

BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

FEB. 14 and 21, 1930.*

I.—GENERAL; PLANT; MACHINERY.

Calculation of tanks for high temperature and pressure. J. K. WOOD (Chem. and Met. Eng., 1929, 36, 737—740).—From a formula for tank design, in which the creep limit of the material is an important functional value, a line chart has been developed to permit a number of tanks to be calculated easily. The approximate weight of a cylindrical tank with elliptical heads is given by the value $0.889tD(l + 3D)$, in which t is the thickness of cylindrical wall, D the internal diameter, and l the length of the cylindrical portion.

C. A. KING.

Accurate measurement of high temperatures. W. E. FORSYTHE (J. Amer. Ceram. Soc., 1929, 12, 780—813).—The theory and practice of all types of high-temperature pyrometry are described, and the possible sources of error and their elimination are discussed in a comprehensive manner.

J. A. SUGDEN.

Measurement of flow of heat. A. F. DUFTON and W. G. MARLEY (Phil. Mag., 1929, [vii], 8, 841—844).—Two instruments are described for measuring the transfer of heat by convection and radiation, respectively, these being simplifications and improvements of that previously described (J. Sci. Instr., 1927, 4, 446).

C. W. GIBBY.

Drying plant. C. H. BUTCHER (Chem. Trade J., 1929, 85, 389—391, 487—488, 619—620).—For tunnel dryers and rotary dryers the safe saturation of the outgoing gases may be taken as 65%, and for chamber dryers 50%. The inlet temperature being fixed, usually by the nature of the material to be dried, the above factors fix the outlet temperature, unless internal heating is used. Velocities of 300—1000 ft./min. are used in tunnel dryers, the limit being that at which dust is entrained. For rotary dryers the maximum gas velocity for most substances is 300—350 ft./min. A table gives approximate relative rates of drying for different gas velocities. The first 80% of moisture is usually removed in 20—25% of the total drying time. Heat loss in outgoing gas is usually 30—40% of the whole unless a heat exchanger is used. Losses due to leakage of hot air in some dryers may reach 25%. The air requirements may be calculated with an error of 1—2% on the assumption that 60,000 cub. ft. of air cooling through 1° F. will evaporate 1 lb. of moisture from the wet material entering at 60° F. The further heat requirements are (a) for heating dry material to dryer temperature, (b) for heating trucks or trays, (c) for compensating for the various losses. The length of a tunnel dryer is best determined by experiment with the material to be dried. If steam is used for heating the air, 1 lb. of low-pressure steam is allowed for the heating

of 3000 lb. of air 1° F. Formulæ for heat transmission between steam pipes and air are given, but in practice it is found that the surface-area efficiency of transmission increases as the pipe diameter decreases. If the air current is at right angles to the steam pipes, much greater transference is obtained than if they are parallel. If a low dryer temperature is necessary the air requirements may be very large and filtration may be necessary. This is best performed by washing with calcium chloride solution, which reduces the moisture content at the same time; or filter frames packed with small metallic rings coated with oil may be used. If flue gases are used the material should travel in the same direction as the gas. Consideration should be given to possible effects of flue dust and the alteration in the draught of the chimney concerned.

C. IRWIN.

Fundamental principles in air conditioning. C. A. BULKELEY (Chem. and Met. Eng., 1929, 36, 734—736).—For the control of atmospheric relative humidity, now a necessity in many commercial processes, the air admitted must have a constant dew point and the temperature must remain uniform. The most satisfactory method of conditioning the air supply is to pass it through a spray chamber in which such intimate contact between water and air occurs that both leave the chamber within 1° F. The air has been cleaned and is now practically saturated. Leaving the spray chamber the air is drawn through a baffle chamber and through some form of steam-heated coil from which it is distributed properly throughout the building. It is stressed that all functional changes except starting and stopping should be under automatic temperature or relative-humidity control or a combination of the two.

C. A. KING.

Design, construction, and operation of a constant-humidity room. P. H. PRIOR (Proc. Tech. Sect. Papermakers' Assoc., 1929, 9, 152—174).—The points to be considered in the design of such a room are discussed and details are given for the construction of a room 12 ft. by 15 ft. by 7 ft. 10 in. Provision is made for complete change of air four times per hour or for recirculation of the air over the controls when the room is only used for conditioning samples. Humidity and temperature control are effected by diverting part of the air over the correcting devices (humidifier, refrigerator, and heater) by means of electric fans controlled by a hair hygrometer and a bimetal strip. The controls normally operate at about 5-min. intervals and to within 1% relative humidity and 1° F.

D. J. NORMAN.

Construction materials for handling corrosive agents. A. H. COOPER (Chem. and Met. Eng., 1929, 36, 747—750).—A condensed account, compiled from

* The remainder of this set of Abstracts will appear in next week's issue.

published work, of the resistant properties of materials to the corrosive action of sulphuric, hydrochloric, nitric, and acetic acids, alkalis, and hydrogen sulphide.

C. A. KING.

Spreading of lubricants on solid surfaces. Molecular influences. Rôle of photolysis. P. WOOG (Compt. rend., 1929, 189, 977—979).—Exceptions to the author's rule (B., 1928, 290) for the spreading of lubricants on solid surfaces have been studied. The addition of 0.1% of lauric, oleic, palmitic, stearic, or similar acid to a 1:1 mixture (η_0 1.729) of saturated mineral oil and neutral sheep's-foot oil reduced the spreading power on brass, whilst on steel the long-chain acids were the most effective in this respect. Aromatic acids accelerated the spreading to an extent which was less for the toluic acids than for benzoic acid. The production of 0.1% of acid by ultra-violet or by solar photolysis increased the spreading power, and though the experiments were complicated by the change in viscosity with temperature, there is evidence that the effects of photolysis were continued after irradiation had ceased. J. GRANT.

Viscosity and plasticity. A. V. BLOM (Farben-Ztg., 1929, 35, 601—602).—A brief account of the general significance of viscosity and plasticity, the former being regarded as a limiting case of the latter. Cellulose solutions are plastics whether pigmented or not, but linseed oil does not show yield value (to whatever cooking it is subjected) unless it be pigmented. S. S. WOOLF.

Relation of adhesion tension to "liquid absorption." F. E. BARTELL and O. H. GREAGER (Ind. Eng. Chem., 1929, 21, 1248—1251).—Liquid absorption (Gardner-Coleman) and adhesion tension (cf. Bartell and Osterhof, A., 1928, 12; B., 1928, 1) values of various liquids for powdered silica, carbon black, and calcium fluoride are correlated. For all systems in which the liquid forms a zero contact angle against the solid the relation is linear, the liquid absorption varying inversely with the adhesion tension. If the liquid forms a finite angle of contact against the solid, the liquid absorption is lower than would be expected from the foregoing relation and decreases as the contact angle increases (and the adhesion tension decreases). A theoretical explanation of the observations is advanced.

E. LEWKOWITSCH.

Freezing mixture. F. NOACK (Ind. Eng. Chem., 1929, 21, 1001).—A freezing mixture composed of a mixture of ammonium chloride, sodium carbonate, and water gives a temperature drop of 31°, and is stated to be only one fourth the cost of the customary ammonium nitrate-sodium carbonate composition. Several suitable proportions of the constituents are given; the preferred composition is ammonium chloride 1, sodium carbonate 1.5, and water 3 pts.

C. A. KING.

Absorptive properties of silica gel and charcoal. OKATOV.—See VII. **Water-hammer erosion.** COOK.—See X. **Alternating-current electrolysis of water.** SHIPLEY.—See XI.

See also A., Jan., 31, **Apparatus for dispersoid analysis** (ANDREASEN and others). 55, **Laboratory mercury still** (KUENTZEL). 56, **Hot-wire viscosimeters** (RICHARDSON).

PATENTS.

Furnace port construction. L. N. McDONALD (U.S.P. 1,735,256, 12.11.29. Appl., 27.10.21).—In a regenerative furnace with a number of fuel ports, an air uptake is provided between the ports and terminates in an air port extending above and between the fuel ports.

A. R. POWELL.

Heat-exchange apparatus. F. SCHUBART (U.S.P. 1,734,274, 5.11.29. Appl., 11.6.28).—The heat is conducted from passage to passage by means of wire mesh. The walls of the passages are moulded through the meshes, and the whole is contained in a rigid frame with inlet and outlet ports which are smaller than the apertures through the mesh.

B. M. VENABLES.

Heat exchanger for recovering heat from industrial waste water. F. B. DEHN. From WHITLOCK COIL PIPE CO. (B.P. 322,366, 24.12.28).—The water or other fluid to be heated flows through tubes in a zig-zag manner generally upwards, and the dirty fluid from which the heat is to be recovered flows in an open vessel surrounding the tubes from an inlet at the top of one end to an outlet at the bottom of the other. A number of units may be used in series so as to give a more perfect countercurrent flow.

B. M. VENABLES.

Heat transferers. SCHMIDT'SCHE HEISSEDAMPF-GES.M.B.H. (B.P. 303,172, 28.12.28. Ger., 29.12.27).—A compact element for a heat exchanger is formed by taking two (or more) tubes *A* and *B* and winding *A* over a straight portion of *B*, then *B* over the remaining straight portion of *A*, the ends being joined together to form single inlet and outlet connexions.

B. M. VENABLES.

Calibration of thermostats. H. J. OSBORN and A. WRIGHT (B.P. 322,204, 23.8.28).—The external arm of the thermostat (which operates the control devices) is freed from the arbor of the thermostat proper, but restrained by a pair of set screws in its appropriate position. The thermostat is then raised to the required temperature and, when steady, the arm is clamped to the arbor.

B. M. VENABLES.

Gyratory crushers. J. E. KENNEDY (B.P. 322,690, 26.1.29).—A gyratory crusher has the head of the shaft supported by springs in such a way that, whilst it remains rigid to normal crushing stresses, it can yield to uncrushable pieces.

B. M. VENABLES.

Machines for disintegrating or acting upon materials. A. MUSKER (B.P. 322,571, 1.10.28).—The fixed impact surface of a disintegrator is formed with grooves parallel to the axis and of such a shape that the material flung centrifugally by the rotor enters and slides round them and leaves in a centripetal direction, so that a concussive action takes place between the leaving and entering streams.

B. M. VENABLES.

Pulverising mills. HARTSTOFF-METALL-A.-G. (HAMETAG) (B.P. 306,154, 15.2.29. Ger., 17.2.28).—The material, together with a current of air, enters the pulveriser tangentially to, in the plane of, and counter to the rotation of the beaters. The inlet opening is in the form of a pocket with a bar or other guard across it to intercept particles thrown by the beaters.

B. M. VENABLES.

Pulverising and treating materials. ERIE CITY IRON WORKS, Assees. of W. J. WOHLBERG (B.P. 313,582, 5.9.28. U.S., 16.6.28).—Various fixed devices are described, suitable for pulverising coal etc. by impact while it is being conveyed in a stream of air or gas. The gas may be heated before impact.

B. M. VENABLES.

Thermal treatment of pulverulent material. TROCKNUNGS-, VERSCHWELUNGS-, U. VERGASUNGS-GES. M.B.H. (B.P. 305,231, 1.2.29. Ger., 2.2.28).—In the heat treatment of pulverulent material when it is not desired that material should mix intimately with the gases present, it is held in a thin layer on a moving hearth or other surface by means of electric adhesion. The electric charge may be generated by friction devices on the travelling surface.

B. M. VENABLES.

Drying system. J. PÖSSNER (B.P. 321,921, 16.6.28).—A kiln suitable for drying bricks, timber, etc. is constructed with a pair of parallel walls which are preferably circular so that the kiln is annular, and is subdivided into a number of compartments by transverse walls which do not extend completely across the kiln. Fans and heaters are arranged in alternate compartments and maintain a large local circulation of air with a minor zig-zag transference. The main walls of the kiln consist substantially of hinged flaps which can be opened at suitable points for charging and discharging the material and for admitting and exhausting air. Additional heated air may be admitted to any compartment from an underground channel.

B. M. VENABLES.

Apparatus for drying broken stone, slag, etc. J. SMART (B.P. 322,274, 2.10.28).—The material is allowed to slide down a series of adjustably sloping floors composed of louvred plates or slats. Hot air is supplied to chambers below the floors and allowed to exhaust freely to atmosphere above them.

B. M. VENABLES.

Rotary drum machines for treating granular materials. H. BEHRENS, and MASCHINEN- U. WERKZEUGFABR. KABEL VOGEL & SCHEMMANN A.-G. (B.P. 322,405, 26.2.29).—A machine for purposes such as reconditioning foundry sand is constructed with a rotor having ratchet-shaped teeth which fling the material against a pair of screens behind each other, the wires being staggered so that no particle can pass straight through both screens without impact. The rotor may be built round an electric motor having an internal stator.

B. M. VENABLES.

Controlling the characteristics of spray-processed products. D. R. LAMONT, Assr. to INDUSTRIAL SPRAY-DRYING CORP. (U.S.P. 1,734,260, 5.11.29. Appl., 3.10.27).—The liquid material is sprayed into heated air and the conditions are carefully regulated so that steam is evolved while the drops are in a viscous condition, the result being formation of hollow shells.

B. M. VENABLES.

Separation of dry materials. BIRTLEY IRON CO., LTD., I. L. BRAMWELL, and C. W. H. HOLMES (B.P. 322,480, 6.6.28).—Substances, such as a mixture of coal and shale, are treated pneumatically so that one product comprises the largest particles of the heavier constituent. The remainder is then screened so that the largest

particles of the lighter constituent are obtained in the pure state, the remainder being then treated in any known way. During the process middling products may be returned to the feed.

B. M. VENABLES.

Centrifugal machine. LAUGHLIN FILTER CO., Assees. of W. C. LAUGHLIN (B.P. 310,504, 27.8.28. U.S., 28.4.28).—The machine is of the screening type with helical scraper to remove the collected solids continuously, the shafts of the basket and scraper being concentric. The edges of the scraper blades can move outwardly by centrifugal force; they rub only on supporting ribs, and not on the screen.

B. M. VENABLES.

Continuously-operating centrifugal sludge separator. A. NYROP (B.P. 302,685, 6.12.28. Denm., 20.12.27).—The bowl has a peripheral slot for discharge of collected solids and can slide vertically on the driving hub. Below the bowl, fixed to the hub, is a dish-like member with upwardly extending flange which closes the slot in the bowl when the latter is at the lowest position. The feed channel for raw liquid is annular, but on the axis is another channel for admitting hydraulic liquid to the space between the bottom of the bowl and the dish below, so that when liquid is admitted the bowl floats and opens the peripheral slot; this same motion also permits discharge of the hydraulic liquid at the periphery so that the slot closes again ready for a fresh accumulation of sludge.

B. M. VENABLES.

Separation of solids from liquids. A. SCHUSTOV (B.P. 322,100, 1.12.28).—The liquid is settled in "flooding troughs" which are constituted by conveyer belts running against the flow of liquid, and removing the settled solid matter to a point behind the feed box, where discharge is effected by scrapers or sprays. The liquid discharge from one conveyer may fall upon another running in the opposite direction, so as to get a series of depositions. The conveyer belt may have upturned edges or may be supported on waisted rollers so that the weight of the material will cause the upper surface of the belt to be concave.

B. M. VENABLES.

Separator. F. A. BROWNE, Assr. to BARBER ASPHALT CO. (U.S.P. 1,734,324, 5.11.29. Appl., 13.2.28).—A mixture of liquid and vapours is admitted to the upper part of a closed chamber after passing through a long, narrow, spiral tube adapted to effect centrifugal separation. The upper outlet for vapours is protected by a foam separator, and the lower outlet for liquid is heated.

B. M. VENABLES.

Centrifugal dome with condensing arrangement. C. SCHMITZ, Assr. to RAMESOHL & SCHMIDT A.-G. (U.S.P. 1,734,533, 5.11.29. Appl., 3.10.28. Ger., 10.9.27).—The air currents induced by the discharge of a separated liquid through nozzles on the centrifuge cause a return circulation of fine spray and vapour inwards under the cool, domed roof of the catch chamber, between the roof and an adjacent baffle.

B. M. VENABLES.

Cleaning the discs of centrifugal separators. AKTIEBOLAGET SEPARATOR (B.P. 308,828, 28.3.29. Swed., 31.3.28).—The bundle of separating discs or cones is taken out of the separating bowl and placed in an apparatus where they are subjected to a strong circulating current of cleansing fluid, so arranged that the flow is

radial between the discs. The circulation of the fluid may be effected by means of steam jets, and the apparatus may be enclosed for working under pressure.

B. M. VENABLES.

Mechanical filters. S. J. RICKS and C. E. DOUGLAS (B.P. 322,148, 2.4.29).—The whole mass of sand, or similar medium, of the filter is cleaned by a device comprising several tiers of horizontal arms which can be rotated intermittently in horizontal planes, each arm carrying a number of stirrers which rotate in vertical planes, in opposite directions in alternate tiers. The arms are hollow and terminate in water jets.

B. M. VENABLES.

Filters for liquids under pressure. G. and S. JAVITCH (B.P. 309,143, 4.4.29. Fr., 5.4.28).—A filter, of the type where a filter medium and a joint ring are clamped between two halves of a casing, is provided with a pin and slot to prevent relative rotation of the halves, and the slot is extended by a recess to allow any liquid that passes round the edge of the filter medium to leak out, thus indicating that the clamping pressure is insufficient.

B. M. VENABLES.

Apparatus for filtering liquids under pressure. H. JUNG (B.P. 322,091, 27.11.28).—The filter is composed of a number of tubular filtering elements contained in a pressure-tight casing. During the filtering period the prefilter is caused to sweep over the full length of the tubes, some prefilter being allowed to escape at the end of the casing remote from that at which it entered. After the cakes have been formed the excess prefilter is blown out and the cakes are dried by air at a pressure in excess of the filtering pressure. Lixiviation or washing may then take place by means of fluid under pressure. After a final drying by air, the bottom (inlet) end of the casing is removed and the dry cakes are blown off by reverse compressed air. The tubular filters may be constructed of a number of ceramic rings assembled round a hollow clamping bolt which forms the outlet for filtrate. They may be strengthened by sprayed metal or other substances on their abutting surfaces.

B. M. VENABLES.

Fluid segregator. D. SAMIRAN and P. MELVILLE (B.P. 322,654, 17.12.28).—The apparatus comprises a float chamber in which water may settle out of, *e.g.*, petrol (or for similar purposes); the needle of the float valve controls the outlet of water, whilst the current of petrol flowing in and out may be continuous. Devices are incorporated to prevent a sudden rush of water from choking the supply of petrol, for adjusting the float to the correct buoyancy, and to afford a resilient connexion between the float and needle valve.

B. M. VENABLES.

Cleaning of filters or strainers. E. FOLTA (B.P. 308,974, 28.3.29. Czechoslov., 2.4.28).—A vacuum cleaner device which travels over the filtering surface is described.

B. M. VENABLES.

Protection of boilers against scale formation. SIEMENS-SCHUCKERTWERKE A.-G. (G.P. 455,983, 12.12.25).—The water is not only heated by the usual methods for steam raising, but also locally by the introduction of hot gases or vapours or by means of an electric arc working under its surface and remote from the side walls of the boiler.

A. R. POWELL.

Distillation of liquid materials. J. PINTSCH A.-G. (B.P. 297,122, 14.9.28. Ger., 16.9.27).—The distillation of a liquid (*e.g.*, hydrocarbon oil) is effected by a constant circulation of a carrier gas (*e.g.*, the permanent gas derived from the oil) which is all heated by passing through one half of a regenerator; then the greater part passes through a distillation chamber preferably situated in a hollow of the wall between the halves of the regenerator where the oil to be distilled is added to the stream. The circulating mixture passes to a first separator where remaining liquid is caught, and then to a column where the desired fraction is condensed; the cool carrier gas is pumped back to the same half of the regenerator (until it becomes too cold), and since an excess of gas will be produced by the distillation, this excess is passed to the other half of the regenerator and burned therein with air, heating it up until the next change-over. The distillation being effected in the presence of a large proportion of gas, the partial pressure of the vapours is low, thus giving a result comparable with the use of vacuum or steam.

B. M. VENABLES.

Separation of liquids by distillation. SOC. ANON. DES DISTILLERIES DES DEUX-SÈVRES (B.P. 304,756, 12.12.28. Belg., 26.1.28).—A mixture of liquids, one of which is very soluble in water and the other only slightly so, is distilled in a column which is provided with a water spray at the top, the water being supplied at the temperature of the azeotropic mixture of the slightly soluble liquid and water. The heat is supplied at the bottom of the column, being preferably assisted by heating the feed which is supplied to the middle of the column. The very soluble liquid is withdrawn from the bottom in the form of a solution diluted with water. The vapours from the top of the column are condensed and settle into two layers, the lower of which, mostly water, is returned to the column. The upper layer will be the slightly soluble constituent mixed with a little water, but will not contain any of the very soluble constituent. It is claimed that mixtures of ethyl acetate, alcohol, and water; acetal, alcohol, and water; isopropyl ether and isopropyl alcohol, can thus be separated. (Cf. B.P. 305,528; B., 1930, 135.)

B. M. VENABLES.

Degasification of liquids. W. S. ELLIOTT (U.S.P. 1,734,515, 5.11.29. Appl., 19.11.23).—The liquid is sprayed over heated tubes and falls to a separating space below; the vapours and permanent gases pass through a surface condenser which is cooled by the raw liquid. The latter may be further preheated in a separate heater before admission to the degasifier proper.

B. M. VENABLES.

Gas and liquid separator. L. L. WESTLING and M. R. HICKMAN (U.S.P. 1,734,507, 5.11.29. Appl., 23.10.28).—The mixed fluids are caused to flow upwards through a vertical pipe. Whirling is produced by vanes at the bottom, and the top is surmounted by a dome from the extreme top of which the gas is withdrawn, the liquid exhausting smoothly through a number of holes lower down. If the flow is too slow to produce a vortex, separation will be effected by simple settlement.

B. M. VENABLES.

Method of absorption [of gas in liquids]. J. A. CAMPBELL (U.S.P. 1,736,070, 19.11.29. Appl., 19.4.27).

—The liquid and gas are continuously introduced through spray jets into the lower part of a reaction vessel so as to form a voluminous froth which is broken down by a paddle device at the top of the reaction vessel.

A. R. POWELL.

Introducing liquid or semi-liquid materials into high-pressure vessels. S. R. BOYCE, W. R. TATE, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 322,645, 7.12.28).—Material such as a mixture of oil and coal is pumped by two plunger pumps in series, and between them is an intermediate receiver comprising a cylinder with differential piston, to the smaller side of which the paste is admitted, whilst the larger side is subjected to the pressure of a gas, which may be the same as that in the high-pressure vessel to be charged.

B. M. VENABLES.

Dust filters. BÜHLER BROS. (B.P. 317,078, 25.7.29. Ger., 10.8.28).—The filter is of the bag type with mechanical shaking. The lower ends of the bags are not secured to anything but are weighted; the upper ends are supported from a frame which at intervals is raised by a cam and allowed to fall on a spring cushion.

B. M. VENABLES.

[Stream-line gas] filters. F. E. SQUIRE. From MIDWEST STEEL & SUPPLY CO., INC. (B.P. 322,684, 23.1.29).—The filter comprises a number of spaced plates all bent equally into hyperbolic shapes, resulting in a stream-line flow, with a certain amount of expansion and contraction between them. The outlet edges of the plates are provided with collecting pockets which extend (transversely to the gas currents) outside the casing so that the settled dust may be collected without stopping the action. The pockets are preferably formed by bending back the edges of the plates.

B. M. VENABLES.

Solidification of gases. GES. F. LINDE'S EISMASCHINEN A.-G. (B.P. 301,741, 3.12.28. Ger., 2.12.27).—The process when used for the solidification of carbon dioxide is worked as follows: Liquid carbon dioxide at cold-water temperature and 58 atm. is passed through one passage, say the inner, of three heat-interchangers (*A*, *B*, *C*) in series. Between *A* and *B* a portion (about one third) of the liquid is expanded to a pressure just above the triple point, and the cold gas is passed through the outer of *B*, thus reducing the temperature of the liquid remainder to just above the f.p. (-50°); after further cooling in *C*, the liquid is expanded through a valve into the freezing chamber at 1 atm., where the kinetic energy of the issuing carbon dioxide is utilised to cause the solid to form in lumps. The gas at atmospheric pressure passes through theouters of *C* and *A* to atmosphere. The gas (at 7 atm.) from the outer of *B* also passes through a separate outer of *A* and passes to the second or third stage of the compressor. The theoretical (adiabatic) yield of solid is increased to 61.5% from 39% by the ordinary process. A further reduction of power can be effected by working the final expansion not to atmosphere, but to a pressure slightly below the triple point, and returning the exhaust gases to the compressor. Several freezing chambers, used intermittently, are preferably provided for one set of heat exchangers, used continuously.

B. M. VENABLES.

Pressure vessel for transport and evaporation of liquefied gases of low b.p. A. L. MOND. From I. G. FARBEIND. A.-G. (B.P. 322,702, 25.2.29).—The vessel is constructed of an austenitic, non-magnetic, alloy steel containing such components as manganese, chromium, or nickel in such small amounts that the crystals are of a single type. Such steel, in addition to its already known low contraction, is found to resist impact and transpiration.

