

BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

FEBRUARY 5, 1926.

I.—GENERAL; PLANT; MACHINERY.

Measurement of temperature by thermocouples in unequally heated enclosures. W. MANDELL (Proc. Physical Soc., 1925, 38, 47—68).—A consistent difference in the temperature recorded by thermocouples of different thickness has previously been observed. Further experiments with four couples of different diameter in a gas enclosed between two plates at different temperatures confirm the observation. The thickest couple recorded the highest temperature near the hot plate, and the thinnest the highest temperature near the cold plate. The recorded temperature varies with different gases, being nearest the true value in hydrogen. The temperature of a couple of zero diameter, found by extrapolation, was taken as the true temperature. When the temperatures of the plates differed by 200° in air the difference between the temperature of the zero couple and of the thickest was 20°. The walls of the vessel also affect the recorded temperature. All the couples agreed at some temperature between the plates, this being nearer the hot plate with black, than with bright, surfaces. The results are explained by radiation and molecular impact effects. The conclusion is reached that thermocouples cannot be used as precision instruments in industrial plant except under black-body conditions of radiation. C. J. SMITHELLS.

Application of spectro-photography to measurement of high temperatures. I. O. GRIFFITH (Proc. Physical Soc., 1925, 38, 85—87).—The spectrum of the source is photographed through a neutral wedge placed immediately in front of a photographic plate. The curved boundary of the spectrum varies in height, the variation depending upon the distribution of energy in the source, and therefore upon its temperature. It is assumed that the source radiates as a black or grey body, but with certain limitations the method is applicable to bodies which are neither black nor grey. The probable error is 40° at 5000° and 150° at 10,000°. C. J. SMITHELLS.

Photo-electric radiation pyrometer. F. A. LINDEMANN and T. C. KEELEY (Proc. Physical Soc., 1925, 38, 69—73).—By means of two photo-electric cells with suitable colour filters the energy radiated in two distinct spectral bands is compared. By combining the ascertained sensitivities of the cells and their filters with the radiation law the black-body temperature of the radiator can be determined. The accuracy of measurement is 1.6° at 2000°, 3° at 3000°, and 7° at 4000°. C. J. SMITHELLS.

Gallium-in-quartz thermometer graduated to 1000°. S. BOYER (Ind. Eng. Chem., 1925, 17, 1252—1253).—The b.p. of gallium is 1700° and when highly purified and sealed in quartz tubes under 2 or 3 μ pressure the metal may often be cooled to -15° or -20° before solidifying. In order to prevent wetting of the quartz thermometer capillary tube, oxide films, occluded gas (present in electrolytically prepared gallium), and any traces of zinc or arsenic must be absent. Oxide is removed by hydrochloric acid, the bright metal is solidified under acid, the excess of acid removed, and the gallium transferred to the vacuum apparatus where the protective surface film of chlorides is removed by volatilisation, and the metal introduced into the attached thermometer tube. In order to etch the thermometer stem polymerised tung oil is used as a protective coating. The etched marks are coloured greyish-black by a mixture of copper oxide and sand. D. G. HEWER.

Measurement of humidity in closed spaces. E. GRIFFITHS (Engineering Committee of the Food Investigation Board, Special Report No. 8, 1925, 54 pp.).—An account is given of experiments made with existing types of hygrometers, together with a description of novel instruments and methods of hygrometry designed to meet special requirements. Various methods of controlling the humidity in closed spaces are also described. J. S. G. THOMAS.

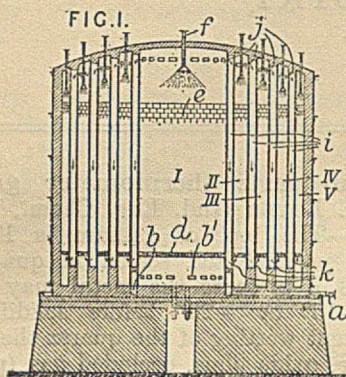
See also A., 1926, 12, **Examination of nickel catalysts with X-rays** (CLARK, ASBURY, and WICK). 19, **Adsorption by coconut charcoal from alcohol-benzene and acetone-benzene mixtures** (TRYHORN and WYATT). 41, **Automatic pressure regulator** (DAWSON); **Viscosity measurements by means of Mohr's balance** (STICH); **Circulation apparatus for gases** (CHATTERJI and FINCH).

Gas masks. ENGELHARD.—See XXIII.

PATENTS.

Absorption apparatus for gases and vapours. CHEM. WERKE LOTHRINGEN G.M.B.H. (E.P. 236,918, 24.6.25. Conv., 10.7.24).—Gases or vapours are absorbed by a liquid in a series of towers, I to V, one within the other. The gases are introduced through the pipe, *a*, and circular channel, *b*, having apertures, *b'*, and pass upwards through the perforated plate, *d*, and filling material, *e*, in the tower, I, absorbent liquid being sprayed in through *f*. The gases pass from each tower to the next outer one through annular passages, *i*, and apertures, *j*, *k*.

The apparatus is specially suitable for absorbing nitrous gases, in which case the outermost tower is



supplied with an alkaline solution to absorb the last traces of nitrous gases. S. BINNING.

Colloid mills, and drying, concentrating, mixing, emulsifying, grinding, and like machines. RISSIK, FRASER AND CO., LTD., and A. FRASER (E.P. 243,052, 16.8.24).—A colloid mill consisting of a pair of discs, preferably with concentric, intercalating corrugations, rotating at high speed in opposite directions, is provided with a main feed of material at the centre of the discs, also with an auxiliary feed to a zone between the centre and circumference, the passages for this being formed in the thickness of one disc. The portion of the discs between the centre and the auxiliary inlets may be provided with teeth (interrupted corrugations) to provide a preliminary grinding action upon the material that enters by the main feed. Instead of two discs rotating in opposite directions, there may be one fixed and one rotating disc. B. M. VENABLES.

Grinding, milling, and pulverising apparatus. R. K. RAMSAY and M. J. MAYHEW (E.P. 243,166, 28.11.24).—A grinding machine of the disintegrator type is provided with a fan for withdrawing the ground material. The fan has curved pivoted blades which will yield without breaking when struck by a piece of uncrushable material, and are held in their working position by centrifugal force; this enables the fan to run at the same high speed as the disintegrator and to be driven by the same shaft. The disintegrator beaters are loosely mounted on pivots and are of such a shape that they will automatically change their position and expose fresh wearing surfaces every time the mill is stopped. B. M. VENABLES.

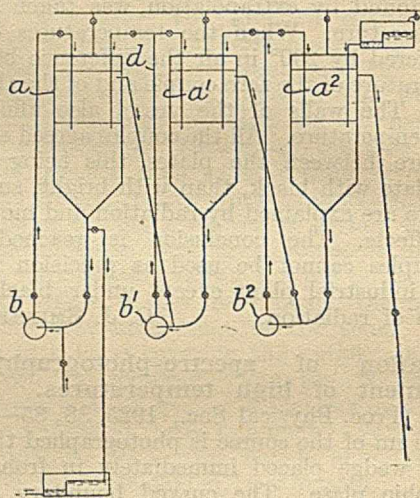
Filtering liquids [e.g., separating oil from water]. PIRBRIGHT CO., LTD., and J. T. PEDDIE (E.P. 243,107, 9.9.24).—A filter suitable for the separation of a small quantity of oil from water is constructed of cow hair and a coarse textile fibre, e.g., jute, made into a felt and associated with wire or a perforated backing. B. M. VENABLES.

Apparatus for filtering dust-laden gases. T. THOMSON and N. NISBET (E.P. 243,117, 18.9.24).—Gases such as blast-furnace gas are filtered several times through the same moving diaphragm, the crude

gas passing first through the freshly cleaned diaphragm, which is capable of retaining only the coarser particles of dust. The deposition of dust partially closes the pores of the diaphragm and makes it capable of retaining the finer dust when gas is again passed through. All the passes must be in the same direction through the diaphragm. The diaphragm preferably consists of loose material which is allowed to descend between vertical perforated walls to a cleaning apparatus at the bottom. B. M. VENABLES.

[Edge] filters. GENERAL ELECTRIC CO., LTD., and L. D. GOLDSMITH (E.P. 243,176, 6.12.24).—In a filter of the edge or stream-line type for filtering hot gases, the impermeable sheets are made of fibrous heat-resisting material with a rough surface, e.g., asbestos paper. B. M. VENABLES.

Treatment of liquids [e.g., continuous-current washing of mineral oils]. T. A. SMITH (E.P. 243,113, 13.9.24).—A liquid is washed by successive intermixture with another liquid of different density and the mixed liquids are passed successively into a series of settlers, a , a^1 , a^2 . The mixers may con-



veniently take the form of centrifugal or other pumps, b , b^1 , b^2 , which also act as circulating pumps. The liquids circulate in counter-current as indicated by the arrows, and the delivery pipe, d , of each pump is divided, so that part of the mixed liquids passes to the settler from which the less dense liquid is derived and part to the settler from which the denser liquid is derived. The method is applicable to the refining of mineral oils. B. M. VENABLES.

Still. M. F. DE BAJLIGETHY (U.S.P. 1,562,690, 24.11.25. Appl., 20.6.22).—The still comprises a boiler in which a number of drums are mounted, one end of each drum projecting from the boiler and being provided with a detachable head. The inner end of each drum is provided with an inlet pipe, part of which is formed as a heating coil in a furnace setting, and the outer end of the drum is provided with a nozzle discharging into the boiler. H. HOLMES.

Evaporator. H. D. MILES, Assr. to BUFFALO FOUNDRY AND MACHINE Co. (U.S.P. 1,562,713, 24.11.25. Appl., 28.1.24).—Inclined up-take tubes are mounted longitudinally within an inclined steam-chest with their ends rigidly secured in upper and lower stationary flue-sheets. The tubes communicate with an upper exhaust chamber and a lower return chamber rigidly connected to the upper and lower ends respectively of the steam-chest. The chambers also communicate through an inclined return tube disposed beneath the steam-chest. This tube is connected to one chamber rigidly, and to the other chamber in such a way that it is free to slide.

H. HOLMES.

Treating [concentrating] liquid materials. G. D. HARRIS, Assr. to INDUSTRIAL DRYER CORP. (U.S.P. 1,562,760, 24.11.25. Appl., 23.10.20).—The liquid is heated and exposed to a drying atmosphere as it flows tranquilly by gravity in a film in contact with a succession of inclined surfaces.

H. HOLMES.

Drying semi-liquid materials. G. D. HARRIS, Assr. to INDUSTRIAL DRYER CORP. (U.S.P. 1,562,761, 24.11.25. Appl., 23.10.20).—The material is delivered so as to form a film on an exposed portion of an endless carrier moving through a drying chamber, and flows through a succession of channels defined by baffles adjacent to the carrier. The channels are provided with central heating devices and with transverse baffles staggered in relation to the carrier and to the main baffles, the two series being disposed alternately adjacent to the upper and lower boundaries of the channels. Means are provided for delivering air at normal temperature to the channel adjacent to the point of discharge of the material, for circulating the air through the channels in a direction opposed to the flow of the material, and for discharging the heated air adjacent to the point of delivery of the material.

H. HOLMES.

Drying apparatus. G. D. HARRIS, Assr. to INDUSTRIAL DRYER CORP. (U.S.P. 1,562,762-3, 24.11.25. Appl., [A] 31.3.21, [B] 8.8.22).—(A) The material or object under treatment is placed on the floor of a chamber provided with an inlet and an outlet for an oxidising or drying atmosphere. Means are provided for circulating this atmosphere so that it is repeatedly directed downwards on to the material, and independent means are provided for feeding fresh air into the chamber. (B) The material is subjected to contact with a drying atmosphere as it moves through successive channels within a chamber. The atmosphere is directed downwards upon the centre of the stream of material and then flows across the material transversely of the stream.

H. HOLMES.

Drying. G. D. HARRIS, Assr. to INDUSTRIAL DRYER CORP. (U.S.P. 1,562,764, 24.11.25. Appl., 20.10.22).—A drying atmosphere is heated and subsequently cooled to promote its circulation in contact with the material to be dried. The humidity of this atmosphere is controlled in accord-

ance with the content of surface moisture and its diffusion within the material by condensing the moisture content of the atmosphere to a definite dew-point. The atmosphere is heated to a constant temperature in the periods between its initial heating and subsequent cooling.

H. HOLMES.

Liquefaction of gases. C. E. RECORDON and J. W. HILLE, Assrs. to AIR REDUCTION Co. (U.S.P. 1,562,915, 24.11.25. Appl., 24.6.22).—The gaseous mixture is supplied to one of two chambers connected to the bottom of two sets of tubes, contained in a case filled with a refrigerating liquid. The two sets of tubes are connected at the top by a header, but the chambers at the bottoms are separated by a partition, which can expand longitudinally while remaining gas-tight; this prevents contamination of the liquid collected in the second chamber.

A. GEAKE.

Condenser. E. W. ISOM and J. E. BELL, Assrs. to SINCLAIR REFINING Co. (U.S.P., 1,563,492, 1.12.25. Appl., 19.5.21).—A tank to contain condensate and a cooler are connected so as to provide a closed circulation from the tank through the cooler and back to the tank. The vapours to be condensed are injected below the normal level of the condensate contained in the tank, and means are provided for withdrawing condensate from the tank.

H. HOLMES.

Preparing [nickel] catalytic material. M. RANEY (U.S.P. 1,563,587, 1.12.25. Appl., 20.9.24).—Nickel is alloyed with an equal weight of silicon, and the alloy is pulverised and treated with caustic soda until the silicon is converted into sodium silicate. The finely-divided catalytic material is then removed from the solution.

H. HOLMES.

Drying apparatus. FULLER-LEHIGH Co., Assees. of D. V. SHERBAN (E.P. 242,604, 19.9.25. Conv., 6.11.24).—See U.S.P. 1,558,119; B., 1926, 2.

Process of making material for filtering and decolorising. P. L. WOOSTER (Reissue 16,225, 15.12.25, of U.S.P. 1,518,289, 9.12.24. Appl., 5.8.25).—See B., 1925, 86.

Centrifugal separator. G. R. SCHUELER (U.S.P. 1,564,632, 8.12.25. Appl., 27.9.23).—See E.P. 217,065; B., 1924, 697.

Apparatus for removing material from the wall of a revolving centrifugal basket. E. VAN DER MOLEN (U.S.P. 1,565,605, 15.12.25. Appl., 16.12.24).—See E.P. 238,460; B., 1925, 790.

Means for transfer of heat. (E.P. 242,690, 29.7.24).

Atomising apparatus. E. C. MARCESCHE (E.P. 239,488, 27.11.24. Conv., 8.9.24. Addn. to 238,128).

Apparatus for separating oil from liquids. D. B. MORISON (E.P. 243,428, 25.8.24).

Apparatus for separating fuel and other oils from water. E. W. GREEN and H. OGDEN (E.P. 243,433, 26.8.24 and 8.1.25).

Disintegrators for grinding coal and the like. F. TWORT (E.P. 244,003, 19.6.25).

Gas producer and furnace for steam generators (E.P. 243,092).—See II.

Separating volatile constituents from materials. (E.P. 214,273).—See XII.

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

Sardinian coals, especially those of the Gonesa [Inglesias] field. R. BINAGHI and D. ROMOLI-VENTURI (Annali Chim. Appl., 1925, 15, 397—410).—The view that the Sardinian coals are lignites has prejudiced their use even in cases where they could with advantage have replaced English anthracite. Laboratory and large-scale tests show that by low-temperature distillation (Benzo-naftène process) they furnish a high-grade gas in yield equal to that obtained from the best coal and that all the by-products are commercially valuable.

W. E. ELLIS.

Peat and peat problems in Sweden. S. ODÉN (Fuel, 1925, 4, 505—527; cf. B., 1924, 817).—The formation, constitution, and utilisation of peat is dealt with, particularly in relation with the peat resources of Sweden. The formation of peat is illustrated by sections through the more important peat bogs. The changes involved in ulmification are discussed from a comparison of analyses of peat from different depths. For the chemical characterisation of peats it is suggested that the following six groups be determined:—(1) fats, waxes, and resins by extraction with ether; (2) lignoid substances by extraction with sulphurous acid at 110°; (3) ulmins by extraction with ammonia at 110°; (4) cellulose by Schweitzer's reagent; (5) insoluble organic residue, and (6) inorganic residue. Further special groups may be determined, e.g., total hexoses and pentoses produced on inversion, pentoses and methylpentoses, methoxyl, ulmic acids colorimetrically, and nitrogen. The utilisation of peat in agriculture is briefly outlined. For its utilisation as fuel the removal of the excess water is of the first importance. The simple theory of water removal from the peat capillaries by pressure leads to the relation: water removed \times pressure = a constant for the same peat. This has been experimentally verified for several samples of peat. Some calculations of the economics of different drying processes are given. The yields and composition of the products of "wet carbonisation" and low-temperature carbonisation at temperatures from 150° to 400° are tabulated for a number of samples of peat. For ammonia recovery, distillation in steam at 700° gives the best yield, equivalent to about 55% of the nitrogen in the peat. Some experiments were made on heating peat in an

autoclave with sodium hydroxide at 365°. The product was distilled, first directly, then with superheated steam, and yielded a gas (mainly hydrogen), methyl alcohol, acetone, and light and heavy oils. In experiments on the anaerobic fermentation of peat, a loss of pentosans and hexosans was observed, the relative loss of the latter being the greater.

A. B. MANNING.

Possible use of Philippine coals for liquid fuel. V. G. LAVA (Philippine J. Sci., 1925, 28, 193—204).—When an emulsion of crude oil in water stabilised by soap is mixed with coal (200-mesh) a stable liquid fuel is obtained. Potassium soaps produce greater stability than sodium soaps. The greatest stability was obtained with suspensions containing 7.7 and 8.7% of water. Higher calorific value, but lesser stability were given with 4.2 and 4.8% of water. Differences in the stability of suspensions were noted with variation in composition of the coal, the stability being greater with coals having a low content of volatile combustible matter. The calorific value of the suspensions varied from 8670 cal. with 6% of water to 8720 cal. with 4.8% of water. The coal content of the suspensions was approximately constant at 46%, and the content of crude oil varied from 46.2 to 48.5%.

W. S. PATTERSON.

Test of the vertical [gas] retorts with a 24-hr. [carbonising] period at the Hanover gasworks. F. KLEEMANN (Gas- u. Wasserfach, 1925, 68, 747—748).—The results of a three-day test on a vertical retort system erected by the Dessauer Vertikalofen-Ges. are tabulated. The system consists of ten vertical chamber retorts, of which, however, only eight were in operation during the test. Each retort consists of six chambers, each of five tons capacity, and is provided with two generators and recuperator. Each chamber is provided with two steam inlet ports. The carbonisation period was 24 hrs., and the charge was steamed for 9 hrs. A Ruhr coal (Ewald) with 2.4% of moisture, 29.2% of volatile matter, and 8.8% of ash, was used. The average temperature in the chambers was 1040°. The average gas yield was 41.9 m.³, of gross calorific value 4625 cal., per 1000 kg. of coal. The average coke consumption was 13.8 kg. (dry) per 100 kg. of coal.

A. B. MANNING.

Mechanism of combustion in the Bunsen cone. E. W. REMBERT and R. T. HASLAM (Ind. Eng. Chem., 1925, 17, 1233—1236).—The rate of combustion of a mixture of fuel gas and air, burning as a Bunsen cone in a small furnace, was determined by analysis of the flue gases, sampled at a point 4½ in. above the port. The rate of combustion was found to be independent of the temperature of the furnace walls between 110° and 1100°. This is verified by direct calculation of the change in the radiation heat losses from the flame. On increasing the air:gas ratio, complete combustion was attained a short distance above the port with only 5% excess air. It is concluded that the rate of gaseous combustion in furnaces is controlled by the rate of mixing of secondary air with the combustible gases.

The effect of varying port velocity, port diameter, and the air:gas ratio on the height of the Bunsen cone was observed. The cone height increased with gas velocity up to a point, and was then practically constant. The cone height increased with port diameter, but in some cases passed through a maximum. The cone height decreased with increase of the air:gas ratio. A. B. MANNING.

Factors influencing length of a gas flame burning in secondary air. E. W. REMBERT and R. T. HASLAM (Ind. Eng. Chem., 1925, 17, 1236—1238; cf. preceding abstract).—The length of a gas flame burning in free space can be represented by an equation of the form $L = K \log u - B \log D - E$, where u is the port velocity, D is the port diameter, and K , B , and E depend on the primary air:gas ratio. If a constant quantity of fuel gas is supplied to a burner per unit time, and the amount of primary air mixed with the gas increased from zero, the length of the flame decreases. The ratio of secondary air to gas has practically no effect upon the length of the flame, provided this ratio does not fall below that required for the combustion of 75% of the fuel gas. A. B. MANNING.

Factors affecting utility of secondary air in gaseous combustion. E. W. REMBERT and R. T. HASLAM (Ind. Eng. Chem., 1925, 17, 1238—1240; cf. preceding abstracts).—The flue gases from a fuel gas flame, burning in a measured supply of secondary air only, have been carefully sampled and analysed. Curves showing the variation of air utilised for combustion with air supplied, port velocity, and port diameter, have been plotted. The total amount of air supplied materially affects the fraction thereof used for combustion. The fraction, air used ÷ air supplied, passes through a maximum as the supplied air is increased. The position of the maximum depends on the port velocity and diameter. The fraction of supplied air that is utilised for combustion increases with both port velocity and diameter, owing probably to an increased rate of mixing. Over the range investigated the log. of the air supplied is practically a linear function of the air utilised. A. B. MANNING.

