samples tested, none had $\Delta \times 10^2$ less than 51.5. For milk of individual cows, those having $\Delta \times 10^2$ above 53 are genuine, 53.0—50.0 probably, and under 50 certainly diluted.

A. A. ELDRIDGE.

Optical detection of watering of milk. E. MUNDINGER (Milchwirt. Forsch., 1929, 7, 280—291; Chem. Zentr., 1929, i, 1163).—The refractivity of a drop of milk, determined by Löwe's method, bears a fairly constant relation to the total solids. Shaking and small variations in acidity affect the result but slightly.

A. A. ELDRIDGE.

Sensitiveness of the "thybromol" test in comparison with other methods for detecting pathological changes in milk. G. ROEDER (Milchwirt. Forsch., 1929, 7, 365—435; Chem. Zentr., 1929, i, 1164).—The "thybromol" test is preferred.

A. A. ELDRIDGE.

Water content of cheese. K. TEICHERT and H. SCHLAG (Milchwirt. Forsch., 1929, 7, 259—270; Chem. Zentr., 1929, i, 1162).—Average values for cheese containing 40—50 (or 20—30)% of fat are: Emmental 35, Dutch 43 (50), Tilsit 43 (52), Limburg 50 (60), Camembert 55 (62). In young cheese higher values are permissible.

A. A. ELDRIDGE.

Changes produced in eggs by micro-organisms. G. L. PAVARINO (Annali Chim. Appl., 1929, 19, 266—272).—Altered eggs from store showed spots due to moulds on the interior of the shell, and the yolk was sometimes liquefied and the white turbid and watery and often coloured superficially by a green fluorescent pigment. These changes were due mainly to *B. fluorescens-liquefaciens*, *Micrococcus roseus*, and *Staphylococcus aureus*.

T. H. POPE.

Viscosity of egg albumin and the changes it undergoes in fresh and preserved eggs. D. CORTESE (Annali Chim. Appl., 1929, 19, 260—265).—In eggs kept at the ordinary temperature, the viscosity of the albumin diminishes rapidly and fairly regularly, in spite of the evaporation of water which occurs. At lower temperatures, fluidification also proceeds regularly but is far more slow. In accord with the known dissolving and liquefying action of bacteria, the diminution in viscosity is much more rapid in altered eggs.

T. H. POPE.

Influence of p_H of the white on keeping quality of hen eggs. P. F. SHARP (Science, 1929, 69, 278—280).—Control of the p_H value is essential in the storage of eggs. Freshly-laid eggs containing few bacteria keep well if the p_H value is maintained at about 7.6, the normal figure; a rise in the p_H value favours the factors which make for deterioration. The loss of carbon

dioxide by stored eggs causes the p_H to rise to about 9.7 and the white to become fluid; the addition of small percentages of carbon dioxide to the storage atmosphere hinders this change. L. S. THEOBALD.

Effect of certain salts on the physical properties of ice cream mixes. J. C. HENING and A. C. DAHLBERG (J. Dairy Sci., 1929, 12, 129—139).—Addition of sodium citrate, potassium oxalate, or sodium hydrogen phosphate to ice cream before pasteurisation and homogenisation reduces the viscosity, diminishes the size of the fat-globule clumps, and causes easier whipping. The size of the clumps is probably related to the viscosity. Calcium lactate increased both, causing more difficult whipping; lactic or citric acid had a similar effect. Difficult whipping can be corrected by addition of alkali. The relative amounts of sodium and calcium salts in ice cream made from normal dairy products probably varies sufficiently to affect the whipping properties.

CHEMICAL ABSTRACTS.

Metals in dairy equipment; metallic corrosion in milk products and its effect on flavour. O. F. HUNZIKER, W. A. CORDES, and B. H. NISSEN (J. Dairy Sci., 1929, 12, 140—181).—A study of the effect of various metals, coated metals, and alloys on dilute solutions of acids and on milk products.

CHEMICAL ABSTRACTS.

Production of caffeine-free coffee. F. IHLÖW (Chem.-Ztg., 1929, 65, 629—630).—Plant for the purpose is described.

See also A., Aug., 947, **Irradiated proteins** (SPIEGEL-ADOLF and KRUMPEL). 953, **Inorganic constituents of milk** (WRIGHT and PAPISH). 959, **Antineuritic and water-soluble B-vitamins in beef and pork** (HOAGLAND). 960, **Effect of drying and of sulphur dioxide on antiscorbutic property of fruits** (MORGAN and FIELD). 962, **Determination of chlorine in foods** (BIRNER).