B. M. VENABLES.

Apparatus for [cooling and] conditioning air. L. HELMER (U.S.P. 1,735,611, 12.11.29. Appl., 31.1.29).—Cold water is sprayed into the stream of air in a dehumidifying chamber with spray trap and collecting sump for the water; the latter is drawn into an evaporator, where it is cooled by a high vacuum produced by a mechanical pump and steam-jet augments. The vapours may be condensed and, together with the cooled water, used again.

B. M. VENABLES.

Apparatus wherein gases are passed over solids. W. R. WOOD (B.P. 322,601, 29.10.28).—In a rotating heat recuperator of the type where comminuted solid matter is contained in an annular chamber subdivided into sectors, through some of which a hot gas is passed axially while simultaneously through others a gas to be heated is passed, the sectors are provided with radial guides which do not extend to the outer and inner circumferential walls, and the heat-absorbing material does not completely fill the sectors. Thus, on rotation, the material will turn over and over, thereby freeing itself from dust which leaves through perforations provided preferably through the inner circumferential wall.

B. M. VENABLES.

Controllably feeding gases [from containers containing them in liquid phase]. J. M. ROWLAND, ASST. to HOOKER ELECTROCHEM. CO. (U.S.P. 1,736,509, 19.11.29. Appl., 7.1.27).—The gas is withdrawn from the bottle as a liquid and vaporised in a coil submerged in a bath held at a constant temperature by a thermostat. The bottle is also submerged in a bath of which the temperature is raised as the gas is withdrawn, so that the pressure is held constant.

B. M. VENABLES.

Measuring the turbidity of liquids. W. PATERSON. From D. J. MIDDENDORP (B.P. 322,461, 4.9.28).—A trough has its vertical walls lined with mirrors which are not quite parallel. A constant source of light is situated behind a transparent aperture in one side near one end, and a view is taken through a hole in the opposite side a little further along the trough. A number of virtual images of the aperture will appear on the mirror opposite this hole, and in the presence of a turbid liquid these images will gradually get fainter, the number of images remaining visible being inversely as the turbidity of the liquid.

B. M. VENABLES.

Anti-freezing mixtures for use in radiators. GES. F. KÄLTECHEMIE GES.M.B.H., and H. SAUTIER (B.P. 322,859, 2.11.28).—An aqueous solution containing aluminium and calcium chlorides is claimed.

H. ROYAL-DAWSON.

Production of artificial fog. HANSEATISCHE APPARATEBAU-GES. VORM. L. VON BREMEN & CO. (B.P. 298,980, 11.9.28. Ger., 18.10.27).—Suitable organic

substances, *e.g.*, formic or oxalic acid, are brought into contact with the fog-forming acid (*e.g.*, sulphur trioxide dissolved in chlorosulphonic acid), whereby decomposition and dehydration occur immediately, the gas is liberated, and the necessary pressure produced to atomise the materials.

H. ROYAL-DAWSON.

Heat-exchanging device. C. McNEIL (U.S.P. 1,740,192, 17.12.29. Appl., 11.12.28. U.K., 11.7.28).—See B.P. 313,780; B., 1929, 739.

II.—FUEL; GAS; TAR; MINERAL OILS.

Coking tests on coals from Western Canada.

R. E. GILMORE and R. A. STRONG (Canada Dept. Mines Fuel Invest., 1927, No. 696, 12—31).—Nine bituminous coals (20—30% of volatile matter) were examined. The investigation was conducted in two stages, *viz.*, "box" coking tests in full-scale by-product ovens, followed by carbonisation tests in a special laboratory apparatus. It was found that three of the nine coals examined were suitable, individually, for the production of high-quality coke, gas, and by-products. The remaining six coals each produced a satisfactory domestic coke when blended with a high-quality (imported) coking coal; for use in plants where no blending facilities are available a considerable further reduction in ash content is necessary before any of these (six) coals can be utilised. All nine coals were characterised by low sulphur contents (0.4—0.9%) and comparatively high ash-fusibility temperatures.

C. B. MARSON.

Coke as a domestic heating fuel. P. NICHOLLS and B. A. LANDRY (Fuel, 1929, 8, 588—600).—Coke at present forms about 6% of the total solid fuel used in the United States for domestic purposes. The general characteristics of coke as a fuel for central-heating are discussed. Tests carried out with an experimental furnace of the type used for central-heating have shown (a) that the draught required to give a fixed rate of burning decreases rapidly with increase in the size of the coke pieces; (b) that the draught required increases almost linearly with the rate of burning; (c) that the carbon monoxide content of the gases rising from the fuel bed, averaged over the period between firings, and consequently the secondary air required, decreases with increase in the size of the coke pieces. With small coke ($\frac{1}{2}$ —1 in.) it is easier to start the fire, which is also less likely to go out; the furnace is more easily controlled (by adjustment of the dampers) and firings need not be so frequent as with larger coke. On the other hand a greater draught is required, and a hotter fire may be obtained, with consequent clinker trouble; moreover, the efficiency is lower. Low-temperature coke ignites and burns more readily and requires less draught than high-temperature coke. It requires, however, more secondary air for complete combustion. The efficiency with low-temperature coke tends to be lower on account of the higher temperature of the flue gases and the tendency for unburnt volatile matter to pass to the chimney.

A. B. MANNING.

Use of gas and by-product cokes for domestic heating purposes. E. S. MALLOCH and C. E. BALTZER (Canada Dept. Mines Fuel Invest., 1927, No. 696, 5—11). The chief differences between the two cokes in common

use, *viz.*, gas and by-product cokes, are outlined. Types of domestic central-heating furnaces most frequently used in Ontario and Quebec are described, and instructions are given for the utilisation of coke in these appliances.

C. B. MARSON.

Production of a strong semi-coke from a poorly caking or non-caking coal by the addition of ordinary or oxidised low-temperature tar. F. FISCHER, A. PRANSCHKE, and H. SUSTMANN (Brennstoff-Chem., 1929, 10, 480—487).—A hard, coherent coke has been obtained by carbonising a non-caking coal (Brassert), mixed with its own low-temperature tar, at 500—600°. It was necessary to mix the tar with the finely-ground coal as uniformly as possible in the proportion of at least 1 : 1, and to avoid a too rapid rate of heating over the range 300—400°. About 86% of the tar was recovered; this was much richer in lighter-boiling constituents than the original tar, and had lost the power of forming a coherent coke with the coal. This power, however, was restored by gentle oxidation, *e.g.*, by blowing air through the tar at 60—70°, or preferably at higher temperatures.

A. B. MANNING.

Determination of mineral matter in coke. K. HRADSKÝ (Paliva a Topeni, 1929, 11, 30—32).—The relation between the true mineral content of coke and the composition of the ash is discussed. If the coke contains little sulphur and no sulphate the ash is free from sulphate. Sulphide-sulphur may be removed by treatment with acid. Sulphate in the ash is not derived from organic sulphides. The sulphur in the ash is unchanged by addition of lime to the coke. The coke (0.5—1 g.) is treated in a porcelain boat with dilute acetic acid (3—5 c.c.), dried, and ashed in air or oxygen at 700—800°; the ash is reduced with dry hydrogen at the same temperature, and cooled in hydrogen. After further treatment with acetic acid and reduction in hydrogen the ash is weighed. The iron in coke is present as the element or as ferrous sulphide.

CHEMICAL ABSTRACTS.

Use of a portable calorimeter in the retort house.

G. G. BUTTERY (Gas J., 1929, 188, 840—841).—For control of individual streams of coal gas which are subsequently mixed, a small water-flow calorimeter is used. A gas sample is taken into a large aspirator, and 0.1 cub. ft. is employed for the calorific value determination. The whole outfit can be made portable and is easily operated; examples are given of its applications.

R. H. GRIFFITH.

Destructive distillation of coconut shells and oil palm nut shells.

C. D. V. GEORGI and T. A. BUCKLEY (Malayan Agric. J., 1929, 17, 398—402).—Coconut shells give a higher yield of charcoal than oil palm nut shells and these, in turn, than hardwoods. Both shells yield hard, brittle charcoals, palm nut charcoal having the glossier fracture and a remarkably high sp. gr. (d 1.47; coconut charcoal has d 1.17—1.21). Coconut shells form a valuable source of supply of acetic acid, creosote, and wood spirit, recoverable from the pyrolygneous acid.

E. LEWKOWITSCH.

Regeneration of norit. S. S. KUTZEV and M. R. KOTLYARENKO (Zhur. Sakh. Prom., 1928, 2, 236—238).—Exhausted norit (ash 17.5%, mineral oils 2.03%) was

treated with ether to remove the oils, and washed with 2% sodium hydroxide solution (6 times) and 2% hydrochloric acid (once); the decolorising power was restored to 69% of the original. Regenerated norit, after being heated in carbon dioxide and washed once each with sodium hydroxide solution and hydrochloric acid, had a decolorising power 88% of the original.

CHEMICAL ABSTRACTS.

Complete gasification plant at Mill Hill. F. J. PEARCE (Gas J., 1929, 188, 580—585).—Modifications of an existing water-gas plant are described which made it available for gasification of coal. A new plant evolved from it has been constructed and successfully operated for several months, using coal only. It consists of a generator with superimposed carbonising chamber, carburettor, and superheater, and is fitted with the back-run device and with a circulating fan. The coal is carbonised by the sensible heat of superheated steam mixed with water-gas; maintenance of the optimum temperature in the cracking vessels and in the circulated gas is very important and requires more supervision than is given to the ordinary water-gas set. No difficulties were encountered in enrichment of the gas by means of oil, but the quality of the tar produced is uncertain and the ammoniacal liquor formed is too weak to be of any use. Figures are given for a variety of working conditions, and it is stated that 172.2 therms of gas are obtained per ton of coal; this is compared with 162 therms in a normal two-stage process, but no data for steam consumption are included. The capacity of a plant giving 1 million cub. ft. per day with coke is reduced to about $\frac{3}{4}$ million with coal.

R. H. GRIFFITH.

Gas drying and producer practice. F. FIRTH (Gas J., 1929, 188, 657—658; cf. B., 1926, 474).—A rough calculation shows that to dehydrate gas saturated at 20° to a dew point of 2° by refrigeration would require about 21 tons of ice per 5000 cub. ft. The most suitable arrangement for carrying out the process consists of a washer filled with a mineral oil, e.g., gas oil, having a low viscosity at low temperatures, and cooled by refrigeration. The naphthalene in the gas is thereby removed at the same time. The quality of the gas from a producer of the open step-grate type improved with increased velocity of gas through the fuel bed, but remained unchanged when the depth of the fuel bed was decreased by allowing the clinker to accumulate to a depth of 2 ft. The carbon dioxide content of the gas is high immediately after clinkering, but diminishes as a layer of clinker forms; this improvement in quality of the gas is attributed to the increased velocity of the air passing through the interstices of the clinker. Some further effects of clinker formation on the performance of a gas producer are briefly described.

A. B. MANNING.

Recovery of by-product nitrogen and sulphur in the coke-oven and gas industries. F. MUHLERT (Brennstoff-Chem., 1929, 10, 487—490).—The following processes for the removal of hydrogen sulphide and/or ammonia from coal gas are briefly discussed: (1) the "Seabord," "Ferrox," "Thylox," and "Nickel" processes of the Koppers Co. (cf. B., 1928, 357; 1929, 8 *et seq.*); (2) the processes of the Ges. f. Kohlentechnik

(cf. Ferbers, B., 1929, 5); (3) Bähr's process (B., 1928, 354); and (4) Petit's process (cf. Lorenzen, B., 1929, 766).

A. B. MANNING.

Economics of benzol recovery at gas works. F. FIRTH (Gas J., 1929, 188, 595—596).—The thermal aspect of stripping benzol from coal gas and, if necessary, replacing it by oil gas is discussed. A hypothetical cost sheet has been prepared and the various items involved are inspected.

R. H. GRIFFITH.

Determination of sulphur in spent [coal] gas-purification material. A. RINCK and E. KAEMPF (Gas- u. Wasserfach, 1929, 72, 1269—1270).—The material (10 g.) is extracted with carbon disulphide and the extract made up to 100 c.c.; 10 c.c. of this are heated on a water-bath until all the solvent is removed, and the residue is heated at 100° for 2 hrs. with 15 g. of caustic potash and 20 c.c. of water. The whole is then diluted to 200 c.c., filtered, and one tenth of it is mixed with excess of bromine water; the sulphuric acid formed is determined as barium sulphate.

R. H. GRIFFITH.

Carburettng process in water-gas manufacture. A. G. GRANT (Gas J., 1929, 188, 590—593).—The types of oil available for enrichment of water-gas are described and the manner in which cracking conditions affect operating results is shown in a review of recent work on the subject. The difficulty of exact measurements on the plant is emphasised, but it is shown that the efficiency of oil cracking is easily under control in practice. Possible future sources of oils for enrichment are surveyed and the general trend of plant design is discussed.

R. H. GRIFFITH.

Tar works' emulsions. R. G. W. EADIE (Gas J., 1929, 188, 658—660).—Emulsions are discussed under the headings: (a) those formed between the crude tar and liquor, and in the extraction of the tar acids; (b) creosote emulsions used as disinfectants; and (c) road-tar emulsions. The water content of Maclaurin tar can be reduced from 10% to 2% by centrifuging. The agents producing the emulsions formed during the extraction of the tar acids are probably the free carbon in the tar, calcium carbonate in the caustic soda, and other finely-divided solids. Creosote emulsions are more effective as disinfectants than the solutions obtained when excess of soap is used, probably because the bacteria are adsorbed on the particles of the emulsion and thereby exposed to the action of the concentrated creosote. Some advantages of the use of an emulsified pitch, such as the French preparation "Arcite," for road-surfacing purposes are discussed.

A. B. MANNING.

Assay of bituminous sands. R. E. GILMORE, A. A. SWINNERTON, and G. P. CONNELL (Canada Dept. Mines Fuel Invest., 1927, No. 696, 83—103).—A number of laboratory tests for the examination of bituminous sands have been examined and the following methods are recommended: (1) Determination of bitumen.—A sample ($\frac{1}{4}$ — $\frac{1}{2}$ lb.) is air-dried to constant weight; the water content of the air-dried sample is determined by the toluene method, in which 100 g. of the sand are weighed into a 500-c.c. round-bottom flask, fitted with reflux and graduated receiver, 150 c.c. of toluene

are added, and heating is continued until no more water is collected. The extraction with solvent is effected by centrifuging 0.5–1 kg. of the sample with benzol in a Dulin–Rotarex centrifuge; further quantities of benzol are added until the solvent comes out colourless; the sand is dried to constant weight at 105°, and, after being kept overnight, the solvent, with its extracted material, is decanted, the sediment is transferred to a filter paper, washed with benzol, dried, added to the main bulk of the sand, and weighed. The total loss by extraction minus the moisture content represents the bitumen content. (2) Determination of sulphur.—A 50-g. sample is placed in a glass-stoppered graduated cylinder and the volume made up to 250 c.c. with benzol; after shaking, the sandy material is allowed to settle and 10 c.c. of the supernatant liquid are transferred to a Parr peroxide bomb, from which the solvent is evaporated by placing the bomb in a specially adapted steam-bath; the potassium chlorate accelerator is added, mixed with the bitumen, sodium peroxide is then added, the bomb is exploded, and the sulphur determined in the usual way. (3) Destructive distillation of bitumen.—1 kg. of bituminous sand is extracted with benzol as in (1), the solvent-free bitumen is weighed and transferred to a cast-iron retort (capacity 1000 g.) which is connected to condensers, receivers, and a gas-meter. Distillation is stopped when no further oil distills off; the distillate is weighed, the water separated from the oil, and the yield of dry oil obtained; the pitch residue is also weighed and the weight of the gas calculated from its volume and analysis. Then 100 c.c. of the distillate are subjected to fractional distillation in a 250-c.c. Engler flask, temperature readings are taken at every 5% distilled over, and the receiving vessels changed at 150° and 300°. The amount of pitch remaining is weighed. The three fractions are examined for sp. gr. and for unsaturated compounds by treatment with sulphuric acid. C. B. MARSON.

Asphalt emulsions for highways. H. NOVÁK (Paliva a Topeni, 1929, 11, 4–11).—Laboratory tests of asphalt made by the cold process are recorded.

CHEMICAL ABSTRACTS.

Testing of parquet asphalt. H. NOVÁK (Paliva a Topeni, 1929, 11, 17–20).—The deflexion test for asphalt to be used as a base for parquet floors is described.

CHEMICAL ABSTRACTS.

[Preparation of] anti-knock gasoline by cracking various products at the atmospheric pressure. V. F. GERR (Neft. Choz., 1928, 15, 343–351).—When cracked at atmospheric pressure, a mixture of dimethyl-, trimethyl-, and ethyl-benzene (fraction b.p. 122–200°) gave good results; toluene was more resistant and formed carbon. With copper as catalyst, more tar was produced. Green oil and paraffin wax, m.p. 60°, gave a low yield, whilst Surakhani fuel oil and crude oil behaved similarly to kerosene distillate. Cracked kerosene, b.p. 150–300°, gave slightly lower yields than normal kerosene; the unsaturated hydrocarbons were readily converted into aromatic compounds. Over the temperature range 670–700°, the highest yields of aromatic compounds were obtained when the charging rate was kept within certain limits. The gasolines were

of high anti-knock quality, containing up to 25% of aromatic hydrocarbons. As compared with cracking under increased pressure, the quantity of gas obtained was trebled.

CHEMICAL ABSTRACTS.

Rectification of gaseous products from crude oil cracked in the vapour phase. M. B. MARCOVICH (Neft. Choz., 1929, 16, 67–73).—Gasoline obtained in the "blau gas" cracking process had d_{40}^{25} 0.725 and absorbed up to 60 vol.-% of gas; it contained propylene 2, butylene 19, C_5 hydrocarbons (up to 90% unsaturated) 28, C_6 hydrocarbons (at least 85% unsaturated) 22, benzene 17, higher polymerides 12%, and some divinyl and butane. The composition of the absorbed and permanent gases is recorded.

CHEMICAL ABSTRACTS.

Sakhalin crude oil from Katangli. S. S. NAMETKIN and L. N. ABAKUMOVSKAYA (Neft. Choz., 1929, 16, 527–529).—The characteristics of the oil are recorded.

CHEMICAL ABSTRACTS.

Vacuum distillation of the typical Baku fuel oils. V. GURVICH and B. KAMINER (Azerbeid. Neft. Choz., 1929, No. 5, 64–70).—Distillation data for paraffin-, naphthene-, asphalt-, and mixed-base crude oils are recorded.

CHEMICAL ABSTRACTS.

Oxygen values of asphaltenes and resins in crude oils. S. S. NAMETKIN and V. G. PUTZILLO (Neft. Choz., 1929, 16, 230–235).—The discrepancies in the coefficients of unsaturation determined by iodine and oxygen values, respectively, are due to asphaltenes. Perbenzoic acid, but not iodine, reacts with the resins and asphaltenes. The results are unaffected by the small amounts of sulphur compounds present in the oil.

CHEMICAL ABSTRACTS.

Action of sulphuric acid on gas from cracked kerosene. V. F. GERR and M. M. TIKHOMIROVA (Neft. Choz., 1929, 16, 411–414).—The gas (heavy hydrocarbons 33.6, CH_4 49, H 17.4%), after treatment with sulphuric acid, contained: heavy hydrocarbons 24, CH_4 56, H 20%, 0.3 g. being absorbed from each litre. Acid recovered from sludge was more active than pure acid. The composition of the oil layer formed on the acid and its behaviour on fractionation are described.

CHEMICAL ABSTRACTS.

Cylinder oils from heavy bottoms. L. GUKHMAN (Azerbeid. Neft. Choz., 1929, No. 5, 70–72).—Excessive polymerisation in the treatment of heavy lubricating oil bottoms with acid is avoided by dilution with gas oil. The characteristics of the oil fractions and of asphalts from the acid sludge are recorded.

CHEMICAL ABSTRACTS.

Utilisation of acid sludge from lubricating oil bottoms. S. N. OBYADCHIKOV (Neft. Choz., 1929, 16, 80–82).—The acid in the sludge from Grozni lubricating oil is partly removed by settling; the remainder is neutralised with lime and the mixture is extracted with gasoline at 50–80°. Alternatively, the sludge is blown with air for 15 min. at 185–218°, affording a brittle product having softening point 113° and being suitable for use as pulverised fuel.

CHEMICAL ABSTRACTS.

Asphalt tar from Grozni mixed-base crude oil. A. I. VORONOV and V. S. TVERTZIN (Neft. Choz., 1929, 16, 242–246).—Heavy residues (characteristics recorded) were agitated with superheated steam (320°) and heated

at 350—375°. The properties of the asphalt obtained (optimal d_{20}^{20} 1.003) and of products recovered are recorded. CHEMICAL ABSTRACTS.

Determination of sp. heat of crude oil products at elevated temperatures. V. I. TIKHOMIROV and V. P. ZHUSE (Nef't. Choz., 1929, 16, 74—79).—The following values were obtained: kerosene distillate, b.p. 26.84—144.10°, 0.4418—0.5936; gas oil, d 0.8649, 29.67—204.00°, 0.434—0.6293; gas oil, d 0.8845, 24.41—196.32°, 0.4226—0.6367; gas oil, d 0.8916, 24.13—221.94°, 0.4307—0.6603. CHEMICAL ABSTRACTS.

Prevention of knocking of gasoline. Y. NAGAI (J. Fuel Soc. Japan, 1929, 8, 109—111).—The addition of small amounts of anti-knock agents to a gasoline raises the temperature of flame propagation in its vapour, and narrows the inflammable limits. These effects are considered sufficient to explain the successful use of these substances with higher compression ratios.

R. H. GRIFFITH.

Amyl acetate from aviation gasoline. A. DOBRYANSKI and E. GUREVICH (Nef't. Choz., 1928, 15, 532—559).—The pentane fraction (about 20%) of Krasnodar aviation gasoline, after redistillation between 31° and 38° (11.5—12.5% of gasoline, d 0.6332, mol. wt. 69—70.5), was chlorinated in artificial light; the highest yields of monochloride were obtained by chlorination in the gas phase with dry chlorine at 60—70°. A yield of about 90% of crude amyl acetate was obtained by esterification with dry sodium acetate at 230° in sealed tubes for 4—8 hrs. CHEMICAL ABSTRACTS.

Standards for Diesel fuel. N. I. TSCHERNOZHUKOV (Izvest. Teplotekh. Inst., 1927, No. 9, 78—87).—The Russian standards are recorded.

CHEMICAL ABSTRACTS.

Preparing petrolatums. N. I. TSCHERNOZHUKOV (Nef't. Choz., 1929, 16, 240—241).—The preparation of petrolatums of high or low viscosity is described. For medicinal petrolatums only the paraffins of high m.p. are removed.

CHEMICAL ABSTRACTS.

Technical and medicinal petrolatums from Grozni mixed-base fuel oil. B. K. TARASOV (Nef't. Choz., 1929, 16, 236—239).—The fuel oil was treated with sulphuric acid, neutralised with sodium silicate, filtered through silica gel, and the resulting oil was distilled with steam. For the preparation of medicinal petrolatum the technical product was dissolved in gasoline, treated twice with fuming sulphuric acid, separated from sludge, neutralised, washed, dried, and treated with fuller's earth. Russian and American petrolatums, respectively, have d 0.866, 0.832, and contain paraffin wax (18.9%, 30%) of m.p. 56—69.5°, 58.5—62°.

CHEMICAL ABSTRACTS.

Oil analysis. KETTLE.—See XII.

See also A., Jan., 57, **Oxidation of petroleum hydrocarbons** (BERMEJO). **Structure of bog-head coal** (STADNIKOV and KASCHTANOV). 80, 2:3:6-Trimethylantracene (MORGAN and COULSON).

PATENTS.

[Coal-]distillation apparatus. G. V. MCINTIRE, Assr. to CONSOLIDATION COAL PRODUCTS CO. (U.S.P. 1,733,747, 29.10.29. Appl., 19.10.22).—A compact

masonry body is formed with a series of vertical retorts of small horizontal cross-section, and a series of separate vertical channels parallel to and between the retorts. Ports connect the retorts with some of the channels so that they serve as flues for distillation gases, whilst others act as heating flues for the retorts.

W. G. CAREY.

[Coal-]distillation apparatus. E. PIRON (U.S.P. 1,733,750, 29.10.29. Appl., 3.12.26).—An endless conveyor in the distillation chamber is fitted with scrapers to remove the residue remaining thereon after discharge.

W. G. CAREY.

Regenerative coke ovens. W. MUELLER (B.P. 322,303, 3.11.28. Addn. to B.P. 308,994; B., 1929, 464).—Each of the twin heating flues or single heating flues (cf. the prior patent) is connected directly with one of a number of adjacently disposed gas and air regenerators, situated underneath each oven chamber and extending the whole length thereof.

A. B. MANNING.

Utilisation of coke ovens. N. V. SILICA EN OVENBOUW MIJ., and W. HIBY (B.P. 322,341, 3.12.28).—A non-caking coal is carbonised together with a caking coal in a coke oven or horizontal chamber oven by first charging the caking coal into the chamber in such a manner that a free space of triangular section is left at the front end of the oven, into which the non-caking coal is then charged. When the coking process is complete and the oven door is opened, and the coke from the non-caking coal is discharged automatically by gravity and can be removed prior to the expulsion by the ram of the normal cake of coke. The non-caking fuel may be introduced into the oven in the form of briquettes, if desired.