Relative rates of combustion of constituents of city gas burning in secondary air. E. W. REMBERT and R. T. HASLAM (Ind. Eng. Chem., 1925, 17, 1240—1242; cf. preceding abstracts).—From the analyses of the flue gases from city gas burning in varying amounts of secondary air, relative mass action constants have been deduced giving the ratios of the rates of combustion of the different components of the gas. The combustion of methane and ethylene proceeds according to the equations $\text{CH}_4 + \text{O}_2 = \text{CO} + \text{H}_2 + \text{H}_2\text{O}$ and $\text{C}_2\text{H}_4 + \text{O}_2 = 2\text{CO} + 2\text{H}_2$, where $k_{\text{C}_2\text{H}_4}/k_{\text{CH}_4} = 1.1$. The relative rates of combustion of hydrogen and carbon monoxide, burning simultaneously in the presence of small quantities of methane and ethylene, follow an expression of the type $1/\text{H}_2 = (k_{\text{H}_2}/k_{\text{CO}})1/\text{CO} + c$, where $k_{\text{H}_2}/k_{\text{CO}} = 4.9$

(approx.). Similar expressions hold for the simultaneous combustion of hydrogen and methane, $k_{\text{CH}_4}/k_{\text{H}_2} = 3.0$, and of carbon monoxide and methane, $k_{\text{CH}_4}/k_{\text{CO}_2} = 14.5$. A. B. MANNING.

Effects of knock inducers and suppressors upon gaseous ionisation. G. L. CLARK, E. W. BRUGMANN, and W. C. THEE (Ind. Eng. Chem., 1925, 17, 1226—1229).—The experiments of Wendt and Grimm on the effect of knock suppressors and inducers on the rate of re-combination of gaseous ions (B., 1924, 856) have been repeated under carefully controlled conditions. A constant current of air, air+benzene, air+benzene+butyl nitrite, or air+benzene+lead tetraethyl, was ionised by exposure to monochromatic X-rays ($K\alpha$ of molybdenum), and its ionisation was measured at two points about 20 cm. apart in a secondary ionisation chamber. The ratio of the ionisation currents at the two points gives a measure of the relative rates of re-combination of the ions. The mixtures were obtained by passing the air current over benzene, a 2% solution of butyl nitrite in benzene, or a 3.4% solution of lead tetraethyl in benzene, respectively. The presence of butyl nitrite slightly increased the total ionisation of the benzene-air mixture, and slightly decreased the rate of re-combination. This is in accord with the theory of Wendt and Grimm. The presence of lead tetraethyl gave a still larger total ionisation, and a greater decrease in the rate of re-combination. This accords neither with the theory nor with the results of Wendt and Grimm. The above results were confirmed by a second series of experiments using a specially designed and very sensitive ionisation chamber and quadrant electrometer. The theories that have been suggested to explain the action of knock suppressors are summarised. A. B. MANNING.

Chemical equilibrium in gases exhausted by gasoline engines. W. G. LOVELL and T. A. BOYD (Ind. Eng. Chem., 1925, 17, 1216—1219).—A consideration of the data of Fieldner and his co-workers on the composition of the gases exhausted by automobile engines (B., 1921, 111 A; 1922, 622 A) shows that the value of the ratio $K = (\text{CO})(\text{H}_2\text{O})/(\text{CO}_2)(\text{H}_2)$ lies within narrow limits, 3.0—4.0, over the whole range of conditions of mixture ratio and other variables employed. It is concluded that in the ordinary automobile engine there is substantial equilibrium of the reaction $\text{CO}_2 + \text{H}_2 \rightleftharpoons \text{CO} + \text{H}_2\text{O}$. The value of K corresponds to the equilibrium value for this reaction at temperatures of 1350—1550°. Measurements of the maximum temperatures occurring in the cylinders of gasoline engines by other investigators give values of the same order, 1500—1800°. Over 95% of the carbon in the fuel was burnt to carbon monoxide plus carbon dioxide for the range of variables over which the engines ran satisfactorily. The relative amounts of hydrogen burnt to water and carbon burnt to carbon monoxide confirm the hydroxylation theory of the combustion of hydrocarbons, and disprove the old belief that the reason for the

maxima of the power curves of gasoline engines occurring at about 85% of theoretical air was due to a preferential burning of hydrogen.

A. B. MANNING.

Vacuum assay distillation test [for mineral oils]. A. G. PETERKIN and S. W. FERRIS (Ind. Eng. Chem., 1925, 17, 1248—1249; cf. U.S. Bur. Mines, Bull. 207, 1922).—A simplified vacuum distillation apparatus for carrying out routine tests of medium and heavy oils is described. The apparatus includes a device for maintaining a constant pressure of 10 mm. 100 c.c. of the oil are distilled from a 250-c.c. Claisen flask under the reduced pressure, into a 100-c.c. measuring cylinder, the procedure being similar to that of the Engler distillation test.

A. B. MANNING.

Relation between boiling point and some other properties of petroleum products. J. B. HILL and S. W. FERRIS (Ind. Eng. Chem., 1925, 17, 1250—1252; cf. preceding abstract).—The relations between some physical properties of a number of close-cut fractions from various crude petroleums, and the boiling ranges of the fractions as determined by the vacuum assay distillation test, have been studied. Five typical crude petroleums were examined, ranging from a Pennsylvania crude to a highly naphthenic Gulf Coast crude. The b.p. of the fractions, as given by the 50% point on the vacuum assay distillation, were plotted against viscosity, temperature coefficient of viscosity, specific gravity, and refractive index. For fractions of the same b.p., these properties all increase as the crude oil varies from paraffinic to naphthenic. The relations observed can be used as a good indication of the source of an unknown oil.

A. B. MANNING.

Phosphorescent flame of carbon disulphide. DIXON and HIGGINS.—See A., 1926, 10.

Union of carbon monoxide and oxygen in contact with a gold surface. BONE and ANDREW.—See A., 1926, 33.

Hydrogenation of ethylene. PEASE and STEWART.—See A., 1926, 43.

PATENTS.

Production of water-gas from solid fuel. J. RUDE (E.P. 235,007, 18.6.24).—In the production of water-gas in externally-heated retorts, the steam is admitted at various points and levels, the gases being withdrawn either through pipes at different levels passing through the wall of the retort to a main, or through a central outlet pipe. The gases may be superheated and used for preheating the fuel as described in E.P. 204,718 (B., 1924, 663). The steam may be admitted at different levels alternately, in which case the zones not receiving steam are reheated preparatory to being again steamed.

Utilisation of the waste gases from water-gas generators. C. MARISCHKA (E.P. 236,579, 3.7.25. Conv., 5.7.24).—The heat in the waste "blow" gases from water-gas generators having a steam-generating jacket is utilised by passing the gases,

either directly or through a combustion chamber, where they are burnt with air, into a jacket chamber surrounding the generator boiler. This arrangement ensures a better thermal efficiency with smaller costs and less floor space than the use of a separate waste-heat boiler. The combustion chamber may also serve as a heat accumulator, the water-gas generated in the second period being led through it and thence through the jacket chamber of the boiler; or it may be used for superheating the steam supplied to the generator. The heating surface in the jacket chamber is increased by the addition of a number of vertical water tubes to the boiler. In a modification the jacket chamber is lined with heat-storing material, and itself serves as a combustion chamber.

A. B. MANNING.

Combined gas producer and furnace for use with steam generators. T. R. WOLLASTON (E.P. 243,092, 28.8.24 and 26.2.25).—A gas producer is combined with the furnace space or fire-box of a vertical or horizontal type of boiler, the normal grate of the fire-box being omitted, and communication being made between the two by one or more "bottle-neck" apertures, through which the fuel, fed in at the ordinary fire-door, passes down into the producer. The "bottle-neck" may be provided with a door or valve. A fan supplies primary air to the producer, and secondary air to the furnace chamber. The producer is cased and lined, and is provided with annular spiral passages, in which the secondary air is preheated. Separate additional communications other than the "bottle-neck" may be provided between the producer and the furnace chamber to act as gas outlets. The piping from the fan to the producer or other parts involved may pass through the smoke-box of the boiler, and the air supply be thus further preheated.

A. B. MANNING.

Vertical or inclined gas-making retorts. T. R. WOLLASTON (E.P. 243,169, 1.12.24; cf. E.P. 113,856, 207,700, and 209,352; B., 1918, 233 A; 1924, 209).—A composite gas retort comprises an upper vertical portion, in which the fuel undergoes a pre-coking process, and a lower portion, either vertical or inclined, in which the coking proper takes place. The gases from the lower portion pass up and over the fuel or coal in the upper portion, which is thereby heated. If required, the upper portion may, like the lower, be mounted in an ordinary setting with the usual flues or combustion chambers, and so be further suitably heated. The time of complete coking is shortened by this process, and the difficulties arising from excessive caking or swelling are avoided.

A. B. MANNING.

Coking process [for pitch]. F. W. SPERR, JUN., Assr. to KOPPERS Co. (U.S.P. 1,563,595, 1.12.25. Appl., 18.7.19).—A low-ash coke is produced from liquefiable bituminous material by heating a proportion of the material to expel part of the volatile matter, mixing the semi-coke so formed with a proportion of the original material, and completely coking the mixture.

A. B. MANNING.

Utilisation of grape residues. F. DUPLAN (F.P. 590,739, 15.2.24).—By dry distillation of the residues from the manufacture of wine, ethyl and methyl alcohols, acetic acid, and tar are obtained as well as combustible gases and a highly absorbent type of carbon. The tar is similar to that obtained by distillation of peat or brown coal and contains aromatic hydrocarbons and oils of high boiling point.

C. T. GIMMINGHAM.

Purifying materials for acetylene and other gases. CHEM. FABR. GRIESHEIM-ELEKTRON, and A. HERMANN (E.P. 243,607, 24.4.25).—See U.S.P. 1,551,878; B., 1925, 873. To render the material porous, the mass, prior to solidification, is mixed with a small quantity of a substance, *e.g.*, finely divided aluminium or magnesium, which will react to generate gas.

Dehydrating [oil] emulsions by externally-charged particles. W. MEREDITH, Assr. to PETROLEUM RECTIFYING Co. (U.S.P. 1,562,712, 24.11.25. Appl., 14.2.21).—Conducting particles (*e.g.*, of water) are separated from an insulating medium (*e.g.*, oil) by introducing into the medium other particles, electrically charged, and subjecting the mixture to an electric stress.

H. HOLMES.

Process of forming activated carbon. G. W. WALLACE (U.S.P. 1,565,129, 8.12.25. Appl., 15.5.25).—See E.P. 234,161; B., 1925, 661.

Cracking hydrocarbons. F. G. NIECE, Assr. to INTERNATIONAL HOLDING Co. (U.S.P. 1,565,326-7, 15.12.25. Appl., 7.7 and 13.7.21).—See E.P. 185,632; B., 1922, 850 A.

Bottom grids for gas purifiers. S. E. SPENCER (E.P. 243,867, 22.10.24 and 11.6.25).

Treatment of mineral oils. (E.P. 243,113).—See I.

Mixtures of nitrogen and hydrogen for ammonia synthesis (E.P. 243,122).—See VII.

III.—TAR AND TAR PRODUCTS.

Distribution of pyridine between water and benzene. WOODMAN and CORBET.—See A., 1926, 19.

Reduction of organic compounds containing oxygen [cresols] by active carbon. STADNIKOV, GAWRILOV, and WINOGRADOV.—See A., 1926, 60.

PATENT.

Treating wood-tar oil. A. E. MAZE, Assr. to ELLIS-FOSTER Co. (U.S.P. 1,558,446, 20.10.25 Appl., 27.3.24).—A distillate, boiling up to 130°, obtained from wood-tar oil is agitated in the presence of bleaching powder. The product has an improved odour and is a good solvent for nitrocellulose.

A. J. HALL.

IV.—DYESTUFFS AND INTERMEDIATES.

Comparative study of azo dyes made with H-acid and acetyl-H-acid. W. W. LEWERS and A. LOWY (Ind. Eng. Chem., 1925, 17, 1289—1290).—The hypsochromic effect due to the introduction of an acetyl group has been studied by the coupling of 33 diazotised compounds with H-acid and with acetyl-H-acid respectively. Tables are given for each of the two series of dyes which show the % yields, the appearance of the dyes as powders, the shades produced on wool, the colours of the aqueous solutions, and the colour changes of aqueous solutions when acted on by hydrochloric and sulphuric acids and sodium hydroxide respectively.

A. COULTHARD.

Cyanine dyes. MILLS and RAPER.—See A., 1926, 77.

Diazotisation of picramide. BLANGEY.—See A., 1926, 62.

Solubility and retention of water of crystallisation in salts of aromatic sulphonic acids. EPHRAIM and SEGER.—See A., 1926, 18.

PATENTS.

Manufacture of azo colouring matters dyeing wool fast to milling. BRITISH DYESTUFFS CORP., LTD., J. BADDILEY, J. HILL, and A. RILEY (E.P. 243,115, 17.9.24).—Azo dyestuffs suitable for dyeing wool in yellow to brown shades fast to milling are obtained by coupling a diazotisable compound, prepared by the action of at least 1 mol. of formaldehyde on 1 mol. of the hydrochloride of an aromatic amine, with a sulphonated pyrazolone, naphthylamine, or naphthol, or an aminonaphtholsulphonic acid. For example, 90 pts. of formaldehyde solution (containing 38.7 pts. of CH₂O in 100 c.c.) are added to a solution at 20° containing 93 pts. of aniline, 106 pts. of hydrochloric acid (*d* 1.18), and 200 pts. of water, whereby the temperature of the mixture rises to 60°; after 24 hrs. the anhydro-base (CH₂.C₆H₄.NH)_n produced

is precipitated by the addition of an excess of alkali filtered off, washed, and dried. A 10% solution of the anhydro-base in dilute hydrochloric acid is diazotised at 5° with 70 pts. of sodium nitrite and poured into a cold solution containing 254 pts. of 1-*p*-sulphophenyl-3-methyl-5-pyrazolone, 3000 pts. of water, 40 pts. of caustic soda, and 160 pts. of sodium carbonate. The resulting dyestuff is yellow. Suitable anhydro-bases are prepared from *o*-anisidine, *m*-nitroaniline, and β -naphthylamine, and suitable compounds for coupling include 1-(2:5-dichloro-4-sulphophenyl)-3-methyl-5-pyrazolone, 2-naphthol-6-sulphonic acid, 2:8-aminonaphthol-6-sulphonic acid, and 2:7-naphthylaminesulphonic acid.

A. J. HALL.

Preparation of 5(?)-nitro-3-amino-6-hydroxyacetophenone. FARBW. VORM. MEISTER, LUCIUS, U. BRÜNING, Assees. of K. STREITWOLF and A. FEHRLE (G.P. 417,444, 8.1.24).—3-Acetamido-6-hydroxyacetophenone is added to concentrated

sulphuric acid with cooling, and a mixture of concentrated sulphuric and nitric acids (d 1.38) is then added, drop by drop, at -10° to 0° . On pouring on to ice there is obtained, in 92.4% yield, yellow 5(?) - nitro-3-acetamido-6-hydroxyacetophenone, which on crystallisation from alcohol, hydrolysis with hydrochloric acid, and precipitation with ammonia yields orange-yellow 5(?) - nitro-3-amino-6-hydroxyacetophenone, m.p. 142° (decomp.). The latter after diazotisation couples with 1-amino-8-hydroxynaphthalene-3:6-disulphonic acid (violet) and β -naphthol (red). B. FULLMAN.

Preparation of tetrabenzoylperylene. H. PEREIRA, and COMP. NAT. DE MATIÈRES COLORANTES ET MANUF. DE PROD. CHIM. DU NORD RÉUNIES, ETABL. KUHLMANN (F.P. 591,271, 31.12.24. Conv., 10.4.24).—1 pt. of perylene, at least 2 pts. of benzoyl chloride, and aluminium chloride are heated in carbon disulphide, *e.g.*, for 6 hrs. to boiling, the solvent is distilled off, and the resulting aluminium chloride double compound decomposed with hydrochloric acid. Tetrabenzoylperylene, dark yellow prisms, m.p. about 320° , is soluble in high-boiling organic solvents. Its concentrated sulphuric acid solution is bluish-green, with strong red fluorescence. B. FULLMAN.

Manufacture of *o*-[hydr]oxyazo-dyestuffs. ART.-GES. FÜR ANILIN-FABR. (E.P. 232,629, 18.4.25. Conv., 19.4.24).—See U.S.P. 1,556,329; B., 1926, 7.

Manufacture of benzanthrone derivatives. BADISCHE ANILIN- U. SODA-FABR., Assees. of A. LÜTTRINGHAUS, H. WOLFF, and H. NERESHEIMER (U.S.P. 1,564,423, 8.12.25. Appl., 26.4.23).—See E.P. 203,533; J., 1923, 1064 A.

Condensation products [dyestuffs] of the anthraquinone series. G. KRÄNZLEIN and R. SEDLMAYR, ASSIS. to GRASSELLI DYESTUFF CORP. (U.S.P. 1,564,584, 8.12.25. Appl. 27.9.23).—See E.P. 205,502; B., 1924, 627.

Bluish sulphurised indophenolbenzidine dye. SOC. OF CHEM. IND. IN BASLE, Assees. of L. HAAS and E. REBER (U.S.P. 1,565,736, 15.12.25. Appl., 7.5.23).—See E.P. 199,360; B., 1924, 9.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Testing of wood pulps with the large size Lampen ball mill. R. SIEBER (Ver. Zellstoff- u. Papier-Chem., Hauptversamml., 1924, 175—176; cf. B., 1925, 540).—The Lampen mill, consisting of a single heavy bronze ball in a revolving casing, has proved more satisfactory for beating test-samples than the more usual type of porcelain ball-mill. In order to avoid "chattering" the mill should revolve at not more than 200 revs. per min. The single ball may require a longer time to produce the desired result than several balls, but the uniformity and comparative accuracy of the beating should be more certain. The beating result would appear to depend not so much on the force of the strokes as upon their number or frequency, and this is controlled by the single ball. The substitution of metal for

porcelain has proved very satisfactory. The sheet of paper is produced on a mould connected with a water suction pump and is pressed up, after couching, in a copying press. Uniformity of treatment is essential. A drying arrangement is used consisting of a steam-heated horizontal cylinder with thermometers at inlet and outlet. The cylinder is provided with a felt which is attached to the cylinder at one end and weighted with an iron rod at the other end, so that weights may be applied to hold the sheet of paper stretched between the felt and the cylinder. J. F. BRIGGS.

Disintegration of fibrous raw materials by means of nitric acid. P. KRAIS (Papier-Fabr., 1925, 23, 797—799; cf. G.P. 391,713 and 395,191; B., 1925, 68, 626).—The use of nitric acid is economically sound where this is cheap, *e.g.*, in South America and in places where cheap electric power is available. A. GEAKE.

Colloidal properties of sericin. BROSSA.—See A., 1926, 22.

Decomposition of cellulose by fungi. HEUKLEKIAN and WAKSMAN.—See XVI.

PATENTS.

Paper-making machinery. R. R. BLIGHT (E.P. 243,640, 2.7.25).

Organic thiocarbonates (F.P. 563,214).—See XX.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Use of sodium silicate in printing [textile fabrics] with vat dyestuffs. LA MANUFACTURE E. ZUNDEL, and L. LANTZ (Sealed Note 2088, 22.5.11. Bull. Soc. Ind. Mulhouse, 1925, 91, 559—560. Report by P. BINDER, *ibid.*, 560—561).—Sodium or potassium carbonate is replaced by sodium silicate in printing pastes containing vat dyestuffs since this substitute may be easily freed from suspended grit and it also assists the preparation of highly thickened printing pastes. Satisfactory results are obtained by means of a printing paste prepared by heating a mixture containing 200 pts. of prepared indigo paste, 125 pts. of gum water, 50 pts. of sodium silicate of 35° B. (d 1.32), 75 pts. of caustic soda of 38° B. (d 1.36), and 50 pts. of a mixture of sodium hyposulphite and glycerin, at 50° until the dyestuff is completely reduced and then adding 170 pts. of gum water, 300 pts. of sodium silicate (d 1.32), and 30 pts. of Rongalite C; the prepared indigo paste contains 200 pts. of Indigo 2 B (M.L.B.) powder, 200 pts. of sodium silicate (d 1.32), and 600 pts. of gum water. Binder reports favourably on the process but points out that dilute solutions of sodium silicate tend to become gelatinous.

A. J. HALL.

[Production of] scroop effects on cotton. C. SUNDER (Bull. Soc. Ind. Mulhouse, 1925, 91, 561—562).—A scroop finish is imparted to cotton materials by impregnation with a solution containing

per 100 litres, 1 litre of an emulsion prepared by agitating a mixture of 180 pts. of coconut oil, 10 pts. of oleic acid, 20 pts. of caustic soda of 10° B. (d 1.075), and 400 pts. of water. Sodium soaps are unfavourable and triglycerides are favourable to the production of scroop effects. When the fabric being treated contains soap, an ammonium salt should be added to the emulsion described above, but the shade of the fabric may then be affected; Alizarin Pink shades are affected, and although ultramarine is scarcely affected it is preferably replaced by Indanthrene Blue.

A. J. HALL.

PATENTS.

Dyeing, printing or stencilling cellulose acetate. BRITISH CELANESE, LTD., and G. H. ELLIS (E.P. 242,393, 19.9.24. Addn. to 219,349; B., 1924, 906).—Solubilised dyestuffs suitable for dyeing cellulose acetate are prepared by treatment of dyestuffs previously described (cf. E.P. 219,349, *loc. cit.*, also E.P. 224,681, 227,183, and 237,943, B., 1925, 39, 204, 801) with sulphoaromatic fatty acids, e.g., sulphobenzene-stearic acid (Twitchell reagent), sulphophenol-stearic acid and sulphonaphthalene-stearic acid, which act as solubilising agents (cf. E.P. 219,349, *loc. cit.*, and E.P. 224,925, B., 1925, 39). A suitable solubilising agent is prepared by adding a cold paste containing 25 kg. of naphthalene (or benzene) and 25 kg. of oleic acid to 100 kg. of 20% oleum at 40°, the temperature being then raised to 100° and maintained for 3 hrs. The product is poured into 250 litres of water containing 50 kg. of sodium chloride and the upper layer is separated and purified.