Spray drying of dairy products. NYROP.—See I. **Spontaneous decomposition of butter fat.** MUNDINGER.—See XII. **Yeasts for bread-making.** E. and L. ELION. **Sulphurous acid in apple juice.** WARCOLLIER and LE MOAL.—See XVIII.

PATENTS.

Apparatus for manufacture of margarine. H. BORGES and G. W. WADSWORTH (B.P. 316,481, 25.10.28).

Food product [in cheese envelope]. E. GALBANI (B.P. 316,850, 22.1.29).

Method and apparatus for use in preparation of malted foodstuffs. J. SLEEMAN (B.P. 315,329, 10.1.28).

Food products [from honey]. O. A. SIPPEL (B.P. 312,036, 30.10.28. U.S., 18.5.28).

XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Determination of formaldehyde in a pharmaceutical preparation. O. HEIM (Ind. Eng. Chem. [Anal.], 1929, 1, 128).—To a 10-c.c. sample (about 0.2% of formaldehyde) 2 c.c. of hydrochloric acid and 10 c.c. of *N*-silver nitrate are added, and, after shaking, 4 c.c. of 50% sodium hydroxide. After 15—20 min.

with occasional shaking the blackened precipitate is washed and the reduced silver is dissolved in nitric acid and determined in the usual way as silver chloride ($2\text{AgCl} = 1\text{CH}_2\text{O}$).

C. HOLLINS.

Acids of tobacco. I. A. SCHMUCK (U.S.S.R. State Inst. Tobacco Invest., 1929, Bull. 50, 10 pp.).—By extracting fermented Trebizond tobacco with dilute hydrochloric acid, and extracting the concentrated filtrate with ether, a solution was obtained containing malic, succinic, fumaric, acetic, and formic acids, together with other acids not yet identified.

T. H. POPE.

Acids of tobacco as a qualitative indication of its value. M. PIATNSKI (U.S.S.R. State Inst. Tobacco Invest., 1929, Bull. 51, 11 pp.).—The proportion of total acids present in tobacco, determined by extracting the acidified tobacco with ether and titrating the extracted matter with standard sodium hydroxide solution, is lower in good than in poor tobaccos.

T. H. POPE.

Determination of nitrate-nitrogen in tobacco. H. B. VICKERY and G. W. PUCHER (Ind. Eng. Chem. [Anal.], 1929, 1, 121—123).—To avoid large blank determinations, nicotine and pre-existing ammonia are removed by steam distillation of a suspension of the tobacco product in alkaline solution. Two 5-g. samples of the material with 30 c.c. of water and 5 c.c. of 50% sodium hydroxide solution are steam-distilled into 0.1N-hydrochloric acid until 800 c.c. have been collected. Titration of the distillate gives total volatile bases, nicotine being determined subsequently by the silicotungstic acid method. Nitrate-nitrogen is determined in one of the residues by reduction with sulphuric acid and iron powder (cf. Jones, B., 1927, 262). The second residue is used for a blank determination, the difference in the titration values of the two residues being the nitrate-nitrogen in the original sample. Wide variations in nicotine and nitrate-nitrogen were observed.

H. J. DOWDEN.

Determination of ammonia and amide-nitrogen in tobacco. H. B. VICKERY and G. W. PUCHER (J. Biol. Chem., 1929, 83, 1—10).—Ammonia can be determined in presence of other volatile bases by absorption with permutit followed by liberation from the latter with alkali and determination by Nessler's reagent. Extract of tobacco is distilled over magnesium oxide, and the ammonia in the distillate determined by the above method; similar treatment of another sample of extract after hydrolysis with hydrochloric acid gives the sum of the ammonia- and amide-nitrogen.

C. R. HARRINGTON.

Nicotine content of fresh tobacco leaves. S. NISHIYAMA (Bul. Sci. Fak. Terkultura, 1929, 3, 10—15).—The nicotine content increases from the lower to the higher leaves.

CHEMICAL ABSTRACTS.

Determination of nicotine in tobacco. M. SAMEJIMA and K. KATAI (Bul. Sci. Fak. Terkultura, 1929, 3, 112—116).—Kissling's, Chapin's, and Okuda's methods give similar results. Toth's method gives high, and Fodor and Reifenberg's method low, results.

CHEMICAL ABSTRACTS.