A. B. MANNING.

Gasification of earthy, moist, raw, brown coal, without ammonia recovery. ALLGEM. VERGASUNGS-GES.M.B.H. (G.P. 455,066, 1.6.23).—The air used for gasification is preheated to above 300° so that the fuel introduced into the upper part of the producer is pre-dried by the sensible heat of the gas current passing through it.

A. B. MANNING.

Removing distillation products from the lower part of coke ovens or retorts. K. BEUTHNER, M. and M. KLÖNNE (B.P. 322,351, 11.12.28).—The bottom of the oven is slightly extended in cross-section in such a manner that the fuel does not completely fill the extension, but, as a result of its natural angle of repose, leaves a space suitable for conducting away the distillation products. The off-take from this space is provided with cleaning means and is connected with an upper off-take pipe. Steam is introduced into the oven through the lower off-take towards the end of the coking period for the production of water-gas.

A. B. MANNING.

Improving the economy of operating a coke-oven plant by running a Bergius hydrogenation plant in co-operation therewith. SOC. INTERNAT. DES COMBUSTIBLES LIQUIDES (F.P. 630,328, 5.3.27. Ger., 19.11.26).—The coke-oven gas poor in hydrogen, produced in the first stages of distillation, is mixed with the rich gas from the hydrogenation process, and distributed as illuminating gas in long-distance transmission

systems. The gas rich in hydrogen evolved in the later stages of distillation is supplemented with hydrogen made by utilising the coke, and used in the hydrogenation plant. A poorer gas coal is used in the coke-oven plant than in the hydrogenation plant.

A. B. MANNING.

Production of liquid hydrocarbons by hydrogenation of coal. SOC. INTERNAT. DES COMBUSTIBLES LIQUIDES (F.P. 630,324, 5.3.27. Ger., 30.7.26).—The high-boiling products of the hydrogenation of coal at elevated temperatures and under high pressures are reintroduced into the pressure apparatus, the carbonaceous material being thereby further transformed into liquid and soluble products.

A. B. MANNING.

Production of briquetted fuel. IMPERIAL CHEM. INDUSTRIES, LTD., and R. E. SLADE (B.P. 322,194, 31.7.28).—A paste of coal and oil is hydrogenated under conditions, *e.g.*, at 410° and under 200 atm., which result in only a partial hydrogenation of the coal with the formation of a liquid product which solidifies on cooling to the ordinary temperature. This is used as a binding agent for briquetting fuels, particularly friable semi-coke.

A. B. MANNING.

Briquetting of fuels. CHEM.-TECHN. GES.M.B.H. (B.P. 308,579, 14.2.29. Ger., 23.3.28. Addn. to B.P. 300,195; B., 1929, 546).—The mixing of the blended fuel described in the prior patent is carried out rapidly in a disintegrator or similar device, in such a way that the heat interchange of the differently heated fuels occurs during and after the mixing, or mainly after the mixing. The pressure treatment is preferably carried out during the equalisation of the temperature of the mixture, at the time when its caking capability is at a maximum. Pitch or other binding agent may be added, if desired, during the mixing. Grooves or holes may be provided on or in the briquettes for the escape of the gases evolved during the pressure treatment.

A. B. MANNING.

Carbonaceous briquette and its manufacture. H. F. RIPPEY, G. DAVIDSON, C. N. CONE, I. F. LAUCKS, and H. P. BANKS (U.S.P. 1,735,506, 12.11.29. Appl., 3.5.26).—Coal, coke, or anthracite fines are bonded with a mixture of 5 pts. of soya-bean flour, 10 pts. of wheat flour, 5 pts. of molasses, 3 pts. of slaked lime, and 4 pts. of sodium carbonate, and briquettes formed therefrom under pressure are dried at 40–80°.

A. R. POWELL.

Preparation of absorptive carbon. A. B. RAY, ASSR. to CARBIDE & CARBON CHEM. CORP. (U.S.P. 1,736,051, 19.11.29. Appl., 28.10.21).—Carbon for water filtration is prepared by mixing finely-divided activated carbon with 2–3 times its weight of commercial glucose, moulding the mixture under pressure into bricks, and heating these slowly up to 450–500°.

A. R. POWELL.

Improving the electrical and thermal conductivity of active charcoal. METALLBANK U. METALLURGISCHE GES. A.-G. (G.P. 454,855, 16.2.24).—Previously activated charcoal is heated above 600°, preferably at about 750°.

L. A. COLES.

[Carbon] pigment. W. O. SNELLING (U.S.P. 1,730,389, 8.10.29. Appl., 9.10.24).—In order to produce the deep black colour of carbon black obtained by the

incomplete combustion of hydrocarbons, carbonaceous material, *e.g.*, coal or charcoal, is ground wet in a colloid mill, and dyed with a complementary colour. *E.g.*, a brown-black charcoal is dyed with a blue-black dye.

F. G. CLARKE.

Gas-producing apparatus. Making mixed water-gas and coal gas. Gas-producing process. J. J. O'CONNOR (U.S.P. 1,733,621—3, 29.10.29. Appl., [A] 12.10.21, [B] 14.4.23, [C] 8.4.29. Renewed [B] 8.4.29).—(A) In an arrangement of duplicate generators and a gas receiver each pair of generators has a chamber for gas-yielding material and duplicate upper and lower conduits for the gas, one of each being common to the two chambers, and the other pair leading to the receiver; a system of separate valve control for the various conduits is described. (B) Separate charges of coal or other carbonaceous material are contained in duplicate gas generators and one charge is heated to incandescence, steam passed through, and the resultant water-gas passed while hot directly through the second charge and thence to a gas outlet. The direction of flow of the steam is reversed periodically without altering the order in which the two masses are attacked thereby. (C) The material as in (B) is treated so that one charge is subjected to partial combustion, and the gas obtained passed directly through the second charge without substantial change or decrease in its sensible heat and thence to a gas outlet. The flow of gas through the first charge is reversed frequently.

W. S. E. CLARKE.

Production of rich gas in a water-gas plant. K. WOLINSKI (G.P. 454,873, 13.12.25).—A current of hot gas is introduced into the distillation chamber of the producer. This gas is preheated by making use of the sensible heat of the gas produced, which has been raised to a high temperature in order to fix the low-temperature tar vapours it contains.

A. B. MANNING.

Removal of sulphuretted hydrogen from gases. KALI-IND. A.-G., C. T. THORSSELL, and A. KRISTENSSON (B.P. 297,114, 31.8.28. Ger., 16.9.27).—The gases are washed with a suspension of basic ferric salts in a ferric salt solution, obtained by treating a solution of the corresponding ferrous salt with a strong oxidising agent, *e.g.*, nitric acid. The reaction, which may be represented by the equation: $11\text{FeCl}_2 + \text{FeCl}_3 \cdot 6\text{Fe}(\text{OH})_3 + 9\text{H}_2\text{S} = 18\text{FeCl}_2 + 9\text{S} + 18\text{H}_2\text{O}$, proceeds quantitatively and the sulphur is readily recovered in a pure form.

A. B. MANNING.

Odorised [coal] gas production. J. H. JAMES, ASSR. to C. P. BYRNES (U.S.P. 1,732,516, 22.10.29. Appl., 16.7.26).—To prevent accidental poisoning by coal gas or carbon monoxide a small quantity of an odorant gas is added. This gas is obtained by the incomplete oxidation of aliphatic or naphthenic hydrocarbons in the presence of a catalyst, *e.g.*, molybdenum trioxide, at 450–500°, and consists of a mixture of aldehyde derivatives.

A. R. POWELL.

Preparation of a hard pitch, combining high binding power with high softening point. CONTINENTALE PRODORIT A.-G. (G.P. 453,712, 5.12.24).—Tars of low free carbon content, or similar materials, are distilled until the residue possesses a softening point

(Krämer-Sarnow) of 100–160° or higher. The distillation may be carried out under reduced pressure and, in the later stages, if necessary, also in a current of superheated steam. The product is used especially in the manufacture of concrete compositions.

A. B. MANNING.

Treatment of bitumen for production of new products. F. W. NICHOLLS (B.P. 323,060, 6.10.28).—Glue is melted in half its weight of gas oil, the solution (5%) is added to a mixture of bitumen (20%) and gas oil (75%) heated to about 150°, and the whole is emulsified in a colloid mill.

H. ROYAL-DAWSON.

Blending of [creosote] oils. T. COX and A. S. KNOWLES, ASSRS. to M. L. REQUA (U.S.P. 1,735,421, 12.11.29. Appl., 10.8.25).—To produce creosote oil of predetermined gravity, an intimate mixture of predetermined amounts of petroleum oil and finely-crushed coal is coked from below and upwards at a temperature sufficiently low to blend the mixture chemically and liberate a maximum quantity of vapours and a minimum of gas therefrom, which are condensed. F. R. ENNOS.

Manufacture of bituminous emulsions. L. KIRSCHBRAUN (U.S.P. 1,733,493—4, 29.10.29. Appl., [A] 7.5.24, [B] 25.5.25).—(A) A coating composition comprises an emulsion containing a pigment, a protective colloid to prevent inversion, and a bituminous material solid at the ordinary temperature. An emulsifying agent is used, which normally gives an emulsion that is unstable when brushed or rubbed, in the presence of a pigment. (B) A flocculating agent having an acid reaction is added to an aqueous vehicle containing a clay-like emulsifying agent, and the vehicle then used for emulsifying a bituminous material. F. G. CLARKE.

Manufacture of aqueous [bitumen-pitch] dispersions. L. KIRSCHBRAUN (U.S.P. 1,733,495—8, 29.10.29. Appl., [A] 25.3.27, [B] 30.7.27, [C] 8.8.27, [D] 2.1.28).—(A) After a bitumen-pitch material has been dispersed in a medium which has been modified by the addition of an acidic substance, more of the latter is added to reduce the p_H value to less than 4. (B) A bitumen-pitch material is dispersed at a predetermined p_H value, the viscosity of the dispersion is reduced, and then further quantities of the bitumen-pitch is dispersed therein, while maintaining a p_H value different from that of the first dispersion. (C) An aqueous dispersion of a bitumen-pitch material is subjected to a beating action to counteract the action of an electrolyte which is added in sufficient quantity, normally to produce flocculation. (D) An alkaline earth is used as the electrolyte and, in addition to beating the dispersion, a protective colloid is added.

F. G. CLARKE.

Apparatus for treating [cracking] oils. W. R. HOWARD, ASSR. to UNIVERSAL OIL PRODUCTS CO. (U.S.P. 1,715,066, 28.5.29. Appl., 31.3.24. Renewed 2.6.27).—Hydrocarbon oil is raised to cracking temperature, e.g., 400°, in a heating coil and passed into a partitioned expansion chamber in such a way that reflux from the dephlegmator flows into the bottom chamber. Vapours from the dephlegmator pass to the usual condenser and receiver, whilst the residuums from the expansion chamber are drawn off separately, that from the inner and upper chamber being passed to a still connected

with a condenser and receiver. Residuum from this still may be stored or circulated to the heating coil as desired.

R. BRIGHTMAN.

Combined process of distilling, cracking, and gas-making, and apparatus therefor. A. SCHWARZ (U.S.P. 1,733,135, 29.10.29. Appl., 5.1.27).—The apparatus described comprises within a furnace a combustion chamber, a series of heating zones connected thereto, gas retort, oil still, steam superheater, boiler, and oil and water preheaters. In order to produce volatile hydrocarbon distillate and gas from crude petroleum oil, separate streams of preheated oil and steam are passed in countercurrent flow out of direct contact with flue gases, and the steam is superheated. The oil is vaporised at points where the flue gases are at sufficiently high temperatures, and the oil vapours are removed and condensed. The residual oil is treated with the superheated steam at a point in the flow of the flue gases where the temperature is highest and able to convert a substantial portion of this oil into gas. W. S. E. CLARKE.

Heat treatment of hydrocarbon oils. E. C. D'YARMETT, ASSR. to FRACTIONATOR CO. (U.S.P. 1,732,805, 22.10.29. Appl., 3.11.28).—Preheated oil, pumped into the bottom of a vertical cylindrical still through a tangential pipe, is thus caused to move upwards with a rotary motion. This motion is accelerated by means of a series of rotating discs with radial fins so that a thin film of oil is formed on the heating surface. In this way overheating during the cracking operation is avoided and the light oils produced contain the maximum content of gasoline and the minimum of unsaturated hydrocarbons. Addition of hydrogen or methane to the cracking vessels improves the yield still further.

A. R. POWELL.

Treatment of heavy hydrocarbon oils. C. A. JENSEN. From JENKINS PETROLEUM PROCESS CO. (B.P. 319,040, 13.6.28).—Hydrocarbon oils, in which a finely-divided absorptive material has been intimately mixed, are treated under pressure in a closed still, comprising an upper, longitudinal drum superimposed over a bank of tubes expanded into front and rear transverse drums, the latter being connected to the upper drum by suitable sluiceways in one of which is installed a positive circulatory device. This consists of a balanced propeller having a flywheel adapted to force the entire liquid contents of the still through its cyclic channel at a velocity sufficiently great to maintain the liquid in a uniform condition as to temperature and dispersion of solids. The cracking stock is continuously introduced into the still, cracked vapours being led to a dephlegmator and residual stock withdrawn. H. S. GARLICK.

Method of distillation. [Cracking of hydrocarbons.] C. P. TOLMAN, ASSR. to PETROLEUM CONVERSION CORP. (U.S.P. 1,733,143, 29.10.29. Appl., 22.11.24).—Saturated mercury vapour, at a temperature not much in excess of the desired conversion temperature, is passed into physical contact with hydrocarbon compounds in a reaction zone. The mercury vapour provides the heat required at the substantially uniform temperature of its condensation, the products are withdrawn from the reaction zone, and the hydrocarbons of low mol. wt. recovered.

W. S. E. CLARKE.

Converting high-boiling hydrocarbons into low-boiling hydrocarbons. H. TERRISSE and L. DUFOUR (B.P. 305,981, 21.1.29. Ger., 13.2.28).—High-boiling oils are cracked by heating at 200–500° and under 5–40 kg./cm.² in the presence of hydrogen, water-gas, or like gases. Ferrous chloride is added as a catalyst and to act as a desulphuriser. The reaction is accelerated by the addition of active carbon, brown coal, lignite, or peat.

W. S. E. CLARKE.

Cracking of petroleum products. A. SACHANEN [SACHANOV] and M. TILITSCHYEW [TILITSCHEEV] (B.P. 322,760, 11.9.28).—To overcome the disadvantage of coke formation which takes place in cracking plants fitted with reaction vessels, while the oil is held in a quiescent state at high temperature, the present process is so designed that the oil, after leaving the heating coil, is passed through a long series of reaction coils, of larger diameter, where it is held at cracking temperature while in a condition of turbulence. The duration of heating is more definite under these conditions than when the oil forms part of a big bulk of which it is only possible to fix an average reaction period. After leaving the reaction tube the oil is expanded into a vaporising chamber at atmospheric pressure, from which coke may be easily removed. Two such expansion chambers are used so that the process need not be interrupted for cleaning purposes.

T. A. SMITH.

Cracking or destructive hydrogenation of oils. F. HOFMANN and C. WULFF (B.P. 301,395, 27.11.28. Ger., 29.11.27).—The process is carried out in the presence of a halide of boron or of an addition product thereof, such as $\text{Et}_2\text{O} \cdot \text{BF}_3$. In the presence of such a catalyst only small amounts of gases (e.g., methane) or of carbon deposits are produced. Owing to the catalysts being gases or liquids, a good distribution of them throughout the material is obtained. A crude mineral oil, boiling above 300°, in the presence of the halide (5%) and hydrogen at 150 atm. and 380° gave 75% of oil boiling below 250° and 15% of a highly viscous lubricating oil. With the double compound (10%) at 400° and 1 atm. a yield of 60% of light oil was obtained.

T. A. SMITH.

Lubricating oils. H. M. WELLS and J. E. SOUTHCOMBE (B.P. 320,899, 19.7.28).—Synthetic hydrocarbons of low viscosity, manufactured by hydrogenation of carbonaceous material, are mixed with small quantities (1% or less) of organic acids containing more than five carbon atoms (e.g., oleic acid).

W. S. E. CLARKE.

Manufacture of viscous [lubricating and insulating] oils. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 322,935, 21.1.29. Addn. to B.P. 305,553; B., 1929, 274).—Liquid products, prepared by the process of the prior patent and having a viscosity greater than that desired, may be blended with lighter hydrocarbon oils to give lubricating oils etc. of any desired viscosity.

T. A. SMITH.

Reclaiming lubricating oil. W. C. RATH (U.S.P. 1,735,546, 12.11.29. Appl., 20.3.29).—Used lubricating oil from internal-combustion engines etc. is treated with a current of hot water-gas or producer gas, direct from the generator, to remove volatile oils and enrich the gas, and the heavier oils are then filtered while still hot,

the filtrate being suitable for use again as lubricating oil.

A. R. POWELL.

Purifying oils. M. LUTHER and K. PIEROH, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,732,371, 22.10.29. Appl., 29.6.27. Ger., 5.7.26).—Mineral and vegetable oils are purified by agitation with methyl formate, which extracts the coloured impurities and sulphur compounds.

A. R. POWELL.

Refining of petroleum oils. Treatment of hydrocarbons. J. C. MORRELL, Assr. to UNIVERSAL OIL PRODUCTS Co. (U.S.P. 1,733,619 and 1,733,620, 29.10.29. Appl., [A] 9.12.25, [B] 24.10.27).—(A) Lighter-gravity distillation products from the cracking process are treated with an aqueous solution of an acid sulphate. (B) An alkaline-earth metal soap is introduced into the residual oil from the cracking process, and the whole is subjected to a homogenising treatment.

W. S. E. CLARKE.

Refining of crude paraffin wax. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 320,921, 19.7.28).—Crude wax is treated in the liquid form with hydrogen at high temperature and pressures. The duration of treatment and the temperature are regulated so that the wax suffers no cracking. A catalyst consisting of oxides of at least one of the metals of groups III, IV, or VI may be added, and the addition of small quantities of iron, nickel, cobalt, or their oxides has an activating effect.

W. S. E. CLARKE.

Manufacture of white petrolatum. A. HOLMES, Assr. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,733,597, 29.10.29. Appl., 27.10.25).—The material yielding petrolatum is treated in the liquid form with fuming sulphuric acid at a high temperature, the residual liquid containing suspended carbonaceous products is treated with a solvent for the petrolatum, and the purified petrolatum is recovered from the solution.

W. S. E. CLARKE.

Preparation of mixtures of carbon monoxide and hydrogen from hydrocarbons. L. CASALE (U.S.P. 1,734,559, 5.11.29. Appl., 14.4.27. Italy, 20.4.26).—See B.P. 299,492; B., 1929, 17.

Safety device for gas burners. K. BECK (B.P. 300,966, 19.11.28. Ger., 21.11.27).

Fuel burners for steam generators, metallurgical furnaces, etc. A. E. YOUNG and G. P. DENNIS (B.P. 322,808, 14.9.28).

Thermal treatment of pulverulent material (B.P. 305,231). **Separation of dry materials** (B.P. 322,480). **Fluid segregator** (B.P. 322,654). **Distillation of liquids** (B.P. 297,122). **Introducing materials into high-pressure vessels** (B.P. 322,645).—See I. **Cleanser for fabrics** (U.S.P. 1,733,842).—See VI. **Hydrogen** (U.S.P. 1,736,065). **Nitrogen and hydrogen** (B.P. 298,190).—See VII. **Organic acids** (B.P. 321,399). **Unsaturated fatty acids** (B.P. 322,437). **Products resembling wax** (B.P. 320,854).—See XII. **Plastic masses** (B.P. 322,496 and G.P. 455,551).—See XIII.

III.—ORGANIC INTERMEDIATES.

Determination of impurities in naphthalene. M. COQUETTE (Bull. Soc. chim. Belg., 1929, 38, 387–391).—The setting points of mixtures of pure naphthalene and

of various quantities of oil, b.p. 175—380°, d 1.05, isolated in the industrial purification of naphthalene, were determined and a curve was constructed. The oil content of naphthalene could thus be determined from the setting point by reference to the curve.

A. I. VOGEL.

[Acetic acid etc. from] nut shells. GEORGI and BUCKLEY. Amyl acetate from gasoline. DOBRYANSKI and GUREVICH.—See II. Aldehyde-oxidation reactions for phenols. FULTON.—See XX. By-products of saccharin manufacture. HERZOG.—See XXI.

See also A., Jan., 80, Synthesis of anthracene homologues (MORGAN and COULSON). 82, Anomalous diazo-coupling with unsaturated phenols (QUILICO and FREMI). 87, Electrolytic reduction of aromatic acids (SOMLO). 96, Polycondensed heteronuclear systems (CHARRIER).

PATENTS.

Production of carbon disulphide. I. G. FARBEN-IND. A.-G. (B.P. 300,579, 1.11.28. Ger., 15.11.27).—Carbon uniformly heated in a retort is treated with sulphur vapour superheated in a separate retort to a temperature regulated according to the quantity of carbon disulphide required. The retorts, which may be arranged, e.g., in blocks of three comprising two carbon retorts with an intermediate sulphur superheater, are so fired that their lower ends are heated the most strongly. (Cf. B.P. 237,716 and 282,049; B., 1925, 759, 1928, 262.)

L. A. COLES.

Production of concentrated acetic acid. CONSORT. F. ELEKTROCHEM. IND. G.M.B.H. (B.P. 308,210, 7.3.29. Ger., 19.3.28).—Aqueous acetic acid is run slowly into an acetic acid solvent, preferably a chlorinated hydrocarbon, both liquids being cooled so that the temperature of the mixture does not exceed about -25° . Ice crystals which separate are removed by centrifugal means, and glacial acetic acid is recovered from the residual liquid by fractional distillation. The ice crystals and the cold residual liquid are used for precooling fresh supplies of the liquids, or in the condenser of a refrigerator.

L. A. COLES.

Manufacture of organic bases [from acetylene and ammonia or amines]. I. G. FARBENIND. A.-G. (B.P. 302,939, 22.12.28. Ger., 23.12.27. Addn. to B.P. 283,163 and 296,423; B., 1929, 275, 747).—In the process of the prior patents the product boiling at 120—300° is used to scrub the vapours leaving the catalyst chamber, thereby removing liquid products, acetylene, and ammonia; the latter are recovered on boiling the solution, and are returned to the reaction chamber.

C. HOLLINS.

Manufacture of keten. H. J. CLARKE and C. E. WARING, Assrs. to EASTMAN KODAK Co. (U.S.P. 1,723,724, 6.8.29. Appl., 13.4.28).—Acetone etc. is passed through a copper tube heated to 650—670° and packed with copper or other turnings of a metal, m.p. above 700°, coefficient of heat conductivity > 0.150 c.g.s. unit, the period of contact being less than 5 sec. and the tube and packing free from iron and nickel.

C. HOLLINS.

Increasing the wetting property of treatment liquids. H. T. BÖHME A.-G. (B.P. 307,397, 21.2.29.

Ger., 6.3.28).—Esters of adipic acid or of the cheaper substituted adipic acids are used as wetting-out agents; they dissolve in water in presence of solubilising agents (soap, sulphonated oils, alkylated naphthalenesulphonic acids).

C. HOLLINS.

Separation of organic liquids from mixtures containing same. SOC. ANON. DES DISTILLERIES DES DEUX-SÈVRES (B.P. 305,528, 19.11.28. Belg., 6.2.28).—For the separation of a liquid *A* from a lower-boiling liquid *B* in aqueous mixtures of the two, water is first removed by the azeotropic method, using as entrainer either *A* or a more volatile liquid *E*, and the anhydrous mixture of *A* and *B* is then resolved by distillation in the ordinary manner. A continuous process for separating isoamyl and isobutyl alcohols from wet fusel oil, ethylene chlorohydrin from cyclohexanol and water, or acetic acid from cyclohexyl acetate and water is described. (Cf. B.P. 304,756; B., 1930, 126.)

C. HOLLINS.

Substituted dithiocarbamates and their manufacture. S. M. CADWELL, Assr. to NAUGATUCK CHEM. Co. (U.S.P. 1,726,646—8, 3.9.29. Appl., 2.3.28).—(A) Polynitroaryl-, (B) benzylidenebis-, and (c) 4-chloro-2:6-dinitrophenyl-dialkyldithiocarbamates are prepared by the usual methods.

C. HOLLINS.

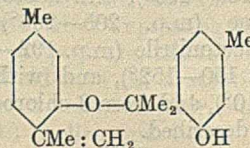
Manufacture of halogenated anilines. W. J. HALE and G. H. CHENEY, Assrs. to DOW CHEM. Co. (U.S.P. 1,729,775, 1.10.29. Appl., 23.8.26. Renewed 26.7.28).—Polyhalogenated benzenes, or their mixtures, are heated with anhydrous ammonia in presence of a copper compound. E.g., dichlorobenzene in alcohol is heated with 3 mols. of ammonia at 150—250° in presence of metallic copper and 0.1 mol. of cuprous chloride.

R. BRIGHTMAN.

Carrying on catalytic reactions. [Manufacture of phthalic anhydride from naphthalene.] F. A. CANON and C. E. ANDREWS, Assr. to SELDEN RES. & ENG. CORP. (U.S.P. 1,735,951, 19.11.29. Appl., 12.6.22).—A mixture of air and naphthalene vapour is conducted over a vanadium pentoxide catalyst at 425°, and the heat of the reaction is controlled by cooling the reaction vessel with an alloy (b.p. 425°) of 30% Pb, 30% Sn, and 40% Hg. The mercury vapour passes into a reflux air condenser from which the condensed metal passes back to the container holding the alloy, the composition and b.p. of which are thus kept constant.