A. J. HALL.

Centrifugal machine for treating textiles with liquid and gases. H. WOLFER, ASSR. to OBERMAIER U. Co. (U.S.P. 1,564,503, 8.12.25. Appl., 8.12.24).—See E.P. 226,527; B., 1925, 239.

Textile fabric dyeing machines. E. CADGENE (E.P. 242,936, 2.3.25. Conv., 13.11.24).

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

[Combustion temperatures of] pyrites and zinc-blende. J. BAUMANN (Chem.-Ztg., 1925, 49, 1061).—The maximum temperature attainable by the combustion of pyrites, assumed to contain 48% of sulphur as FeS₂ and 10% of silica, in the chamber process of sulphuric acid manufacture is calculated to be 1216°. That of zinc-blende having 28.4% of sulphur and 14% of silica is calculated as 1234°. The exit gases from the chamber plant are assumed to contain 6.0–6.5% of oxygen. These figures are maxima, no allowance having been made for losses due to radiation, incomplete combustion, or secondary reactions.

C. IRWIN.

Influence of water vapour and hydrogen chloride on the velocity of decomposition of ammonia. A. SCHMIDT (Z. angew. Chem., 1925, 38, 1146–1154).—Experiments were made with a current of pure ammonia flowing at constant

pressure through a 100-c.c. porcelain bulb with capillary inlet and outlet and maintained at a known temperature, the volume of nitrogen and hydrogen being measured. The undecomposed ammonia was determined by titration. It was found that at all temperatures from 700° to 1000° the decomposition velocity of dry ammonia increased steadily over a period of many days to a figure many times the initial one. The inner wall of a used porcelain bulb was found to be coated with a grey substance which was proved to be metallic iron and in a particular case amounted to 0.04 mg. per sq. cm. This iron catalyses the decomposition of ammonia, causing the progressive increase in the decomposition velocity. It appears that iron passes from the interior of the porcelain to the surface. The deposit is destroyed by heating with ammonia gas saturated with aqueous vapour. Quantitative tests showed that small proportions of water vapour had no protective effect. The decomposition velocity began to decrease when the concentration was such as to reverse the equation, $Fe_3O_4 + 4H_2 = 3Fe + 4H_2O$. To determine the effect of hydrogen chloride the porcelain surface was replaced by broken coke. The catalytic effect of separated iron on dry ammonia gas was in this case still more marked. Treatment with hydrogen chloride removed the iron on the surface of the coke and caused a decrease in the decomposition of ammonia when this was first re-admitted. The velocity of decomposition soon rose again. Longer treatment with hydrogen chloride in which the greater part of the iron content of the coke was distilled off as ferric chloride produced more permanent results.

C. IRWIN.

Assay of potassium chlorate. A comparison of methods. LEHN AND FINK, INC. (Ind. Eng. Chem., 1925, 17, 1277–1278).—No method involving reduction to potassium chloride with subsequent determination of the chloride was found altogether satisfactory. Standard titanous chloride solution may be used for reduction if a standard potassium chlorate of known purity is kept for standardisation, and this method is suitable for routine control analyses. Where potassium permanganate is used after reduction by excess of ferrous salt, it is important to use sodium oxalate of known purity for standardisation of the permanganate. The Frankford Arsenal method in which ferrous ammonium sulphate is used for reduction was found the most satisfactory and accurate, and better than the U.S.P. method in which a more concentrated solution (of ferrous sulphate) is used for reduction, and the solution is titrated cold.

D. G. HEWER.

Oxidation of chrome iron ore in briquettes [for preparation of chromates]. P. M. LUKIANOV (Russian J. Chem. Ind., 1924, 1, [1], 11–13).—The conversion of chrome iron ore into sodium or potassium chromate is facilitated by making the ore (152 pts.) into briquettes with soda ash (82), quicklime (135), and water (82), prior to effecting the oxidation by roasting. With the above mixture, the degree to which the Cr₂O₃ undergoes oxidation to

CrO₃ amounts to 90% or even more in the interior of the briquettes. Addition of straw and sawdust, although it increases the porosity of the mass, lowers the extent of the oxidation; similar lowering is caused by addition of ferric oxide in the form of burnt pyrites. The use of these briquettes renders the roasting process automatic and entirely independent of skilled or experienced workmen and renders unnecessary the heavy labour required if the mixture is roasted in a finely divided form. T. H. POPE.

Heat of reaction in the formation of calcium cyanamide [from calcium carbide]. H. H. FRANCK and F. HOCHWALD (Z. Elektrochem., 1925, 31, 581—589).—The heat evolved in the exothermic reaction $\text{CaC}_2 + \text{N}_2 = \text{CaCN}_2 + \text{C}$ has been measured by two distinct methods. First, the heat of combustion of pure calcium cyanamide was found to be 163.1 ± 0.4 Cal., whence its heat of formation is 84.0 ± 0.75 Cal. From this and the heat of formation of calcium carbide the value 70.5 ± 2.6 Cal. is calculated for the heat of reaction in converting the carbide into cyanamide. By a second method the heat of reaction was directly measured in a combustion bomb charged with pure compressed nitrogen. To effect the heating-up of the carbide, the latter was packed in a small quartz tube wound with platinum wire, the whole being suspended within the bomb. A value of 72 ± 2 Cal. at constant volume was thus found. At 1100° the heat of reaction is calculated to be 67.07 cal. In the case of magnesium cyanamide the heat of formation is found 61 Cal. by the first method. W. A. CASPARI.

Method of obtaining iodine, based on electrolysis in alkaline solution. L. PISARSHEVSKI and S. TELNI (Russian J. Chem. Ind., 1924, 1, [1], 13—15).—Electrolysis of a neutral or alkaline solution of an iodide proceeds in accordance with the equation, $6\text{I}^- + 6\text{OH}^- \rightarrow 5\text{I}^- + \text{IO}_3^- + 3\text{H}_2\text{O}$, provided that the electrolyte is kept sufficiently well mixed. The solution tends to become richer in iodate, but if, at the moment when one-sixth of the total iodine in the solution exists as iodate, the electrolysis is discontinued and the electrolyte is removed and acidified, the whole of the iodine is precipitated: $6\text{H}^+ + 5\text{I}^- + \text{IO}_3^- = 3\text{I}_2 + 3\text{H}_2\text{O}$. Addition of a small proportion of alkali during the electrolysis is advisable in order to neutralise any acidity developing at the anode in consequence of imperfect mixing. The crude iodine obtained in this way has the composition: I, 87%; water, 12%; non-volatile residue, 0.8%; S and Cl, traces. The current efficiency amounts to 50%, the preparation of 1 kg. of iodine requiring the expenditure of 1.7 kw.-hrs. and 0.228 litre of sulphuric acid, *d* 1.83. T. H. POPE.

See also A., 1926, 16, Compression and decomposition of nitric oxide (BRINER, BIEDERMANN, and ROTHEN). 17, Absorption of gaseous hydrogen chloride by sulphuric acid (CUPR). 24, Behaviour of silica gel towards alkalis and salts (PATRICK and BARCLAY); Effect of temperature of formation on physical character of hydrous aluminium oxide (YOE). 27, Thermal

decomposition of sulphates (MARCHEAL). 32, Thermal decomposition of nitrogen pentoxide at low pressures (HIRST and RIDGAL). 34, Isomeric hydrogels of aluminium hydroxide (WILLSTÄTTER, KRAUT, and ERBACHER). 35, Aluminium hydroxide gel of formula AlO.OH (WILLSTÄTTER, KRAUT, and ERBACHER). 36, Silicic acid (WILLSTÄTTER, KRAUT, and LOBINGER); Bismuth nitrates (PICON). 37, Attack of hydrogen chloride and ammonium halide on metals (HOFMANN and HARTMANN). 38, Argentometric titration of iodides (KOLTHOFF); Volumetric determination of soluble sulphates (ATKINSON). 39, Separation of silver iodide, bromide, and chloride (BRITTON). 40, Determining ferrous oxide in insoluble silicates (HACKL).

Analysis of products rich in aluminium. SCHÜRMAN and BÖHME.—See VIII.

Direct production of zinc oxide from sulphide ores. WARING.—See X.

PATENTS.

Absorbing hydrochloric acid gas. J. E. EGGLESON, Assr. to GEN. CHEMICAL Co. (U.S.P. 1,563,732, 1.12.25. Appl., 7.9.22).—Hydrochloric acid gas and an absorbing liquid travel together through an externally cooled tube; a portion of the solution thus obtained is diluted and used for further absorption. A. GEAKE.

Producing carbon and hydrocyanic acid. R. W. POINDEXTER, Assr. to CALIFORNIA CYANIDE Co. (U.S.P. 1,562,914, 24.11.25. Appl., 4.12.22).—Carbon and hydrocyanic acid are produced simultaneously by rapidly heating a mixture of a hydrocarbon and ammonia by passage through an externally heated zone. A. GEAKE.

Production of silicic acid. N. L. COLLINS (U.S.P. 1,562,940, 24.11.25. Appl., 27.3.24).—Pure silicic acid is obtained by electrolysis of an aqueous solution of sodium silicate between a rotating anode and a mercury cathode. A. GEAKE.

Decomposition of alkali chlorides by steam in the presence of silicate. J. KERSTEN (E.P. 243,104, 8.9.24).—The known process for the decomposition of alkali chloride by steam in presence of an alkali silicate containing excess silica is improved by the addition of carbon, as graphite or charcoal, to the mass. Air may be injected as well as steam to burn a part of this carbon, or the furnace may be externally heated. In either case the action of the steam on the carbon yields hydrogen, which decomposes the chloride more readily than steam alone. Three types of furnace are described, one of the "converter" type connected with separate melting pans for the raw materials, a similar one in which the melting is carried out in an expansion formed in the side of the converter, and a continuous furnace with external melting chamber and an overflow arrangement for removal of the finished product. C. IRWIN.

Production of mixtures of nitrogen and hydrogen for ammonia synthesis. H. A. HUMPHREY, and SYNTHETIC AMMONIA AND NITRATES, LTD. (E.P. 243,122, 24.9.24).—If the hydrogen required for ammonia synthesis is derived from producer gas and especially when the nitrogen-hydrogen mixture is repeatedly circulated, inconvenience arises from the accumulation of methane in the gas. The maintenance of a temperature of 1300° in the producer practically eliminates the production of methane, and this can be attained either by the use of powdered fuel, or when lump fuel fed from below is used, by strongly preheating the air and steam injected. If air enriched with the required amount of oxygen can be used the correct nitrogen : hydrogen ratio in the purified gas can be obtained without further adjustment. In other cases an addition of hydrogen or of water-gas is necessary. C. IRWIN.

Method of producing pure alumina. R. JACOBSSON (E.P. 243,183, 16.12.24. Addn. to 221,209; B., 1925, 758).—The sulphuric acid used for dissolving the raw material in the method previously described need not be of greater concentration than d 1.3, but in this case the solution must be filtered and concentrated. The final removal of iron from the alumina is carried out by reducing the former to the metallic state and then heating to above 300° in a current of chlorine or of dry hydrogen chloride free from oxygen. This treatment is carried on in presence of the chlorides of either aluminium, chromium, tin, or carbon, or these substances may be added in the elementary state. C. IRWIN.

Aluminium chloride process. H. T. LEA and C. W. HUMPHREY (U.S.P. 1,558,897, 27.10.25. Appl., 20.6.23).—Aluminium sulphate is heated until it decomposes into aluminium oxide, sulphur trioxide, sulphur dioxide, and oxygen, and the last two gases are caused to form sulphur trioxide by passing over a catalyst. The sulphur trioxide is converted into sulphuric acid which is treated with sodium chloride to give hydrochloric acid, and the latter is converted into chlorine. The aluminium oxide obtained in the first stage of the process is mixed with carbon and treated with the chlorine to produce aluminium chloride and carbon monoxide. Alternatively, the sulphur dioxide may be caused to act directly on sodium chloride in presence of oxygen and steam to obtain hydrochloric acid.

T. S. WHEELER.

Preparation of translucent rod-shaped bodies [incandescence bodies for electric lamps, artificial gems] from powdered material. GENERAL ELECTRIC Co., ASSEES. of PATENT TREUHAND GES. FÜR ELEKTRISCHE GLÜHLAMPEN M.B.H. (E.P. 243,251, 27.5.25. Conv., 16.12.24).—Powdered material, e.g., aluminium oxide or other oxide or fluoride, is projected by an upwardly-directed blowpipe flame on to a vertical fireproof support, e.g., of refractory ceramic material, and the flame is adjusted so that globules from the stream of

molten material form continuously on the lower end of the support. J. S. G. THOMAS.

Method of making arsenates. H. P. BASSETT (U.S.P. 1,562,490, 24.11.25. Appl., 19.2.23).—Arsenates are made from arsenious compounds and bases which form soluble chlorides and insoluble arsenates. The arsenite first formed is oxidised with chlorine in acid solution, and a further quantity of base is then added to make the solution alkaline and precipitate the arsenate. A. GEAKE.

Zirconium oxide complex. C. J. KINZIE, ASSR. to TITANIUM ALLOY MANUF. Co. (U.S.P. 1,562,890, 24.11.25. Appl., 10.4.23).—Impurities are removed from zirconia by heating with a small quantity of a vitrifiable mixture. A. GEAKE.

Producing artificial cryolite, free from iron. H. SPECKETER, ASSR. to CHEM. FABR. GRIESHEIM-ELEKTRON (U.S.P. 1,563,536, 1.12.25. Appl., 10.1.25).—Aluminium salt solutions containing iron are treated with not more than 9 mol. of hydrofluoric acid, and not less than 3 mol. of an alkali chloride per molecule of aluminium oxide; the precipitate thus obtained is treated with an alkali fluoride in the presence of water. A. GEAKE.

Separating soluble sodium salts. C. E. DOLBEAR (U.S.P. 1,563,613, 1.12.25. Appl., 17.12.23).—Sodium chloride, sulphate, and carbonate are separated by extracting the two last-named salts with sodium chloride solution. Sodium hydrogen carbonate is then precipitated by treatment with carbon dioxide, and sodium sulphate by the addition of ammonia. After distilling off the ammonia the liquor is used to repeat the cycle. A. GEAKE.

Separating constituents of mineral silicates. S. W. SCOFIELD and J. B. LA RUE (U.S.P. 1,563,875, 1.12.25. Appl., 4.2.24).—Amorphous potash felspar is completely converted into soluble substances by heating with 1—2 times its weight of 90% alkali hydroxide, together with its own weight of water, at 300 lb. pressure and 270°. Heating is continued until the normally insoluble constituents are fused, and more water is then added. A. GEAKE.

Absorption apparatus. (E.P. 236,918).—See I.

Magnesia cement (E.P. 243,197).—See IX.

VIII.—GLASS; CERAMICS.

Fundamental law of annealing [glass]. F. W. PRESTON (Trans. Opt. Soc., 1924-5, 26, 270-273).—Assuming that annealing is a function of stress (f) and viscosity (η) only, dimensional analysis leads to the relationship $1/f - 1/f_0 = Bt/\eta$ (in which f_0 is the initial stress at $t=0$), a law identical with that obtained experimentally for glass by Adams and Williamson (cf. B., 1921, 81 A). If the modulus of rigidity (G) is included, the dimensional equation obtained is $-df/dt = f^2\phi(f/G)/\eta$. A. COUSEN.

Chrome aventurine glaze. S. KONDO (Tokyo Higher Tech. School, Bull. 3, 1925, 13—21).—In fritted glazes of the type (0.25 K₂O, 0.25 Na₂O, 0.5 RO) (0.05 Al₂O₃, 0.02—0.10 Cr₂O₃) (2.50 SiO₂, 0.50 B₂O₃), no crystals appeared when RO was BaO, CaO, or MgO, but a slight aventurine effect was obtained at cones 010a—1a when RO was PbO. In fritted glazes of the type (0.25 K₂O, 0.25 Na₂O, 0.50 PbO) (0.05 Al₂O₃, 0.02—0.10 Cr₂O₃) (xSiO₂, yB₂O₃), the best proportions for the production of the aventurine were $x=1.65$ and $y=0.60$, 0.02—0.04 Cr₂O₃ was completely or almost completely dissolved at cone 5a. On adding 0.02—0.10 equiv. of prepared chromic oxide crystals to frits of the type (0.25 K₂O, 0.25 Na₂O, 0.50 BaO or CaO or PbO) (0.05 Al₂O₃) (2.50 SiO₂, 0.50 B₂O₃), an aventurine effect was produced by the recrystallisation of the dissolved Cr₂O₃ in all cases when the glazes were cooled rather quickly. The best proportions of RO and Cr₂O₃ were 0.25 BaO and 0.25 CaO and 0.03—0.10 Cr₂O₃. Using frits of the composition (0.25 K₂O, 0.25 Na₂O, 0.25 BaO, 0.25 CaO) (0.05 Al₂O₃) (1.75—2.50 SiO₂, 0.50 B₂O₃), with added chromic oxide crystals, the best results was obtained with 0.10 Cr₂O₃; the glazes appear finer on chrome bodies than on white ones. Aventurine glazes with clean surfaces were obtained at cone 12 when 0.2 or 0.5 equiv. of chromic oxide crystals was added to frits of the type (0.25 K₂O, 0.25 Na₂O, 0.50 CaO) (0.05 Al₂O₃, 0.04—0.08 Cr₂O₃) (1.65 SiO₂, 0.30 B₂O₃) containing 0.08 or 0.05 equiv. of Cr₂O₃ respectively. With fritted glazes of the type (0.09 K₂O, 0.41—0.61 Na₂O, 0.50—0.30 CaO) (0.09 Cr₂O₃) (1.60—2.60 SiO₂, 0.50—0.00 B₂O₃), the aventurine appeared in glazes rich in B₂O₃ and alkalis. The best result was obtained with the glaze (0.09 K₂O, 0.41 Na₂O, 0.50 CaO) (0.09 Cr₂O₃) (1.80 SiO₂, 0.40 B₂O₃) fired at cone 8.

S. KONDO.

Chromate glaze. S. KONDO (Tokyo Higher Tech. School, Bull. 3, 1925, 23—26).—Glazes of the composition (0.90 PbO, 0.10 CaO) (0.20 Al₂O₃, 0.01—0.45 Cr₂O₃) (0.50 SiO₂) were fired at cone 05a—5a. On vitrified porcelain, the immature glazes had a red colour which showed a strong tendency to change to green as melting progressed. All the immature glazes showed red needles. Most of the mature glazes showed green or red crystals. No crystals appeared on porous biscuits. Glazes of the composition (0.90—0.50 PbO, 0.10—0.50 CaO) (0.05 Al₂O₃, 0.02—0.25 Cr₂O₃) (0.50—2.00 SiO₂) were fired at cones 05a—5a. No crystals appeared in glazes with PbO less than 0.70 equiv. Crystals can be obtained with glazes which contain less than 0.20 equiv. of Al₂O₃ and more than 0.5 equiv. of SiO₂.

S. KONDO.

Analysis of refractory materials and other products rich in alumina. E. SCHÜRSMANN and W. BÖHM (Chem.-Ztg., 1925, 49, 933—934, 958—959).—The separation of large amounts of aluminium as chloride by saturating the solution with hydrogen chloride (cf. Schürsmann and Schob, B., 1924, 299) greatly facilitates the determination of the minor

constituents of clays and other aluminous materials. 10 g. of the sample are heated with hydrofluoric acid and sulphuric acids to expel silica, and the solution is evaporated until the bulk of the sulphuric acid is removed. The residue is dissolved in 200 c.c. of hydrochloric acid, the solution cooled and saturated with hydrogen chloride, and the precipitate collected on glass wool and washed with concentrated hydrochloric acid. The filtrate is evaporated nearly to dryness, treated with hydrogen sulphide to remove any copper etc., oxidised with chlorine, and treated with ammonia to precipitate iron, titania, zirconia, and the remaining alumina. The precipitate is dissolved in hydrochloric acid, the iron separated by ether or by ammonium sulphide after addition of tartaric acid and ammonia, and the titanium and zirconium by means of cupferron. Nickel, manganese, and lime are determined in the ammoniacal filtrate as usual. Magnesia is precipitated with ammoniacal ammonium carbonate or, preferably, the solution is evaporated to dryness, and the residue heated gently to expel ammonium salts, and the residual magnesium and alkali sulphates are weighed. The sulphates are dissolved in water and converted into chlorides by treatment first with lead acetate, then, after removal of the lead sulphate, with hydrochloric acid. The excess of lead is separated with hydrogen sulphide, the solution evaporated to dryness, and the residue heated with thrice its weight of mercuric oxide until it ceases to evolve fumes. After extraction with hot water the insoluble magnesia is collected, ignited, and weighed. The filtrate is tested for potassium and lithium by any suitable method. A. R. POWELL.

Structure of α - and β -quartz. BRAGG and GIBBS.—See A., 1926, 13.

Electrolysis of soda-lime glass. MULLIGAN.—See A., 1926, 31.

Elastic after-effect of glass. KÖNIG.—See X.

PATENTS.

Manufacture of glazed or enamelled ware. I. TRAUBE (E.P. 221,830, 15.9.24. Conv., 14.9.23).—See G.P. 394,817; B., 1924, 749.

Producing enamels and glazes. F. SOMMER and M. GROTH, Assrs. to CHEM. WERKE VORM. AUERGES. (U.S.P. 1,564,907, 8.12.25. Appl., 17.5.23).—See E.P. 197,933; B., 1924, 382.

IX.—BUILDING MATERIALS.

Xylolith [from sawdust and magnesia cement]. R. GRÜN (Hauptversamml. Ver. Deuts. Steinholzfabr., 2.5.25. Reprint).—The setting of Sorel cement (magnesite cement) is generally ascribed to the formation of magnesium oxychloride; the author shows that the amount of magnesium chloride used is only a fraction of that required to form the oxychloride, whilst setting will also take place with salts other than chlorides or magnesium salts. A determination of the viscosity of suspensions of finely divided magnesium oxide in various setting agents and water shows that the setting of the cement is due to the

formation of magnesium hydroxide in a colloidal form, and not of magnesium oxychloride. Experiments carried out with magnesite obtained from various sources show how the strength, volume changes, and adhesion of the xylolith prepared from sawdust and magnesia cement vary with the grade of magnesite used.