Determination of morphine in opium, opium extract, and tinctures. J. BOEHM (Apoth.-Ztg., 1929,

44, 88—91; Chem. Zentr., 1929, i, 1244).—The official (D.A.B. VI) method gives high and variable results, whilst Hairs' method gives concordant, although somewhat low, results. A new procedure is described.

A. A. ELDRIDGE.

An impurity in commercial narceine, which gives the colour reaction with sodium nitroprusside. J. J. L. ZWIKKER (Pharm. Weekblad, 1929, 66, 445—449).—The earlier observation (cf. A., 1929, 832) that narceine gives a coloration with nitroprusside is found to be erroneous; the colour is due to the presence of a small quantity of methylnarceine, formed in methylation during the synthesis from narcotine. Pure narceine gives no colour, but the presence of 1 mg. of the methyl derivative in 50 mg. of the alkaloid is enough to give a positive reaction. The m.p. of the hydrochloride of the methyl compound is 234° , and not 243° , as given by Tambach and Jäger (cf. A., 1906, i, 879). S. I. LEVY.

Preparation of emodin. C. ROULIER and R. DUBREUIL (Bull. Soc. Pharm. Bordeaux, 1928, 66, 145—152; Chem. Zentr., 1929, i, 888).—The bark of *Rhamnus frangula* is heated for $\frac{1}{2}$ hr. at 75° with five times its weight of 97% alcohol and 1 g. of hydrogen chloride per 5 litres of liquid. After cooling and separation by pressure the liquid is evaporated, the residue dried in a vacuum at the ordinary temperature, and the powdered material is treated in a mortar with 5% ammonia solution until a red coloration no longer appears. The solution is precipitated in presence of ether with excess of hydrochloric acid, and exhaustively extracted with several litres of ether. The ether is evaporated; the residue is hardened by cooling or keeping, dissolved in the minimal quantity of 5% ammonia solution, filtered, precipitated with hydrochloric acid, centrifuged, and washed twice with distilled water, these operations being repeated, and the precipitate dried over sulphuric acid for several days. It is then redissolved in ether and extracted with 5% ammonia solution; the ether is completely removed and the hot liquid precipitated dropwise with hydrochloric acid. The mixture is cooled slowly, centrifuged, decanted, and the precipitate washed with distilled water and dried over sulphuric acid, being finally extracted 3—4 times with 97% alcohol, which is then slowly evaporated.

A. A. ELDRIDGE.

Commercial lecithins and specialities with lecithin as base. I. J. SONOL (Rev. fac. cienc. quim. Univ. La Plata, 1927, 4, No. 2, 95—110).—The purest commercial specimens of lecithin contain cholesterol and other substances. The following method of preparation is preferred: The tissue is dried over acetone, and extracted for 12—24 hrs. three times at 50° with absolute ethyl alcohol, which is incompletely removed in a vacuum. The yellow liquid is decanted from the lower red liquid, concentrated in a vacuum, and treated with a little ether. The lecithin is precipitated three times with acetone and dried to remove acetone.

CHEMICAL ABSTRACTS.

Assay of belladonna. J. NOLLE (Arch. exp. Path. Pharm., 1929, 143, 184—191).—A unit is defined as that amount of a preparation which after 10 minutes' action renders the frog's gastrocnemius insensible to acetylcholine (1/100,000). The contents of a number

of commercial extracts expressed in physiological units are tabulated and show marked deviation from the alkaloid content as determined chemically.

P. W. CLUTTERBUCK.

Water content of essential oils and turpentine. H. NICOL (Compt. rend., 1929, 189, 289—292).—The absorption of radiant heat by the vapours of essential oils, observed by Tyndall, is believed to be due chiefly to the water which they contain, and attention is drawn to the fact that these oils are distilled in the presence of water. A simple conductivity method for measuring the relative water content has been devised; the results are in agreement with those obtained by a qualitative electrostatic method and by the turbidity produced when they are mixed with turpentine. Oils from xerophilous plants and from peels of citrous fruits are anhydrous and even hydrofuge, whilst those from the *Cymbopogon* may have a relatively high water content. From these facts conclusions concerning the botanical history of the oils have been drawn. Of all the products of plant physiology examined, only turpentine gives a turbidity with every oil containing water.