A. R. POWELL.

Alkylcoumarans and their manufacture. H. JORDAN, Assr. to CHEM. FABR. AUF ACTIEN VORM. E. SCHERING (U.S.P. 1,679,664, 7.8.28. Appl., 20.6.27. Ger., 29.6.26).—The condensation product from *m*-cresol and acetone (annexed formula) gives on distillation at 300° 3:6-dimethylcoumaran, b.p. 98°/11 mm., together with 4-isopropenyl-*m*-cresol. The product from *p*-cresol and acetone similarly yields 3:5-dimethylcoumaran, b.p. 102°/11 mm., and 3-isopropenyl-*p*-cresol. The dimethylcoumarans are sol-



vents for lacquers, and the isopropenylcresols may be hydrogenated to thymols and menthols. C. HOLLINS.

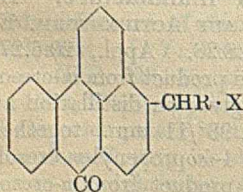
Manufacture of alkylisopropylphenols and their hydrogenation products [thymol, menthol]. CHEM. FABR. AUF ACTIEN VORM. E. SCHERING (B.P. 273,685, 15.6.27. Ger., 29.6.26).—The isopropenyl-*m*- and -*p*-cresols of B.P. 273,686 (B., 1928, 236) are di- or octahydrogenated at 140–160° or 170–180° in presence of nickel to give thymol, 3-isopropyl-*p*-cresol, menthol, or 4-methyl-6-isopropylcyclohexanol. C. HOLLINS.

Manufacture of hydrogenation products. SCHERING-KAHLBAUM A.-G. (B.P. 293,001, 23.6.28. Ger., 29.6.27. Addn. to B.P. 276,010 and 280,956; B., 1929, 237).—The process of the prior patents is applied to coumarans (3:6-dimethylcoumaran gives thymol or menthol or their isomerides) and to the condensation product from α -naphthol and acetone (giving 4-isopropyl- α -naphthol etc.). C. HOLLINS.

Manufacture of hydrogenated aromatic carboxylic esters and acids. W. W. GROVES. From I. G. FARBENIND. A.-G. (B.P. 286,201, 7.1.29).—Aromatic esters (other than acylaminonaphthoic esters) are hydrogenated at 30–40 atm. and 120–150° in presence of a catalyst, comprising nickel or a mixture of nickel and a metal of the iron group, prepared by the method of B.P. 255,884 (B., 1927, 528). Examples are: ethyl hexahydrobenzoate; ethyl cyclohexylacetate; methyl hexahydrovaleryl, b.p. 96–103°/8 mm.; ethyl hexahydrophthalate; methyl hexahydroterephthalate, b.p. 133–139°/13 mm.; ethyl 5:6:7:8-tetrahydro-1-naphthoate, b.p. 156–159°/12 mm.; ethyl 5:6:7:8-tetrahydro-3-hydroxy-2-naphthoate, b.p. 170°/17 mm.; and ethyl 5:6:7:8-tetrahydro-3-amino-2-naphthoate, m.p. 55–58° (free acid, m.p. 178°). C. HOLLINS.

Manufacture of nitrated aromatic amino-compounds. BRIT. CELANESE, LTD., D. H. MOSBY, H. C. OLPIN, and G. H. ELLIS (B.P. 319,296, 18.6.28).—Arylsulphonyl derivatives of arylamines are nitrated with nitric acid of 60–70% concentration, and are subsequently hydrolysed by means of concentrated sulphuric acid. *p*-Toluenesulphon-*o*-anisidide gives at 20–40° 5-nitro-*o*-anisidine, and at 40–50° 3:5-dinitro-*o*-anisidine, m.p. 182°. C. HOLLINS.

Manufacture of condensation products of the benzanthrone series. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 319,593, 24.3. and 7.8.28).—Benzanthrones having a free 4-position are condensed at 10–30° in presence of caustic alkali and an organic solvent with compounds of the type $R \cdot CH_2 \cdot X$, where X is CN, CO·NH₂, or COR', and R is hydrogen, or an alkyl, aryl, or carboxylic ester group. The products have the annexed formula. Those from benzanthrone with acetone (m.p. 189–190°), with acetophenone (m.p. 205–206°), with acetonitrile (m.p. 192–194°), with propionitrile (m.p. 150–152°), and with phenylacetonitrile (m.p. 208–210°), and from 3-chloro-benzanthrone with acetone are described.



C. HOLLINS.

[Alkylation and aralkylation of] amino-derivatives [especially of vat dyes and their interme-

diates]. W. SMITH, J. THOMAS, and SCOTTISH DYES, LTD. (B.P. 319,805, 30.4.28).—Aminoanthraquinones etc. are converted into sulphamic acids, *e.g.*, by means of pyridine-sulphuric anhydride in pyridine, and these are alkylated or aralkylated, *e.g.*, by means of methyl sulphate and alkali. Examples are the preparation of 2-methylaminoanthraquinone, 3-chloro-2-methylaminoanthraquinone (m.p. 234–235°), 1-amino-4-methylaminoanthraquinone, methylaniline, and methylaminodibenzanthrone. C. HOLLINS.

Condensation product [of a phenol], containing sulphur. P. VIRCK, ASSR. to GEN. ANILINE WORKS, INC. (U.S.P. 1,736,063, 19.11.29. Appl., 7.11.25. Ger., 14.11.24).—See B.P. 242,974; B., 1926, 596.

Hydrogenation of naphthalene. (A) W. SCHRAUTH, and (B) G. SCHROETER and W. SCHRAUTH, ASSRS. to NEWPORT MANUF. CO. (U.S.P. 1,733,908–9, 29.10.29. Appl., 29.8.21. Ger., [A] 13.5.16, and [B] 1.8.16).—See G.P. 299,012 and 324,863; B., 1920, 743 A; 1921, 253 A.

Production of homonuclear aminoalkylaminoanthraquinonesulphonic acids. K. WEINAND, ASSR. to GEN. ANILINE WORKS, INC. (U.S.P. 1,735,147, 12.11.29. Appl., 18.8.26. Ger., 21.8.25).—See B.P. 280,637; B., 1928, 83.

Manufacture of 1-phenylbenzanthrone compounds. W. TRAUTNER, B. STEIN, and R. BERLINER, ASSRS. to GEN. ANILINE WORKS, INC. (U.S.P. 1,736,061, 19.11.29. Appl., 16.9.26. Ger., 23.11.25).—See B.P. 297,129; B., 1928, 847.

Separation of liquids (B.P. 304,756).—See I. **Fatty acids** (B.P. 322,437 and G.P. 456,353).—See XII. **Vulcanisation accelerators** (B.P. 303,827).—See XIV.

IV.—DYESTUFFS.

Zeiss scale-photometer. KÜNTZEL.—See XV.

See also A., Jan., 53, **Determination of minute amounts of copper** (CALLAN and HENDERSON). 79, **81-Triphenylbenzene dye** (VÖRLANDER and others). 81, **Cleavage of azo-dyes by sulphite** (ENGEL). **Chrome dyes: chromotrope 2R** (ROSENHAUER and others). 96, **Cyanine dyes** (HAMER).

PATENTS.

Manufacture of sulphur dyes. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 319,860, 18.7.28).—The addition of 4–7 pts. of cyclohexanol or other hexahydrophenol to the sulphide melt results in a purer dye, especially in the case of sulphurised indophenols or leucoindophenols. Examples are the sulphurisation of carbazole-leucoindophenol, of 4-anilino-4'-hydroxydiphenylamine, and of 4-amino-4'-hydroxy-3-methyldiphenylamine, in presence of hexahydrocresol. C. HOLLINS.

Indanthrene compound and its manufacture. M. S. THOMPSON, ASSR. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 1,731,800, 15.10.29. Appl., 24.7.24).—2-Aminoanthraquinone is added to fused sodium and potassium hydroxides at about 220° in presence of potassium chlorate or other oxidising agent and an alkali phenoxide, *e.g.*, sodium phenoxide or cresoxide. The *N*-dihydro-1:1':2:2'-anthraquinoneazine (Ponsol

Blue R) obtained in increased (15–20%) yield is more resistant to bleaching than Indanthrene Blue RS.

R. BRIGHTMAN.

Manufacture of [azo] dyes [for cellulose ester materials]. BRIT. CELANESE, LTD., D. H. MOSBY, H. C. OLFIN, and G. H. ELLIS (B.P. 319,308, 18.6.28).—3:5-Dinitro-derivatives of *o*-toluidines, *o*-anisidines, or *o*-phenetidines are diazotised and coupled with non-sulphonated coupling components, particularly α -naphthylamines and their hydroxyalkyl derivatives. The dyeings on acetate silk are readily discharged. Examples are: 3:5-dinitro-*o*-anisidine \rightarrow *N*- γ -chloro- β -hydroxypropyl- α -naphthylamine (bright blue) or α -naphthylamine (violet); 3:5-dinitro-*o*-toluidine \rightarrow 4-nitro-*m*-phenylenediamine (yellow). (Cf. B.P. 319,390; B., 1930, 139.)

C. HOLLINS.

Hair dye. M. A. MINGUS (B.P. 319,946, 11.10.28).—A suitable synthetic or vegetable dye is mixed with a large excess of tartaric acid.

C. HOLLINS.

Manufacture of isodibenzanthrones. A. LÜTTINGHAUS and H. WOLFF, ASSTS. to GEN. ANILINE WORKS, INC. (U.S.P. 1,725,590, 20.8.29. Appl., 16.10.25. Ger., 28.2.25).—See G.P. 436,533; B., 1927, 386.

Amino-derivatives of dyes (B.P. 319,805).—See III.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Composition of sisal hemp from different countries. ANON. (Bull. Imp. Inst., 1929, 27, 441–449).—The chemical composition and behaviour of samples of sisal hemp from the following countries are described: Tanganyika (9 samples, av. cellulose content 78.9%; underwent smallest losses on hydrolysis, water washing, and acid purification), Kenya (4 samples, av. cellulose content 77.3%; suffered greater losses on water washing and acid purification), Portuguese East Africa (4 samples, av. cellulose content 76.3%, slightly inferior to Kenya samples), Mexico (10 samples, av. cellulose content 73.1; mostly inferior to the East African).

E. H. SHARPLES.

***Eucalyptus saligna* as a source of wood pulp for paper and artificial silk.** ANON. (Bull. Imp. Inst., 1929, 27, 449–452).—The soft, rather coarse-grained wood (moisture 9.3%, ash 0.5%, cellulose 56.9%) from a six-year-old tree of *Eucalyptus saligna* grown in Zululand gave a 55% yield of dry, unbleached pulp under comparatively mild treatment with caustic soda and produced a fairly soft, opaque, pale brown paper of good strength, but it required a concentrated bleaching solution to bleach it to even a moderately pale colour. To determine its suitability for artificial silk manufacture the dry bleached pulp (42% of the original wood) was examined. It had moisture 8.2%; α -, β -, and γ -cellulose 85.0%, 10.2%, 4.8%, respectively (on moisture-free material); ash (on dry pulp) 0.33%; copper number 2.04%; phloroglucinol absorption value 1.6; soda absorption value 209; acetone extract 0.46%. Probably, by submitting the wood to a more drastic treatment, the content of α -cellulose could be increased and the β -cellulose content and phloroglucinol absorption value reduced.

E. H. SHARPLES.

Identification and evaluation of unbleached chemical wood pulps. G. A. HALL (World's Paper

Trade Rev., 1929, 91, 1340–1354, 1396, 1442, 1444, 1484–1492, 1530–1536, 1588, 1630–1638, 1676–1688, 1738–1750, 1818–1834, 1906–1916).—A detailed discussion of the relation between the treatment and properties of unbleached chemical wood pulps, particularly unbleached sulphite and sulphate pulps.

CHEMICAL ABSTRACTS.

Acetate silk. D. KRÜGER (Papier-Fabr., 1930, 28, 1–8).—A review.

Preparation of [rosin] size [for paper] by a cold process. W. DOLIWO-DOBROWOLSKI and I. KAHAN (Zellstoff u. Papier, 1929, 9, 836–838).—The process described, in which a solution of sodium hydroxide is circulated over pieces of rosin, is similar to the Delthirna process. The most suitable concentration of sodium hydroxide is 0.5%; higher concentrations give too alkaline a size. Most rapid dissolution of the rosin occurs at 22–24°, so that the temperature of 15° recommended by Delcroix (B., 1928, 851) is not the most satisfactory one. The highest circulation velocity of the liquor consistent with good dissolution of the rosin is used (up to 6 cm./min.), and pieces of rosin 5–6 cm. in size are better than smaller ones, which cause blocking of the liquor channels. Experiments show that in sizing paper a 35% saving in rosin, compared with that when white size is used, may be obtained, but there is an increase in the proportion of alumina to rosin necessary. Comparison is made between sizing results obtained by the new and old processes from the point of view of cost and the properties of sized writing and printing papers. The following advantages of the new process are claimed in addition to saving of materials: reduction of steam consumption by 80%, economy of personnel, limitation of running replacements, decreased cleaning of plant, and avoidance of the disadvantages of the old soda-boiling process.

B. P. RIDGE.

Constant-humidity room. PRIOR.—See I. Calcium sulphate content of tower liquors. SCHMIDT and HÖNN.—See VII.

See also A., Jan., 10, Spectrography of cellulose derivatives (RASSOW and AEHNELT). 21, Fibre X-ray diagrams of copper-alkali-cellulose (TROGUS and HESS). 28, Sorption of water vapour by cellulose and its derivatives (SHEPPARD and NEWSOME). 46, Action of light on cellulose nitrate (DEVORE and others). 72, Cellulose ethers (NIETHAMMER and KÖNIG).

PATENTS.

Production of fibre articles. M. M. FROST (U.S.P. 1,735,426–9, 12.11.29. Appl., 20.8.27. Renewed [A, c, d] 1.5.29).—A pulp formed of the fibre in finely-divided condition with water is mixed with an adhesive such as rosin soap (A–C), or with casein and borax (D), and, after expressing the water in a suitable die under high pressure, the moulded article is dried and impregnated with (A) a solution of pine oil and banana oil; (B) 6 pts. of sulphur, 3 pts. of rosin, and 1 pt. of paraffin; (C) shellac and borax; (D) formaldehyde.

F. R. ENNOS.

[Fibrous] material for making gears and similar objects. W. H. ADAMS (B.P. 322,345, 7.12.28).—

A blank from which gears etc. may be cut is made by winding fibrous, hard, twisted cord in layers, the strands being saturated and bound together with a synthetic resin which is applied in the fluid state and subsequently polymerised.

F. R. ENNOS.

Treatment of silk-containing wool materials.

D. C. CHISHOLM and J. A. HANNUM, ASSRS. to G. E. COLLINGS (U.S.P. 1,735,420, 12.11.29. Appl., 12.5.26).—In order to destroy the silk in a wool-silk mixture, the latter is sprayed with 30% hydrochloric acid at ordinary temperature, wrung out, neutralised by spraying with 5% sodium hydroxide, again wrung out, washed with water, and dried.

F. R. ENNOS.

Treatment of waste spun or woven textile material.

A. L. BURLIN (B.P. 322,608, 2.11.28 and 21.2.29).—Textile waste containing natural or artificial fibres is cleaned by means of aqueous detergents and, before or after treatment in an opening carder, is subjected to the action of a weak acid (boric acid) and dextrin or soluble starch solution, with sodium sulphate solution, and also, if much artificial silk is present, with a solution of acid ammonium phosphate.

F. R. ENNOS.

Treatment [lubrication] of fibrous material of vegetable, artificial, or animal origin. J. G. KASTNER (U.S.P. 1,730,430, 8.10.29. Appl., 20.7.28. Ger., 27.8.26).—A highly viscous aqueous extract of carob-bean kernels is added to emulsions, oils, and fats used for wetting and softening fibres, *e.g.*, cotton and jute, before spinning. The kernels are finely ground and the embryos removed before they are extracted.

F. G. CLARKE.

Pulping of raw cellulosic material. Production of sulphite pulp. Production of cellulose pulp.

G. A. RICHTER, ASSR. to BROWN CO. (U.S.P. 1,735,013—5, 12.11.29. Appl., [A] 1.6.28, [B] 20.7.28, [C] 23.8.28).—(A) Wood is digested under pressure at temperatures above 100° with a solution of the usual fibre-liberating chemicals in 90% glycerin containing 3% of sodium carbonate. The waste liquor is steam-distilled to recover glycerin, the aqueous solution evaporated to dryness, and the residue burned to remove organic matter. (B) Wood is digested under pressure with a solution of sodium and barium or strontium hydrogen sulphites. After releasing the pressure and pumping off the liberated sulphur dioxide the fibres are screened off from the finely-divided barium sulphite precipitate. (C) The digestion is carried out in a tall, cylindrical vessel with a screen at the bottom, which is provided with a pump for continuously removing screened liquor and circulating it through an indirect heater which is connected with a second pump for returning the liquor to the top of the digester.

A. R. POWELL.

Manufacture of cellulose [from sugar-cane fibre].

J. J. DE LA ROZA (B.P. 322,763, 30.6.28).—Cane fibre is treated with dilute sulphurous acid solution to prevent growth of fungus etc., and in this condition may be stored. After thorough washing with water the material is heated with dilute (15–20%) sodium or potassium hydroxide solutions, with or without pressure, and subsequently bleached by known methods.

A. G. POLLARD.

Cyclic process of [cellulose] fibre liberation.

G. A. RICHTER, ASSR. to BROWN CO. (U.S.P. 1,730,383, 8.10.29. Appl., 19.5.28).—Cellulosic material is digested with a sulphurous acid solution of borax, at the usual temperature and pressure, and the liberated fibre separated from the spent liquor. The latter is neutralised, evaporated, and calcined to recover the alkali salts for re-use.

F. G. CLARKE.

Production of artificial silk by the cuprammonium stretch-spinning process.

J. P. BEMBERG A.-G. (B.P. 299,038 and Addn. B.P. 322,425, 11.9.28. Ger., [A] 20.10.27).—The still plastic threads, after leaving the spinning funnel, where they have been preliminarily coagulated and stretched, are (A) subjected to a second considerable stretching by suitable means and are finally hardened by treatment with acid, or (B) treated with acid and, while still moist with acid, are subjected to a second considerable stretching.

F. R. ENNOS.

Production of artificial filaments [by the dry or evaporative method].

BRIT. CELANESE, LTD., and W. I. TAYLOR (B.P. 322,557, 19.9.28).—After leaving the spinning cell, the filaments are propelled at a speed greater than that of their extrusion by means of a gaseous or other fluid, *e.g.*, compressed air, which passes through the annular space between two conical tubes while the filaments pass through the inner tube where they are stretched and reduced in denier.

F. R. ENNOS.

Working-up of cellulose derivatives. A. EICHENGRÜN (B.P. 291,386, 31.5.28. Ger., 31.5.27).—The cellulose ester or ether is treated in the cold with a non-solvent, and after removal of the excess of liquid the swollen material is converted into a homogeneous plastic mass by heating and/or addition of small amounts of a solvent or a non-solvent, together with a plasticiser, if desired. The product is then worked up into the desired form in any suitable known manner.

F. R. ENNOS.

Manufacture of products having a basis of cellulose derivatives.

C. DREYFUS and G. SCHNEIDER, ASSRS. to CELANESE CORP. OF AMERICA (U.S.P. 1,732,330, 22.10.29. Appl., 21.11.25. U.K., 24.12.24).—Powdered cellulose acetate is made into a paste with water and the paste is thoroughly incorporated with a mixture of benzene and triacetin. The product is dried and moulded.

A. R. POWELL.

Manufacture of artificial cork masses.

J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 322,752, 10.9.28).—Cork meal is impregnated with less than 30% of its weight of an unhardened resinous condensation product of urea (or its derivatives) and formaldehyde, with a softening, plasticising, or binding agent (*e.g.*, glycerin) and is subsequently pressed.

A. G. POLLARD.

Adhesive for binding waxed paper.

F. SICHEL KOMM.-GES. (G.P. 455,014, 9.10.25).—The product obtained by heating starch with water and subsequently treating the paste with oxidising agents, *e.g.*, chlorine, ozone, is mixed with toluene, xylene, etc., capable of forming stable emulsions without the addition of protective colloids.

L. A. COLES.

Utilisation of stem fibres.

C. E. BAHRE (U.S.P.

1,739,491, 17.12.29. Appl., 9.12.27).—See B.P. 302,052; B., 1929, 202.

Treatment of fibrous vegetable materials [flax]. O. D. LUCAS, Assr. to VICKERS, LTD. (U.S.P. 1,739,683, 17.12.29. Appl., 11.12.28. U.K., 8.12.27).—See B.P. 309,211; B., 1929, 593.

Manufacture of sheet-like articles and the like from cellulose. Cellulose precipitating agent. E. CZAPEK and R. WEINGAND (U.S.P. 1,740,226—7, 17.12.29. Appl., 31.8.26. Ger., 1.9.25).—See B.P. 257,924—5; B., 1927, 745,699.

Felt and felt-like materials [containing silk residue etc.] and hats etc. or materials made therefrom. M. J. L. SOBRINHO (B.P. 303,017, 22.12.28. Brazil, 23.12.27).

Pumping of artificial silk-spinning solutions. BRIT. CELANESE, LTD., J. BOWER, and W. YORKE (B.P. 322,778, 12.7.28).

Treatment of cellulose derivatives (B.P. 291,765).—See XIII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Basic cotton dyeing. R. HALLER and K. ECKARDT (Kolloidchem. Beih., 1929, 30, 1—82).—The theoretical and practical aspects of basic cotton dyeing and mordanting are discussed. The tannin-potassium antimonyl tartrate reaction product used as a mordant consists of antimonyl digallate and has the composition $(C_{14}H_5O_9)_2SbOH$; it forms a colloidal solution which is readily taken up by cotton fibre. The reaction product of tannin and methylene-blue consists of methylene-blue tetragallate and its colloidal properties have been investigated. An examination of the three lakes formed by methylene-blue with tannin and potassium antimonyl tartrate shows that in each case the components are present in the same stoichiometric proportion, but are stereoisomerides, and this difference gives rise to differences in the degree of dispersion. The D-lake is less highly dispersed than the F-lake; the former corresponds to true printing and the latter to dyeing; a difference in structure is recognisable by microscopical examination of the fibre. Some colloid-chemical properties of katanol have been investigated.

E. S. HEDGES.

Mothproofing. M. G. MINAEFF and J. H. WRIGHT (Ind. Eng. Chem., 1929, 21, 1187—1195).—The mothproofing powers of different substances have been examined by exposing treated and untreated samples of woollen material to attack by mature larvæ under controlled conditions. Many nitrogenous substances are found to be valueless. Urea derivatives of good mothproofing power contain sulphur and have at least one amino-group intact, whereas those of no value either contain no sulphur or are thio-derivatives having substitution radicals in both amino-groups. The alkalis possess some proofing power, but it is considered insufficient; so also has oleic acid, but it is destroyed by the presence of alkaloids such as quinidine, caffeine, etc. Compounds containing fluorine differ widely in the amount of protection they afford. Silicofluorides are the most effective, and sodium silicofluoride is better

than sodium fluoride even when the latter is present in twice the concentration. The addition of certain salts (chlorides or sulphates) in limited proportion enhances the protective power of substances containing fluorine; mild acidity is also of assistance, but in higher concentrations acids have a retarding action. Sodium silicofluoride gives the best results when aluminium ions are also present, and materials treated with this substance retain their resistance to larval attack after rinsing in water to a much greater extent than do fabrics treated with sodium fluoride. Analysis of silicofluoride and fluoride solutions before and after the immersion of woollen fabrics shows that the former readily become exhausted, whereas the latter change but little in concentration. Undyed wool absorbs silicofluoride more readily than does dyed material. The acceleration of the absorption by aluminium ion is a function of the concentration of the latter, whilst, in equivalent concentrations, chlorides give greater acceleration than do sulphates.

B. P. RIDGE.

PATENTS.

Treatment of artificial fibres with liquids. HERMINGHAUS & Co. G.M.B.H., Assees. of H. RATHERT (B.P. 297,000, 10.9.28. Ger., 10.9.27).—Artificial viscose or cuprammonium fibres are sprayed with appropriate liquids (for desulphurising, de-coppering, bleaching, acidifying, oiling, or dyeing) while wound in a twisted condition on perforated or non-perforated bobbins made of or coated with porous material.

F. R. ENNOS.

Treatment of materials made of or containing cellulose esters. BRIT. CELANESE, LTD., and G. H. ELLIS (B.P. 319,420, 26.6.28).—Acetate silk etc. is weighted and partially hydrolysed (preferably in that order) and then acquires, in addition to its affinity for basic and insoluble dyes, an affinity for direct, mordant, sulphide, and vat dyes. In particular, the treated material is suitable for production of discharge effects. The weighting may be performed according to prior patents B.P. 258,874, 259,899, 260,290, 277,602, 280,094, 281,084, 284,798, 285,941, and 309,876 (B., 1928, 288; 1927, 295; 1928, 477, 154, 296, 227, 444, 330; 1929, 596); for hydrolysis dilute sodium hydroxide and soap are used.