B. W. CLARKE.

Action of sodium and magnesium sulphates on calcium aluminates. G. R. SHELTON (Ind. Eng. Chem., 1925, 17, 1267—1270).—The hydration products of the calcium aluminates $3\text{CaO}\cdot 5\text{Al}_2\text{O}_3$, $\text{CaO}\cdot\text{Al}_2\text{O}_3$, and $5\text{CaO}\cdot 3\text{Al}_2\text{O}_3$, of which the two last are important constituents of aluminous cement which resists well the disintegrating action of sulphate solutions, are hydrated tricalcium aluminate and amorphous matter, whereas with $3\text{CaO}\cdot\text{Al}_2\text{O}_3$ hydrated tricalcium aluminate crystals alone appear. The amount of gel formed and the time required for complete hydration increase with the alumina content of the compound. Sodium sulphate solutions, and magnesium sulphate solutions below 0.1M, form large quantities of sulphoaluminate crystals, especially in dilute solution, amorphous grains in the original hydrated suspension being transformed in the process. Stronger magnesium sulphate solutions form gypsum crystals. With magnesium sulphate solution, crystalline aluminate grains become surrounded by layers of gel, containing magnesium hydroxide, protecting the grains from further action of sulphates.

B. W. CLARKE.

Effect of size and shape of test specimen on compressive strength of concrete. H. F. GONNERMAN (Bull. 16, Structural Materials Research Lab., Lewis Inst., Chicago, Oct. 1925, pp. 16).—The 6 in. by 12 in. cylinder generally used for compression tests of concrete is satisfactory for aggregates up to 2 in. diameter. The ratio of diameter of cylinder to maximum size of aggregate should not be less than 3, with cylinders of length equal to two diameters. Cubes show a strength 13—18% higher than the corresponding cylinders.

B. W. CLARKE.

Studies of bond between concrete and steel. D. A. ABRAMS (Bull. 17, Structural Materials Research Lab., Lewis Inst., Chicago, Oct., 1925, 20 pp.).—The bond resistance of a steel bar embedded in concrete depends on the quality of the concrete and the condition of the surface of the bar; factors which influence the compressive strength of the concrete, *e.g.*, water ratio, proportion of cement, and fineness of aggregate, will affect the bond in the same way. The maximum bond resistance is about 24% of the compressive strength of the concrete, with an end slip of 0.01 in., but slipping of the bar commences at about 55—60% of this load. The use of crude oil instead of mixing water or hydrated lime in place of cement reduces the bond resistance and compressive strength of the concrete. The allowance of 4% of the 28-day compressive strength of concrete as the bond strength for plain bars gives a factor of safety of $2\frac{1}{2}$ —3.

B. W. CLARKE.

PATENTS.

Magnesia cement. K. WERNER (E.P. 243,197, 24.1.25).—Silicic acid, supplied entirely in the form of a filling material containing at least 30% of silicic acid capable of combining with the surplus magnesium chloride solution, is added to magnesia cement to form a cheap cement for the production of castings required to keep a constant shape, *e.g.*, as a substitute for iron in making pattern plates. Residues obtained in the manufacture of aluminium sulphate and alum are suitable silicious materials.

B. W. CLARKE.

Impregnation of wood. L. F. BLARINGHEM (F.P. 561,927, 8.2.23).—Green wood is impregnated with solutions of alkali dichromates containing alkali chlorides or fluorides and, if desired, colouring agents. In this way the proteins and reducing sugars of the wood cells are coagulated, the wood is hardened, and the time required for drying reduced by 50%, whilst deformation during drying is avoided. In order to obtain the wood in different shapes the green wood is first treated with the dichromate solution, then shaped, treated with the chloride or fluoride solution, and dried; wood so treated retains its shape indefinitely.

A. R. POWELL.

Refractory cement with a base of zirconium ore. F. C. F. LE COULTRE, Assr. to Soc. D'ETUDE DES AGGLOMÉRÉS (U.S.P. 1,565,472, 15.12.25. Appl., 9.10.24).—See E.P. 224,214; B., 1925, 318.

Treatment of cementitious material. K. WINKLER (U.S.P. 1,565,839, 15.12.25. Appl., 14.12.20).—See E.P. 167,138; B., 1922, 503 A.

Bituminous emulsions [containing blue clay]. WAILES DOVE BITUMASTIC, LTD., and R. SHAW (E.P. 243,976, 5.2.25).

Making [bituminous] emulsions. L. KIRSCHBRAUN (E.P. 244,135, 10.6.24).

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

Thermal treatment of molten iron and its application to malleable cast iron. E. PIVOVARSKI (Stahl u. Eisen, 1925, 45, 2001—2004).—In agreement with the author's observations on the influence of thermal treatment on fluid iron (B., 1925, 805), experiments on malleable irons of different compositions showed that heating to 1400—1500° retarded decomposition of the carbide on subsequent annealing, the effect increasing with decreasing silicon content. Heating to a lower temperature (about 1300°) or to a higher temperature (above 1500°) had the opposite tendency. These effects persisted even after annealing for 60 hrs. An iron made by mixing two samples which had been heated to temperatures in the lower and higher temperature zones showed after annealing greater carbide decomposition than a similar iron which had been heated directly to approximately the same temperature (1450°).

in the intermediate zone. As the temperature to which the fluid iron was heated was raised the temper carbon subsequently deposited became finer but not to the same degree as in the experiments with grey iron. Annealing above 900° gave finer distribution of the temper carbon although the rate of carbide decomposition was not accelerated. Annealing at about 800° produced no refinement of temper carbon but increased the rate of graphite crystallisation. By combining these annealing treatments additive effects were produced.

T. H. BURNHAM.

High-quality cast iron with high carbon and phosphorus contents as an electric furnace product. K. VON KERPELY (Stahl u. Eisen, 1925, 45, 2004—2008).—High-quality cast iron containing less than 3.0% C and 0.3% P is usually made in the cupola from carefully calculated burdens, and casting involves certain technical difficulties. By treating cast iron in a Nathusius electric furnace of 4—6 tons capacity, equally good mechanical properties can be obtained when the carbon and phosphorus are above these limits, *e.g.*, with C 3.0—3.2%, P 0.2—0.8%. The quality is influenced by the special slag used, consisting of crude lime, fluorspar, and powdered coke, and the casting temperature (usually between 1500° and 1600°) has an important effect. Owing to the quick cooling of the iron the graphite and phosphide eutectic are uniformly distributed in a fine network. Analyses and mechanical properties of a large number of "heats" made when feeding the electric furnace by three cupolas having an output of 5000 kg. per hr. are tabulated. The cupolas were charged with low-quality scrap high in phosphorus, carbon, and silicon. Equally good tensile properties were obtained as when pig iron was used. The iron produced showed a fine fracture and was tough under the repeated impact test. It was resistant to high pressure and sudden changes of temperature. The ultimate strength increased as the cross-section of the test pieces decreased.

T. H. BURNHAM.

Influence of some elements on spheroidisation of carbides in steels. T. ISHARA (Sci. Rep. Tôhoku, 1925, 14, 377—390).—Cylindrical rods, prepared from a series of manganese, chromium, and copper steels, were annealed at 1100°, cooled to make the structure lamellar, and then heated at the rate of 2° per min. to the neighbourhood of the A₁ transformation, and the degree of spheroidisation of carbides observed. The three series, each embracing 20 alloys, were prepared from Swedish iron and the appropriate alloying metal within the limits. C 0.51%, Mn 1.02% to C 2%, Mn 4.09%, C 0.45%, Cr 0.99% to C 1.85%, Cr 3.95%, and C 0.41% Cu 1.01% to C 1.98%, Cu 3.98%. The interval of temperature above the A₁ point within which spheroidising occurs is increased slightly with the content of manganese, and considerably with chromium, whilst copper has an intermediate effect. If the content of these elements in steels be kept constant the interval remains nearly constant up to the

eutectoid concentration and then increases rapidly with increase in the content of carbon.

C. A. KING.

Structural diagrams of some special steels. T. KASÉ (Sci. Rep. Tôhoku, 1925, 14, 453—478).—The structural diagrams of nickel, manganese, and chromium steels, made from Swedish iron, sugar charcoal, and the alloying element, were examined with reference to hardness (scleroscope), microstructure, and transformations, especially at low temperatures. Alloys which have completed the Ar₃ transformation at atmospheric temperature do not undergo any marked change in physical properties when cooled in liquid air, but those having an austenitic structure may be transformed into martensite and expand abnormally, with increase in hardness. Thus an increasing content of nickel in nickel-iron alloys causes a rapid depression of the Ar₃ point, which in the case of a 26% Ni alloy falls below 20° and in that of a 35% Ni alloy below -190°. Annealed nickel-iron alloys containing 20—34% Ni increase in hardness after being immersed in liquid air. The alloys, *e.g.*, iron-carbon-nickel (up to 10% Ni), which exhibit stepped transformations in magnetic analysis, assume a martensitic structure on cooling in virtue of the lower transformation temperature (below 300°). The structural diagrams of the steels examined are different from those described by Guillet, in that when the former are cooled slowly from the melted condition, the structural fields, after an addition of a small quantity of carbon, are bordered by straight lines almost parallel to the axis of the carbon.

C. A. KING.

Influence of the thermal zone of working on the selection of steels for the valves of aeroplane engines. C. GRARD (Compt. rend., 1925, 181, 1143—1145).—The most suitable alloy examined was a steel containing C 0.4, Si 2.5, Cr 12%, quenched in air at 1200° and reheated to 900°. This steel possessed the following characteristics: Ac 950°, *d* 7.8, tensile strength 92, elongation 12%, Brinell hardness 280 at ordinary temperature, nearly 40 at 900° (this latter value may be slightly increased by addition of 1.5% of tungsten), resistance to repeated impact 18,140. Valves made of this alloy retained their original polish and texture after continuous operation for 50 hrs.

S. I. LEVY.

Quenching of light aluminium-copper alloys containing more than 5% of copper. L. GUILLET and J. GALIBOURG (Compt. rend., 1925, 181, 1107—1108).—The hardness and electrical resistivity of castings containing 7—45% Cu, after quenching and subsequent reheating, are tabulated. Quenching and reheating greatly increase the hardness, which is more than doubled by the optimum treatment in some cases. The resistivity is abnormal, being increased not only by quenching, but also in some cases by the subsequent annealing. Both properties increase steadily with increasing copper content.

S. I. LEVY.

Effect of cold working and annealing on some physical properties of copper, aluminium, and their alloys. T. MATSUDA (Sci. Rep. Tôhoku, 1925, 14, 343—376).—The physical properties of copper, brasses (Cu 71, 60, and 54%), aluminium-bronze (7% Al), phosphor-bronzes (Sn 3 and 9%), manganese-copper (Mn 3.6%), aluminium, and duralumin, were determined after cold rolling and annealing. The electrical resistance increased as the result of cold deformation whether the deformation was produced by rolling, drawing, or twisting, but there was no systematic differences in the resistance of cold-drawn plates measured along or transversely to the direction of rolling. The increase in resistance is considered to be due to straining of the space lattice and not to the formation of fine cracks as suggested by Tammann. Lower strength and higher elongation were observed in specimens cut longitudinally to the direction of rolling. When the alloys were heated the strain in the space lattice began to disappear at temperatures much below that at which recrystallisation commenced, and the first step in the decrease of electrical resistance corresponded with this release of strain, the second change in resistance occurring during the recrystallisation. On heating, the alloys expanded in the direction of rolling and contracted in the transverse direction, but the internal strain produced by cold rolling is considered not to exert much influence on the electrical resistance.

C. A. KING.

Determination of certain curves [of the lead-zinc-silver system] and their application to the desilverisation of lead by the Parkes process. G. K. WILLIAMS (Proc. Austral. Inst. Min. Met., 1925, [58], 47—97).—As a result of a detailed investigation of the behaviour of ternary alloys at the lead corner of the lead-zinc-silver system a diagram has been constructed giving the cooling curves, temperature contours, and eutectic compositions of this system so that the behaviour of any lead-silver alloy containing less than 100 oz. of silver per ton may be accurately followed during desilverisation by the Parkes process. The composition of the lead bullion obtained after the zinc treatment is dependent on the amount of silver present and on the amount of zinc added, but the final alloy is always a eutectic having a composition corresponding with some point on the line joining the lead-silver eutectic point to the lead-zinc eutectic point. The crust that separates from the molten ternary alloys is essentially a solid solution of lead, silver, and zinc, and may contain 5—10% Pb other than that entangled in the crystals. The statement that a minimum amount of 0.7% Zn must be present in the lead before any desilverisation will take place is erroneous, the amount of zinc necessary depending entirely on the silver content of the lead before desilverising; the higher the silver up to 2.5% the lower will be the quantity of zinc required to remove it. After desilverisation the lead usually contains about 0.6% Zn and 0.2 oz. Ag per ton as the Pb-Zn-Ag eutectic. In applying these facts to practice considerable variation in the results and working costs may be

obtained by varying the mode of application of the zinc, temperature of stirring, temperature of skimming, and proportion of zinc added. When only one zinc treatment is used, effective desilverisation requires a larger amount of zinc, and a correspondingly large weight of crust is formed if the skimming is done in one operation at a temperature just above the eutectic temperature. If, however, the crusts that form first are removed at a comparatively high temperature and set aside for recovery of the silver, and the later crusts are removed at the eutectic temperature and returned to the next charge, then the zinc consumption is lower, the first crusts are richer in silver, and the time of desilverisation is shortened; on the other hand, the fuel consumption is very high, the strain on the workman is greater, and the weight of crusts for re-treatment is comparatively large. At the Port Pirie smelter two zinc treatments are given; lead containing 60 oz. Ag per ton is heated to 450° and crusts from the second zinc treatment of a previous charge are added. After cooling to the temperature at which the lead begins to solidify, the crusts are removed with a Howard press and set aside for the recovery of the silver. The metal is again heated to 450°, new zinc added to bring the zinc content to about 0.7%, and after cooling as before, the crusts are removed and used for the first treatment of the next batch. The final crusts are heated to 650—700° and allowed to cool until the zinc layer solidifies; this contains 16,000 oz. Ag per ton and is sent direct to the retorts. The lead layer is allowed to cool to 350° and the crust that separates is added to the next lot of crust to be enriched, whilst the remaining lead is returned to a main charge before the second zinc treatment. Tables showing the requisite quantities of zinc required for the first and second treatments of lead containing varying amounts of silver are given.

A. R. POWELL.

System lead-antimony. II. R. S. DEAN, W. E. HUDSON, and M. F. FOGLER (Ind. Eng. Chem., 1925, 17, 1246—1247; cf. B., 1923, 836 A; 1924, 835).—The extent to which antimony forms solid solutions with lead has been determined at the eutectic temperature (247°) by thermal analysis, and over a range of temperatures from 20° to 238° by observing the break in the composition-electrical conductivity curves. The solubility is 2.45% Sb at 247°, and falls to 0.80% at 20°. Lead-antimony alloys containing antimony in excess of the amount soluble at room temperature, when quenched from higher temperatures, subsequently age-harden at room temperature, as indicated by increase in tensile strength. The amount of hardening shows a maximum near 2.5% Sb. The increase in conductivity during the hardening process indicates that the solid solution formed at higher temperatures is retained by quenching and subsequently breaks down by separation of a constituent in a fine state of subdivision.

A. B. MANNING.

Elastic after-effect [of metals and glass] at different temperatures. H. KÖNIG (Physikal. Z., 1925, 26, 797—811).—Determinations have been

made by Bennewitz's method of the rate of bending and recovery of thin rods of glass, copper, brass, and aluminium subjected to fixed loads at temperatures between 15° and 360°. The loading and recovery curves were approximately logarithmic in nature, but in the majority of cases the deformation of the rods increased rather more quickly than the logarithm of the duration of the load, although for glass between 150° and 250° the increase was slower. The logarithmic law is approximately applicable for times up to about 3000 sec. for certain temperatures, but, to within experimental error, it is valid only up to 100 sec. The loading curves may be approximately reproduced by the formula $y = y_0 + at^n$, where a and n are constants. The recovery curves were usually represented approximately by the application of the superposition principle to the loading curves. The calculated recovery curves were usually somewhat flatter than the experimental ones, the discrepancy being greater for glass than for the metals. The flow of the metals at high temperatures enhanced this discrepancy, but when this effect was neglected the after-effect was found to be roughly proportional to the loading. The variation of the after-effect with temperature was greater with the metals than with glass. It was especially large in the case of brass, the deformation of which in a given time interval was 100 times as great at 300° as at 16°. The rate of deformation in the case of metals increases with rise of temperature. With glass, a notable decrease of deformability occurs in some temperature ranges, although in others a marked increase occurs. The after-effect is greatly dependent on the pre-treatment of the specimen. In the case of glass preheating generally decreases the after-effect. The after-effects in copper showed a complex behaviour under different conditions of preheating, due apparently to recrystallisation changes during the heat treatment.

F. G. TRYHORN.

Gases in metals. II. Determination of oxygen and hydrogen in metals by fusion in vacuum. L. JORDAN and J. R. ECKMAN (Sci. Papers U.S. Bur. Standards, 1925, 20, [514], 445—482).—Twenty to 60 g. of metal are fused in a gas-free graphite crucible in a vacuum in a high-frequency induction furnace. A crucible of electrically fused magnesia around the crucible serves as a radiation screen and heat insulator. The double crucible is set inside a silica tube within the furnace and the arrangement permits of maintaining the molten metal at 1500° while the furnace walls remain comparatively cool. Water vapour and carbon dioxide are determined directly and carbon monoxide and hydrogen indirectly by passing the gases evolved from the heated sample through a train of solid absorbents at low pressures. Phosphorus pentoxide and ascarite (a granular sodium hydroxide-asbestos absorbent) are used for the absorption of water and carbon dioxide respectively, and an electrically heated copper oxide furnace for the oxidation of carbon monoxide and hydrogen forms part of the train. The method does not distinguish between oxygen

present in the metal as carbon monoxide or dioxide or oxides of non-metallic inclusions or of metallic constituents. The recovery of oxygen is complete from oxides of iron, manganese, silicon, aluminium, titanium, and zirconium, and the determination of oxygen in iron and steel is not interfered with by the presence of sulphur. The method is suitable for the determination of oxygen in iron, steel, cast iron, and many non-ferrous metals and alloys. Direct fusion of low-carbon steels in refractory-oxide crucibles or the Goerens-Paquet method (fusion of the sample with an antimony-tin alloy in similar crucibles) does not determine all the oxygen present in the metal. The reduction of the refractory oxides by the carbon in the steel is an additional difficulty which becomes more pronounced with higher carbon content. The use of the graphite crucible permits of a satisfactory determination of oxygen irrespective of the amount of carbon in the steel. M. COOK.

Copper from its sulphide ores. R. SAXON (Chem. Trade J., 1925, 77, 626—627).—Iron pyrites gives a solution of ferrous and ferric sulphates when electrolysis takes place in a medium of 10% sulphuric acid, using an iron cathode surrounded by the mineral and a carbon anode. The proportion of ferric sulphate in solution increases with time and eventually ferric hydroxide is precipitated. Copper pyrites with similar treatment gives a solution of ferrous sulphate, copper sulphide being deposited on the cathode. If the electrolyte and cathode be then removed and the latter be used as an anode, copper can be deposited on a new ferrochrome cathode. An apparatus for effecting this without changing the electrolyte is described.

L. M. CLARK.

Extraction of copper from burnt pyrites by means of sulphuric acid. N. F. JUSCHKEVITSCH (Russian J. Chem. Ind., 1924, 1, [1], 5—11).—In the laboratory 86% of the total copper may be extracted from burnt pyrites by boiling dilute sulphuric acid, but on a works scale the extraction is less complete owing to the slowness with which the copper is dissolved. The amount of acid required is considerable even when the percentage extraction is low and increases to 11.3 kg. of monohydrate per kg. of copper, when 85.5—86% of the latter is extracted. Increase in the concentration of the acid effects neither improved extraction of the copper nor diminution of the amount of acid required. This method seems too costly for practical application. Better results are obtained by subjecting the burnt pyrites to preliminary sulphatisation by heating at 500—600° and afterwards treating with water and sulphuric acid solution, as much as 97% of the total copper being readily extracted in this way with an expenditure of 8 kg. of chamber acid per 100 kg. of pyrites. The sulphatisation is expensive as regards both fuel and labour if carried out in separate furnaces, but it could be cheapened by using a mechanical furnace and by either atomising the sulphuric acid or introducing sulphur dioxide into the lower zones of the furnace. T. H. POPE.

Zinc compounds at high temperatures. [Direct production of volatilised zinc oxide from sulphide ores.] W. G. WARING (Min. and Met., 1925, 6, 610—613).—Zinc sulphide may be volatilised directly from complex ores containing zinc blende, galena, pyrites, etc., and burnt directly to pure white zinc oxide which may be selectively condensed. The high temperature produced by the combustion of zinc sulphide in a confined space is sufficient to keep the oxide formed in the state of vapour, which condenses at 1370° leaving the more volatile impurities (basic lead sulphate, bismuth, antimony, arsenic, cadmium, selenium, and tellurium oxides) which condense at temperatures below 1060°, to be collected in a second receiver. Experiments carried out in a combined reverberatory-blast furnace (U.S.P. 1,513,775; B., 1925, 14), using a shallow charge and oxidising the volatilised sulphides at the surface by means of a hot blast, resulted in the production of a zinc oxide product containing 97% ZnO with a loss of only 2% of the total zinc in the slag and flue dust; at the same time a high-grade copper matte containing the gold and most of the silver was obtained. The zinc oxide was purified by digesting it under slightly reduced pressure in iron vessels with 4*N*-ammonium carbonate at the ordinary temperature. In 1 hr. all the zinc dissolved together with the cadmium and a small quantity of silver, leaving a residue of basic lead carbonate and other impurities. After settling and filtering, the solution was passed through a cylinder containing scrap zinc to remove cadmium and silver and then distilled with live steam, whereby the zinc was deposited as a light, non-adherent powder of zinc carbonate which could readily be converted into oxide by heating at 400°. The ammonia and carbon dioxide were recovered for use again. A. R. POWELL.