A. A. GOLDBERG.

Oil of *Asarum Europeanum*. S. GERÖ (Riechstoffind., 1928, 3, 176—177, 195—196, 214—216, 232; Chem. Zentr., 1929, i, 946—947).—The composition of the essential oil of the root of *Asarum Europeanum* depends on soil and climatic conditions. The oil contains *asaraldehyde*, $C_{10}H_{12}O_4$, m.p. 114° (*oxime*, m.p. 138°), *asarone* (*dibromide*, m.p. 86°), *diasarone* ($C_{12}H_{16}O_3$)₂ (oxidised to *asaronic acid*, m.p. 144°), an ethereal substance, $C_{11}H_{18}O$, a sesquiterpene, and a sesquiterpene alcohol.

A. A. ELDRIDGE.

Hungarian essential oils. M. JANICSEK (Riechstoffind., 1928, 3, 211—213; Chem. Zentr., 1929, i, 946).—The following data are recorded for the corresponding essential oils: *Thymus vulgaris*: d_{20}^{15} 0.9051, $\alpha_D -2^\circ 80'$, n_D^{20} 1.4922; *Thymus serpyllum*: d_{20}^{15} 0.8944, $\alpha_D -10.93^\circ$, n_D 1.4859; *Salvia officinalis*: d_{20}^{15} 0.9195, $\alpha_D +13^\circ 32'$, n_D^{20} 1.4631 (German seed), and d_{20}^{15} 0.9165, $\alpha_D -1.60^\circ$, n_D^{20} 1.4623 (French seed); *Mentha crispata*: d_{20}^{15} 1.4793; *Chenopodium ambrosioides* var. *anthelminticum*: d_{20}^{15} 0.9852, $\alpha_D -8^\circ 39'$, n_D^{20} 1.4760; *Lavandula vera*: d_{20}^{15} 0.8885, $\alpha_D -7^\circ 37'$, n_D^{20} 1.4632; *Juniperus communis*: d_{20}^{15} 0.8686, $\alpha_D -5^\circ 61'$, n_D^{20} 1.4802, and data for rectified and residual oil; *Mentha piperita*: data for various fractions.

A. A. ELDRIDGE.

Hungarian essential oils. M. FÖLSCH (Riechstoffind., 1928, 3, 181, 197—198, 217—218, 233—234; Chem. Zentr., 1929, i, 945—946).—The following data are recorded for the corresponding essential oils: peppermint: d_{20}^{15} 0.901—0.905, $\alpha_D -26.38^\circ$, n_D^{20} 1.4605, total menthol 59.6%; *Tanacetum vulgare*, L.: d_{20}^{15} 0.926; *Salvia officinalis*, L.: d_{20}^{15} 0.926; *Salvia sclarea*, L.: d_{20}^{15} 0.918, $\alpha_D +4^\circ$, n_D^{20} 1.4603, acid value 1.25, ester value 21.2 (after acetylation 69); *Achillea millefolium*: d_{20}^{15} 0.935; *Thymus vulgaris*: d_{20}^{15} 0.916; *Juniperus communis*, L.: d_{20}^{15} 0.876, $\alpha_D -7^\circ 12'$, n_D^{20} 1.4793; wine lees oil: d_{20}^{15} 0.8771, $\alpha_D +0.5^\circ$, n_D^{20} 1.4296, acid value 54, ester value 208; *Artemisia absinthum*: d_{20}^{15} 0.937.

A. A. ELDRIDGE.

See also A., Aug., 916, **Synthesis of ephedrine and**

its homologues (MANSKE and JOHNSON). 932, **Cedrene** (RUZICKA and VAN MELSEN). 933, **Rotenic and tubaic acids from *Derris* root** (TAKEI and others). 934, **Tea catechin from green tea** (TSUJIMURA). 939, **Copper compounds of diethylbarbituric acid** (ROMANOWA). 943, **4-*mp*-Dihydroxyphenylthiazoles** (JOHNSON and GATEWOOD). 944, **Nicotine tetra-chloriodide** (CHATTAWAY and PARKES). **Calycanthine from *Meratia praecox*** (MANSKE). ***Strychnos* alkaloids** (LEUCHS and HOFFMANN). **Disinomenine and ψ -disinomenine** (GOTO and SUDZUKI). 948, **Micro-determination of sulphur, phosphorus, and arsenic in organic compounds** (HELLER). 949, **Determination of cocaine in physiological material** (SADOLIN). 959, **Standardisation of thyroid preparations** (MÖRCH). **Vitamin-B from brewer's yeast** (SEIDELL). **Antineuritic and water-soluble B vitamins in beef and pork** (HOAGLAND). 961, ***Phytolacca*** (JENKINS). **Lobeline-like substance from roots of *Lobelia sessilifolia*** (KUBOTA and others). ***isoSakuranetin*** (HATTORI).