C. HOLLINS.

Coloration of materials comprising cellulose [ester or ether] derivatives. BRIT. CELANESE, LTD., D. H. MOSBY, H. C. OLPIN, and G. H. ELLIS (B.P. 319,390, 18.6.28. Cf. B.P. 319,308; B., 1930, 137).—The dyes of the prior patent are applied to acetate silk etc. or may be produced on the fibre, e.g., by padding with α -naphthylamine and developing with the diazotised amine.

C. HOLLINS.

Production of fast prints [with azo chrome dyes] on vegetable fibres. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 319,457, 7.8.28).—For printing cotton with prechromed azo dyes an organic acid (acetic) and a metallic mordant (chromium acetate) are added to the printing paste.

C. HOLLINS.

Cleanser [for fabrics]. F. S. VIVAS, Assr. to INTERNAT. FIREPROOF PRODUCTS CORP. (U.S.P. 1,733,842, 29.10.29. Appl., 30.6.26).—Gasoline is chlorinated in the presence of 7.5% of ammonium carbonate and 2%

of aluminium (or molybdenum) chloride until 35% of its weight of chlorine has been used; the product is then washed with soda and distilled; the chlorinated compounds obtained may be used for the removal of grease etc. from fabrics. A. R. POWELL.

Dyeing mixed textile goods made of wool and silk fibres. H. WAGNER, H. EICHWEDE, and E. FISCHER, Assrs. to GEN. ANILINE WORKS, INC. (U.S.P. 1,739,879, 17.12.29. Appl., 17.3.27. Ger., 22.3.26).—See B.P. 267,985; B., 1928, 669.

Production of aniline-black on textile fibres. L. A. LANTZ and R. WATSON (U.S.P. 1,739,908, 17.12.29. Appl., 18.7.27. U.K., 20.7.26).—See B.P. 279,164; B., 1928, 11.

Production of pattern effects upon textile goods. G. HEBERLEIN, Assr. to HEBERLEIN PATENT CORP. (U.S.P. 1,739,965—6, 17.12.29. Appl., 11.11.26. Ger., [A] 27.3.26, [B] 30.3.26).—See B.P. 268,389; B., 1928, 332.

Proofing cellulosic, animal, and other substances against insects, animals, and organisms. S. W. KENDALL (U.S.P. 1,739,840, 17.12.29. Appl., 10.8.25. U.K., 14.8.24).—See B.P. 247,242; B., 1926, 314.

Means [coloured paper sheets] for tinting of liquids [for laundry purposes]. L. CRUMP and E. R. MITFORD (B.P. 322,295, 25.10.28 and 16.5.29).

Wetting-out agents (B.P. 307,397).—See III. **Cleansing preparation** (B.P. 322,868).—See VII.

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

Adsorptive properties of silica gel [and charcoal]. A. P. OKATOV (J. Appl. Chem. Russia, 1929, 2, 21—84).—The adsorptive properties are independent of the coagulating temperature and the concentration of silica in the sol. Above 25° it is difficult to obtain sols containing more than 12.5% SiO₂. Rapid coagulation hinders the development of internal structure. Mono-basic acids increase the rate of coagulation. Syneresis is a good measure of the maturity of the gel. Excess of ammonia tends to produce gels with a slow rate of adsorption, but gels produced by incomplete neutralisation with ammonia are unsatisfactory. The internal structure is independent of the water content up to 80%. Treatment with water increases the rate of adsorption, but not the adsorptive capacity. The adsorptive properties of gels not treated with activating solutions are almost independent of the temperature changes during drying and activation. The adsorption of benzene, ether, and ethyl alcohol, but not that of water vapour, accords with Freundlich's law. More heat is evolved in the adsorption of vapours of organic substances by charcoal than by silica gel. Of chlorine adsorbed by charcoal 11% is retained even after heating at 260—280° in a current of air; charcoal poisoned with chlorine loses some of its adsorptive capacity. The hydrogen and oxygen present in charcoal are active substances which are indispensable constituents of its colloidal particles. CHEMICAL ABSTRACTS.

Cause of deformation and breaking of stirrers in mechanical pyrites burners. K. SHABALIN (J.

Chem. Ind. Russia, 1928, 5, 521—522).—The metal becomes almost completely converted into ferrous sulphide and covered with a layer of a mixture of this substance with pyrites. CHEMICAL ABSTRACTS.

Converter for the oxidation of ammonia with pure oxygen. J. Y. YEE (Ind. Eng. Chem., 1929, 21, 1024—1026).—The converter was designed for the production of liquid oxides of nitrogen as a step in the direct manufacture of highly-concentrated nitric acid. It is made of aluminium, in two parts, each water-cooled. A series of sharp edges on both castings are in contact with the gauze and conduct away surplus heat. Conduction direct to the converter surface is minimised to avoid unequal temperature distribution on the gauze. The oxygen-air mixture is passed through a baffle chamber and thence through very small ports to prevent the transmission of an explosion backwards from the gauze. The best volume ratio was found to be 7 vols. of oxygen to 4 vols. of ammonia, good efficiencies (up to 94%) being thereby obtained. Photomicrographs are given showing the effect on the structure of an activated gauze of overheating. The temperature of the hottest part of the gauze in the converter described was found to be 850—900°. C. IRWIN.

Stabilising hydrogen peroxide solution with "nipagin" [methyl *p*-hydroxybenzoate]. E. BÖHM (Pharm. Ztg., 1929, 74, 1670—1671).—A solution of hydrogen peroxide containing 0.1% of "nipagin" and kept in a corked flask at room temperature, after periodical examination from 1925 to 1928, had only decreased in strength from 3.0% to 2.7% in that time. Under similar condition, solutions preserved with oxalic acid and urea had decreased in strength to 0.1% and nil, respectively. E. H. SHARPLES.

Dehydration of Glauber salt by aqueous ammonia. G. YAKOVKIN (Trans. State Inst. Appl. Chem., Moscow, 1927, No. 8, 5—13).—When the concentration of ammonia is about 15 g. per 100 g. of water, temperature variations have no effect on the solubility of sodium sulphate, and the heat of dissolution is zero; at lower concentrations of ammonia the solubility of the sulphate decreases slightly with rise of temperature, and the heat of dissolution of the anhydrous salt is positive, whilst in solutions containing 15—35 g. it increases with rise of temperature, indicating a negative heat of dissolution. In general, the influence of temperature is small in comparison with that of concentration of ammonia. As a dehydrating agent ammonia lowers the solubility to a greater extent than does methyl or ethyl alcohol; the expense of heat is approximately the same.

CHEMICAL ABSTRACTS.

Preparation of alkali cyanides from their carbonates, carbon, and nitrogen. N. A. FLEISHER (Trans. State Inst. Appl. Chem. Moscow, 1928, No. 10, 5—27).—A wet mixture of sodium carbonate 1, charcoal (70.7% C) 0.7, and reduced iron 0.17 pt. was briquetted, dried, and heated (e.g., at 990° for 1.5 hrs.) in an iron tube in a current of nitrogen. Briquetting improves the yield (e.g., 58%) of sodium cyanide; moisture is detrimental, and the addition of manganese (G.P. 176,080) is superfluous. With potassium carbonate (1.3 pts.) the yield (e.g., 55% for 990°, 2.75 hrs.) is affected by the state of

division of the iron. Better yields (64%, 68%) were obtained at 1010° at atmospheric pressure, using reduced iron and potassium ferrocyanide, but not the latter alone. Potassium sulphate is detrimental. The iron was reduced by various processes.

CHEMICAL ABSTRACTS.

Preparation of barium chloride from wastes in the production of lithopone. F. N. STROKOV (Trans. State Inst. Appl. Chem., Moscow, 1928, No. 10, 28—35).—The solid residue remaining after extraction of barium sulphide from the product of reduction of barytes with carbon contains barium silicate and carbonate. By treatment with hydrochloric acid, igniting, dissolving in water, filtering, and crystallising, barium chloride containing BaCl_2 85·16, H_2O 14·93%, CaCl_2 trace, Fe and SiO_2 none, was obtained.

CHEMICAL ABSTRACTS.

Conversion of barium sulphide into barium chloride by the action of chlorine. F. N. STROKOV (Trans. State Inst. Appl. Chem., Moscow, 1928, No. 10, 36—56).—Barium sulphide was extracted with hot water, and the cold solution filtered from precipitated hydroxide and hydrosulphide; rapid or prolonged treatment with chlorine increases the amount of sulphate formed. Treatment of a filtered, hot solution (preferably containing 160—270 g. per litre) with chlorine (of which 80—94% reacted), the liquid being filtered from sulphur, gave yields of 95% of barium chloride and 90% of sulphur, of which 27% was present as barium sulphate. Complete conversion of barium sulphide into chloride is possible by passing chlorine over the dry substance heated above 60°, the exothermic reaction maintaining the temperature for a time at 90—100°; further heating to 120° is necessary, and is followed, with distillation of sulphur monochloride, by rise of temperature to 200°. After 3 hrs. the mass is washed with benzene to remove sulphur monochloride, extracted with hot water, and the filtered solution is crystallised. Over 70% of sulphur chloride is recoverable.

CHEMICAL ABSTRACTS.

Determination of the calcium sulphate content of tower liquors. E. SCHMIDT and C. HÖNN (Papier-Fabr., 1929, 27, 813—815).—Raschig's benzidine method (B., 1903, 883, 1066) has been found very suitable for rapid process-control determinations of calcium sulphate in presence of sulphur, as benzidine sulphate is completely precipitated at p_{H} 2 as in tower liquors. Thus 5 g. of benzidine are shaken with 100 c.c. of water, 4 c.c. of concentrated hydrochloric acid are added, and the solution is diluted to 2 litres. Tower liquor (50 c.c.) is then run into 100 c.c. of this reagent, the precipitate being collected and washed on a filter with 10 c.c. of cold water only. It is then washed off the filter paper by shaking with water warmed to 50° and titrated with caustic soda and phenolphthalein. When neutrality is approaching, the solution is boiled. The method gives very exact results, which are quite unaffected by sulphur dioxide concentration. It is not suitable for cooker liquors, as ligninsulphonic acids also give a precipitate with benzidine hydrochloride.

C. IRWIN.

Producing alumina by acid and electrothermal processes. J. D. EDWARDS and R. B. MASON (Chem.

and Met. Eng., 1929, 36, 730—733).—Methods which have been proposed and in many instances protected for the production of alumina from ores, clays, etc. by means of acid processes are reviewed. Contrary to alkaline processes, iron and titanium are dissolved in quantity and a complete separation is practically always difficult and expensive. Electrothermal processes aim to reduce the impurities in the raw material to the metallic state and to separate them in that form from an upper layer of molten alumina. A modification of Hall's process has been operated commercially, by which a mixture of siliceous and ferruginous bauxites, properly proportioned, is reduced and the impurities are tapped out as a ferrosilicon-aluminium-titanium alloy, together with a small quantity of aluminium. The molten alumina (at 2500°) may be cast into blocks, or is preferably blown by high-pressure air or steam into small hollow granules. The process is completed by leaching the granules with dilute acid to remove lime and about half of the remaining oxides of iron, silicon, and titanium; the purity may then attain 99·75%. Another modification of Hall's process lowers the fusing point of alumina by the introduction of ferrous sulphide, which yields aluminium oxide embedded in a matrix of aluminium sulphide; this is then decomposed by water, chlorine, or hydrochloric acid. Other "nitride" dry processes as represented by the Serpek method have failed to materialise into useful commercial application owing to the difficulty of forming the nitride on a large scale, and also because of the numerous problems involved in its subsequent decomposition.

C. A. KING.

Manufacture of alumina by a wet process. J. SÉAILLES (Compt. rend., 1929, 189, 1276—1279).—Interaction in solution of lime and bauxite in the proportions Al_2O_3 : 4CaO for 1½—8 hrs. at 4—8 kg. pressure in the autoclave, followed by treatment with sodium carbonate, filtration of the sodium aluminate, and precipitation with carbon dioxide, gives a 90% yield of iron-free alumina containing 0·15—3% SiO_2 . There is evidence for the formation in the autoclave of the compound $\text{Al}_2\text{O}_3 \cdot 3\text{CaO}$ (cf. Travers and Schnoutka, A., 1928, 1124). Low silica contents are ensured by the absence of free alkali before the carbonate treatment. The precipitate of ferruginous calcium carbonate is suitable for inclusion in Portland cement pastes.

J. GRANT.

Preparation of pure alumina from Tikhvin bauxites. J. LILEEV (Trans. State Inst. Appl. Chem., Moscow, 1927, No. 8, 14—38).—Packard's process gave good results with bauxite containing SiO_2 17·4, Al_2O_3 40·6, and Fe_2O_3 23·5%, but was inapplicable to samples containing, respectively, 7·6, 63·5, 14·0%, or 5·0, 74·5, 5·7%, since the reactions taking place are: $\text{Na}_2\text{CO}_3 + \text{Al}_2\text{O}_3 = 2\text{NaAlO}_2 + \text{CO}_2$ and $\text{Fe}_2\text{O}_3 + \text{Na}_2\text{CO}_3 = 2\text{NaFeO}_2 + \text{CO}_2$. It is necessary to use equimolecular ratios of sodium carbonate and alumina and ferric oxide, respectively, to adjust the ratio Na_2CO_3 : CaCO_3 to 1·5:2, to calcine in an oxidising atmosphere at 875—925°, and to wash with water at 90°. Under the conditions employed 85—90% of the alumina is extracted.

CHEMICAL ABSTRACTS.

Reduction of tricalcium phosphate by carbon: effect of silica and alumina on the reaction. K. D.

JACOB, D. S. REYNOLDS, and W. L. HILL (Ind. Eng. Chem., 1929, 21, 1126—1132).—Silica has a marked effect in increasing the rate of reduction. Volatilisation of phosphorus begins at 1050°, and under favourable conditions is more than 90% complete in 1 hr. at 150° or in 10 min. at 1350°. As the silica content of the charge was increased there was a progressive increase in the total phosphorus volatilised; *e.g.*, at 1200° the percentage of phosphorus volatilised increased from 45.1 with a mol. ratio of $\text{SiO}_2:\text{CaO} = 1.3$ to 65.8 with a ratio of 4.3. The effects of quartz and silica gel were similar. Alumina also accelerates the reduction, though to a less pronounced degree than silica. Rapid reduction of aluminium phosphate by carbon occurs at 1100°, and the presence of silica exerts little influence on this reaction. It is suggested that in the presence of silica carbon monoxide acts as a reducing agent towards tricalcium phosphate, or probably towards phosphorus pentoxide vapour formed by dissociation.

C. A. KING.

Gaseous ammonia for superphosphate. M. M. HALE (Chem. and Met. Eng., 1929, 36, 741).—Treatment of phosphatic fertilising materials with ammonia solution may be a new factor, but the use of gaseous ammonia has been suggested since 1867. When wet acid phosphate is treated with ammonia the phosphoric oxide reverts to insoluble form owing to a reaction between calcium sulphate and ammonium mono- or di-hydrogen phosphate. This reaction does not occur if the moisture content does not exceed 6%, neither does it revert on storage. When a pure salt was treated with ammonia a triple combination existent as a single salt, *e.g.*, calcium ammonium phosphate, was indicated.

C. A. KING.

Utilisation of natural aluminium phosphate on the Pacific coast. Y. KIDA (Proc. III Pan-Pacific Sci. Cong., 1926 [1928], II, 1999—2000).—(1) The material was decomposed with sulphuric acid and either extracted with alcohol or acetone and treated with ammonia to give ammonium phosphate, or treated with a sulphate and lime or calcium phosphate to yield an alum and monocalcium phosphate. (2) The material was treated with sodium hydroxide solution under different conditions.

CHEMICAL ABSTRACTS.

Determination of lead peroxide. II. A. V. PAMFILOV and E. G. IVANČEVA (Z. anal. Chem., 1929, 79, 186—195; cf. B., 1929, 850).—Lead peroxide may be determined by heating until dissolved with excess of 0.15—0.20*N*-ferrous chloride solution to which 5 c.c. of concentrated hydrochloric acid per 25 c.c. have been added, then titrating with dichromate, using ferricyanide as indicator. Diphenylamine may be employed as internal indicator if only 10 c.c. of 4*N*-hydrochloric acid per 25 c.c. of ferrous chloride solution are added. Lux's method is unsatisfactory for the determination of either lead peroxide or manganese dioxide.

R. CUTHILL.

Anti-corrosive construction materials. COOPER. **Freezing mixture.** NOACK.—See I.

PATENTS.

Concentration of sulphuric acid. W. BÜSCHING (B.P. 322,977, 22.3.29).—Impure acid which has been

pretreated in a dephlegmator is fed by means of a pipe to the bottom of a closed cast-iron vessel, which is heated and fitted with a stirring apparatus. Compressed air is introduced into the stirred acid to increase the oxidising effect.

W. G. CAREY.

Purification of caustic soda. A. H. HOOKER and W. J. MARSH, Assrs. to HOOKER ELECTROCHEM. CO. (U.S.P. 1,733,879, 29.10.29. Appl., 12.8.26. Renewed 14.3.29).—A solution containing 40—46% NaOH is saturated with sodium chloride at ordinary temperature, then diluted with water, and cooled below the point at which it becomes saturated with respect to $\text{NaOH}\cdot 3.5\text{H}_2\text{O}$.

W. G. CAREY.

Dehydration of caustic [alkali]. J. F. WAIT, Assr. to NAT. ANILINE & CHEM. CO., INC. (U.S.P. 1,734,699, 5.11.29. Appl., 31.12.24).—Caustic alkali solution is heated under reduced pressure in a closed iron vessel only 40% of the volume of which is filled. As evaporation proceeds more solution is run in to maintain the volume nearly constant. When the temperature rises to 300° addition of solution is stopped, the pressure is reduced to 2 lb., and dehydration finished above 400°.

A. R. POWELL.

Cleansing preparation. J. ANDERSON and T. D. HEFFERNAN (B.P. 322,868, 15.11.28).—An aqueous solution containing caustic soda or potash, ammonium bicarbonate, potassium carbonate, and borax or baking soda.

H. ROYAL-DAWSON.

Production of ammonium sulphate. I. G. FARBEN-IND. A.-G., Asses. of F. ACKERMANN and E. SCHUBERT (G.P. 453,686, 25.2.26).—Ammonium bisulphite dissolved in alcohol of at least 60% concentration is oxidised by treatment with air or other gases containing oxygen.

L. A. COLES.

[Manufacture of] ammonium sulphate. T. NISHIGAWA (F.P. 630,426, 7.3.27).—A mixture of ammonia, sulphur dioxide, and oxygen or gas containing oxygen enters at the base of a cylindrical tower containing filling material in the form of shells with perforated bases. A fan-type atomiser is arranged in the upper part of the tower and distributes either water or dilute aqueous solutions of ammonium sulphite or sulphate. Laminar atomisers are arranged between layers of the filling material in order to distribute liquid falling from the filling.

J. S. G. THOMAS.

Production of ammonium phosphates. J. GUILLISSEN, and UNION CHIM. BELGE SOC. ANON. (B.P. 322,700, 22.2.29).—A solution of phosphoric acid containing impurities, such as ferric salts, alumina, and lime, is partially saturated with ammonia until the impurities are precipitated, whereon the mother-liquor is separated and treated with excess of ammonia until the bulk of the triammonium phosphate is precipitated. The latter is pure and may be thermally converted into mono- or di-ammonium phosphate. The original phosphoric acid solution is preferably diluted so that ammonium phosphates are not precipitated with the impurities.

S. K. TWEEDY.

Purifying fused salt baths. W. J. MERTEN and C. T. GAYLEY, Assrs. to WESTINGHOUSE ELECTRIC & MANUF. CO. (U.S.P. 1,736,457, 19.11.29. Appl., 10.10.25).—Impurities may be removed from fused chloride

annealing baths by the addition of a mixture of boric acid with 10–25% of powdered charcoal. Sulphates, phosphates, carbonates, and particles of slag and scale are thus removed as a spongy dross which floats on the surface of the bath and is readily skimmed off.

A. R. POWELL.

Refining of borates. W. A. GALE and C. F. RITCHIE, ASSRS. to AMER. POTASH & CHEM. CORP. (U.S.P. 1,732,806, 22.10.29. Appl., 27.1.25).—Borate solutions containing phosphate, such as are obtained in the mother-liquors in the refining of Searles Lake borates, are purified by treatment with sufficient milk of lime to precipitate all the phosphoric acid as calcium phosphate without appreciably precipitating the boric acid.

A. R. POWELL.

Manufacture of calcium sulphite liquors. R. BÖHLIG (G.P. 455,681, 10.9.25).—Sulphur dioxide and lime water are sprayed simultaneously into an absorption tower from jets located at the bottom thereof, whereby a solution of $d\ 1.036$ is obtained containing calcium sulphite and excess sulphur dioxide.

A. R. POWELL.

Production of pure alumina. SALZWERK HEILBRONN A.-G., K. SCHMIDT GES.M.B.H., and K. FLOR (G.P. 455,472, 27.2.25).—The dross obtained in melting aluminium is sieved to remove coarse aluminium prills and digested with hydrochloric acid to obtain a relatively pure solution of aluminium chloride, which is then saturated with hydrogen chloride, whereby $AlCl_3 \cdot 6H_2O$ is precipitated. This is washed with concentrated hydrochloric acid and calcined to obtain alumina and hydrochloric acid for use again.

A. R. POWELL.

Treatment of phosphate rock. G. SINGLETON and R. P. THORNTON (U.S.P. 1,736,553, 19.11.29. Appl., 17.12.23).—Native aluminium phosphate (wavelite) is ground and moistened with ammonia or potassium carbonate containing sufficient alkali to convert all the phosphate into alkali phosphate. After keeping for several days the mass is dried, ground, and used directly as a fertiliser.

A. R. POWELL.

Separation of titanium dioxide hydrate from hydrolysable solutions of titanium salts. J. BLUMENFELD (B.P. 310,949, 28.1.29. Czechoslov., 5.5.28).—An inhibition period occurs in the thermal hydrolysis of titanium solutions in mineral acid during which amicroscopic nuclei serving as accumulation centres for hydrate particles are formed. It is proposed to hasten the hydrolysis by treating the solutions with a liquor containing nuclei of titanic hydroxide (to the extent of 1% of the total titanium), which nuclei are still capable of being dispersed wholly or partially by dispersing agents towards or into a condition of apparently homogeneous solution. The liquor is made by hydrolysing titanium compounds (*e.g.*, a portion of the main solution to be hydrolysed) under conditions of low acidity (p_H 2–7, preferably 4–4.5), ripening at a moderate temperature (70–80°), and, if necessary, cooling. The conditions must be nicely adjusted to obtain a liquor having highly active nuclei, but a correctly prepared liquor maintains its activity for weeks.

S. K. TWEEDY.

Preparation of coagulating sols. R. A. HENRY (B.P. 322,798, 15.6.28).—Sols to coagulate suspensions

or emulsions in water are made by adding amylaceous material or living cells, *e.g.*, starch, aquatic weeds, vegetables, etc., together with potassium, sodium, or calcium hydroxides to the water after neutralising its acidity with lime. The amylaceous material is maintained in suspension by a pump working in a closed circuit, and is mixed with the hydroxide in a channel where the speed of the common flow and the length of the path travelled can be adjusted so as to govern the duration of the reaction.

W. G. CAREY.

Manufacture of colloidal metallic salts. R. LORENZ and H. HEINZ (G.P. 456,188, 30.7.24).—Such salts are produced by reaction between one or more components present in the colloidal state, the remaining components being present in the massive form. The resulting solution is evaporated and solid reversible colloids are obtained.

J. S. G. THOMAS.

Production of hydrogen. R. WILLIAMS, ASSR. to DU PONT AMMONIA CORP. (U.S.P. 1,736,065, 19.11.29. Appl., 5.8.26).—A mixture of steam and a gaseous hydrocarbon, *e.g.*, methane, is passed through a series of reaction vessels containing a number of superimposed trays containing a suitable catalyst, and the heat of the reaction is maintained by admitting small quantities of air to the free spaces just below every tray so that only a small part of the mixture is converted into hydrogen and carbon monoxide at every stage of the treatment, thus avoiding overheating and undesired side-reactions.

A. R. POWELL.

Production of nitrogen and hydrogen. KALI-IND. A.-G., and C. T. THORSELL (B.P. 298,190, 24.9.28. Ger., 5.10.27. Addn. to B.P. 288,154; B., 1929, 719).—Coke-oven, blast-furnace, lignite-distillation gases etc. containing a proportion of carbon dioxide too high for satisfactory use in the reduction stage of the prior process are rendered suitable by being passed over coke at a temperature such that in the treated gases the ratio $CO_2:CO$ does not exceed 0.45 and the ratio $CO:CH_4$ is at least 1.5. Alternatively, a portion only of the gas is treated and mixed with the remaining gas in proportion such that the mixture conforms to the required standard.

L. A. COLES.

Manufacture of mixtures of nitrogen and hydrogen for the synthesis of ammonia. J. Y. JOHNSON. From I. G. FARBERIND. A.-G. (B.P. 322,701, 22.2.29. Addn. to B.P. 307,529; B., 1929, 393).—Part of the air added before the exposure of the carbonaceous material to the electric arc is replaced by carbon dioxide, which latter is converted by the arc with liberation of oxygen into carbon monoxide (from which the requisite carbon dioxide is produced, *e.g.*, by passing with steam over a nickel catalyst). The nitrogen and hydrogen in the resulting gas mixture are more nearly in the proportion of 1:3 than in the mixture obtained by the process previously described.