Reduction of zinc oxide by carbon. G. A. ZELLER and B. M. O'HARRA (Sch. Mines Met. Univ. Tech. Bull., 8, 3—32; Chem. Abstr., 1925, 19, 3451).—At temperatures above that at which the reduction of zinc oxide by carbon in a sealed graphite retort began, the rate of reduction was doubled with equal intervals of temperature, the intervals varying for different forms of carbon. Calcined zinc carbonate was reduced much more rapidly than other forms of zinc oxide. The differences are due mainly to differences in the condition of the surfaces. A. A. ELDRIDGE.

Determination of silver in zinc retort residues. V. HASSREIDTER (Metall u. Erz, 1925, 22, 403—404; Chem. Zentr., 1925, II., 2219).—Zinc retort residues usually have such a high carbon content that an oxidising charge is necessary in order to get a satisfactory lead button for the determination of silver. The following charge is recommended: 15 g. of residues, 75 g. of lead dioxide, 10 g. of sand, and 45 g. of sodium carbonate. If the button weighs more than 60 g. the requisite amount of nitre should be added in order to obtain a 60-g. button, which is then scorified and cupelled as usual. A. R. POWELL.

Method of reducing the corrosion of water conduits consisting of pipes of two different metals. H. CASSEL (Korrosion u. Metallschutz, 1925, 1, 75; Chem. Zentr., 1925, 96, II., 2024).—Considerable corrosion takes place at copper-iron joints in water conduits. This may be greatly reduced by inserting a short length of lead piping between the copper and the iron pipes. The lead piping becomes coated with a thin layer of lead peroxide and acts as an inert body and, owing to the separation of the iron and copper and to the poor conductivity of ordinary water, no current flows between the two metals and hence corrosion is slight. A. R. POWELL.

Natural water corrosion and hydrogen-ion concentration. J. R. BAYLIS (Chem. Met. Eng., 1925, 32, 974—975).—Experiments confirm the electrochemical theory of corrosion. In no case was a concentration of 3 p.p.m. of soluble iron found in a solution free from oxygen with iron present when the p_H was between 8 and 9. Soluble iron in water with excess of dissolved oxygen oxidises at a much faster rate at p_H 9.0 than at p_H 6.0. If an alkalinity of 50 p.p.m. be assumed, then at p_H 8.0 less than 0.1 p.p.m. of soluble iron is found in the absence of oxygen, about 0.1 at p_H 8.0, about 1.0 at p_H 7.5, and about 4.0 at p_H 7.0. At less than p_H 7.0 the soluble iron increases rapidly. "Tuberculous" deposits form an impervious coating where soluble iron from the interior comes into contact with dissolved oxygen. If the water has p_H 8.5 the iron forms an impervious coating of crystalline iron oxide in a few months. Pits are often found under tubercles and negative ions, such as sulphate and chloride ions, are concentrated in these: the overlying tubercles may contain over 1% of these salts. The volatility of ferrous carbonate determines the likelihood of the water to stain. H. MOORE.

Mechanism of plastic deformation [of metals]. H. MEYER and F. NEHL (Stahl u. Eisen, 1925, 45, 1961—1972).—A review of the literature of the subject is given and special attention is devoted to considering the "slip-cone" theory of deformation. The formation of cones on compressing cylindrical test-pieces of steel is ascribed to frictional forces between the jaws of the compressing machine and the end surfaces of the test-piece: the lines of stress in the test-piece are brought out by etching. By using the fact that the yield load in compression depends on the height of the test-piece when end surface frictional forces are not eliminated, a method is devised whereby the angle of inclination of the plane of deformation proceeding from the end surface can be measured for iron at the yield point. By measuring the amount of crushing in cylindrical test-pieces undergoing more severe deformation, it was found that to produce a given decrease in height always required much heavier loading than would be expected by calculation: this is also explained by the influence of frictional forces at the end faces. The factors bearing on the work needed to cause plastic deformation are discussed, and the

mechanisms of slight and severe deformation in a test-piece with non-rectilinear cross-section, are explained on the basis of experiments with double cones of mild steel. Information on the rolling of iron is obtained by etching cold-rolled square bars, when lines of stress are revealed. L. M. CLARK.

Froth flotation explained by X-rays. C. G. McLAHLAN (Eng. Min. J. Press, 1925, 120, 408—409; Chem. Abstr., 1925, 19, 3450).—Space-lattice diagrams show that in non-floatable minerals oxygen is present at the surface, with consequent small attraction for air bubbles, whilst the surface of floatable minerals contains metal or sulphur.

A. A. ELDRIDGE.

See also A., 1926, 17, **Remanent magnetism and specific resistance of pure iron-carbon alloys** (CAMPBELL). 20, **Production of oxide films on copper at ordinary temperature** (EVANS). 30, **Electromotive behaviour of aluminium** (DE GRUYTER). 33, **Effect of differential aeration on corrosion** (MCAULAY and BOWDEN). 41, **Volumetric determination of iron in hydrochloric acid solution** (MANCHOT and OBERHAUSER); **Separating cadmium, bismuth, and lead** (MANCHOT, GRASSL, and SCHNEEBERGER).

PATENTS.

Non-magnetic steel wire. P. H. BRACE, Assr. to WESTINGHOUSE ELECTRIC AND MANUFACTURING Co. (U.S.P. 1,561,306, 10.11.25. Appl., 21.4.21).—A non-magnetic ferrous alloy contains 10—18% Mn, 2—8% Cr, and 5—10% Ni. T. H. BURNHAM.

Tool [steel]. E. G. HONES (U.S.P. 1,561,857, 17.11.25. Appl., 29.6.25).—Tools are made of alloy steel containing 0.1—3.0% Cu, 0.1—3.0% Zr, and 0.1—3.0% Co. T. H. BURNHAM.

Heat-resisting steel. E. H. NOACK (U.S.P. 1,562,782, 24.11.25. Appl., 14.6.24).—The steel contains Si 1.50—2.00%, Cu 0.50—1.00%, Mn not more than 0.12%, and C not exceeding 0.10%.

M. COOK.

Heat-resisting [iron] alloy. N. V. HYBINETTE (U.S.P. 1,563,573, 1.12.25. Appl., 11.6.23).—Heat-resisting alloys contain Cr 10—20%, Ni 30—40%, C 0.4—1.5%, less than 1% Si, and the remainder iron. C. A. KING.

Manufacture of alloy steels and iron. B. D. SAKLATWALLA (U.S.P. 1,564,139, 1.12.25. Appl., 8.4.24).—An alloying metal is introduced into iron or steel by electrolysis a molten bath containing an unreduced compound of the alloying metal and allowing the metal to descend into a bath of molten iron beneath the electrolyte bath. C. A. KING.

Process of making ferrovanadium. L. F. VOGT, Assr. to STANDARD CHEMICAL Co. (U.S.P. 1,564,156, 1.12.25. Appl., 26.12.24).—A mixture of a finely-divided fluxing agent containing lime and a reducing agent containing silicon is spread over a slag layer which contains vanadium compounds

and which covers a molten bath of metal. The mixture of reducing agent and flux fuses and descends gradually through the slag, reducing the vanadium compounds during its progress. C. A. KING.

Carburising process. N. E. PHILLIPS (U.S.P. 1,561,482, 17.11.25. Appl., 27.8.23).—The iron is enclosed in a thick, closely consolidated packing of pulverised carboniferous material, which is itself enclosed in a similar packing of a powdered material containing calcium. The temperature is raised and the iron maintained at a white heat for 4—10 hrs., according to the depth of carburisation desired. T. H. BURNHAM.

Cold processes for drawing and rolling metals. J. G. DE LATRE and H. HARDY (E.P. 226,774, 20.6.24. Conv., 29.12.23).—Before rolling or drawing, the metal is coated by dipping into a molten alloy of a soft metal, such as lead, with one or more metals, such as copper, nickel, or tin, present in sufficient quantity to form a large number of small ducts in the covering layer after the soft metal has been removed in rolling or drawing. The preferred composition of the covering alloy is Pb 60, Ni 2, Sn 10, and Cu 28 pts. M. COOK.

Electrolytic separation of metallic chromium. Production of solutions containing oxides of chromium for the deposition of metallic chromium. E. LIEBREICH (E.P. [A] 237,288, 20.7.25, and [B] 243,046, 13.8.24. [A] Conv., 21.7.24).—(A) A solution for the electrolytic deposition of chromium is prepared by the electrolytic reduction of a solution in water of chromium trioxide containing less than 1.2% of free sulphuric acid. A low current density is used so that no metal is deposited until a sufficient quantity of lower oxide has been formed. (B) Chromium trioxide containing less than 1.2% of free sulphuric acid is heated at 170—200° in the absence of air and without stirring until a slightly pasty mass is obtained. This is dissolved in water and the acidity adjusted to 0.6—0.8% of free sulphuric acid for matte deposits and to 0.8—1.2% of free acid for bright deposits of metallic chromium.

A. R. POWELL.

Leaching processes for extraction of metals from ores and the like. W. G. PERKINS, and METALS PRODUCTION, LTD. (E.P. 243,075, 22.8.24 and 5.3.25).—After treatment of the ore by ammoniacal solutions a mixture of steam and ammonia, with or without carbon dioxide, is applied. The presence of ammonia, assisted if necessary by carbon dioxide, prevents the re-precipitation of copper. The vapours may be introduced above the ore while this is in contact with leaching liquor. The liquid condensed in the charge from the vapours is collected separately from the leaching liquors and used to make up fresh leaching solution. Copper ores rendered porous by heating (cf. E.P. 185,242 and 190,246; J., 1922, 863 A; 1923, 147 A) are treated first with ammoniacal carbonate solutions and then with the mixture of steam and ammonia with or without carbon dioxide. The process is

primarily for the treatment of oxidised copper ores but is applicable to all cases where ammoniacal leaching solutions are used. M. COOK.

Condensing zinc vapour. O. RAVNER, Assr. to DET NORSKE AKTIESELSKAB FOR ELEKTROKEM. IND. (U.S.P. 1,562,473, 24.11.25. Appl., 7.3.21).—The condenser comprises a revolving drum connected with a stationary tube in such a way that the condensate formed in the tube falls back automatically into the drum. M. COOK.

Deoxidising metals and alloys. A. PACZ (U.S.P. 1,562,655, 24.11.25. Appl., 11.5.21).—An intimate mixture of aluminium powder and sodium silicofluoride is added to the molten metal or alloy. M. COOK.

Treating metallic objects. Coated metallic article. C. P. MADSEN, Assr. to MADSENELL CORP. (U.S.P. 1,562,710—1, 24.11.25. Appl., 27.7.20. Renewed 10.2.25).—(A) An iron or steel surface is prepared for the application of an adherent impervious metallic coating by arranging it as anode in an electrolytic bath containing sulphuric acid of a strength of 86% or over, maintained at a temperature above normal. (B) A flexible metallic base is provided with an adherent workable coating of a "nickel metal" deposited electrolytically. H. HOLMES.

Treating manganese-silver ores. M. F. COOLBAUGH and J. B. READ, Assrs. to COMPLEX ORES RECOVERIES Co. (U.S.P. 1,562,942, 24.11.25. Appl., 4.3.22).—Ores containing silver, manganese, and sulphides are roasted under such conditions that the silver sulphide is not affected whereas other sulphides are oxidised. The ore and evolved gases then pass together to a cooler zone where the manganese is converted into sulphate, which may be separated from the silver sulphide by extracting with water. A. GEAKE.

Roasting ores. A. D. H. L. FASSOTTE, Assr. to COMP. DES MÉTAUX OVERFELT-LOMMEL (U.S.P. 1,563,616, 1.12.25. Appl., 16.1.24).—A gaseous current with ore particles in suspension travels up a central column and down a surrounding annular column where the heat developed is utilised to preheat the ore particles, most of the necessary air being preheated by heat from the waste gases. The ore together with a small quantity of preheated air is fed into the base of the central column horizontally and the main portion of the preheated air meets the mixture at right-angles. The velocity of the upward gaseous current is gradually reduced and the remainder of the air, which is not preheated, is injected into the central column at different heights. M. COOK.

Precipitating gold from solutions. W. H. BATES (U.S.P. 1,563,957, 1.12.25. Appl., 2.7.23).—In the electrolysis of solutions containing precious metals a mercury cathode having a large active area is used in close proximity to an anode also of large active area. C. A. KING.

Open-hearth furnace. C. DAVIES, JUN. (U.S.P. 1,564,049, 6.12.25. Appl., 6.4.22).—An air-port extends across the end of the hearth of a furnace and a fuel-supply duct is provided to deliver fuel in a direction substantially parallel to the air-port and beneath the issuing stream of air. The fuel-supply duct is of approximately the same transverse width as the air-port. D. F. TWISS.

Removal of gases from molten aluminium. T. STAUB (F.P. 591,145, 6.12.24).—Aluminium is melted under a slag of dehydrated sodium and calcium chlorides, potassium sulphate, and cryolite to remove gases and slag-forming impurities. A. R. POWELL.

Gray cast iron. K. SIPP, Assr. to H. LANZ (U.S.P. 1,564,284, 8.12.25. Appl., 15.5.24).—See E.P. 225,501; B., 1925, 596.

Detinning of tinned-iron scrap. H. DAVIES and M. A. ADAM (U.S.P. 1,565,425, 15.12.25. Appl., 28.6.23).—See E.P. 209,124; B., 1924, 180.

Melting and refining non-ferrous metals. BARRETT Co., Assecs. of D. CUSHING (E.P. 225,871, 6.12.24. Conv., 7.12.23).—See U.S.P. 1,556,591; B., 1925, 996.

Manufacture of alloys. H. WADE. From INTERNAT. NICKEL Co. (E.P. 243,892, 21.11.24).—See U.S.P. 1,533,818; B., 1925, 510.

Treatment of ores or residues containing zinc. S. C. SMITH (U.S.P. 1,565,215, 8.12.25. Appl., 14.5.24).—See E.P. 237,306; B., 1925, 767.

Producing zinc or zinc and lead. C. E. CORNELIUS, Assr. to TROLLHÄTTANS ELEKTROTHERMISKA AKTIEBOLAG (U.S.P. 1,566,183, 15.12.25. Appl., 27.7.21).—See E.P. 171,722; B., 1922, 62 A.

Muffles for the heat treatment of metals. J. H. LLOYD, C. M. WALTER, and J. PALSER (E.P. 244,280, 3.1.25).

Nickel catalyst (U.S.P. 1,563,587).—See I.

XI.—ELECTROTECHNICS.

Amount and distribution of light emitted by carbons of high luminous intensity used in projection. J. REY (Compt. rend., 1925, 181, 1133—1134).—Photometric examination of the image of the crater of an arc formed between carbon electrodes having a core of rare-earth salts, shows the existence of several distinct zones, the average amount of light for the whole area of the crater being 296.3 candles per sq. mm. with a current density of 0.75 ampère per sq. mm. The figures obtained are much below those claimed by the makers.

S. I. LEVY.

Sulphuric acid from a quadruple mixture by electrolysis. SAXON.—See A., 1926, 34.

Electric vacuum furnace. PARTINGTON and ANFILOGOFF.—See A., 1926, 41.

Photo-electric radiation pyrometer. LINDEMANN and KEELEY.—See I.

Obtaining iodine by electrolysis. PISARSHEVSKI and TELNI.—See VII.

PATENTS.

Resistance material electrically conductive in a cold state and usable at high temperatures. T. A. F. HOLMGREN (E.P. 228,142, 12.1.25. Conv., 22.1.24).—Silicon carbide or other similar carbide, e.g., titanium carbide, is mixed with a refractory binding medium consisting wholly or partly of an oxide of a metal of the alkaline-earth or magnesium groups, and the mixture burnt at a temperature not lower than about 1200° in an atmosphere containing carbon monoxide. If desired, one or more refractory metals or graphite may be incorporated in the mixture, and the surface of the conductor may be coated with a glaze consisting, e.g., of 0.1 pt. of barium oxide, 0.2 of calcium oxide, 0.2 of potassium oxide, 0.1 of magnesium oxide, 1.0 of alumina, and 7.0 pts. of silica. J. S. G. THOMAS.

Synthesising gases in electric furnaces. M. J. BROWN, Assr. to ROESSLER and HASSLACHER CHEMICAL Co. (U.S.P. 1,562,684, 24.11.25. Appl., 2.10.22).—In an electric resistance furnace for effecting gaseous reactions, and having a resistor of finely-divided material arranged between the electrodes, the resistor material is supplied at such a rate with the reacting gases that the value of the electrical resistance is maintained within predetermined limits. J. S. G. THOMAS.

[Evacuating] electron discharge devices. WESTERN ELECTRIC Co. From WESTERN ELECTRIC Co., INC. (E.P. 243,200, 31.1.25).—Residual gas is removed from an electron discharge device by means of a getter, e.g., of aluminium, mounted in such a way that the vapour emitted by the getter, which is vaporised by an alternating current, does not attack the electrode surfaces. J. S. G. THOMAS.

Means for automatically interrupting the current in electric furnaces if a fault occurs in an electrode. RHEINISCHE METALLWAAREN- u. MASCHINENFABRIK (E.P. 241,865, 24.8.25. Conv., 22.10.24).

Dehydrating oil emulsions (U.S.P. 1,562,712).—See II.

Silicic acid (U.S.P. 1,562,940).—See VII.

Incandescence bodies for electric lamps (E.P. 243,251).—See VII.

XII.—FATS; OILS; WAXES.

Oils of chaulmoogra group. E. ANDRÉ (Compt. rend., 1925, 181, 1089—1091).—The oils and fats of the chaulmoogra group used in the treatment of leprosy are all strongly dextrorotatory and have closely similar physical properties. Fractionation with organic solvents indicates that the high dextro-

rotation is not due entirely to the content of chaulmoogric and hydnocarpic acids and it is probable that strongly dextrorotatory liquid fatty acids are present. The origins and physical properties of the oils studied are as follow:—*Taraktogenos Kurzii* (chaulmoogra) oil: d^{32} 0.9425; n_D^{20} (5% chloroform solution), +48.0°, m.p. 33—39°; saponif. value, 210.4; iodine value (Hanus), 96.1. *Hydnocarpus anthelmintica* (kraboa) oil (two samples): d^{20} 0.9447, d^{32} 0.9427, n_D^{20} 1.4755, 1.4742, n_D^{25} +58.17°, 48.0°, m.p. 26—29°, 25—26°, saponif. value 191, 187.3, iodine value 90, 88.3. *Hydnocarpus Wightiana* (kavatel) oil: d^{32} 0.9330, n_D^{20} 1.4780, n_D^{25} +61.67°, m.p. 28—32°, saponif. value 197.2, iodine value 103. *Hydnocarpus alpina*: d^{32} 0.9346, n_D^{32} 1.4764, n_D^{25} +57.0°, m.p. 20.5°, saponif. value 201, iodine value 95. *Asteriastigma macrocarpa*: d^{32} 0.9217, n_D^{25} 1.4725, $[a]_D$ +44.0°, m.p. 37—39°, saponif. value 189.4, iodine value 82.8. *Oncoba echinata* (gorli) fat; d^{32} 0.9286, n_D^{31} 1.4740, $[a]_D$ +56.17°, m.p. 40.5—41.5°, saponif. value 184.5, iodine value 98. *Carpotroche brasiliensis*: d^{32} 0.9499, n_D^{31} 1.4755, n_D^{25} +53.67°, m.p. 21—23°, saponif. value 183.7, iodine value 106.1. The "chaulmoogra oils" of commerce appear to be of various botanical origins. L. F. HEWITT.

Higher fatty acids of peanut [arachis] oil. W. D. COHEN (Proc. K. Akad. Wetensch. Amsterdam, 1925, 28, 630—635).—Repeated fractional distillation in a vacuum (0.001 mm.) of the ethyl esters of the higher fatty acids present in arachis oil effects a separation into two fractions, (1) m.p. 42.5°, (2) m.p. 53.5—54°, which on hydrolysis yield respectively arachidic acid, m.p. 74.5—75°, and a C_{24} acid, m.p. 80—80.5°, the properties of which render it probable that it is a straight-chain acid belonging to the same homologous series; each acid is present to the extent of 3—4% of the total fatty acids. No trace of a C_{22} acid could be detected, the substance obtained by Ehrenstein and Stuewer (B., 1923, 1031 A) being probably a mixture, since effective separation cannot be obtained by distillation in an ordinary filter-pump vacuum. J. W. BAKER.

Detection of unsaponifiable matter in marine animal oils. D. HOLDE and A. GORGAS (Chem. Umschau, 1925, 32, 314—316).—The qualitative Spitz-Honig test for unsaponifiable matter was found to fail with two marine animal oils known to contain 6% and 9% of unsaponifiable matter respectively. The failure of the test, which depends on the formation of a turbidity on adding water to the oil saponified by alcoholic alkali, was traced to a surface tension effect, whereby the unsaponifiable matter remained floating on the surface as droplets instead of forming a cloudy emulsion. This anomalous behaviour is determined by the nature of the unsaponifiable matter and the soap present. The test is made more trustworthy in the case of certain marine animal oils containing highly unsaturated hydrocarbons if the saponified alcoholic solution of the oil be diluted with water added drop by drop from a burette. A. DE WAELE.

Application of measurement of capillary forces to study of fatty acids. R. DUBRISAY (Compt. rend., 1925, 181, 1060—1061).—Surface tensions of fatty acids in benzene solution in contact with dilute soda solutions have been determined by the drop method. An equimolecular mixture of stearic and myristic acids has the same refractive index as palmitic acid, but they may be differentiated readily by surface tension measurements. An equimolecular mixture of stearic and palmitic acids has a different surface tension from daturic acid (cf. Gerard, B., 1890, 1137). L. F. HEWITT.