PATENTS.

Antiseptic anaesthetic salts. E. H. VOLWILER and D. L. TABERN, ASSRS. to ABBOTT LABS. (U.S.P. 1,708,712, 9.4.29. Appl., 25.7.27).—Compounds of *n*-butyl *p*-aminobenzoate and a halogenated phenolsulphonic acid have both antiseptic and anaesthetic action. The *n*-butyl *p*-aminobenzoates of 2:6-di-iodo-, m.p. 200° (decomp.), and 2:6-dibromo-phenol-4-sulphonic acid, m.p. 216 — 218° , and of 7-iodo-8-hydroxyquinoline-5-sulphonic acid, m.p. 235 — 240° , are described. R. BRIGHTMAN.

Chloro-*n*-amylmalonamide. A. W. DOX, ASSR. to PARKE, DAVIS, & CO. (U.S.P. 1,713,822, 21.5.29. Appl., 28.5.28).—Ethyl *n*-amylmalonate, b.p. 134 — $136^\circ/14$ mm., is converted into *n*-amylmalonamide, m.p. 206° , which, when chlorinated in acetic acid, yields chloro-*n*-amylmalonamide, $Me \cdot [CH_2]_4 \cdot CCl(CO \cdot NH_2)_2$, m.p. 134 — 135° , claimed as a sweetening agent. R. BRIGHTMAN.

Production of camphene from pinene hydrochloride. H. GAMMAY (U.S.P. 1,721,990, 23.7.29. Appl., 28.1.26).—See B.P. 263,311; B., 1927, 156.

Production of menthol. H. JORDAN, W. SCHOELLER, and R. CLERC, ASSRS. to CHEM. FABR. AUF ACTIEN (VORM. E. SCHERING) (U.S.P. 1,706,784, 26.3.29. Appl., 15.8.27. Ger., 22.2.27).—See B.P. 285,833; B., 1929, 699.

Increasing the yield in civetone, starting from civet. L. RUZICKA, ASSR. to M. NAEF & CO. (U.S.P. 1,720,748, 16.7.29. Appl., 25.1.27. Switz., 17.3.26).—See B.P. 267,893; B., 1927, 892.

[Recessed] surgical dressings. A. E. M. HUNN and C. R. GRAY (B.P. 316,112, 23.3., 13.6., and 11.7.28).

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Theory of hypersensitisation. K. JACOBSON (Z. wiss. Phot., 1929, 27, 19—23).—The hypersensitisation treatment previously described (B., 1928, 211) has a much greater effect on emulsions prepared by the heating method than on those prepared with ammonia. This is probably largely due to ammonia being necessary

for the formation of silver sulphide nuclei by the allylthiocarbimide in the gelatin (cf. Sheppard and Hudson, B., 1927, 765).

R. CUTHILL.

Distribution of silver iodide in silver bromide. LÜPPO-CRAMER (Z. wiss. Phot., 1929, 27, 9—19).—An ammoniacal silver bromide-iodide emulsion in the preparation of which a considerable excess of alkali bromide has been used shows a pronounced tendency to solarisation and the nuclei are remarkably sensitive to the action of chromic acid. These effects do not appear, however, if no iodide is present. In presence of iodide the grains are more or less of a uniform size, whereas in absence of iodide some are smaller and others are larger. Nevertheless there does not seem to be any connexion between variability in size of grain on the one hand, and liability to solarisation and sensitivity to denucleation on the other. It is suggested that the iodide acts by forming a surface layer on the bromide grains, for iodide is known to solarise particularly readily, and acid would displace adsorbed iodide from the surface of the ripening nuclei more easily than adsorbed bromide. Addition of the iodide as silver iodide to the bromide emulsion before mixing has the same effect as adding it as alkali iodide, which would agree with the observations of Baldsiefen, Sease, and Renwick (B., 1926, 466) on the peptisation and inclusion of silver iodide by freshly-formed silver bromide. Addition of silver iodide after the bromide emulsion has been mixed, however, has no effect of any kind.