S. K. TWEEDY.

Purification of nitrogen, hydrogen, or mixtures thereof. SOC. D'ETUDES MINIERES & INDUSTRIELLES (B.P. 302,306, 16.11.28. Fr., 14.12.27).—Nitrogen and hydrogen containing oxidisable impurities, *e.g.*, carbon monoxide, and/or hydrocarbons, and also reducible impurities, *e.g.*, sulphur or phosphorus compounds, are humidified and mixed with water vapour and with

sufficient oxygen and hydrogen to combine with the oxidisable and reducible impurities, respectively, and then passed under pressure over charcoal at not above 600° (except in the case of nitrogen), the conversion products of the impurities then being removed by known means.

W. G. CAREY.

Recovery of iodine. E. KUREK (U.S.P. 1,731,309, 15.10.29. Appl., 29.11.22).—Iodine present in limestone or dolomite is recovered by passing the gases, liberated in the burning process, through a condenser and then into water or an aqueous alkaline solution.

F. G. CLARKE.

Production of absorbent material. T. P. HILDITCH and H. J. WHEATON, Assrs. to H. N. HOLMES (U.S.P. 1,739,305, 17.12.29. Appl., 13.8.23. U.K., 14.8.22).—See B.P. 206,268; B., 1924, 22.

Production of soluble lead reagents. D. W. PARKES, Assr. to H. W. ROBINSON (U.S.P. 1,740,312, 17.12.29. Appl., 31.10.28. U.K., 17.2.28).—See B.P. 305,827; B., 1929, 322.

Apparatus for converting carbon dioxide or other material into a solid. J. E. MORTIMER (B.P. 322,807, 14.9.28).

Solidifying gases (B.P. 301,741). **Anti-freezing mixture** (B.P. 322,859).—See I. White lead (U.S.P. 1,732,490).—See XIII. **Fertilisers** (B.P. 291,461 and 322,424). **Herbicide** (B.P. 322,438).—See XVI.

VIII.—GLASS; CERAMICS.

Relationship between chemical composition and thermal expansion of glasses. S. ENGLISH and W. E. S. TURNER (J. Amer. Ceram. Soc., 1929, 12, 760).—Errors in calculation are pointed out by the authors, in their previous results (B., 1928, 262) for the cubical expansion factors of certain oxides. The true figures should be zinc oxide 2.1, alumina 0.42, baryta 4.2.

J. A. SUGDEN.

Density factors for soda-lime glasses. S. R. SCHOLES (J. Amer. Ceram. Soc., 1929, 12, 753—755).—Density factors calculated in terms of Na_2O , 2SiO_2 , CaO , SiO_2 , MgO , SiO_2 , SiO_2 , and Al_2O_3 have given better agreement with the observed densities of a series of glasses than have the factors based on the individual oxides. (Cf. English and Turner, B., 1921, 891 A.)

J. A. SUGDEN.

Relation between the density and refractive index of silicate glasses, with application to the determination of imitation gem-stones. F. A. BANNISTER (Min. Mag., 1929, 22, 136—154).—Data taken from various sources, e.g., Peddle (B., 1920, 545 A, 783 A; 1921, 216 A, *et seq.*), Wright (B., 1921, 10 A, 487 A), are plotted in various ways. It is found that when $(n - 1.460)/(d - 2.21)$, in which 1.460 and 2.21 are the refractive index and density of silica glass, respectively, is plotted against the refractive index n , there is a wider separation of the different glass families of various chemical compositions. In doubtful cases a further aid is given by a determination of the optical dispersion. New data are given for thallium glasses and a glass with the composition of emerald.

L. J. SPENCER.

Determination of strain in glass by a radiation method. L. R. INGERSOLL (J. Amer. Ceram. Soc.,

1929, 12, 756—759).—In the ordinary optical (polarised light) test for strain, the eye has been replaced by a thermopile. Certain glasses which are too opaque to be tested with visible radiation pass sufficient infra-red rays to be tested with the modified apparatus. It is also possible to test rough-surfaced diffusing glasses. The apparatus can be made suitable for factory use.

J. A. SUGDEN.

Greater efficiency in tunnel dryers. W. D. RICHARDSON (J. Amer. Ceram. Soc., 1929, 12, 761—764).—Decreased efficiency is due to a cold bottom in the exit end of the tunnel, and to the hot air rising immediately to the top and drying only the upper part of the ware, thus emerging from the dryer but partially saturated. The improved dryer is provided with a hot-air duct throughout its whole length, and with a series of baffle plates and fans in order to circulate the air between the bottom and top.

J. A. SUGDEN.

Tunnel kiln installation for porcelain insulators. E. H. FRITZ (J. Amer. Ceram. Soc., 1929, 12, 711—715).—Certain details of equipment are described, the object of which is to give uninterrupted operation and more perfect control of the kiln.

F. SALT.

Oil firing of refractories. R. C. ZEHR (J. Amer. Ceram. Soc., 1929, 12, 742—745).—Data are presented on the construction and operation of round, down-draught kilns firing refractories with fuel oil.

F. SALT.

Chemical changes in clay and clay-lime mixtures on firing. C. J. FRANKFORTER and J. N. DETRICK (J. Amer. Ceram. Soc., 1929, 12, 771—779).—A Nebraska clay to which lime had been added was fired at 1000°. The lime appeared to combine with the various constituents of the clay, and there was also reaction between the iron oxide and silica.

J. A. SUGDEN.

Glost warping of white wall tile. T. D. TEFFT (J. Amer. Ceram. Soc., 1929, 12, 765—770).—A simple apparatus for measuring the degree of warping is described, with which the influence of glaze composition on warping has been studied. The warping seems to be increased by the addition of an oxide which renders the glaze more fusible. Zinc, barium, and magnesium oxides and excess of lime increase the glost warping.

J. A. SUGDEN.

Chrome [ore] and diaspoire mixtures. H. G. JONES (J. Amer. Ceram. Soc., 1929, 12, 732—737).—An investigation was conducted to determine the softening points of various mixtures of chromite and diaspoire, the workability of mixtures made by different processes, the porosity, firing and reheating shrinkage, and the resistance to slag action and spalling. All the mixtures stood up to cones 33—34. The dry-press method was the most suitable for making the test pieces. The addition of 50% of chromite reduced the shrinkage of raw diaspoire to about one third. Chromite and diaspoire have nearly the same absorption, and this was not changed in the mixtures. The addition of a small amount of finely-ground chromite reduced the action of slag on the bricks. The addition of diaspoire to chromite increased its resistance to spalling, and the addition of fine chromite to diaspoire also increased its resistance to spalling.

F. SALT.

X-Ray study of firebrick. A. E. R. WESTMAN (Univ. Ill. Eng. Exp. Sta. Bull., 1929, No. 193, 16 pp.).—In all the bricks examined mullite lines and one cristobalite line were present, the quartz lines being masked or faint. The scope of the method is discussed.

CHEMICAL ABSTRACTS.

Transverse breaking strength of refractories. C. A. VINCENT-DAVISS (J. Amer. Ceram. Soc., 1929, 12, 738—739).—Furnace equipment described by Hartmann and Koehler (B., 1921, 771 A) has been modified so as to give continuous operation of the transverse crushing test at temperatures up to 1350° and 1500°. Two pairs of furnace units are arranged side by side, each unit being mounted on a base fitted with four wheels which run on rails. While one unit of a pair is being heated up the other is cooling.

F. SALT.

Moulding sand. TAKAHASI.—See X.

See also A., Jan., 31, **Apparatus for dispersoid analysis** (ANDREASEN and others). 55, **Porcelain evaporating basins etc.** (VOLKMANN).

PATENTS.

Production of heat-absorbing glasses and batches therefor. CORNING GLASS WORKS, Assees. of W. H. RISING (B.P. 312,311, 17.4.29. U.S., 24.5.28).—The addition of small amounts of tin or its compounds to glasses containing ferrous iron, a reducing agent, and one or more elements (at. wt. 20—140) of group II enables the iron to be much more completely reduced. This complete reduction to the ferrous form imparts to the glass a blue coloration and the property of absorption of the visible red, infra-red, and ultra-violet, together with relatively high transmission for the remainder of the spectrum.

J. A. SUGDEN.

Manufacture of glass transparent to ultra-violet rays. SOC. ANON. DES MANUF. DES GLACES ET PROD. CHIM. DE ST.-GOBAIN, CHAUNY ET CIREY (B.P. 291,468, 2.6.28. Fr., 4.6.27).—From 0.05 to 0.5% of manganese oxide is incorporated in the batch, and melting is performed in a reducing atmosphere, subsequent "solarisation" being thus prevented.

A. COUSEN.

Manufacture of strengthened glass. H. D. MURRAY and D. A. SPENCER (B.P. 322,598, 25.10.28).—The discoloration of the layer of celluloid in "safety glass" can be avoided (i) by mixing with the celluloid a substance such as (a) quinine sulphate or æsculin, to convert the ultra-violet light into a light of less active wave-length, or (b) sodium silicate or glycerin, to inhibit the decomposition of the celluloid or to form colourless compounds with the coloured decomposition products thereof; or (ii) by using glass elements impermeable or less permeable to ultra-violet light.

J. A. SUGDEN.

Matting the interior surface of hollow glass bodies. ELEKTR. GLÜHLAMPENFABR. "WATT" A.-G. (B.P. 302,582, 14.12.28. Austr., 17.12.27).—The two processes of etching and consolidating after-etching are carried out simultaneously by the application of a solution of ammonium hydrogen fluoride, calcium chloride, water, and hydrofluoric acid, which has been rendered viscous by the addition of finely-ground barium sulphate. The etching action generates heat which

serves to liberate, by hydrolysis, the hydrofluoric acid for after-etching.

J. A. SUGDEN.

Vitrified compositions and abrasive objects manufactured therefrom. Grinding wheels and similar abrasive articles. C. J. BROCKBANK (B.P. 322,448—9, 3.9.28).—(A) A mixture of felspar 70 pts., china clay 25 pts., and titanium dioxide 5 pts. is fritted at cone 15—20 and finely ground. The abrasive or other material is mixed with 15% of the frit and a small amount of dextrin, dried, and fired at cone 13. The process of moulding and firing may be completed in 24 hrs., and gives a strong and tough material. (B) Ethylene glycol monoethyl ether is used as the solvent in the bonding of abrasive materials with shellac, rubber, resins, etc. The moulding can be carried out in the cold, after which the article is baked at 140—220°.

J. A. SUGDEN.

Production of lepidolite enamel. C. TRENZEN, ASSR. to C. SCHWARTZ and G. G. G. HUNTER (U.S.P. 1,734,698, 5.11.29. Appl., 9.7.26. Ger., 10.7.25).—Iron goods may be enamelled directly without an under-glaze coat by covering them with a paste of powdered lepidolite and water, drying, and firing just below 1000°. The resulting enamel is white, glossy, and opaque.

A. R. POWELL.

Drying and firing of ceramic ware in the same kiln. F. HAGER (G.P. 447,970, 26.7.25).—The hot gases introduced into the kiln for drying the ware are charged with water vapour by passing over a vessel of water in the entry flue, and when the drying is completed the vessel is removed so that dry gases are available for firing purposes.

L. A. COLES.

Refractory crucibles. C. J. BROCKBANK (B.P. 322,476, 3.9.28).—Titanium dioxide, silicate, or aluminate is added to the clay bond used in the manufacture of graphite and carborundum crucibles. When fired at cone 5—10 a very strong mass is produced having a glazed surface which prevents the oxidation of the graphite etc.

J. A. SUGDEN.

Production of heat-absorbing glasses and batches therefor. W. H. RISING, ASSR. to CORNING GLASS WORKS (U.S.P. 1,737,686, 3.12.29. Appl., 24.5.28).—See B.P. 312,311; preceding.

Light-weight ceramic material and its manufacture. R. ERICSON, ASSR. to UNITED STATES GYPSUM CO. (Re-issue 17,523, 17.12.29, of U.S.P. 1,702,076, 12.2.29).—See B., 1929, 284.

Method and apparatus for producing sheet glass. A. E. WHITE. From MISSISSIPPI GLASS CO. (B.P. 322,759, 11.9.28).

Leading-in wire for glass (U.S.P. 1,734,900).—See X.

IX.—BUILDING MATERIALS.

Method of studying the reactions in a Portland cement kiln. W. N. LACEY and H. WOODS (Ind. Eng. Chem., 1929, 21, 1124—1126).—In order to sample material in any part of a rotary kiln without the necessity of stopping the kiln, a cup provided with an extended lip to prevent the collection of material until the desired moment and to protect it after sampling is mounted on

an iron rod which may be inserted to any position along the length of the kiln. Results of analyses of samples drawn in this manner indicate that comparatively little calcination of limestone occurs in the first 45 ft., calcination is rapid in the next 25 ft., and extensive recombination of lime takes place after this stage. The progress of calcination was followed by observing the loss on ignition and the uncombined calcium oxide, the latter being determined by titration of the lime with ammonium acetate in absolute alcohol solution, the ammonia formed being expelled by heating and therefore allowing the use of phenolphthalein as indicator. C. A. KING.

Action of sulphates on Portland cement. II. Steam-curing of Portland cement mortar and concrete as a remedy for sulphate (alkali) action. III. Effect of addition of silica gel to Portland cement mortars on their resistance to sulphate action. T. THORVALDSON, V. A. VIGFUSSON, and D. WOŁOCHOW (Canad. J. Res., 1929, 1, 259—384, 385—399).—II. The resistance of mortar and concrete to the action of sulphate solutions is very considerably increased by curing in steam for 24 hrs. or more. Curing at 100° reduces considerably the expansion caused by sodium or calcium sulphate and retards that caused by magnesium sulphate, but the curing process produces mortars of low tensile strength and does not preclude the possibility of failure after prolonged exposure to sulphate solutions. Much more satisfactory tensile and compressive strength coupled with a greater resistance to sulphate action is obtained by steam-curing under pressure at 125—175° for 24 hrs. After this treatment the expansion of mortar or concrete in sodium or calcium sulphate solutions is almost entirely eliminated and expansion in magnesium sulphate solution greatly reduced. The behaviour of cements of varying composition after this treatment in sulphate solutions of various concentrations has been examined and the results are reproduced in a series of 19 tables.

III. Replacement of part of the Portland cement in cement-sand mortars by silica gel up to 20% of the total increases slightly the resistance of the steam-cured mortar to the disintegrating action of sodium sulphate or calcium sulphate solutions (see above), but decreases the resistance to magnesium sulphate. Lime-silica gel-sand mortars behave similarly in sulphate solutions to the corresponding cement mortars. During the setting of either type of mortar to which the gel has been added the silica combines with the free lime liberated, in the case of cement mortars, during hydrolysis of the basic silicates present; the product is itself a gel which crystallises only very slowly. Steam-curing of cements free from silica gel also causes the free lime to disappear, with the formation of an isotropic variety of tricalcium aluminate which is not easily hydrolysed by sulphate solution. Apparently it is only the common hexagonal plates and needles of tricalcium aluminate found in ordinary cement mortar after setting which are attacked by sulphate solutions, thus causing expansion and disintegration of the mortar. A. R. POWELL.

Formation of two different calcium sulphato-aluminates from gypsum in cement. P. MECKE (Tonind.-Ztg., 1929, 53, 681—684; Chem. Zentr., 1929,

ii, 340).—Interaction of lime, alumina, and the compound $3\text{CaO}, \text{Al}_2\text{O}_3, 3\text{CaSO}_4$ affords a second sulphatoaluminate according to the equation: $2(3\text{CaO}, \text{Al}_2\text{O}_3, 3\text{CaSO}_4) + 3\text{CaO}, \text{Al}_2\text{O}_3 = 3(3\text{CaO}, \text{Al}_2\text{O}_3, 2\text{CaSO}_4)$. In the formation of the second salt the whole of the sulphate is precipitated, even from dilute solutions.

A. A. ELDRIDGE.

Emulsions. EADIE; NOVAK.—See II.

See also A., Jan., 31, **Apparatus for dispersoid analysis** (ANDREASEN and others).

PATENTS.

Manufacture of concrete. W. O. ZIMMERMANN (G.P. 448,030, 31.7.26).—Mortar prepared from 1 pt. of quick-lime and 16—18 pts. of sand is ground and mixed with 1 pt. of cement before it has set completely.

L. A. COLES.

Solidification of sandy masses permeable by water. TIEFBAU- U. KALTEIND. A.-G., SIEMENS-BAU-UNION GES.M.B.H. KOMM.-GES., and H. JOOSTEN (B.P. 322,182, 24.5.28).—Porous sandy rock, constructional work, etc. is treated with an alkali silicate or silicic acid solution and then with an acid or sodium chloride solution. The material may also be pretreated with water, soap solution, etc., and finally treated with organic salt or acid solutions etc. [Stat. ref.]

L. A. COLES.

Impregnated wood and process of treating wood. Fireproofed wood. J. R. COOLIDGE, ASSR. to MONTAN, INC. (U.S.P. 1,734,714—5, 5.11.29. Appl., [A] 5.4.27, [B] 18.12.26. Renewed [A] 13.4.29).—(A) Wood is impregnated with a solution of zinc chloride or borax together with aluminium sulphate and then treated with a soap solution to precipitate an insoluble aluminium soap in the outer layers to act as a seal for the preservative salts within. (B) A solution of ammonium chloride and borax is used as the impregnating and fireproofing agent and, after kiln-drying, the wood is treated with soap solution to seal the pores. A. R. POWELL.

Liquefier for preparing stone for bitumen coating. S. S. SADTLER, ASSR. to AMIESITE ASPHALT CO. OF AMERICA (U.S.P. 1,739,652, 17.12.29. Appl., 18.8.27).—See B.P. 309,634; B., 1929, 520.

Drying system (B.P. 321,921). **Drying stone, slag, etc.** (B.P. 322,274).—See I. **Hard pitch** (G.P. 453,712). **Bituminous emulsions and dispersions** U.S.P. 1,733,493—8).—See II.

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

Effect of various factors on the open-hearth steel process investigated by large-scale tests. A. HERBERHOLZ (Arch. Eisenhüttenw., 1929—1930, 3, 173—184; Stahl u. Eisen, 1929, 49, 1579—1581).—A summarised account is given of the results of a series of tests, extending over a year and including 2288 charges, designed to determine the effect of varying the calorific value of the gas and the time occupied in charging the furnace in the open-hearth steel process. When the calorific value of the gas fell below 4150 kg.-cal./m.² the heat consumption of the furnace increased by 5—7% compared with normal practice. An increase or decrease

of $\frac{1}{2}$ hr. in the time of charging a 30-ton furnace decreased or increased the heat consumption by about 8%.

A. R. POWELL.

Relation between α -veining and the A3 transformation point. E. AMMERMANN and H. KORNFELD (Arch. Eisenhüttenw., 1929—1930, 3, 307—311; Stahl u. Eisen, 1929, 49, 1581; cf. Rawdon and Berglund, A., 1928, 939).—Annealing experiments with a mild steel containing 0.13% C and with electrolytic iron with 0.03% C showed that the appearance of α -veins throughout the ferrite grains on etching with Fry's reagent occurs only when the annealing temperature exceeds the A3 point. Annealing between the A1 and A3 points produces local veining in those ferrite grains which are in close proximity to cementite or pearlite fields, probably owing to a local reduction of the A3 point caused by segregation of the carbon content. Deformation below the A3 point does not produce veining unless the metal is subsequently annealed above this point, in which case the deformed metal shows the veining more markedly than metal which has been simply annealed without deformation.

A. R. POWELL.

Inhibitors in the action of acid on steel. F. H. RHODES and W. E. KUHN (Ind. Eng. Chem., 1929, 21, 1066—1070).—The measure of inhibiting action was taken as the percentage decrease in the rate of formation of hydrogen by the action of dilute acid on iron due to the presence of organic materials, which in these experiments were chiefly heterocyclic compounds of nitrogen. In compounds of this type the inhibiting effect increased with the mol. wt. and also with the introduction of a methyl, phenyl, or amino-group. Thus in such a series as pyridine-quinoline-acridine the increase in the number of rings in the molecule was accompanied by a regular increase in effect, and in the series pyridine-lutidine-picoline-collidine the introduction of a single additional methyl group increased the inhibiting action of the compound by nearly 25%. Hydroxyl groups appeared to decrease inhibiting action, and the most efficient of all the compounds studied were those containing several alkyl and amino-groups substituted in an acridine nucleus; thus 3:7-diamino-2:8-dimethyl-acridinum ethochloride and -acridine hydrochloride. The addition of a specific inhibitor to an acid electrolyte increased the film resistance, and it is indicated that the protective action is due to some specific property of the observed film and not solely to the increased resistance offered.

C. A. KING.

Thermal analysis of quenched carbon steels. S. SATO (Sci. Rep. Tôhoku Imp. Univ., 1929, 18, 303—316).—When quenched plain-carbon steels containing 0.2—1.8% C are heated very slowly an evolution of heat takes place in the range 100—170° with a poorly-marked maximum at 150° corresponding with the transformation of α - into β -martensite. At 260—300° the latter decomposes into troostite with the evolution of a fair amount of heat; at the same time any residual austenite is transformed rapidly through α - and β -martensite into troostite again with the evolution of heat. Further evolution of heat occurs in the ranges 300—400° and 450—600°; the former is attributed to the crystallisation of very fine cementite and the latter,

which is very small, to recrystallisation of α -iron. Retained austenite is transformed into the two modifications of martensite at the temperature of liquid air, especially when subjected to magnetic agitation at this temperature.

A. R. POWELL.

Gravimetric determination of chromium in steel. W. F. POND (Chemist-Analyst, 1929, 18, 11).—The steel (0.5—1.5 g.) is dissolved in hydrochloric (25 c.c.), nitric (5 c.c.), and sulphuric (1 c.c.) acids (all 6N), the solution evaporated to 10 c.c., and heated for a few minutes with 100 c.c. of hot water. After cooling and cautious addition of sodium peroxide (2 g. in excess), the solution is heated for 30 min. below the b.p. and filtered; the filtrate and (hot water) washings are boiled for 30 min., acidified with acetic acid, and the chromium is precipitated as lead chromate.

CHEMICAL ABSTRACTS.

Detection and determination of cobalt in special steels. M. E. BERTRAND (Bull. Soc. chim. Belg., 1929, 38, 364—371).—Cobalt may be detected by treating 1 g. of steel with 20 c.c. of concentrated hydrochloric acid, making ammoniacal, and adding 3.5 c.c. of 30% tartaric acid. On then adding 2% potassium ferricyanide solution cobalt gives a reddish-brown colour. Interference by nickel and copper can be prevented by adding potassium cyanide until the blue colour produced by ammonia just disappears. Experimental details are given for the separation of cobalt from nickel by precipitation in boiling solution with bromine in the presence of excess of zinc oxide and zinc salts, and for the electrolytic determination of the cobalt.

C. W. GIBBY.

Solvent action of ferrous sulphate solution on oxidised copper ore. W. G. MURRAY (Chem. Eng. Min. Rev., 1929, 22, 52—54).—Leaching tests have been made on an oxidised copper ore carrying 6% Cu as malachite, chrysocolla, and cuprite, using a 5% solution of commercial ferrous sulphate crystals in sea-water or in fresh water. In the absence of air and in a neutral solution very little copper was dissolved; with free access of air a maximum of 56% of the total copper dissolved readily, although 98% was easily dissolved by 2N-acetic acid. The solvent action of ferrous sulphate is due to its oxidation to ferric sulphate, which behaves as a weak acid, the iron being precipitated slowly as a basic salt by the copper minerals. Malachite is far more active in this respect than chrysocolla.

A. R. POWELL.

Surface dezincification of brass and tombak. E. BEUTEL and A. KUTZELNIGG (Z. Metallk., 1929, 21, 412—413).—Six methods of obtaining a clean copper surface on brass and tombak are briefly described. Quenching tombak from a red heat in 10% sulphuric acid produces a bright red matt surface and the solution contains copper, but no zinc, sulphate; heating and quenching in water results in the formation of an outer layer of cupric and cuprous oxides above a layer of almost pure copper, and the sulphuric acid simply dissolves the outer layer, leaving the copper film exposed. A bright copper coating on brass is obtained by immersing the brass in 20% ferric chloride solution, washing to remove soluble salts without breaking the cuprous chloride film, then heating at 120°, whereby the zinc in the brass reduces this film to metallic copper. By

more prolonged immersion in ferric chloride solution a rose-red film is produced on brass by dezincification of the outer layer. This film is produced more rapidly and rendered thicker by placing an electronegative metal in contact with the alloy during this treatment, which is applicable both to tombak and brass. A. R. POWELL.

Application of the potentiometer to the determination of chlorides in zinc dross. N. JOASSART and E. LECLERC (Bull. Soc. chim. Belg., 1929, 38, 360—363; cf. A, 1929, 785).—A potentiometric method, using the authors' gelatin electrode, gives satisfactory results even in the presence of zinc, tin, chromium, aluminium, manganese, and copper. C. W. GIBBY.

Effect of copper and zinc in cyanidation with sulphide-acid precipitation. E. S. LEAVER and J. A. WOOLF (Amer. Inst. Min. Met. Eng. Tech. Pub., 1929, No. 250, 23 pp.).—A proposed process for the cyanidation of gold-silver ores containing less than 0.5% of cyanide-soluble copper is based on the regeneration, by a combination of sulphide and acid precipitation, of about 80% of the cyanide used in dissolving the copper. The resulting solution is made alkaline with lime and the gold is precipitated with zinc dust.