PATENT.

Refining or separating volatile constituents from materials. [Deodorising oils.] H. M. LAMY-TORRILHON (É.P. 214,273, 12.4.24. Conv., 14.4.23).—The oil or other material is treated with steam or other vapour in separate refining chambers which may be arranged in a column. Heat is recovered from the steam or vapour in one of the chambers and used for heating liquid in another chamber on the multiple-effect principle.

J. S. G. THOMAS.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Comparison of stick-lacs of different origins. A. TSCHIRCH and H. H. SCHÄFER (Chem. Umschau, 1925, 32, 309—314; cf. B., 1924, 103).—Proximate analyses of a number of stick-lacs of various origins were made. The moisture content varied from 1.0 to 6.1%, average 2.9%. Lac from *Zizyphus xylopyrus* showed the highest moisture content, and lac from prepared "gala-gala," the lowest. In general, the water content varied directly as the proportion of sugar and nitrogenous matter present and inversely as the content of wax and resin. The lac produced by male insects appeared to contain the greatest proportion of water-soluble constituents and residue insoluble in solvents, but the least wax and resin, the reverse being the case for the lac produced by female insects. A. DE WAELE.

Effect of yellow and brown iron oxide pigments upon the rate of oxidation of linseed oil. F. H. RHODES and J. D. COOPER, JUN. (Ind. Eng. Chem., 1925, 17, 1255—1257; cf. B., 1924, 916).—Ochres retard the initial rate of oxidation of linseed oil, the finely-divided French ochre more so than American ochre. Adsorption of the lead drier from the oil by the pigment is also greater with the French ochre. The final rate of oxidation is increased (except with white ochre which contains very little iron oxide), probably due to the interaction of the iron oxide with the acidic substances produced during drying, whereby catalysts are formed which promote oxidation of the oil; the increase is not so great as with some of the red iron oxide pigments. Raw sienna behaves much like American ochre, but burnt sienna does not retard the initial stages of drying much; both pigments adsorb the drier from the oil almost completely. Apparently small amounts of manganese drier are formed from manganese

present in the pigment and counteract the effect of removal of the lead drier. Retardation does not occur with umbers and here again manganese drier is formed. "Metallic brown" behaves much like American ochre. D. G. HEWER.

Degree of dispersity of litharge as a criterion of its suitability for use as a drier for boiled oils. F. HEBLER (Farben-Ztg., 1925, 31, 637—639).—The colour of litharge is dependent on its method of manufacture, the degree of dispersity determining its tint in most cases, although the presence of small proportions of red lead may have some effect. A rough criterion of the degree of subdivision may be obtained from the volume-weight, i.e., the number of c.c. occupied by 100 g. Comparison of two samples of litharge of extreme degrees of subdivision (volume-weights 87 and 25 respectively) showed that the more finely-divided litharge yielded a boiled oil giving a greater increase in weight on drying, but no indications appeared of its greater efficacy as a drier or greater ease of solution in linseed oil.

A. DE WAELE.

PATENTS.

Titanium pigments. C. A. KLEIN and R. S. BROWN (E.P. 243,081, 25.8.24).—A titanium pigment is obtained by fusing together a titanium ore, such as ilmenite or rutile, with a suitable barium compound, e.g., barium carbonate, with or without a flux, such as fluorspar, and a reducing agent, to form a slag of barium and titanium oxides and metallic iron. Alternatively the titanium ore may be heated with barium sulphate and the mixture of barium oxide, titanium oxide, and iron oxide thus obtained, fused with carbon to obtain metallic iron and a slag containing barium oxide and titanium oxide. The metallic iron is removed from the crushed mass, e.g., by magnetic separation, the slag mixed with sulphuric acid to a paste, and heated to form barium sulphate and titanium sulphate. This is formed into a paste with water and added to boiling water in the presence of organic substances, e.g., aldehydes, sugar, starch, or the like, whereby a titanium compound is precipitated on to the barium sulphate and the precipitation of iron is prevented. The precipitate is washed, dried, and heated.

A. DE WAELE.

Acid-resistant shellac substitute. J. R. KUHN, Assr. to C. ELLIS (U.S.P. 1,564,002, 1.12.25. Appl., 12.1.22).—A spirit varnish is obtained by treating a mixture of *m*- and *p*-cresol with 1½ times its weight of sulphur chloride in the presence of a hydrocarbon diluent, whereby a resin is formed in solution, then blowing the solution with heated air at a temperature below 156°, to remove the diluent and hydrochloric acid, dissolving the deodorised resinous product in an alcoholic solvent, and adding a small amount of phosphoric acid sufficient to change the colour of the solution from yellow to brown. A. DE WAELE.

Preparation of condensation products [artificial resins]. BADISCHE ANILIN- U. SODA-

FABR., Assees. of H. RAMSTETTER (G.P. 416,252, 31.1.23).—In the preparation of artificial resins from carbamide or its derivatives and formaldehyde, the condensation is carried out under the influence of radiation of short wave-length, *e.g.*, from a quartz mercury lamp, in the presence or absence of condensing agents. The rays are applied during the whole reaction or a part of it or during the concentration of the reaction solution or the hardening of the product. The latter has increased solidity and hardness. For example a solution of carbamide is treated at 75° with a mixture of 80% formic acid and 30% formaldehyde at 40°, and heated for $\frac{1}{4}$ hr. under reflux, while exposed to the light of a quartz mercury lamp. Excess of formaldehyde is distilled off under reduced pressure at 40° till a syrup remains, and the latter is poured into flat moulds. On keeping it finally forms transparent, flexible plates, the hardening process also being accelerated by exposure to ultraviolet light.

B. FULLMAN.

Preparation of oily and resinous condensation products. FARBW. VORM. MEISTER, LUCIUS, u. BRÜNING (G.P. 416,904, 17.1.20).—Polynuclear aromatic hydrocarbons (except hydrogenated naphthalenes) and their halogen derivatives are heated with aralkyl halides in the absence of condensing agents (to prevent contamination) and without increase of pressure, using earthenware, porcelain, or enamelled iron vessels. For example, equimolecular proportions of naphthalene and benzyl chloride, heated to 160° under reflux, yield on purification of the product by steam distillation and subsequent distillation at 12 mm., an oil, b.p. 180—210°, solidifying to a grease; an oil, b.p. 210—240°; and a viscous liquid resin. Benzyl chloride heated with α -methyl-naphthalene gives a viscous oil; with anthracene and tetrachloronaphthalene, resins.

B. FULLMAN.

Production of viscous or resinous masses. CHEM. FABR. AUF ACTIEN (VORM. E. SCHERING), E. FREUND, and H. JORDAN (G.P. 417,667, 23.9.21).—On treating halogen derivatives of the type RCHR¹-Hal with surface catalysts (*e.g.*, hydrated aluminium, magnesium, or magnesium-aluminium silicates, kaolin, fuller's earth, silica, and similar substances) at temperatures below 180°, with or without diluting media, and if necessary under pressure, hydrogen halides are split off and polymerisation takes place, the products being oils of various degrees of viscosity or resins of varying degrees of hardness, according to the temperature and dilution. With aluminium-magnesium silicate, 1:2-dibromo-*ac*-tetrahydronaphthalene yields (at 100°) a resin, and benzyl chloride in xylene yields saturated oils of varying viscosity. Chlorinated decahydronaphthalene, the aliphatic halides from solar oil and "yellow oil," and pinene hydrochloride may also be used.

B. FULLMAN.

Preparation of resinous or plastic masses. CHEM. FABR. AUF ACTIEN (VORM. E. SCHERING), E. FREUND, and H. JORDAN (G.P. 417,668, 23.9.21;

cf. preceding abstract).—In a process similar to that described in the preceding abstract the reaction is carried out in the presence of formaldehyde and its derivatives, or (for plastic masses) other aldehydes, ketones, phenols, and their derivatives (these substances being added before or during the reaction). In the case of phenols and benzyl chloride molecular proportions are not used. The resins prepared according to the method of the preceding abstract soften at 100° or above; addition of formaldehyde to the reaction mixture before or during reaction gives rise to fusible resins. For example, tetrachloronaphthalene (in naphthalene solution) and phenol, heated with ferric oxide, yield a resin which softens at low temperatures; benzyl chloride and para-formaldehyde (with "frankonit") yield a hard, infusible resin; equal weights of benzyl chloride and phenol (with "frankonit") yield a plastic mass; technical xylyl chloride and acetophenone (with "tonsil"), and technical xylyl chloride and camphor (with "frankonit F.C.") yield viscous oils.

B. FULLMAN.

Lithopone product. J. L. MITCHELL (U.S.P. 1,565,185, 8.12.25. Appl., 6.10.22).—See E.P. 209,270; B., 1924, 185.

Purifying waste waters (U.S.P. 1,557,188).—See XXIII.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Two-phase structure [of rubber]. E. A. HAUSER (Rev. gén. Colloid., 1925, 3, 289—293, 321—324).—A general review of work bearing on the subject.

D. F. TWISS.

Significance of the protein film [around rubber globules]. H. P. STEVENS (Indiarubber J., 1925, 70, 1059—1060).—The results of Sebrell, Park, and Martin (B., 1925, 1000) as to the persistence of the rubber particles during coagulation are in accord with the author's earlier demonstration (Comm. 8th Int. Congr. Appl. Chem., 1912, 9, 17) of the influence of the adsorbed protein film on the behaviour of smoked sheet rubber towards benzene. The protein film in crêpe rubber coagulated in the presence of tannic acid appears to be more resistant to mechanical treatment than that in ordinary crêpe rubber.

D. F. TWISS.

Problems of vulcanisation. IV. Shell aggregation and colloidal crystallisation of caoutchouc. H. FEUCHTER (Koll. Chem. Beihefte, 1925, 21, 171—194; cf. B., 1925, 367).—An elaboration and extension of the earlier theory (*loc. cit.*). The structure of rubber involves a spheroidal system on the surface of which dimethyloctadiene or "poly-prene" nuclei are disposed sterically. The elasticity arises from the valency forces between the components of the system, and the phenomena of "grain" and crystallisation in rubber also find explanation. The latex particle is an aggregate of polyprene nuclei forming a "co-molecule" the volume of which is 1.6×10^{13} times that of the hæmoglobin

molecule; the assumption that the skin and interior of the latex globule form two distinct constituents in rubber is unnecessary.

D. F. TWISS.

Action of "vulkone." Reversion [of rubber during vulcanisation]. L. STOLL (Gummi-Ztg., 1925, 40, 676—678).—When vulcanised over a range of periods by heating with steam at a pressure of 3.2 atm., mixtures of rubber 100, zinc oxide 5, sulphur 5, and an accelerator "vulkone" 0.5—6 pts. give indications of "reversion," particularly with the higher proportions of accelerator. The evidence of "reversion" includes increase in ultimate extension and in rate of swelling in benzene, and decrease in hardness, with progressive "vulcanisation."

D. F. TWISS.

Hot vulcanisation in air. B. V. BYZOV (Russian J. Chem. Ind., 1925, 1, [2], 14—17).—Vulcanisation of rubber in hot air requires the presence, in sufficient proportions, of sulphur and of compounds of lead, mercury, or silver with organic hydroxy-compounds of acid character. After the vulcanisation, the lead compounds are insoluble in chloroform and exist only to a small extent as lead sulphate and sulphide, which are evidently secondary products.

T. H. POPE.

Rubber and the rubber industry. J. C. BON-GRAND (Chim. et Ind., 1925, 14, 823—838).

PATENTS.

Treating rubber composition. J. B. DICKSON, Assr. to B. F. GOODRICH Co. (U.S.P. 1,564,050, 1.12.25. Appl., 31.1.23).—A small quantity of an accelerator of vulcanisation is applied to the surface of a rubber mass containing a vulcanising agent, so as to induce a relatively high degree of vulcanisation at the surface.

D. F. TWISS.

Vulcanisation of caoutchouc. CHEM. FABRIK KALK G.m.b.H., Asses. of H. OEHME (U.S.P. 1,565,812, 15.12.25. Appl., 13.7.25).—See E.P. 239,173; B., 1925, 932.

XV.—LEATHER; GLUE.

PATENTS.

Producing gas-tanned leather. R. H. PICKARD, D. JORDAN-LLOYD, and A. E. CAUNCE (E.P. 243,089, 27.8.24).—Pelt, hide, or skin is dehydrated with acetone or other volatile solvent of water, the solvent evaporated off, and the dry pelt subjected to the action of a tanning agent in gaseous form, e.g., formaldehyde.

D. WOODROFFE.

Production of leather. R. H. PICKARD, D. JORDAN-LLOYD, and A. E. CAUNCE (E.P. 243,090, 27.8.24).—Pelt, hide, or skin is dehydrated by immersion in acetone until it is in equilibrium with a mixture of acetone and water of *d* greater than 0.810, then drained, the acetone evaporated off, and the pelt, hide, or skin subjected to the action of an aqueous solution of a tanning agent (vegetable, chrome, or gaseous). The pelt is instantly penetrated and a saving of time of 75% is effected.

D. WOODROFFE.

Preparation of chrome-tanned leather for storage in the crust condition previous to dyeing. R. H. PICKARD, D. JORDAN-LLOYD, and A. E. CAUNCE (E.P. 243,091, 27.8.24).—Wet chrome-tanned leather prepared for dyeing is steeped in, or sprayed with, acetone, then drained, the acetone evaporated off by subjecting the leather to the action of air or inert gas warmed to 57°, and the leather stored. The density of the acetone bath should not rise above 0.810 during use.

D. WOODROFFE.

Tanning of leather. L. A. JORDAN (E.P. 243,144, 31.10.24).—A small amount of a synthetic organic dye, e.g., Quinoline Yellow, Quinoline Yellow KT, Disulphine Green, or Neptune Green, resistant to the bleaching action of sulphurous acid or bisulphites, is added to tanning solutions or extracts which ordinarily produce a reddish coloured leather, e.g., quebracho, mimosa, or kahua, in quantity sufficient to compensate or neutralise the red colour. A soluble bisulphite may also be added if desired.

D. WOODROFFE.

Organic thiocarbonates (F.P. 563,214).—See XX.

XVI.—AGRICULTURE.

Relation of biological processes to concentration of cations in soils. J. S. BURD (Soil Sci., 1925, 20, 269—283).—Studies are reported on the effect of time and various treatments on the concentration and composition of the liquid phase of soil from which the original soil solution has been removed by displacement with water (cf. Burd and Martin, B., 1923, 845 A; 1924, 988). When the soils, after initial displacement, were kept under conditions such that biological activities were reduced to a minimum, the total concentration of the liquid phase increased but remained very low. On the other hand, when the soils were kept under aerobic conditions, the concentration of the liquid from later displacements was greatly increased. Biological oxidations resulting in increases in the concentration of nitrates and sulphates tend in general to increase the total concentration of the soil solution and, in effect, determine the concentration of cations as well as of anions. Under conditions favouring reduction processes, there is a decrease of nitrates without an equivalent decrease of cations, the loss being compensated for by increase of hydrogen carbonate ion.

C. T. GIMMINGHAM.

Carbon and nitrogen transformations in the decomposition of cellulose by filamentous fungi. H. HEUKELEKIAN and S. A. WAKSMAN (J. Biol. Chem., 1925, 66, 323—342).—Experiments with a species of *Trichoderma* and one of *Penicillium* isolated from soil indicate that these fungi, whether grown in a liquid medium, on sand or on soil, are capable of decomposing cellulose completely to carbon dioxide and water; as much as 45% of the carbon dioxide produced may be utilised by the organism; there is a definite relationship, which varies with the type and

age of the organism, between the carbon and nitrogen assimilated, but in both cases nitrogen is utilised much more readily in the form of ammonia than as nitrate.

C. R. HARINGTON.

Hydrogen-ion concentration of soils as affected by carbon dioxide and by the soil-water ratio, and the nature of soil acidity. W. H. PIERRE (Soil Sci., 1925, 20, 285—305).—Neither the presence of the roots of actively growing plants nor the passage of carbon dioxide through the soil affects the p_H value of the displaced soil solution. The p_H of some soils, especially very acid ones, varies with the soil-water ratio used in making the suspensions; others show no variation. When soils which exhibit this difference are thoroughly leached, they no longer show any such variation. Data are recorded indicating that the hydrogen-ion concentration of a filtered soil extract or displaced soil solution, determined by the colorimetric method, agrees well (provided certain conditions are adhered to) with the figure obtained electrometrically with a suspension of the same soil. C. T. GIMMINGHAM.

Influence of the amount and nature of the replaceable base upon the heat of wetting of soils and soil colloids. W. W. PATE (Soil Sci., 1925, 20, 329—335).—Saturation of a soil, or of colloidal material extracted from it, with a univalent base lowered the heat of wetting. Saturation with a bivalent base had no very marked effect. Comparing the extracted colloids from different soils, it is shown that the heat of wetting can be positively correlated with the amount of replaceable base in the colloid (cf. Bouyoucos, A., 1925, i, 1228).

C. T. GIMMINGHAM.

Influence of hydration on the stability of colloidal solutions of soils. L. C. WHEETING (Soil Sci., 1925, 20, 363—366).—When a known volume of a suspension of a soil colloid in water is brought to a temperature of -4° , the volume of water which freezes is greater than the original volume measured. Water of hydration held by the colloid becomes free and is frozen. If a salt of strong hydrating and flocculating powers (e.g., aluminium sulphate) be added, the volume of (free) water which can be frozen is further increased. The presence of a salt of low hydrating power and strong deflocculating action (e.g., sodium carbonate), on the other hand, reduces the amount of freezable water. A correlation exists between flocculation effects and the amount of water of hydration of the colloid, which holds more combined water when in a dispersed condition than when flocculated. Flocculation is brought about by any treatment which reduces the water of hydration below a certain point. The measurements were made by the dilatometer method of Bouyoucos.

C. T. GIMMINGHAM.

Colloid determination in mechanical analysis [of soils]. R. O. E. DAVIS (J. Amer. Soc. Agron., 1925, 17, 275—279; Chem. Abstr., 1925, 19, 3339).—Since the absorption of water vapour by soils is proportional to the amount of colloidal material present, the

average absorption over 3.3% sulphuric acid being 0.3 g. per g. of colloid, the percentage of colloid in a soil may be thus determined. The separation of the sand sizes is carried out in the usual way, and the silt obtained by difference. A. A. ELDRIDGE.

Biological measurement of the availability of potassium in soils. D. E. HALEY (Pennsylvania Agr. Exp. Sta. Bull., 1925, [188], 1—8; Chem. Abstr., 1925, 19, 3341).—Soils treated with potassium over a period of years contained no more water-soluble potassium than untreated soils. A. A. ELDRIDGE.

Distribution of calcium cyanamide [mixed] with soil. E. BLANCK and F. GIESECKE (J. Landw., 1925, 73, 305—316).—Vegetation experiments in soil with oats indicate that the injurious action of calcium cyanamide on germination and plant growth (due to the presence of dicyanodiamide) is much reduced if the fertiliser is first mixed with a quantity of soil and kept for some days before application. A proportion of the nitrogen is converted into ammonium salts and the percentage utilised by the plants is increased. At the same time, the annoyance caused by the dusty nature of the material when it is being distributed is avoided. C. T. GIMMINGHAM.

Influence of irrigation water and manure on the composition of the maize kernel. J. E. GREAVES and D. H. NELSON (J. Agric. Res., 1925, 31, 183—189; cf. B., 1924, 269; 1925, 415).—Field experiments, extending over 12 years, in which maize was grown on a calcareous soil with and without varying quantities of irrigation water and of farmyard manure, show that the nitrogen content of the grain depends upon the available nitrogen content of the soil. Under irrigation, nitrogen is more rapidly rendered available, but it is also more rapidly removed beyond the reach of the plant. There is an increase of both nitrogen and ash constituents in the grain due to the manure; nitrogen is decreased and ash constituents are increased by the application of irrigation water. The results are in accord with the view that the increased ash and mineral constituents of the grain are due to increased bacterial activity which increases the available plant food in the soil.

C. T. GIMMINGHAM.

Hop investigations. Manuring experiments, 1924. A. H. BURGESS (J. Inst. Brew., 1925, 31, 609—612; cf. B., 1924, 956).—The average hop crops obtained during the past three years from the series of plots at Chilham under treatment with various fertilising elements, bear the following relationships: complete manure (including dung) 100.0; complete manure (mineral) 95.2; without phosphate 92.1; without nitrogen 60.1; without potash 54.4; unmanured 40.7. The corresponding values for the Horsmonden plots were: complete manure 100.0; without potash 96.3; without phosphate 92.1; complete manure (including dung) 81.4; unmanured 61.9; without nitrogen 60.9. The differences in resin content were small; the average soft resin percentage corresponding with the various manurial treatments decreased in the same order as the average crop from these plots decreased. C. RANKEN.

Combined lead arsenate and lime-sulphur spray. R. W. THATCHER and L. R. STREETER (New York Agr. Exp. Sta. Bull., 1924, [521], 3—20; Chem. Abstr., 1925, 19, 3558).—Increase in insoluble material and soluble arsenic in combined lead arsenate and lime-sulphur sprays, yielding a less fungicidal and more harmful mixture, is prevented by the addition of calcium hydroxide (5 lb. per 100 gals.) or casein. A. A. ELDRIDGE.

Influence of soil, season, and manuring on barley. LANCASTER.—See XVIII.

PATENTS.

Manufacture of superphosphates. A. C. HYDE (E.P. 243,192, 19.1.25).—Phosphatic rock, ground fine enough to pass through a 200-mesh sieve, is mixed as a dust cloud, as nearly as possible in the correct proportions, with a fine spray of ordinary concentrated sulphuric acid. Reaction is almost instantaneous and the product can be continuously removed, no drying being necessary. C. T. GIMINGHAM.