R. CUTHILL.

See also A., Aug., 871, **Photodichroism and photoanisotropy** (WEIGERT). 893, **Nature of sensitivity and latent image** (GERMANN and SHEN). 894, **Photochemistry of silver halides** (SCHMIDT and PRETSCHNER). **Primary process in formation of latent image** (SHEPPARD). **Measurement of induced photodichroism** (WEIGERT). 902, **Magnesium light for photographic sensitometry** (EDER).

PATENTS.

Combined [photographic] desensitiser and developer. H. MEYER, Assr. to AGFA ANSCO CORP. (U.S.P. 1,713,613, 21.5.29. Appl., 8.9.27. Ger., 13.11.26).—Cyanides of heavy metals are claimed as desensitisers; e.g., 0.3 g. of mercuric cyanide is added to 1 litre of a metol-quinol developer.

R. BRIGHTMAN.

Photographic silver halide emulsion. O. MATTHIES and W. DIETERLE, Assrs. to AGFA ANSCO CORP. (U.S.P. 1,719,711, 2.9.29. Appl., 6.8.26. Ger., 14.9.25).—See B.P. 258,237; B., 1927, 861.

Film for lenticular-screen colour photography. R. BERTHON, Assr. to Soc. CIVILE POUR L'ÉTUDE DE LA PHOTOGRAPHIE ET DE LA CINÉMATOGRAPHIE AU COULEURS (U.S.P. 1,721,244, 16.7.29. Appl., 17.6.29. Fr., 20.7.26).—See B.P. 274,837; B., 1928, 286.

XXII.—EXPLOSIVES; MATCHES.

See also A., Aug., 940, **New group of hydrazomethylenes** (BUSCH and others).

PATENTS.

Manufacture of nitrocellulose smokeless powder. A. S. HAWKESWORTH (U.S.P. 1,713,505, 14.5.29. Appl.,

11.6.28).—Nitrocellulose is simultaneously dried, dissolved, and stabilised by means of mononitrotoluene.

H. ROYAL-DAWSON.

Manufacture and packing of matches. A. OVTSCHINNIKOFF (B.P. 316,592, 27.1.28).

XXIII.—SANITATION; WATER PURIFICATION.

Sodium peroxide respirators. G. STAMPE and E. HORN (Z. angew. Chem., 1929, 42, 776—779).—In 12 experiments the period of service of a sodium peroxide respirator averaged 61 min., with a mean deviation of 3.5 min. The addition of 0.1% of various "catalysts" (manganese dioxide, copper oxide, etc.), in general, raised the period of service, but produced greater fluctuations from the mean value in series of repeat experiments. The period of service can be somewhat lengthened by the introduction of a drying agent (calcium chloride) into the lower part of the respirator. The activity of the sodium peroxide falls off on keeping. The material used, "pyroxylit," had a water content of 6%, which appears to be about the optimum for use in respirators.

A. B. MANNING.

Biochemical oxygen demand of certain substances. G. E. SYMONS and A. M. BUSWELL (Ind. Eng. Chem. [Anal.], 1929, 1, 161—162).—An attempt has been made to establish a relationship between the biochemical oxygen demand and the theoretical oxygen demand of lactose, starch, cellulose, sodium palmitate, peptone, and urea. The demands of a filtered sewage as control and of the control plus the pure substance have been studied over a period of 30 days, the difference being the oxygen demand of the pure substance. Difficulty was experienced at the 15th day, when nitrification began in the control, but the procedure was again applicable when nitrification also set in in the other series. Urea undergoes nitrification from the start and does not present this difficulty. It was found that with carbonaceous substances the oxidation follows an equation of the first order, but the biochemical oxygen demand is only 70—85% of the theoretical demand. Urea shows only second-stage oxidation, and the biochemical oxygen demand is equal to the calculated demand.

H. J. DOWDEN.

See also A., Aug., 904, **Trinidad well waters** (PARKER and SOUTHWELL).

Insecticides. HART.—See XVI.

PATENTS.

Removal of dissolved silicic acids from liquids, especially water for domestic or industrial uses. A. ROSENHEIM (B.P. 291,435, 1.5.28. Ger., 4.6.27).—The water is filtered through beds comprising dried gels capable of forming insoluble or only slightly soluble silicic acid adsorption compounds, polysilicic acid compounds, or double silicates, e.g., oxides or hydroxides of iron, chromium, or the elements of group III, or mixtures of these. The process can be combined with softening by using gels containing alkalis. The gels are regenerated by treatment with alkalis etc.

L. A. COLES.

Apparatus for treating refuse. F. C. EVANS (B.P. 315,458, 13.4.28).