CHEMICAL ABSTRACTS.

Effect of small quantities of third elements on the ageing of lead-antimony alloys. E. E. SCHUMACHER, G. M. BOUTON, and L. FERGUSON (Ind. Eng. Chem., 1929, 21, 1042—1044).—The normal rate of precipitation of antimony in a lead-antimony alloy due to ageing is influenced greatly by the presence of minute quantities (0—0.01%) of a third element. Changes were observed by means of resistance measurements on wires of a lead alloy containing 1% Sb and a third element. The rate of precipitation of antimony was increased first by the presence of arsenic, being followed closely by manganese, copper, and silver, though nickel retarded the effect after three days. Quantities of impurity greater than 0.01% did not produce proportionately increasing effects.

C. A. KING.

Determination of non-sulphide lead. H. K. HANSEN (Chemist-Analyst, 1929, 18, 10—11).—For the determination of lead present as sulphate, oxide, or carbonate the finely-divided sample (2.5—5 g.) is heated to incipient boiling for 5 min. with 20 c.c. of concentrated ammonium acetate solution containing 5 c.c. of acetic acid; the mixture is filtered and 1—2 c.c. of saturated sodium sulphide solution is added to the filtrate. After boiling, the precipitate is collected, washed with cold water, treated with nitric acid and potassium chlorate, and evaporated to fuming with sulphuric acid (5—7 c.c.), the determination being completed in the usual manner. In an alternative procedure the sulphuric acid is added to the first filtrate. Directions for the determination of zinc and iron are also given.

CHEMICAL ABSTRACTS.

Metals of the tungsten and tantalum groups. C. W. BALKE (Ind. Eng. Chem., 1929, 21, 1002—1007).—An account is given of the preparation and uses of metals of this group. As the grain size of a sintered ingot of tungsten is of the utmost importance in the later mechanical processes, and is affected by the original

purity of the material, the density of the oxide, the rapidity of reduction, and the conditions of heat treatment, great care has to be taken in the purification of the crude tungstic acid which is dissolved in ammonia and evaporated to obtain ammonium paratungstate. This salt is treated with hydrochloric and nitric acids in proper proportions to reproduce tungstic acid, and this cycle must usually be repeated five times to reduce the total impurities present, e.g., iron, calcium, aluminium, etc., to negligible quantity. The reduction of tungstic acid in hydrogen may be controlled so as to vary the product from a light fluffy powder (apparent d_{15}) up to a very coarse-grained powder (apparent d_{100}). The preparation of molybdenum is essentially identical with that of tungsten, taking into account the lower m.p. (2620°) of the metal. Tantalum and niobium are usually associated in ores found only in pegmatite dikes, and are separated by recrystallisation of the double fluorides of potassium, the successful production of these metals depending on the purification of the metal powder from which the ingots are sintered. Both metals exhibit great avidity for hydrogen, oxygen, and nitrogen, and any heat treatment can be conducted only in specially constructed vacuum furnaces.

C. A. KING.

Inclusions in [Japanese] moulding sand. E. TAKAHASHI (Sci. Rep. Tôhoku Imp. Univ., 1929, 18, 329—340).—Sand from the Kunimitôge district of Japan contains small rounded grains of a volcanic glass which contain small gas bubbles. This causes them to decrepitate at high temperatures, and consequently when the sand is used for moulds the castings have a poor skin and are subject to surface deformation. Satisfactory castings were obtained in moulds made from sand that had been heated at 600° and mixed with 10% of clay bond.

A. R. POWELL.

Water-hammer erosion. S. S. COOK (Proc. Univ. Durham Phil. Soc., 1929, 8, 88—100).—Calculation of the water-hammer pressure set up by a jet of water impinging on a metal surface in a high vacuum, such as arises by the condensation of steam by expansion, shows that this pressure may frequently exceed the elastic limit of the metal, in which case serious erosion occurs. This effect may also be caused in turbines by the impact of condensed drops of water on a rapidly rotating blade. Experiments with a rotor containing blades of various metals run for 18½ hrs. at 8800 rev./min. and setting up water-hammer pressures of 12—20 tons/in.² showed that under these conditions staybrite steel, monel metal, and mild steel with elastic limits of 16—18 tons/in.² were badly eroded, whereas Hecla A.T.V. steel and tungsten steel with elastic limits of 31—40 tons/in.² were scarcely attacked. The action of collapsing cavities is to intensify the water-hammer effect; some experiments with the water-hammer cone devised by Parsons showed that it was possible to puncture a brass plate 0.03 in. thick in one blow by the collapsing cavity effect, which must therefore have set up a pressure of about 140 tons/in.²

A. R. POWELL.

Reducing and oxidising agents and lime consumption in flotation pulp. L. KLEIN, C. R. KING,

T. F. MITCHELL, O. E. YOUNG, F. H. MILLER, L. M. BARKER, and O. C. RALSTON (Amer. Inst. Min. Met. Eng. Tech. Pub., 1929, No. 224, 17 pp.).—Atmospheric oxygen is absorbed by pyritic flotation pulps made alkaline with lime, sulphide minerals then giving rise to soluble sulphide and thiosulphates. Lime is consumed by interaction with sulphide and gangue minerals, probably by surface adsorption, and by interaction with oxidation products, atmospheric carbon dioxide, and constituents of the water. CHEMICAL ABSTRACTS.

Significance of wetting and adsorption in flotation process. E. BIERBRAUER (Z. tech. Physik, 1929, 10, 139–141; Chem. Zentr., 1929, ii, 344).—The flotation of apatite and cassiterite with sodium palmitate is considered. A. A. ELDRIDGE.

Chromium-plating experiments. C. M. ALTER and F. C. MATHERS (Amer. Electrochem. Soc., Sept. 1929. Advance copy. 7 pp.).—The effect of certain special factors on the deposition of chromium from the standard type of plating bath has been examined. Under conditions giving a good current efficiency of chromium deposition at a copper cathode comparatively low efficiencies were obtained at cathodes of platinum, palladium, or Acheson graphite. The deleterious effect of cobalt salts in the plating bath is very marked, 0.5 g. of cobalt chromate per 100 c.c. preventing the deposition of chromium altogether, whereas copper, zinc, cadmium, ferric iron, nickel, molybdenum, vanadium, or aluminium had little effect up to 5 g. per 100 c.c. The action of cobalt is regarded as due to its catalysing the reduction of chromic acid, and thus reducing the cathode potential below that necessary for chromium deposition. Periodic reversal of the current during electrolysis or periodically raising the cathode from the bath greatly reduced the current efficiency, often to zero, thus supporting the view that chromium deposition occurs from a layer of partially reduced solution formed at the cathode surface. Adding silica gel to the bath produced no definite effect on the current efficiency, and did not improve the throwing power (cf. U.S.P. 1,705,954; B., 1929, 401). The current efficiency of chromium deposition was materially raised by surrounding the anodes with porous cups, but the deposited metal was soft, dark, and non-adherent. H. J. T. ELLINGHAM.

Anti-corrosive construction materials. COOPER.—See I.

See also A., Jan., 19, Analysis by X-ray emission spectra (SCHREIBER). 22, X-Ray investigations of copper amalgams (KATOH). 43, Equilibria in reduction, oxidation, and carbonisation processes in iron (SCHENCK and others). 45, Electrolysis of metallic oxides (ANDRIEUX). 47, Extraction of germanium (PUGH). 53, Separation of lead and bismuth (COLLIN). 54, Separation of platinum metals and alloys (WADA and SAITŌ).

PATENTS.

Roller-hearth furnace. R. M. HORTVET, Assr. to MAHR MANUF. CO. (U.S.P. 1,735,968, 19.11.29. Appl., 28.9.28).—A furnace for the heat treatment of rounded

steel articles comprises a longitudinal furnace chamber provided with transverse I members above the refractory bottoms, these members carrying a number of rollers of varying diameter so as to support castings of different sizes and to prevent buckling while they pass through the furnace. A. R. POWELL.

Briquetting of blast-furnace or other ferruginous dust. G. WEBER (F.P. 628,408, 2.2.27).—The materia is ground to destroy the spherical shape of the particles, mixed with carbonaceous material, ferruginous limestone, cement, tar, and other fluxes or binders, and the mixture briquetted in known manner.

A. R. POWELL.

Production of cast iron in a coke-fired blast furnace. M. NEUMARK (F.P. 629,277, 18.2.27).—The charge is smelted under such conditions that the slag obtained contains less than 10% SiO_2 , more than 30% Al_2O_3 , and is rich in lime. This is effected by adding bauxite to the fluxes, and including a proportion of ilmenite in the charge; the titania content of the latter replaces the usual silica in the slag. The resulting iron contains less than 0.5% Si, less than 0.4% Mn, not more than 0.05% S, and about 4% C. The slag is suitable for the manufacture of cement.

A. R. POWELL.

Preparation of open-hearth steel. J. P. ROBERT (F.P. 629,508, 19.2.27. Spain, 20.2.26).—Steel turnings are melted in the open-hearth furnace and a mixture of scrap steel and cast iron is melted in a cupola. The metal from the latter furnace is tapped directly into the former, and the refining finished as usual. By adding carbon to the charge in the cupola the quantity of cast iron required can be appreciably reduced.

A. R. POWELL.

Hardening of steel. S. I. SALZMAN (U.S.P. 1,732,244, 22.10.29. Appl., 29.3.28).—Thin bands of steel, such as is used for making safety-razor blades, are drawn successively through a furnace in which they are heated to the hardening temperature, a water-cooled tube in which they are cooled rapidly, a second furnace in which they are tempered, and a second water-cooled tube. In the last three treatments pressure is applied to prevent deformation.

A. R. POWELL.

Method and apparatus for annealing. O. TÂNGRÎNG, Assr. to AMER. STEEL & WIRE CO. OF NEW JERSEY (U.S.P. 1,734,697, 5.11.29. Appl., 2.4.27).—An apparatus for annealing iron or steel wire in coils comprises an annular pot filled with a mixture of fused sodium chloride and calcium carbonate into which is placed a second annular pot containing the wire coils packed in sand or similar inert material. The whole is fired in a cylindrical furnace provided with several gas burners so as to provide an even heat throughout.

A. R. POWELL.

Preservation of metallic surfaces. J. C. VIGNOS, Assr. to RUBBER SERVICE LABS. CO. (U.S.P. 1,734,949 and 1,734,950, 5.11.29. Appl., [A] 8.3.28, [B] 18.4.28).—Inhibitors for baths for pickling iron and steel comprise (A) an unsymmetrically substituted thiocarbamide, e.g., phenyl-*p*-tolylthiocarbamide, or (B) the reaction product of an aldehyde-ammonia and a substituted thiocarbamide. A. R. POWELL.

Inhibitor [for steel-pickling baths]. L. J. CHRISTMANN, Assr. to AMER. CYANAMID CO. (U.S.P. 1,734,560—1, 15.11.29. Appl., 18.9.29).—To prevent dissolution of the iron or steel during pickling a small quantity of (A) thiobenzamide or (B) a condensation product of *o*-toluidine and sulphur chloride is added to the bath.

A. R. POWELL.

Selectively controlling metal-pickling baths. J. H. GRAVELL, Assr. to AMER. CHEM. PAINT CO. (U.S.P. 1,736,118, 19.11.29. Appl., 16.7.27).—A pickling bath for removing scale from iron and steel comprises 3% sulphuric acid containing 0.5% of thiourea and 0.1% of gelatin.

A. R. POWELL.

Alloying molybdenum with iron and steel. A. KISSOCK (U.S.P. 1,736,120, 19.11.29. Appl., 15.11.27).—A pig iron containing 4–50% Mo, formed by addition of calcium molybdate or of molybdenite to the blast-furnace charge, is claimed as an intermediate agent for adding molybdenum to iron or steel.

A. R. POWELL.

Nickel-chromium-iron alloy and articles made therefrom. W. ROHN (U.S.P. 1,736,053, 19.11.29. Appl., 16.9.27. Ger., 23.11.25).—A rustless alloy for surgical instruments comprises 80–50% Ni, 10–40% Cr, 1–40% Fe, 0.2–12% Mo, and less than 0.05% C. In addition part of the above constituents may be replaced by cobalt, tungsten, and/or aluminium, so that the final alloys contain 0.2–15% W, 2–20% Co, and 0.5–6% Al.

A. R. POWELL.

Leading-in wire for glass vessels. E. FRIEDERICH, Assr. to GEN. ELECTRIC CO. (U.S.P. 1,734,900, 5.11.29. Appl., 29.10.24. Ger., 10.2.16).—A metal wire having a coefficient of expansion nearly the same as that of glass comprises an alloy of 80% Fe, 10% Co, and 10% Mo; part of the iron may be replaced by manganese and all or part of the molybdenum by tungsten.

A. R. POWELL.

Continuous copper-melting furnace. H. S. LUKENS and R. P. HEUER (U.S.P. 1,733,419, 29.10.29. Appl., 19.12.25. Renewed 16.8.29).—The furnace comprises a well-shaped hearth provided with an inclined flue through which the copper to be melted is fed into the hearth and in which it is preheated by the hot gases without being appreciably contaminated with sulphur. The hearth contains molten copper under a layer of slag, above which an oxidising atmosphere is maintained. As the slabs to be melted reach the end of the flue they fall through the slag into the hot metal below and melt immediately without contamination. The lower layer is tapped occasionally into an electric refining furnace where it is treated with a slag adapted to dissolve its oxide content.

A. R. POWELL.

Ore-flotation apparatus. H. D. HUNT (U.S.P. 1,732,893, 22.10.29. Appl., 6.8.27).—The apparatus comprises a V-shaped cell with wide, central tubes closed at the upper end and passing nearly to the bottom. Air is passed downwards into the cell through narrower tubes centrally disposed in the wider tubes and extending slightly below them so that the uprising streams of air bubbles suck the oiled pulp up through the central tubes into very short, downwardly and outwardly directed tubes from which the mixture of

pulp and air bubbles falls back into the main body of pulp outside the central tube, thus ensuring efficient aeration. Protective screens prevent the froth which forms from coming into contact with the cascading aerated streams.

A. R. POWELL.

Flotation process [for copper-zinc ores]. S. P. WARREN (U.S.P. 1,735,190, 12.11.29. Appl., 19.4.28).—In the flotation treatment, when pine oil and xanthate are used in an alkaline circuit, the addition of small quantities of copper ammonium salts inhibits flotation of the blende but accelerates flotation of the copper and precious-metal minerals.

A. R. POWELL.

Treating [sulphide] ores. Chlorinating [sulphide] ores. T. A. MITCHELL, Assr. to L. M. HUGHES (U.S.P. 1,736,659—1,736,660, 19.11.29. Appl., 11.10.26).—(A) Pyritic ores containing copper and zinc are suspended in a solution of calcium and manganese chlorides and chlorine is passed through the mixture until the sulphides are dissolved with liberation of sulphur, the manganese chloride acting as a carrier for the chlorine. After filtration the solution is treated with zinc carbonate to precipitate iron, then with zinc carbonate and chlorine to recover the manganese as dioxide. The filtrate from the latter process is treated with powdered limestone, which regenerates zinc carbonate and calcium chloride for use again. The chlorine is obtained by electrolysis of part of the recovered calcium chloride solution. (B) Lead sulphide ores are treated with chlorine in a solution of ferric and manganese chlorides, the filtered liquor is treated with litharge and chlorine to remove manganese and iron, and the lead chloride recovered by dilution and cooling after decomposition of the tetrachloride present.

A. R. POWELL.

Treatment of ores containing zinc carbonate. P. MOUTONNIER (F.P. 628,810 and 628,811, 31.1.27).—The finely-divided ore is leached with feebly acid solutions of alkali chlorides or hypochlorites or with an acid solution containing free chlorine, and the purified solution is electrolysed for the recovery of zinc and regeneration of the leaching solution.

A. R. POWELL.

[Nickel-copper-silicon] alloy and its heat treatment. M. G. CORSON, Assr. to ELECTRO METALLURGICAL CO. (U.S.P. 1,732,327, 22.10.29. Appl., 19.11.26).—An alloy of 40–80% Ni, 1.5–10% Si, and remainder copper is claimed. The Si: Ni ratio should be 1: 7–28. The preferred composition is 70% Ni, 26.5% Cu, and 3.5% Si. After quenching from 900° the alloy age-hardens at 500–700°.

A. R. POWELL.

Soldering of chain and ring-mesh fabrics. E. THOMA, Assr. to E. G. BEK (U.S.P. 1,732,317, 22.10.29. Appl., 4.9.24. Ger., 10.9.23).—The chain or mesh is plated with successive layers of the constituents of the desired solder, *e.g.*, with copper, silver, and zinc or cadmium, then heated slowly to allow these layers to diffuse into one another and finally to melt the solder into the joints.

A. R. POWELL.

Metal alloy [silver-copper] for electrical contacts. H. M. FREDRIKSEN (U.S.P. 1,732,839, 22.10.29. Appl., 31.5.27).—The alloy comprises 80% Ag and 20% Cu, the copper being used in the form of the nodules which

form on the cathode during the electrolytic refining of copper. A. R. POWELL.

Purification of aluminium and its alloys. ELEKTRIZITÄTSWERK LONZA (F.P. 628,495, 5.2.27. Ger., 8.2.26).—Aluminium containing calcium, carbides, or the like is treated with a slag containing alumina, which reacts with the impurities. A. R. POWELL.

Solder for aluminium and its alloys. E. D. DEHAESE (F.P. 628,802, 24.4.26).—An alloy of 45% Zn, 45% Sn, 3.5% Cu, 3.5% Sb, and 3% Pb is claimed. A mixture of this alloy with 5% of sodium chloride and 3% of stearin is rubbed on to the cleaned parts which have been preheated to 250°. A. R. POWELL.

[Aluminium alloy] piston and its manufacture. G. D. WELTY, ASSR. to ALUMINUM CO. OF AMERICA (U.S.P. 1,732,573, 22.10.29. Appl., 2.8.24).—An alloy of aluminium with 10% Cu, 0.25% Mg, and 1.25% Fe is cast into shape and annealed, without cold-working or quenching, at 150–315° for 2–60 hrs. A. R. POWELL.

Cyanide process of treating ores containing precious metals. P. C. SCHRAPS (U.S.P. 1,734,306, 5.11.29. Appl., 16.1.25).—The ore pulp is subjected to diminished pressure to remove dissolved air, cyanide is added, and the mixture either aerated with oxygen or treated with a compound which evolves oxygen readily in alkaline solution. The method is especially suitable for ores containing silver sulphide. A. R. POWELL.

Electroplating with chromium on other metals, especially iron. A. E. HARDY (F.P. 629,423, 30.4.26).—The metal to be plated is first coated with a thin deposit of tin, cadmium, or lead, or an alloy of these metals, and then plated as usual with chromium. A more efficient protection against rusting is thus obtained. A. R. POWELL.

Production of agglomerates of ores, mineral, etc. P. JUNG (U.S.P. 1,739,839, 17.12.29. Appl., 5.7.23).—See B.P. 200,524; B., 1924, 985.

Machine for mixing two or more substances with each other. H. ERIKSSON (U.S.P. 1,740,166, 17.12.29. Appl., 9.11.27. Swed., 16.6.27).—See B.P. 287,016; B., 1928, 372.

Extraction of volatilisable metals from ores and metallurgical products. H. PAPE, ASSR. to F. KRUPP GRUSONWERK A.-G. (U.S.P. 1,736,665, 19.11.29. Appl., 19.4.27. Ger., 26.4.26).—See B.P. 252,679, B., 1927, 583.

Magnetic [alloy] material and appliance. G. W. ELMEN, ASSR. to BELL TELEPHONE LABS., INC. (U.S.P. 1,739,752, 17.12.29. Appl., 28.12.27. U.K., 29.8.27).—See B.P. 297,938; B., 1928, 899.

Manufacture of tools of tungsten. O. DIENER (U.S.P. 1,740,009, 17.12.29. Appl., 20.3.28. Ger., 19.1.28).—See B.P. 294,086; B., 1928, 716.

Working up mixed shavings of white metal and red metal. A. SCHWARZ (U.S.P. 1,739,992, 17.12.29. Appl., 10.6.27. Austr., 5.5.26).—See B.P. 270,740; B., 1928, 610.

Forming an electrically insulating and anti-corrosive oxide coating on aluminium material.

S. SETOH and S. UEKI, ASSRS. to ZAIDAN HOJIN RIKAGAKU KENKYUJO (U.S.P. 1,735,509, 12.11.29. Appl., 22.10.26. Jap., 30.10.25).—See B.P. 226,536; B., 1925, 725.

Rotary drum machines [for foundry sand] (B.P. 322,405). [Alloy steel for] pressure vessel (B.P. 322,702).—See I. Heating furnace (U.S.P. 1,735,866). Separation of ores (B.P. 305,102). Magnetic cores (U.S.P. 1,733, 592). Cathodes for electron-discharge devices (B.P. 316,536). Composite metallic body (U.S.P. 1,733,813).—See XI.

XI.—ELECTROTECHNICS.

Cone-fusion [electric] muffle furnace for high-temperature work. H. N. BAUMANN, JUN. (J. Amer. Ceram. Soc., 1929, 12, 740–741).—A laboratory muffle furnace for temperatures up to at least 1600° consists of a small muffle made of "refrax" bricks (recrystallised silicon carbide), heated by two slotted graphite electric resistors. Powdered petroleum coke is filled into the furnace to protect the resistors from oxidation and to act as a heat insulator. A variable-voltage transformer is a necessary part of the equipment. F. SALT.

Alternating-current electrolysis of water. J. W. SHIPLEY (Canad. J. Res., 1929, 1, 305–358; cf. A., 1928, 245, 1337).—Electrolysis of water takes place in many types of commercial hot-water heaters and steam generators operated with alternating current. As the hydrogen-oxygen mixture thus produced is highly diluted with steam at the point of generation there is little danger of explosion until most of the steam has condensed; in electric steam generators feeding steam accumulators a separate chamber should therefore be provided so that condensation takes place before the steam enters the accumulator. Current density is the primary factor in the alternating-current electrolysis of water at low voltages, and there is a critical current density for metal electrodes below which no gas is evolved, but above which all the current is utilised in the decomposition of the water according to Faraday's law for alternating current. This critical density varies with the temperature of the water, with the metal of the electrode, and with the periodicity of the current. For silver it is 1.6, for platinum 0.7, copper 1.9, oxide-coated copper 10, steel 4.5, soft iron 3.8, nickel 4.6, and aluminium <0.01 amp./cm.² The electrolytic capacity of the electrode is constant for copper, but varies with the quarter-wave area for platinum and silver; with a constant area the capacity decreases to a minimum with increasing frequency. With high-voltage currents decomposition of water may also occur thermally by arcing effects which are quite independent of alternating-current electrolysis, the rate of decomposition depending on the rate of consumption of electrical energy. Arcing is prevented by increasing the hydrostatic pressure in the neighbourhood of the electrodes; the arcing current decreases hyperbolically with increasing voltage when the area of the electrodes is kept constant, and increases with the diameter of the electrodes when the voltage is kept constant. The practical application of the results of the investigation to commercial boilers and heaters is discussed and recommendations are made for their safe operation. A. R. POWELL.

Determination of chlorides in zinc dross. JOAS-SART and LECLERC. **Chromium plating.** ALTER and MATHERS.—See X. **Determination of moisture.** LAMPE.—See XIX.

See also A., Jan., 44, **Preparation of hydroxylamine** (STSCHERBAKOV and LIBINA). 45, **Electrolysis of metallic oxides** (ANDRIEUX). **Electrolytic oxidation of ether** (MARIE and LEJEUNE). **Reduction of arylarsinic acid** (NAKADA). 53, **Separation of lead and bismuth** (COLLIN). 56, **Photo-cells and their application** (MARTON and ROSTAS). 87, **Reduction of aromatic acids** (SOMLO).

PATENTS.

Electric furnace. F. W. BROOKE, Assr. to W. SWINDELL & BROS. (U.S.P. 1,735,419, 12.11.29. Appl., 2.6.28).—The furnace, which has a hearth of greater length than breadth, is provided with two sets of movable electrodes supported on one side and arranged along its greater dimension, each set taking current from opposite ends of the furnace, which is capable of a tilting movement about its major axis.

F. R. ENNOS.

Non-oxidising [electric] heating furnace. G. KELLER, Assr. to A.-G. BROWN, BOVERI & Co. (U.S.P. 1,735,866, 19.11.29. Appl., 13.5.26. Ger., 30.5.25).—The furnace comprises a cylindrical heating chamber heated internally by a wire resistance and provided with a tightly fitting lid sitting in a liquid seal. An outlet pipe from the lid dips into a sump at the lower end of a brickwork pit in which the furnace is built. The articles to be annealed are placed in the heating chamber, which is then closed and filled with carbon dioxide. During the heating operation the gas is partly expelled into the sump and on cooling is sucked back into the chamber, thus preventing oxidation of its contents.

A. R. POWELL.

[Thermal fuse for] electric furnaces. L. W. WILD, and WILD-BARFIELD ELECTRIC FURNACES, LTD. (B.P. 322,975, 20.3.29).—A two-pole switch controlling the fuse circuit is operated by opening and closing the furnace door, both poles of the fuse being "dead" when the door is opened.