Preparation of copper liquors for combating vine-pests. FARBW. VORM. MEISTER, LUCIUS, u. BRÜNING (G.P. 416,899, 10.2.20).—Addition of sodium or calcium salts of aromatic sulphonic acids, such as benzylanilinesulphonic acid or naphthalenetrisulphonic acids, to the calcium hydroxide liquor or the copper sulphate solution, or to the reaction product or to a copper-sodium carbonate liquor, causes an increase in degree of dispersion, of viscosity, and of adhesive power. With a liquor containing 0.3% of copper salt in the presence of a sulphonate, the results obtained in protection against *Peronospera* are equal to, or better than, those given by similar liquors, without sulphonates, containing 1%, 1.5%, and 2% of copper salt respectively in the first, second, and third sprayings. B. FULLMAN.

Material for combating pests. FARBW. VORM. MEISTER, LUCIUS, u. BRÜNING, Assees. of A. STEINDORFF, K. PFAFF, and H. MEYER (G.P. 417,041, 27.5.22).—Naphthenates of bases, such as pyridine, piperidine, or nicotine, which are themselves insecticides, may be used, alone or combined with other materials, against plant lice, caterpillars, and sawflies and their larvæ, and against human parasites. When used in plant sprays the adhesive power of the materials is increased by addition of soaps or soluble resins. B. FULLMAN.

Increasing wetting power of spray mixtures for plants. SOC. CHIM. DES USINES DU RHÔNE (F.P. 562,213, 4.4.22).—A solution of the active agent is treated with a silicic acid sol, or the latter is produced in the solution by the decomposition of alkali silicates with mineral acids or acid salts. For example, a solution of potassium dichromate is treated with sodium silicate solution of 30° B. (*d* 1.26), 10% sulphuric acid is added, with stirring, and the mixture kept for 14 hrs.; or a solution of sodium silicate is treated with sodium hydrogen

carbonate, and, after keeping 2—3 days, potassium permanganate is added; or copper sulphate solution is treated with sodium silicate and sodium hydrogen carbonate, and after 1—2 days sodium carbonate is added. The process is specially useful in cases where the active substance is decomposed in presence of organic protective colloids. B. FULLMAN.

Organic thiocarbonates (F.P. 563,214).—See XX.

XVII.—SUGARS; STARCHES; GUMS.

Catalysis [precipitation of lime] in the sugar industry. E. SAILLARD (Planter and Sugar Mfr., 1925, 74, 269; Chem. Abstr., 1925, 19, 3610).—Precipitation of calcium oxide by sulphurous acid in syrups is incomplete even after 24 hrs.; precipitation by sodium carbonate is more efficient, but not complete. It is accelerated by heat, agitation, or kieselguhr. A. A. ELDRIDGE.

[Determination of sucrose in molasses.] E. SAILLARD (Planter and Sugar Mfr., 1925, 75, 68—69; Chem. Abstr., 1925, 19, 3610).—To obtain a true sucrose content value for exhausted molasses, the neutral double polarisation is corrected by subtracting the content of hydrated raffinose from the Clerget readings. A. A. ELDRIDGE.

PATENT.

Manufacture of soluble-starch products. R. HALLER, Assr. to CHEM. FABR. PYRGOS (U.S.P. 1,594,955, 8.12.25. Appl., 24.2.25).—See E.P. 229,623; B., 1925, 896.

XVIII.—FERMENTATION INDUSTRIES.

Influence of soil, season, and manuring on the 1924 barley crop as indicated by the malts made therefrom. H. M. LANCASTER (J. Inst. Brew., 1925, 31, 601—608; cf. B., 1925, 518).—The barleys were malted for the purpose of determining whether their commercial value was reflected in the resulting malts, both barleys and malts being assessed on an open market basis. In some cases the market value of the barley was too high, in others too low, and the valuations of the barleys were borne out by the malts in six cases only. In an appendix, tables are given by H. L. Hind incorporating extensive analyses of the barleys and malts dealt with in the report. Particulars of the manuring of the experimental plots are also included. C. RANKEN.

[Hops.] Report on work at [Institute of Brewing's] experimental oast, 1924. A. H. BURGESS (J. Inst. Brew., 1925, 31, 613—622; cf. B., 1924, 958).—For a given temperature, the time of drying cannot be reduced below a certain minimum, however great the air speed and however shallow the layer of hops. The extra time of drying above this minimum varies directly as the depth of loading; an empirical formula is deduced from the results, connecting time of drying with depth of loading and air

speed, under the conditions of the experiments. The time of drying per pound of green hops decreases as the depth of loading is increased; this decrease becomes small when a certain depth is reached, which depends on the air speed used. The rate of loss of water from the hops is rapid at first, but during the last two hours little water is lost. Early application of sulphur produced the best coloured samples. Its effect in restoring the colour of brown hops is very slight, even when large quantities of sulphur are burned. Definite conclusions cannot be reached with regard to the influence of the effect of drying temperature on the brewing value of the hops. In seven different commercial kilns the air velocities varied from about 8 to 20 ft. per minute. A comparison of open and closed fires is made.

C. RANKEN.

Separation of the enzymes of barley malt.

H. PRINGSHEIM, A. GENIN, and R. PEREWOSKY (Biochem. Z., 1925, 164, 117—125).—Separation of the enzymes (diastase, the polyases lichenase and mannanase, the disaccharases cellobiase and manno-biase, maltase) of germinating barley was attempted both by allowing the mixture of enzymes to remain in a solution of such p_H that one group was inactivated more rapidly than another group, and by repeated adsorption on kaolin or aluminium hydroxide from solutions of different p_H with subsequent elution by a buffer solution. After keeping for 18 days at p_H 3—4 mannanase and cellobiase are inactivated but amylase retains slight activity. At p_H 6—7 all the enzymes are more resistant and separation is impossible. Adsorption on kaolin at p_H 3 is quantitative, at p_H 5 less vigorous, and at p_H 8 a difference is obtained in the adsorption of the polyases and disaccharases which is intensified in alcoholic solution. From alcohol of 20% and higher concentrations manno-biase and a small quantity of cellobiase are adsorbed whilst mannanase and lichenase remain in alcoholic solution. By treating mannan with mannanase thus freed from manno-biase, mannobiose was obtained and isolated as the phenylhydrazone. Malt amylase is adsorbed from acid but not from neutral or alkaline solution. Amylase obtained by repeated adsorption from 40% alcoholic solution is completely free from maltase and reducing substances.

P. W. CLUTTERBUCK.

Takadiastase. S. NISHIMURA (Chem. Zelle u. Gewebe, 1925, 12, 202; Chem. Zentr., 1925, II., 2212).—Takadiastase contains the enzymes, amylase, invertase, maltase, proteases, catalase, lipase, rennin, lactase, inulase, sulphatase, and amidase, of which amylase, invertase, maltase, proteases, catalase, and lipase are quantitatively adsorbed by colloidal alumina at p_H 6.0. If the enzymes are extracted from the alumina by means of phosphate mixture at p_H 8.0, the enzymic activity of the solution so obtained is three times that of the original solution. The individual enzymes differ neither in their capacity to be adsorbed nor in the amounts in which they are extracted. If the solution of extracted enzymes is again brought to p_H 6.0 and the process of adsorption

and extraction repeated, the activities of the enzymes then obtained differ markedly. Compared with those of the original solutions, the values corresponding to their activities are: amylase 7.0; invertase 4.63; maltase 5.05; proteases 5.53; catalase 10.0.

C. RANKEN.

Abnormal wines. FONZES-DIACON (Ann. Falsif., 1925, 18, 532—536).—A weak wine may be considered abnormal but natural when the following four conditions obtain. The sum of the fixed acid and alcohol is less than 12 g. per litre; the tartaric acid index (*i.e.*, the ratio of cream of tartar corresponding to the total tartaric acid to that corresponding to the total potassium) is less than 1; the total potassium in the tartrate is above 4 g. per litre, and the volatile acidity less than 0.7 g. per litre. Wines that have become abnormal owing to the development of "tourne" diminish in fixed acidity and increase in volatile acidity (above 1), but fulfil the first three conditions given above.

D. G. HEWER.

Oxidisability of iron in wines. J. WOLFF and L. GRANDCHAMP (Compt. rend., 1925, 181, 939—941).—Wines normally contain iron in the ferrous condition but in certain diseased conditions discoloration occurs owing to the formation of ferric tannate. Certain oxydase-containing fungi, *e.g.* *Russula delica*, rapidly oxidise the ferrous iron in wines to the ferric condition, the transformation being inhibited by the presence of a minute amount of sulphur dioxide.

L. F. HEWITT.

Composition of the yellow oil obtained in the manufacture of *n*-butyl alcohol by fermentation. C. S. MARVEL and A. E. BRODERICK (J. Amer. Chem. Soc., 1925, 47, 3045—3051).—*n*-Butyl alcohol, active amyl alcohol, *iso*amyl alcohol, *n*-hexyl alcohol and the *n*-butyric, caprylic, and caproic esters of these alcohols were identified in the high-boiling material obtained as a by-product in the *n*-butyl alcohol fermentation. *a*-Mono-*n*-amyl 3-nitrophthalate, m.p. 132—133°, and *a*-mono-*n*-hexyl 3-nitrophthalate, m.p. 121—122°, are described.

F. G. WILLSON.

Decomposition of cellulose by fungi. HEKUELEKIAN and WAKSMAN.—See XVI.

Hop manuring experiments. BURGESS.—See XVI.

By-product-yeast as source of vitamin-B. HEPBURN.—See XIX.

Mobile-scale densimeters. SETTIMJ.—See XIX.

Dehydration of aqueous alcohol. BARBAUDY.—See XX.

PATENT.

Utilising grape residues (F.P. 590,739).—See II.

XIX.—FOODS.

Use of sodium nitrite in curing meats. W. L. LEWIS, R. S. VOSE, and C. D. LOWRY, JUN. (Ind. Eng. Chem., 1925, 17, 1243—1245).—Pork hams, beef tongues, and beef hams were cured quite satisfactorily in a pickle in which sodium nitrate

was replaced by one-tenth of its weight of sodium nitrite. Analyses of nitrate and nitrite pickles during use showed that the losses in salt and sugar are approximately the same in both cases, and the final proportions of sodium nitrite in the meat cured with nitrite and nitrate respectively were as follows:—Pork hams, 40, 50; beef tongues, 45, 70, and beef hams, 13, 13 p.p.m. Colour fixation proceeded more rapidly with the nitrite cure. Sodium nitrite was also successfully used for dry curing. D. G. HEWER.

Reduction test of milk and its theoretical basis. C. BARTHEL (Svensk Kem. Tidskr., 1925, 37, 157—165; Chem. Zentr., 1925, II., 2111).—The reduction of methylene-blue by milk is correlated with the bacterial content of the sample. The bacteria consume dissolved oxygen and reduce the colouring matter. Some decolorisation does, however, occur in milk containing only few bacteria; this is shown to be due to the reducing action of citric acid, which may be present in milk up to 0.25%. In spite of this complication, the test can be made use of by noting the velocity with which reduction takes place. 20 c.c. of milk are mixed with an alcoholic solution of methylene-blue, warmed to about 35°, and the time taken for decolorisation is observed. C. T. GIMINGHAM.

Mobile-scale densimeters. (Modification of Quevenne's lactometer.) M. SETTIMI (Annali Chim. Appl., 1925, 15, 378—386).—In the case of both full-cream and separated milks, the density of a sample at any given temperature between 0° and 30° is a function (independent of the temperature) of the density of the sample at 0°. The same holds less accurately for alcohol-water mixtures between the limits of 50% and 75% of alcohol. It is therefore possible to construct a mobile-scale hydrometer which will give the densities of such mixtures directly at any temperature between 0° and 30°. Its stem consists of two parts, the lower one of which slides within the upper and is calibrated. The instrument gives densities directly for the temperature corresponding to the calibration at which the end of the upper part of the stem is set. W. E. ELLIS.

Measurement of the hydrogen-ion concentration of cheese by means of the quinhydrone electrode. S. KNUDSEN (Z. Unters. Nahr. Genussm., 1925, 50, 300—306).—A method by which the p_H value of cheese may be determined with accuracy by means of the quinhydrone electrode is described. C. T. GIMINGHAM.

Organic acids of tomatoes, particularly citric acid and its state of combination. A. BORNTRÄGER (Z. Unters. Nahr. Genussm., 1925, 50, 273—300).—Tomato fruits in sound condition always contain citric and malic acids in appreciable amounts. Oxalic, tartaric, racemic, benzoic, and lactic acids cannot be detected, nor are volatile organic acids present. Benzoic acid was found in over-ripe fruit. Special attention is given to the question of oxalic acid; it is never present in the fruits at any stage.

Citric acid occurs as primary or secondary citrates, never as a normal salt; a little free acid may also be present, amounting to not more than 0.05%. The content of citric acid in the juice, in general, falls with complete ripening, and both citric and malic acids disappear when the fruit becomes rotten. The phosphate content also decreases with ripening. Experimental methods are given in detail.

C. T. GIMINGHAM.

Manganese chlorosis of pineapples. M. O. JOHNSON (Hawaii Agr. Exp. Sta. Bull., 1924, [52], 1—38; Chem. Abstr., 1925, 19, 3559).—In experiments with rice and nutrient solutions, manganous sulphate or manganese dioxide caused chlorosis when a normal amount of iron was also supplied, but a large increase in the latter nullified the effect, which is therefore due to a depression of the assimilation of iron, or a deficiency of iron in the plant. Stimulation of plant growth by manganese was not observed, unless an undesirable excess of iron was originally present. The manner in which manganese induces chlorosis is explained by the varying solubility of iron at different hydrogen-ion concentrations. The application of iron salts to the leaves of pineapple plants on manganiferous, acid Hawaiian soils results in the immediate resumption of normal growth. A. A. ELDRIDGE.

Effect of fermentation with specific micro-organisms on vitamin-C content of orange and tomato juice. S. LEPKOVSKY, E. B. HART, E. G. HASTINGS, and W. C. FRAZIER (J. Biol. Chem., 1925, 66, 49—56).—Prolonged fermentation of tomato juice with organisms present in fermented maize, under strictly anaerobic conditions, resulted in practically no destruction of vitamin-C; the absence of the latter from maize silage and from sauerkraut is therefore ascribed to destruction by oxidation, and not by bacterial action. C. R. HARRINGTON.

By-product yeast [as source of vitamin-B]. J. S. HEPBURN (J. Franklin Inst., 1925, 200, 767—770).—Feeding experiments on albino rats showed that dried by-product yeast was a source of water-soluble vitamin-B. C. RANKEN.

Cocoa. I. Detection of shell. W. PLÜCKER, A. STEINRUCK, and F. STARCK (Z. Unters. Nahr. Genussm., 1925, 50, 307—315).—Data obtained by determinations of the crude fibre and phosphoric acid in cocoa and chocolate give no reliable indication of adulteration with cacao bean shell. The composition of the shell of beans from different sources varies greatly. Further, adulteration with shell cannot be satisfactorily recognised by microscopical examination unless an actual count of the number of "stone-cells" present is made. A method for this determination is suggested. C. T. GIMINGHAM.

Formation of jellies. A. MEHLITZ (Konserven-Ind., 1925, 12, 467—470; Chem. Zentr., 1925, II., 2110; cf. B., 1925, 687).—The influence of the amounts of dry matter (sugar), pectin, and acid (in apple pulp) on jelly formation has been investigated. The formation of a jelly occurs only when

the content of dry matter lies between 50 and 70%. With 50% of dry matter, at least 1.2% of pectin is required, this amount being reduced to half with 70% of dry matter. The optimum p_H for jelly formation is 2.9—3.1. C. T. GIMINGHAM.

Degree of sweetness of saccharin and dulcin. TÄUFEL and KLEMM.—See XX.

PATENTS.

Bleaching nuts. A. W. CHRISTIE, Assr. to CALIFORNIA WALNUT GROWERS' ASSOC. (U.S.P. 1,558,963, 27.10.25. Appl., 30.4.25).—The nuts are immersed first in a solution in which nascent chlorine is being liberated, and then in sulphurous acid.

D. G. HEWER.

Concentrating and drying fruit juices. W. H. DICKERSON, Assr. to INDUSTRIAL WASTE PRODUCTS CORP. (U.S.P. 1,562,309, 17.11.25. Appl., 2.8.22).—Fruit juices are concentrated by freezing to preserve aromatic ethers, and then dried to a powder by spraying into a hot gas.

C. RANKEN.

Treatment of chocolate. J. B. BARNITT (U.S.P. 1,563,682, 1.12.25. Appl., 26.7.22).—Ground roasted cacao nib from which a large proportion of the cacao butter has been removed is bleached in a slightly alkaline solution of hydrogen peroxide.

D. G. HEWER.

Treating milk. A. W. BOSWORTH and L. H. CHRYSLER (U.S.P. 1,563,891, 1.12.25. Appl., 20.12.24).—A substance containing the phosphoric acid radical is added to the milk in such quantity that the milk is rendered slightly alkaline and the calcium is converted into insoluble calcium phosphate, whilst the casein is left in solution. The precipitate is removed, and any undesired excess of alkali in the milk is then neutralised.

D. G. HEWER.

Manufacture of bran food. J. L. KELLOGG, Assr. to KELLOGG Co. (U.S.P. 1,564,181, 1.12.25. Appl., 26.10.22).—A mixture of bran and an agent containing diastatic enzymes is moistened and heated to convert the bran starches into maltose, and the product is cooked, dried, disintegrated, and toasted.

D. G. HEWER.

Recovering oil or fat from milk and cream. A. E. WHITE. From MILK OIL CORP. (E.P. 243,792, 30.11.23).—See U.S.P. 1,485,700 and 1,485,702; B., 1924, 397.

Treating [bleaching] flour, meal, or milling products. T. KROEBER, Assr. to N. V. NOURY & VAN DER LANDE HANDELSMAATSCHAPPIJ (U.S.P. 1,565,375, 15.12.25. Appl., 29.4.25).—See E.P. 213,268; B., 1924, 824.

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

Roots of *Gentiana lutea*, L. R. BINAGHI and P. FALQUI (Annali Chim. Appl., 1925, 15, 386—396).—Deprived of its branches and aerial parts, and

freed from soil, the root was dried in air at the ordinary temperature. Its percentage composition was as follows:—Moisture, 13.78; ash, 6.21; alcohol-soluble matter, 52.00; residue, 28.01. From the fresh, pulverised root the following compounds were extracted by a modification of Tanret's method (J., 1905, 1123, 1124): a waxy substance, m.p. 142—143°, $[\alpha]_D^{20}$ —29.4° (in chloroform), resembling Tanret's gentiostearin; resins; gentiopicrin, which hydrolysed to dextrose and gentiogenin; gentiamarin and gentiin (Tanret, *loc. cit.*); gentisein, m.p. 266—267°; sucrose and gentianose (Nordan and Bourquelot, A., 1898, i., 349). Having regard to their relatively high content of extractive matter, and of the active principle, gentiopicrin, the roots should be of value for pharmaceutical purposes.

W. E. ELLIS.

Industrial preparation of sodium methylarsinate and derived salts. (Miss) M. G. TAVERNARI (Boll. chim. farm., 1925, 64, 609—612).—A convenient method and apparatus are described for the preparation, in 1.75-kg. lots, of commercially pure methyl iodide and for the conversion of this into sodium (or potassium) methylarsinate by treatment with arsenious anhydride and sodium (or potassium) hydroxide under pressure. The iron salt may be obtained by evaporating on a glass plate a mixture of green iron citrate and sodium methylarsinate in equal weights.

T. H. POPE.

Natural and artificial sweetening materials.
I. Degree of sweetness of saccharin and dulcin. K. TÄUFEL and B. KLEMM (Z. Unters. Nahr. Genussm., 1925, 50, 264—273).—The degree of sweetness (cf. Paul, B., 1921, 601 A) of both saccharin and dulcin (*p*-phenetole-carbamide) in water or water-alcohol solution is dependent on the concentration. Curves and formulæ are discussed from which the composition of the optimum mixtures of these two substances can be calculated.

C. T. GIMINGHAM.

Manufacture of calcium citrate and citric acid from lime juice. F. H. S. WARNEFORD and F. HARDY (Ind. Eng. Chem., 1925, 17, 1283—1286).—High-grade calcium citrate yielding pale-coloured citric acid solutions from which white crystals are deposited can be obtained by treating the defecated juice at ordinary temperature with a quantity of a thin cream prepared from fine-grained lime sufficient to neutralise the total acid present, and then boiling. The calcium citrate is collected, washed with hot water, and worked up as usual. Alternatively the defecated juice may be partly hot-limed (to p_H 4.0), treated with "norit," and liming completed; or, the defecated juice may be treated with sufficient sodium carbonate at ordinary temperature to neutralise one-third of the total acidity (p_H about 3.8), 1% of "norit" added, the mixture boiled for 15 mins., cooled, and filtered, and the cake of "norit" washed with cold water. Any turbidity may be removed by "filter-cel." Calcium chloride is then added to the liquid in excess of the amount equivalent to the sodium carbonate, the mixture boiled, and

neutralisation completed with milk of lime, followed by a small excess of calcium carbonate. After again boiling, the precipitated calcium citrate is filtered off and washed, and finally converted into perfectly colourless citric acid. A high yield is obtained with the use of less lime and sulphuric acid than usual, although with the additional cost of soda ash and calcium chloride.

D. G. HEWER.

Dehydration of aqueous alcohol by rectification with benzene. J. BARBAUDY (Compt. rend., 1925, 181, 911—913; cf. B., 1925, 608).—The phase-rule diagram for the alcohol-benzene-water system is described, and is utilised for the elucidation of Young's method of dehydrating alcohol (cf. B., 1902, 721).

S. K. TWEEDY.

Determination of arsenic and silver in silver arsenobenzenes. U. CAZZANI (Boll. Chim. farm., 1925, 64, 513—515; cf. B., 1919, 792A).—In order to determine the arsenic, 0.20 g. of the substance mixed with 1 g. of finely powdered potassium permanganate is treated with 5 c.c. of 30% sulphuric acid and then, shaking continually, with 10 c.c. of the concentrated acid. After keeping some minutes, the mixture is treated with hydrogen peroxide till colourless and diluted with 30 c.c. of water. It is then heated cautiously until sulphuric acid commences to be evolved; it is cooled, diluted with 40 c.c. of water, 2 c.c. of hydrochloric acid are added, and the solution is filtered. The precipitate is washed with 10—15 c.c. of water. To the cold filtrate are added 2.50 g. of potassium iodide, and the iodine set free after 1 hr. is titrated with standard thiosulphate solution. The silver is determined by mixing 0.30 g. of the substance with 2 g. of finely powdered potassium permanganate, treating with 10 c.c. of 30% sulphuric acid, and finally with 10 c.c. of the concentrated acid. After occasional shaking during 15 min., the mixture is diluted with 50 c.c. of water; ferrous sulphate is added until the liquid is yellowish and it is then titrated with ammonium thiocyanate. By the following method both metals are determined simultaneously: the substance (0.40 g.) mixed with 3 g. of powdered potassium permanganate is treated with 10 c.c. of 30% sulphuric acid followed by 20 c.c. of the concentrated acid. After occasional shaking during 15 min., the mixture is treated with sufficient hydrogen peroxide to remove the excess of potassium permanganate and manganese dioxide. The liquid is diluted with 40 c.c. of water and heated until sulphuric acid begins to be evolved. It is then cooled, diluted with 60 c.c. of water, and made up to 100 c.c. To 50 c.c. of the solution, 2 c.c. of hydrochloric acid are added; the precipitate is collected and washed. The filtrate is treated with 2 g. of potassium iodide and titrated after 1 hr. with 0.1N-thiosulphate. To the other 50 c.c., 5 c.c. of saturated ferric alum solution are added; after acidifying with nitric acid, it is titrated with 0.1N-thiocyanate.

W. E. ELLIS.

Nepetella, pennyroyal, and origanum oils. G. ROMEO and U. GIUFFRÈ (Annali Chim. Appl., 1925, 15, 363—373; cf. Pellini, B., 1923, 858A).—

The analytical results of earlier workers, of which full references are included, are compared with the authors', from which the following data are taken:—*Nepetella* oil (*Calamintha nepeta*, var. *canescens*, *Satureja nepeta*): d^{15} 0.9227, $\alpha_D^{20} + 14.33^\circ$, n_D^{25} 1.4792, pulegone 49%. Pennyroyal oil (*Mentha pulegium*, var. *hirsuta*): d^{15} 0.9392, $\alpha_D^{20} + 26.5^\circ$, n_D^{25} 1.4802, pulegone and piperitone 66%. Origanum oil (*Origanum virens*): d^{15} 0.9226, $\alpha_D^{20} - 2.10^\circ$, n_D^{25} 1.4943, phenols (thymol and carvacrol), 45%.

W. E. ELLIS.

Saffron. G. PIERLOT (Chim. et Ind., 1925, 14, 839—850).

See also A., 1926, 18, Influence of traces of water on solubility of salicylic acid in benzene (COHEN and VAN DOBBENBURGH). 21, Colloid chemistry of bismuth and its compounds (KUHN and PIRSCH). 48, Hydrogenation of aldehydes and ketones (FAILLEBIN). 51, Sugars [preparation of saccharic acid, *l*-arabonic acid, etc.] (KILIANI). 56, Synthesis of *p*-cymene from isopropyl alcohol. Syntheses with magnesium *p*-isopropylphenyl bromide (BERT). 60, Relation between chemical constitution and pungency in acid amides (JONES and PYMAN). 63, Esters and sulphonic acids of anthranilic and methyl-anthranilic acids (KELLER and SCHULZE). 65, Decarboxylation of tyrosine and leucine (WASER). 72, Constitution of pulegone (GRIGNARD and SAVARD); Oil of flowering *Tagetes glandulifera* (JONES and SMITH); Action of oxalic acid on terpin hydrate. Reaction of Japanese acid clay to terpin hydrate and terpineol (ONO); Occurrence of sylvestrene (RAO and SIMONSEN).

Oils of chaulmoogra group ANDRÉ.—See XII.

PATENTS.

Manufacture of alkamine esters of *N*-substituted *p*-aminobenzoic acids. O. Y. IMRAY. From FARBW. VORM. MEISTER, LUCIUS, U. BRÜNING (E.P. 241,767, 15.1.25; cf. E.P. 17,162 of 1905, B., 1906, 607).—New surface anaesthetics, superior to cocaine in activity, are prepared by exchanging the hydrogen atom of the carboxyl group in *p*-aminobenzoic acid for an alkamine residue, and a hydrogen atom of the amino-group for an alkyl- or alkyloxyalkyl-residue containing more than two carbon atoms. They may be obtained by esterifying an *N*-monoalkyl or *N*-monoalkyloxyalkyl derivative of *p*-aminobenzoic acid with an amino-alcohol or by alkylating an alkamine ester of *p*-aminobenzoic acid. For example, equimolecular quantities of *p*-*N*-propylaminobenzoic acid, m.p. 165—168° (prepared by Houben and Freund's method, cf. A., 1914, i, 43), and β -diethylaminoethyl alcohol are mixed with 10 times their joint weight of toluene. The mixture is saturated with hydrogen chloride and heated for about 8 hrs. at 150°, while a current of hydrogen chloride is slowly passed. The product, β -diethylaminoethyl *p*-*N*-propylaminobenzoate, is an oil, b.p. 217°/7 mm.; the monohydrochloride has m.p. 103—104°. The same compound may also be obtained

by condensing β -diethylaminoethyl *p*-aminobenzoate with propyl bromide in propyl alcohol. The preparation of the following compounds is described:— β -diethylaminoethyl *p*-*N*- β -methoxyethylaminobenzoate, an oil, b.p. 245°/9 mm. (hydrochloride, crystals, m.p. 86°) from *p*-*N*- β -methoxyethylaminobenzoic acid, m.p. 159—161° and ethylene chlorohydrin, or from β -diethylaminoethyl *p*-aminobenzoate, β -chloromethyl ethyl ether and ethylene glycol; β -diethylaminoethyl *p*-*N*-allylaminobenzoate, a yellowish oil, b.p. 232°/10 mm. from ethyl *p*-*N*-allylaminobenzoate, m.p. 60—62° (free acid has m.p. 144—146°), and β -diethylaminoethyl alcohol; γ -diethylaminopropyl *p*-*N*-propylaminobenzoate (monohydrochloride, m.p. 113°) from ethyl *p*-*N*-propylaminobenzoate, m.p. 70°, and γ -diethylaminopropyl alcohol; β -diethylaminoethyl *p*-*N*-isoamylaminobenzoate, a light brown oil, from ethyl *p*-*N*-isoamylaminobenzoate, m.p. 68° (cf. Houben and Freund, *loc. cit.*) and β -diethylaminoethyl alcohol; β -piperidinoethyl *p*-*N*-propylaminobenzoate, m.p. 157—158°; and the monohydrochloride of β -piperidinoethyl *p*-*N*-methoxyethylaminobenzoate, m.p. 138°, from ethyl *p*-*N*- β -methoxyethylaminobenzoate, b.p. 199—200°/8 mm. and β -piperidinoethyl alcohol.

A. COULTHARD.

Preparation of substances to be taken internally by a patient before radiographic examination. T. THORNE-BAKER (E.P. 241,968, 23.6.24).—Salts of heavy metals opaque to X-rays are brought into a very fine state of division and emulsified with gelatin by treating a solution of a compound of the heavy metal with an excess of a soluble non-poisonous salt which has the capacity of precipitating the desired metal salt but does not precipitate the gelatin. The gelatinous product, after washing, is physically similar to a photographic emulsion and can be administered with ordinary food in the form of jellies or otherwise. For example, a solution of 20 pts. by weight of barium chloride, 2 pts. of gelatin, and 50 pts. of water at 43° is added slowly to a solution (also at 43°) of 13 pts. of ammonium sulphate, 1 pt. of glycerin, and 30 pts. of water while stirring energetically. The product is stabilised, if necessary, by the addition of more gelatin. After the jelly has set, it is shredded, washed, and dried.

A. COULTHARD.

Preparation of ethylene glycol from ethylene oxide. CHEM. FABR. KALK G.M.B.H., Asses. of H. OEHME (G.P. 416,604, 15.8.23).—Ethylene glycol solution is produced from ethylene oxide and very dilute sulphuric acid, and is removed, as formed, from the sphere of reaction. For example, a reaction vessel connected by an overflow tube with a still, is filled almost up to the overflow tube with faintly acid water. Ethylene oxide is then passed in by another tube, and, by increasing the volume of the acid solution, drives dilute ethylene glycol continuously into the still, where it is concentrated out of contact with the oxide, the evaporated water being condensed and returned to the first vessel.

Occasional small additions of sulphuric acid must be made. No polyglycols are formed.

B. FULLMAN.

Preparing saturated aldehydes from unsaturated aldehydes. BADISCHE ANILIN- U. SODA-FABRIK (G.P. 416,906, 29.3.23. Addn. to 350,048).—Unsaturated aldehydes are treated in the presence of the copper catalyst, described in the chief patent (cf. U.S.P. 1,410,223; B., 1922, 347 A; also G.P. 407,837; B., 1925, 475), with hydrogen insufficient for the complete formation of saturated alcohols; the latter, if formed, are easily separated from the saturated aldehydes. The results are better than those obtained with nickel catalysts. For example, 100 c.c. of crotonaldehyde vapour passed over finely divided copper, with 30 litres of hydrogen, at 170°, yield a product containing 80% of but-aldehyde and 20% of crotonaldehyde; using 50 litres of hydrogen at 180°, the product contains 60% of butaldehyde and 40% of *n*-butyl alcohol.

B. FULLMAN.

Preparation of ethyl chloride from ethylene. CHEM. FABR. VORM. WEILER-TER MEER (G.P. 417,170, 24.2.24).—The reaction between ethylene and hydrogen chloride is catalysed by metal chlorides or their derivatives (*e.g.*, ferric, aluminium, nickel, or cobalt chloride, or the aluminium chloride-ethylene compound), loss of activity of the catalyst being compensated by treating it with gaseous chlorine, either during the course of the reaction or by treating the exhausted catalyst separately with chlorine at 100°. For example, an equimolar mixture of ethylene and hydrogen chloride is passed, simultaneously with chlorine (5% by vol. of ethylene), over the aluminium chloride-ethylene compound at 80°. The chlorine is led in by a separate tube, and only meets the ethylene in contact with the catalyst. 43% of the theoretical yield of ethyl chloride is obtained, with no significant formation of dichloro-ethylene.

B. FULLMAN.

Preparation of pure 1-phenyl-2 : 3-dimethyl-5-pyrazolone. K. T. HERBST (G.P. 417,696, 25.8.21).—Solutions of the crude salts of the pyrazolone are treated with sodium perchlorate, if necessary after decolorising with sulphur dioxide. The perchlorate of the base crystallises out (being seeded if necessary), is washed, and decomposed with sodium carbonate.

B. FULLMAN.

Calcium preparation [calcium sodium lactate]. H. UMBER, Assr. to J. A. VON WÜLFING (U.S.P. 1,559,478, 27.10.25. Appl., 28.5.23).—Concentrated lactic acid (4 mols.) is mixed with concentrated caustic soda (2 mols.) and quicklime (1 mol.), and the mixture is dried at a low temperature. A double compound of sodium and calcium lactates containing 4 mols. of water is obtained, which is of therapeutic value.

T. S. WHEELER.

Prophylactic [mercuriated salvarsan]. O. LOWRY, Assr. to TECHNICAL PRODUCTS CORP. (U.S.P. 1,559,899, 3.11.25. Appl., 20.12.20).—The

dihydrochloride of diaminodihydroxyarsenobenzene is treated in acidified methyl alcohol solution with a solution of mercuric chloride in the same solvent, and the precipitate of "mercuriated" salvarsan is mixed with glycerin, gelatin, and mercuric chloride to give a prophylactic of firm consistency at ordinary temperatures but fluid at body temperatures.

T. S. WHEELER.

Preparation of water-, alcohol-, and oil-soluble tuberculin preparations. FARBW. VORM. MEISTER, LUCIUS, U. BRÜNING, Assecs. of L. LAUTENSCHLÄGER and M. BOCKMÜHL (G.P. 417,443, 9.6.23).—The precipitates obtained from liquid culture media on which tubercle bacilli of human or animal origin have been grown, or the bacilli themselves, or parts of them, are treated with alcohols and mineral acids. The products, which are separated by known methods, are probably esters of tuberculinic acid, and are very active. For example, dry tuberculin is suspended in absolute methyl alcohol, a stream of dry hydrogen chloride is led through at 15° until solution occurs, the solution concentrated in a vacuum at 40–50°, the residue freed from hydrogen chloride, and the pure compound precipitated by ether from methyl alcohol solution. Dead tubercle bacilli freed from fat and wax may be esterified with ethyl alcohol, and dry tuberculin with absolute amyl alcohol in the presence of sulphuric acid. The products are very soluble in water, alcohols, glycols, and glycerol, slightly soluble in oils and fats. Owing to their solubility they should penetrate skin more rapidly, and hence be more effective in treatment of skin diseases, than former tuberculin preparations.

B. FULLMAN.

Preparation of thymol from 2-cymidine [o-aminocymene]. G. AUSTERWEIL (E.P. 221,226, 30.8.24. Conv., 31.8.23).—See G.P. 413,727; B., 1925, 864.

Producing methyl alcohol and methylene chloride from methane. T. GOLDSCHMIDT A.-G., Assecs. of J. WEBER and P. ERASMUS (U.S.P. 1,565,345, 15.12.25. Appl., 8.4.25).—See E.P. 227,475; B., 1925, 784.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Photochemistry of photographic films. F. WEIGERT (Z. Physik, 1925, 34, 907–917).—The author discusses and tests Eggert and Noddack's hypothesis (cf. A. 1925, ii, 573) that only a small part of the energy incident on a photographic plate is photochemically active, the major part being absorbed by a yellow colouring matter in the gelatin, especially in the case of coarse-grained plates in which the light-path is lengthened by multi-reflections. With normal and fixed plates dyed artificially with a yellow dyestuff (Filter Yellow) not adsorbed by the silver halide grains, the increased absorption due to the dye was even less in the case of the emulsions than with the clear gelatin layers. Any increase in the length of the light-path due to

multi-reflections from the grains is therefore unimportant. All conclusions of Eggert and Noddack based on optical absorption by the gelatin are therefore wrong, and these authors have not established the Einstein law for photographic plates.

W. CLARK.

Photochemistry of photographic films. J. EGGERT and W. NODDACK (Z. Physik, 1925, 34, 918–920).—Weigert's results (cf. preceding abstract) show that a mixture of the three absorbing substances silver bromide, gelatin, and dye in a turbid film absorb less light than the gelatin and dye alone in a clear layer; i.e., turbid films and clear films cannot be considered as similar for purposes of calculation. It is not surprising that Filter Yellow should act differently from the weakly absorbing gelatin under the circumstances. It is possible that in the dried dyed plate the yellow dye is adsorbed by silver bromide, so introducing a further optical complication.

W. CLARK.

Photochemical decomposition of silver chloride. HARTUNG.—See A., 1926, 34.

Application of spectro-photography to measurement of high temperatures. GRIFFITH.—See I.

PATENTS.

Producing colour pictures. L. E. TAYLOR, Assr. to FAMOUS PLAYERS-LASKY CORP. (U.S.P. 1,560,437, 3.11.25. Appl., 19.6.23).—Two negatives taken through a red and a blue-green screen respectively are developed and immersed in a solution of hydrogen peroxide, cupric sulphate, and sulphuric acid. The gelatin is removed from the film base by this solution to a degree depending on the exposure. The negatives are dried and that taken through the blue-green screen is immersed in a red dye and that through the red screen in a blue-green dye. On superposition a coloured negative of the original is obtained. Positives are obtained by a similar process. T. S. WHEELER.

Reversal process for photographic development emulsions. E. O. LANGER (G.P. 416,120, 22.7.24).—The metallic silver in the unfixed image is converted into a modification of silver chloride not reducible by developers, by using a bleaching bath containing a trace (up to 1:1000 of the bath) of a suitable metal (chromium, iron, copper, etc.) or metal salt. The presence of organic or inorganic acids in the bleaching bath accelerates bleaching and assists in rendering the silver chloride non-reducible by the second development. Suitable bleaching baths are: (1) potassium chloride, 10 g.; metallic copper, 0.1 g.; formic acid, 5 c.c.; (2) hydrochloric acid, 4 c.c.; sodium dichromate, 0.03 g.; water, 100 c.c.; (3) sodium chlorate, 10 g.; ferric chloride, 0.2 g.; water, 100 c.c.

W. CLARK.

Printing kinematograph films. R. ROLAND and L. BURSTEIN (F.P. 591,806, 21.1.25).—A film is coated with a mixture of hydrocarbons, albumin, and chromium salts, dried, and exposed under the

negative. It is then washed consecutively with water, dilute acid, and water, dyed, and dried.

W. CLARK.

Producing water-insoluble multicoloured [photographic] screens. J. H. CHRISTENSEN (U.S.P. 1,564,202, 8.12.25. Appl., 20.5.24).—See E.P. 216,853; B., 1924, 998.

Producing photographic copies by means of phosphorescent substances. J. H. CHRISTENSEN (U.S.P. 1,565,256, 15.12.25. Appl., 30.7.20).—See E.P. 160,739; J., 1921, 791 A.

XXII.—EXPLOSIVES; MATCHES.

Explosion wave and detonation wave. P. LAFFITTE (Ann. Physique, 1925, [x], 4, 587—694).—A full account of investigations on the explosion of mixtures of carbon disulphide and oxygen, and of some solid explosives (cf. B., 1923, 640 A, 814 A; A., 1924, ii, 399, 580; 1925, ii, 135).

A. B. MANNING.

Assay of potassium chlorate. LEHM and FINK.—See VII.

PATENTS.

Removing tetranitromethane from technical trinitrotoluene. R. GÄRTNER (G.P. 416,905, 1.1.24, and 417,378, 22.1.24. F.P. 590,951, 26.12.24).—In the upper part of a drying-tower, liquid technical TNT is atomised by a hot air-blast, the resulting mist being exposed to a second similar blast to retard solidification of the droplets. The tetranitromethane volatilises and the purified TNT (which has its natural light colour, and is free from all unstable foreign substances, or those injurious to the worker) is cooled and solidified by a cold blast in the lower part of the tower. The atomising hot air-blast (and if desired the other hot air-blast) may be replaced by a steam-blast, in which case there is greater ease in removing the tetranitromethane and in the regulation of the blast by control of the pressure, and the substances volatilised may be more easily recovered.

B. FULLMAN.

Coating for nitrocellulose powder grains. T. L. DAVIES (U.S.P. 1,561,219, 10.11.25. Appl., 28.4.22).—A carbamide with only two alkyl groups symmetrically substituted in the molecule is used as one of the constituents of the coating.

S. BINNING.

Nitrating cellulose. G. JUER, Assr. to TUBIZE ARTIFICIAL SILK CO. OF AMERICA (U.S.P. 1,562,093, 17.11.25. Appl., 5.6.23).—Cellulose and nitrating acids are thoroughly mixed and the partially nitrated product and admixed acids are transferred to a rotary cylinder and mixed until nitration is complete.

J. S. G. THOMAS.

XXIII.—SANITATION; WATER PURIFICATION.

Determination of dissolved oxygen in water in presence of nitrite. M. E. STAS (Chem. Weekblad,

1925, 22, 584—585).—The various methods described in the literature are criticised, and that of Alsterberg (B., 1925, 940) is recommended as most accurate and convenient.

S. I. LEVY.

Loss of nitrogen on purification of sewage water by the activated sludge method. L. CAVEL (Compt. rend., 1925, 181, 1101—1103).—On treatment with 20% of activated sludge, sewage water with added ammonia or ammonium salts loses over 40% of the total nitrogen present. It is suggested that this loss is in the form of free nitrogen. Less nitrogen is probably lost under industrial conditions.

L. F. HEWITT.

Physics and chemistry of gas masks. H. ENGELHARD (Z. Elektrochem., 1925, 31, 590—593).—Gases of an average density of 1.4 compared with air, with molecular radii not exceeding 10^{-5} cm., have an average Brownian movement of 10^{-3} cm. or more per second. In the usual filtering media of pore-diameter 10^{-2} to 10^{-4} cm. they easily reach the walls of the filter in a transit period of 0.1—1.0 second; hence adsorption is favoured. With smoke particles of 10^{-5} cm. diameter or over, the Brownian movement is slower, and it is necessary to superpose several layers of absorbent. When the size of particles exceeds 10^{-5} cm. there is an improvement in absorption owing to increased deposition by gravity, and direct mechanical filtration. The retention of liquid particles by materials which are wetted by the liquid is complete, but for solid particles a material having serrated fibres is required. The efficiency of an absorbent which acts by chemical reaction is enhanced by mixing a highly adsorptive substance with it.

W. A. CASPARI.

PATENTS.

Base-exchange water softener. O. R. SWEENEY, Assr. to WARD-LOVE PUMP CORP. (U.S.P. 1,557,117, 13.10.25. Appl., 9.2.25).—An apparatus for water-softening by the base-exchange process consists essentially of a container for the water-softening material, provided with a diaphragm having extremely fine interstices, e.g. filter cloth composed of fine non-corrodible wire fabric, or a "filtros" plate, for uniformly distributing the flow of water or brine solution over and to the face of the base-exchange material.

W. T. LOCKETT.

Purifying waste waters. J. A. NEWLANDS (U.S.P. 1,557,188, 13.10.25. Appl., 19.1.21).—A process for the treatment of waste liquors containing sulphuric acid the object of which is twofold, viz., the prevention of the pollution of streams and the utilisation of the sulphuric acid in the production of lithopone. The waste water is treated with metallic zinc to produce zinc sulphate, the deposited copper and other impurities, e.g. iron, are removed, and barium sulphide is added to obtain a mixed precipitate of zinc sulphide and barium sulphate.

W. T. LOCKETT.

Material for combating pests. (G.P. 417,041).—See XVI.