J. S. G. THOMAS.

Gas-treating devices for enclosed electrical apparatus. A. G. ELLIS, H. DIGGLE, and ASSOCIATED ELECTRICAL INDUSTRIES, LTD. (B.P. 321,513, 27.9.28).—Water taken up from air or other gas admitted to the casing of the electrical apparatus is deflected by spouts, baffles, etc. into a collecting tray or funnel communicating with a U-tube forming a seal separate and distinct from the main "breather" trap or seal, so that the water is continuously drained off without coming into contact with the liquid in the "breather" seal.

J. S. G. THOMAS.

Deoxidising apparatus for use with oil-immersed electrical apparatus. ASSOCIATED ELECTRICAL INDUSTRIES, LTD., Assees. of C. A. STYER (B.P. 309,138, 3.4.29. U.S., 5.4.28).—In apparatus in which an inert atmosphere is maintained in the gas space of a tank containing an electrical, oil-immersed apparatus, a coherent block of solid deoxidising material is held in operative relation with a heating element during consumption

of the block. Such material may be prepared by adding a binder, *e.g.*, partly carbonised sugar, and about 1% of cobalt chloride, manganese chloride, sodium chloride, sodium sulphate, or potassium iodide to granular charcoal from which ash-forming constituents and hydrogen have been removed.

J. S. G. THOMAS.

Electromagnetic separation of complex ores. BRIT. THOMSON-HOUSTON Co., LTD., Assees. of J. A. SEEDE (B.P. 305,102, 30.1.29 U.S., 30.1.28).—Crushed gangue and ore flows through a magnetic field generated by coreless coils energised by alternating current the frequency of which is considerably beyond that of commercial supplies.

J. S. G. THOMAS.

Manufacture of magnetic cores. F. J. GIVEN, Assr. to BELL TELEPHONE LABS., INC. (U.S.P. 1,733,592, 29.10.29. Appl., 6.2.29).—In making dust cores of permalloy, dust of an alloy containing more nickel than is desired is mixed with the dust of an alloy containing too little nickel in such proportions that the mass has the desired composition. The mixed dust is then annealed, the mass again pulverised, and the dust formed into cores as usual.

A. R. POWELL.

X-Ray tubes. BRIT. THOMSON-HOUSTON Co., LTD., Assees. of W. D. COOLIDGE (B.P. 298,987, 17.10.28. U.S., 18.10.27).—X-Ray tubes fitted with a metal window which is protected against bombardment by reflected electrons are claimed. [Stat. ref.]

J. S. G. THOMAS.

Vacuum tube. K. OKABE (U.S.P. 1,735,294, 12.11.29. Appl., 11.5.26. Jap., 5.3.26).—The tube contains auxiliary aluminium anodes coated with nickel and tungsten oxides.

J. S. G. THOMAS.

Electric-discharge tube. S. G. S. DICKER, From N. V. PHILIPS' GLOELAMPENFABR. (B.P. 321,438, 9.7.28).—In a rectifying discharge tube filled with a gas or vapour, *e.g.*, argon, neon, or helium, and a small proportion of another gas or vapour, *e.g.*, 0.025% of mercury vapour, having an ionisation voltage lower than the excitation voltage of a metastable state of the principal gas, the electric field near the anode is stronger than that near the cathode.

J. S. G. THOMAS.

Cathodes for electron-discharge devices. A. JUST (B.P. 316,536, 26.11.28. Austr., 30.7.28).—Molten iron is alloyed with one or more alkali, alkaline-earth, or rare-earth metals, *e.g.*, with potassium or lanthanum; the alloy is mechanically worked with iron and annealed in an inert atmosphere to make it more ductile, and then finally drawn into wire.

J. S. G. THOMAS.

[Heating of electrodes of electric] discharge tubes. ÉLECTRO MATÉRIEL, P. HINSTIN, and A. LEHMANN (F.P. 629,551, 6.5.26).—Electrodes are heated by radioactive material contained in a capsule.

J. S. G. THOMAS.

Production of composite [metallic] body. [Filament for radio valves.] J. W. MARDEN and H. C. RENTSCHLER, Assrs. to WESTINGHOUSE LAMP Co. (U.S.P. 1,733,813, 29.10.29. Appl., 1.8.21).—The filament comprises a molybdenum wire coated with a film containing finely-divided thorium, zirconium, uranium, titanium, or vanadium as electron-emitting material, and pow-

dered aluminium, magnesium, chromium, or a rare-earth metal as the getter. A. R. POWELL.

Accumulator. L. BAROSSO (F.P. 631,126, 18.3.27. Ital., 19.3. and 15.5.26).—The negative plates, made of material which is not attacked by caustic alkali solution and mercury, are coated with zinc amalgam; the positive plates are made of Ag_4O_3 , CuO , $\text{Ni}(\text{OH})_2$, etc. and an alkali solution is used as electrolyte. Reactions which occur during charging and discharging are: $3\text{ZnHg}_x + 6\text{NaOH} + \text{Ag}_4\text{O}_3 \rightleftharpoons 3x\text{Hg} + 3\text{Zn}(\text{ONa})_2 + 4\text{Ag} + 3\text{H}_2\text{O}$. The operative voltage of the accumulator is 1.83–1.53 volts. J. S. G. THOMAS.

Accumulator. A. PETIT (F.P. 629,921, 28.2.27).—Negative electrodes formed of metals, *e.g.*, iron, nickel, or more especially zinc, which form soluble chlorides (and, if desired, sulphates) and do not decompose water, and insoluble positive electrodes composed of, *e.g.*, lead chloride, lead sulphate, cuprous chloride, mercurous chloride, or silver chloride, are immersed in water. Thus the accumulator may be prepared by passing a current between a copper electrode and a copper-lined iron vessel containing a solution of zinc chloride.

J. S. G. THOMAS.

Manufacture of electric batteries. A. HELBRONNER and E. DURT (B.P. 295,589, 13.8.28. Fr., 11.8.27).—An insoluble ferricyanide, *e.g.*, of zinc, copper, or silver, is used as depolariser in a cell having an electrode of zinc or other metal occupying a place above carbon, platinum, copper, etc. in the electrochemical series, and having zinc chloride or a double cyanide of zinc and an alkali metal, caustic soda, calcium chloride, etc. as electrolyte.

J. S. G. THOMAS.

Secondary electric cells. L. A. LEVY, and ALMEIDA ACCUMULATORS, LTD. (B.P. 320,916 and 321,405, [A] 27.4.28, [B] 3.5.28).—(A) Cells comprising an acid electrolyte containing salts of two or more different halogens other than fluorine, a cathode at which zinc is deposited during charging, and a conducting anode, *e.g.*, of graphite, substantially unattacked by the electrolyte, embedded in carbonaceous (graphite) granules contained in a low-resistance porous envelope capable of withstanding the bursting stresses set up in working are claimed. The apparent volume of the granules is large (*e.g.*, 10:1) compared with that of the anode. (B) In a cell comprising a cathode, *e.g.*, of Ironac or Tantiron, preferably roughened and coated with mercury, in an electrolyte (zinc chloride and zinc bromide), during charging a halogen (or halogens) is (are) evolved at the anode, and zinc which is deposited at the cathode is completely removed during discharge, the anode being associated with excess of halogens.

J. S. G. THOMAS.

Graphite and depolariser plates for galvanic cells. SIEMENS & HALSKE A.-G., Assees, of K. SCHENKEL (B.P. 299,784, 30.10.28. Ger., 31.10.27).—A layer of perforated material, *e.g.*, linen or paper acting as carrier for electrolyte, is pressed upon a layer of depolarising material placed upon a layer of carbon.

J. S. G. THOMAS.

Production of printing plates by electrochemical processes. C. SCHINZEL (B.P. 291,063, 25.5.28. Czechoslov., 25.5.27).—Soluble layers of gelatin or similar

colloids are partially tanned either by the direct action of an electric current (5–100 volts) on substances incorporated therein, or indirectly by reaction with substances produced by electric or electrolytic action on other incorporated substances, *e.g.*, sodium or calcium chloride, sodium nitrate, chlorates, vanadates, etc. Alternatively, the process may be applied to rendering tanned layers of gelatin etc. soluble. J. S. G. THOMAS.

Electric-discharge tubes. C. J. R. H. VON WEDEL (B.P. 307,424, 5.3.29. U.S., 7.3.28).

Heated filament for thermionic valves. S. LOEWE (B.P. 295,637, 13.8.28. Ger., 15.8.27).

Anode battery [with interchangeable dry batteries]. M. SCHMIDT (M. SCHMIDT ELEKTROTECHNISCHE & METALLWARENFABR.) (B.P. 322,852, 26.10.28).

Thermal treatment of pulverulent material (B.P. 305,231). **Rotary drum machines** (B.P. 322,405).—See I. **Conductivity of charcoal** (G.P. 454,855).—See II. **Mixtures of nitrogen and hydrogen** (B.P. 322,701).—See VII. **Zinc ores** (F.P. 628,810–11). **Alloy for electrical contacts** (U.S.P. 1,732,839). **Chromium plating** (F.P. 629,423).—See X.

XII.—FATS; OILS; WAXES.

Solidification curves of cacao butter. J. D. VAN ROON (Chem. Weekblad, 1929, 26, 619–620; cf. Straub and Malotaux, B., 1930, 109).—The difference in form of the two types of cooling curve obtained for cacao butter is ascribed to supercooling; there is no reason to suppose that the same glyceride will begin to separate first in every case, but even if that were so, different heat effects may still be expected in different cases. A note by STRAUB is appended. S. I. LEVY.

Manufacture of ghee substitutes. W. NORMANN (Chem. Umschau, 1929, 36, 337–339).—The purification, colouring, etc. of ghee substitutes are discussed. The particular granular consistency desired is obtained by regulated cooling of the fat mixture; it is only necessary, however, to control the cooling rate until the minimum on the cooling curve (of usual type) is reached, although the fat at this point is still liquid, the speed of cooling after this point being immaterial. Crystal aggregates may be isolated for examination by spreading a thin layer of fat on a porous plate and keeping it for a day over light petroleum. E. LEWKOWITSCH.

Chemical engineering in a modern stearic acid plant. T. R. OLIVE (Chem. and Met. Eng., 1929, 36, 720–723).—Pressed fats and tallows, after blending, are cleaned by means of an acid wash and hydrolysed with Twitchell's reagent in dilute sulphuric acid, a mixture almost universally adopted. Boiling for 5 hrs. produces 85–90% hydrolysis, at which stage the reagent is renewed and hydrolysis attains 95–97% during a further period of 10 hrs. Dehydrated stearic acid for distillation is run into cast-iron stills of two-piece construction, which are usually coal-fired, and under the action of superheated steam the pure acids volatilise and are condensed in cooled copper drums, the whole process being maintained under vacuum. The acid is cooled in a cascade of aluminium or granite pans and the solidified cakes, each separately wrapped, are

subjected to a pressure of 3000 lb./in.² which forces out a large part of the oleic acid. A further process of hot-pressing and boiling with dilute sulphuric acid yields the highest quality of stearic acid. Glycerin is recovered from the liquors by known methods.

C. A. KING.

Drying oils. XI. Unimolecular films of blown and heat-bodied oils and their constituent fatty acids and esters on water surfaces. J. S. LONG, W. W. KITTELBERGER, L. K. SCOTT, and W. S. EGGE (Ind. Eng. Chem., 1929, **21**, 950—955; cf. B., 1929, 442).—The characteristics of such films when floated on water surfaces and subjected to compression in a modified Langmuir surface-tension balance were observed. The results are tabulated, graphed, and fully discussed. Oxidised oils occupy a greater area per mol. on a water surface than do heat-bodied oils of the same mol. wt. They also require a larger compressive force to crumple the unimolecular film. A method for the direct synthesis of glycerides etc. of saturated and unsaturated acids is described in which a stream of inert gas, converted by means of a rapidly rotated whizzer into a very large number of minute bubbles, is introduced into a mixture of the theoretical amounts of acid and alcohol maintained at 100—225°, the water of reaction being effectively removed. S. S. WOOLF.

Oxidation processes of drying oils. III. S. MERZBACHER (Chem. Umschau, 1929, **36**, 339—342; cf. B., 1928, 678).—Oxidised boiled linseed oil ("Hobum") films were saponified in the cold and then extracted successively with cold water and with light petroleum. In the first case the products were azelaic acid, water-soluble oxyn-acids II (cf. Eibner and others, B., 1925, 679, 930), glycerin, small amounts of formic, propionic, and hexoic acids, and an undefined residue (total 25%), and in the second an extract (20%) containing higher saturated acids from the original oil, unchanged unsaturated acids, together with pelargonic, azelaic, and hexoic acids. The residue on being boiled with water gave a further supply of azelaic acid and left 26.3% of resinous oxyn-acids I. The large proportion of azelaic acid among the products is notable, but only a small proportion can have existed in the free state in the linseed before saponification. Octoic acid was again absent (cf. Part II, *loc. cit.*). Probably considerable quantities of the lower volatile fatty acids had been lost during the drying of the oil. E. LEWKOWITSCH.

Vegetable oils of the Union of S.S.R. IV. Nature of oils of Palmæ in connexion with the climate of district of origin. S. IVANOV and Z. P. ALISSOVA (Chem. Umschau, 1929, **36**, 401—403; cf. B., 1929, 987).—A liquid oil (64.08%) was obtained from the kernels of *Cocos Bonetti* grown in Suchum (northern limit of distribution of the coco-palm) which had acid value 0.7, saponif. value 259.65, iodine value 23.6, thiocyanogen value 19.78; it consisted therefore of the following glycerides: linoleic 4.41%, oleic 18.54%, saturated 77.9%. These figures illustrate the theory that the proportion of unsaturated acids in a vegetable oil and its degree of unsaturation increase with the severity of the climate of origin. Hydrogenation of

the Suchum oil yields a satisfactory substitute for coconut oil. E. LEWKOWITSCH.

Oil content of sunflower seeds. N. USPENSKI (Masloboino-Zhir. Delo, 1928, No. 6, 31—40).—The oil content decreases with the increase in nitrogen content of the soil above the limit required for the maximal growth of leaves. The humidity must not be below a similar limit. CHEMICAL ABSTRACTS.

Relation of bulk density, size, and colour of mustard seeds to their oil content. V. MILASHEVSKI (Masloboino-Zhir. Delo, 1928, No. 9, 10—12).—The bulk density of mustard seeds is not a measure of their oil content. Large seeds yield oil and cake of higher quality than that from small seeds. CHEMICAL ABSTRACTS.

Kepayang oils. C. D. V. GEORGI and G. L. TEIK (Malayan Agric. J., 1929, **17**, 392—397).—The seeds of Pokok kepayang (*Pangium edule*, Reinw.; N. O. *Flacourtiaceae*) contained 8.7% of kernels which yielded 44.5% of moisture and 24.8% of a yellow oil of pleasant odour. Although the plant is closely related to the genus *Hydnocarpus*, the oil is optically inactive. The (extracted) oil had: d_{15}^{30} 0.9132, n_D^{30} 1.4660, saponif. value 196.5, iodine value (Wijs) 108.3, acid value 0.2, unsaponifiable matter 0.6%; the fatty acids had: titer value 20.4°, mean mol. wt. 280.3, iodine value (Wijs) 111.1. The kernels contained a tannin and a cyanogenetic glucoside. Akar kepayang (or Akar klappayang; cf. Gimlette, "Malay Poisons and Cures," p. 140) (*Hodgsonia capricarpa*, Ridley; N. O. *Cucurbitaceae*) seeds (20% of fresh fruit) yielded 9.6% of kernels containing a cyanogenetic glucoside and a light yellow non-drying oil of nutty odour. A small quantity of stearine was deposited after keeping a few days. The (pressed) oil had (cf. *ibid.*, 1913—14, **2**, 67; 1923, **11**, 39): d_{15}^{30} 0.907, n_D^{30} 1.4613, saponif. value 201.2, iodine value 67.1, acid value 3.6, unsaponifiable matter 0.4%; and the fatty acids: titer value 42.1°, mean mol. wt. 272.6, iodine value 68.2. The oil is entirely different from that obtained from *P. edule*. E. LEWKOWITSCH.

Allanblackia Stuhlmannii seeds from Tanganyika territory. ANON. (Bull. Imp. Inst., 1929, **27**, 455—457).—The kernels of the seeds (av. wt. 10.6 g., 22.6% shell) of *Allanblackia Stuhlmannii* gave, on extraction, 66.5% of a white, almost odourless fat having: d_{15}^{100} 0.8549, n_D^{40} 1.457, m.p. 40.0°, solidif. pt. of fatty acids 60.0°, acid value 9.9, saponif. value 189.6, iodine value (Wijs) 39.6%, unsaponifiable matter 0.76%. The residual meal had: moisture 13.9%, crude proteins 14.9%, fat 1.4%, carbohydrates (by diff.) 58.6%, crude fibre 7.7%, ash 3.5%. It contained no alkaloids or cyanogenetic glucosides, but a small amount of tannin was present which imparted an astringent taste. Its nutrient ratio was 1:4.2 and it had food units 99.4. E. H. SHARPLES.

Catalyst for hydrogenating oils. A. MOSHKIN (Masloboino-Zhir. Delo, 1928, No. 10, 16—17).—Regenerated nickel catalyst must be cooled in hydrogen or carbon dioxide. Sulphur is less poisonous than arsenic. CHEMICAL ABSTRACTS.

Influence of air on activity of catalysts used in hydrogenating oils. A. BAG (Masloboino-Zhir. Delo,

1928, No. 5, 6).—Reactivated nickel does not lose its activity when kept in air for 1 month, provided it is treated with carbon dioxide directly after exposure to hydrogen.

CHEMICAL ABSTRACTS.

Hydrogenation of linseed oil. V. VASILEV (Masloboino-Zhir. Delo, 1928, No. 7, 9—11).—Owing to the reduction of hydroxyl groups formed during the oxidation process, slightly deteriorated linseed oil absorbs more hydrogen than can be accounted for by the decrease in the iodine value.

CHEMICAL ABSTRACTS.

Oil analysis. S. KETTLE (Chemist-Analyst, 1929, 18, No. 5, 7).—For the determination of saponif. value, the oil (5 g.) is dissolved in benzyl alcohol (15 c.c.), the free acid being titrated using phenolphthalein as indicator; benzyl-alcoholic potassium hydroxide is added, the mixture boiled under reflux for 5 min., and the excess titrated. Bromine values are determined in carbon tetrachloride solution using potassium bromide, a little potassium iodide, and a known quantity of potassium bromate, shaking, and titrating the excess of bromine with sodium hydrogen sulphite solution. For the chlorine value the sample is treated with a saturated solution of phenyl iodochloride in carbon tetrachloride, the excess of chlorine being titrated with silver nitrate. For the determination of acid values a mixture of benzene (90%) and alcohol (10%) is preferred to alcohol. Brief heating with concentrated nitric acid is employed as a colour test for mineral oils.

CHEMICAL ABSTRACTS.

Determination of iodine value by Margosches' rapid method. S. YUSHKEVICH (Masloboino-Zhir. Delo, 1928, No. 9, 22—28; No. 10, 31—35).—The results agree with those obtained by the methods of Hübl and Hanus. The excess of iodine must reach 65%.

CHEMICAL ABSTRACTS.

Distillation of nut shells. GEORGI and BUCKLEY.—See II.

See also A., Jan., 92, **Saponin from seed kernels of *Achras sapota*, L.** (VAN DER HAAR).

PATENTS.

Recovery of fats and oils. J. A. S. VAN DEURS (B.P. 303,413, 11.12.28. Denm., 2.1.28).—The p_H of the raw material is altered, by the addition of acid (and water as required) or of acid-forming micro-organisms, until it is below 5, whereby the fatty matter is caused to coalesce as a continuous phase and separates easily as the material is shaken, stirred, or treated by centrifugal action. The material may previously be ground or warmed to liquefy the fat.

E. LEWKOWITSCH.

Production of [pale, fatty] organic acids. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 321,399, 6.7.28).—Crude fatty acids, obtained by the oxidation of solid paraffin hydrocarbons, wax, etc., are submitted to a pressing or sweating treatment at slightly elevated temperatures, which, however, are below the m.p. of the pure acids (e.g., at 12—13°). The solid, pale residue (m.p. 45—48°) will furnish pale soaps.

E. LEWKOWITSCH.

Manufacture of unsaturated fatty acids. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 322,437,

30.8.28).—The crude oxidation products of paraffin wax are distilled, preferably under reduced pressure, and/or in the presence of an inert gas, e.g., carbon dioxide, steam, whereby the hydroxycarboxylic acids are converted into long-chain unsaturated acids.

E. LEWKOWITSCH.

Production of sulphoaromatic fatty acids. G. PETROV (G.P. 456,353, 19.5.25).—Crude oleic acid or sunflower seed oil and naphthalene or benzene are treated as in B.P. 252,212 (B., 1927, 348). The sulphoaromatic fatty acids in the form of their neutral alkali salts are suitable as washing, wetting-out, or fat-splitting agents, and can be used for the esterification of acids and alcohols, acetylation of cellulose, condensation of phenols and aldehydes, and in the leather industry.

E. LEWKOWITSCH.

Saponifying free fatty acids contained in vegetable and animal oils and fats with alkali solutions *in vacuo*. W. GENSECKE (B.P. 321,080, 26.11.28).—The free fatty acids are saponified by alkaline solutions at approximately uniform low temperatures in a vacuum, the intensity of which is constantly increased (by means of a steam injector interposed between the neutralisation vessel and the steam condenser), until the soap produced is converted by dehydration into a state in which it may be separated from the fat by filtration.

E. LEWKOWITSCH.

Obtaining fatty acids wholly or almost wholly free from unsaponifiable matter. OEL- U. FETT-CHEMIE GES.M.B.H. (B.P. 296,079, 29.6.28. Ger., 26.8.27).—Such fatty acids (up to 99.6% pure) are obtained by distilling split (waste) fatty acids (e.g., bone, cotton oil soap-stock fatty acids), with the exception of tall oil, in a high vacuum with or without fractionating attachments.

E. LEWKOWITSCH.

Soap. H. E. CROCCO (U.S.P. 1,733,150, 29.10.29. Appl., 8.6.27).—The detergent comprises a base of 2—10 pts. of water-soluble soap with 1 pt. each of a non-volatile liquid, detergent hydrocarbon, a fatty sulphonated compound, and sodium sulphate.

E. LEWKOWITSCH.

Manufacture of detergents. RÖHM & HAAS A.-G. (F.P. 630,409, 7.3.27. Ger., 12.3.26).—Stable detergents containing pancreatic enzymes are prepared from comparatively dry materials, so that the products contain not more than 10% of water, by compressing into blocks mixtures of dry soap and dried pancreas; softening agents (sodium oxalate), salts of bile acids, and alkali salts may also be added.

L. A. COLES.

Cooking and agitating apparatus for extracting oil from palm fruit. DUCHSCHER & CIE. SOC. EN COMM. (B.P. 303,497, 27.10.28. Ger., 6.1.28).—The cooker is fitted with a hollow double bottom, with openings for the admission of steam and the withdrawal of condensed liquors, and with a rotating agitator; a secondary agitating unit is provided which may be brought into action if required.

E. LEWKOWITSCH.

Treatment of mustard oil-containing seeds prior to extraction of the oil by pressure. L. MELLERSH-JACKSON. From F. KRUPP GRUSONWERK

A.-G. (B.P. 322,681, 21.1.29).—The cleaned and ground material is moistened with a small quantity (2½%) of water, or water acidified with, *e.g.*, sulphuric (1/1000), hydrochloric, or citric acid, and thoroughly mixed for 20–45 min. until uniformly moist before pressing. A highly pungent oil is thus obtained. E. LEWKOWITSCH.

Manufacture of lanolin-like compositions. R. HAUSCHKA, Assr. to G. RICARDO (U.S.P. 1,728,205, 17.9.29. Appl., 24.9.25).—A natural ester, *e.g.*, castor oil, beeswax, or pine rosin, is heated with an aldehyde or ketone, *e.g.*, formaldehyde, acetone, and the resulting oil separated and cooled. A metal or a metallic oxide, *e.g.*, iron, or nickel oxide, may be added as a catalyst, and an oleaginous hydrocarbon as a diluent.

F. G. CLARKE.

Imparting (A) a black or (B) a stone colour to leather polish. S. H. DENNINGTON (B.P. 322,969 and 322,970, 7.3.29).—The usual mixture of oils and fats used in the polish is coloured with a mixture of (A) iron calcium phosphate, powdered ivory black, and pure carbon black, or (B) lithopone, barium sulphate, iron oxide, and ivory black.

H. ROYAL-DAWSON.

Manufacture of products resembling [natural] wax. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 320,854, 16.7. and 15.10.28).—Montan wax bleached by oxidation, or a conversion product thereof, is subjected to a short treatment with oxygen, alone or in conjunction with hydrocarbons (*e.g.*, paraffin wax), fatty materials (*e.g.*, castor oil), resins, or waxes, etc., preferably in the presence of oxidising catalysts; the free carboxyl groups produced may be esterified, *e.g.*, by glycol. (Cf. B.P. 296,145, 305,552, 308,996, and 315,283; B., 1928, 779; 1929, 273, 425, 804).

E. LEWKOWITSCH.

Production of esters of saccharides of higher unsaturated fatty acids. L. ROSENTHAL and W. LENHARD, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,739,863, 17.12.29. Appl., 28.10.24. Ger., 10.11.23).—See G.P. 411,900; B., 1925, 642.

Purifying oils (U.S.P. 1,732,371).—See II.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Determination of degree of "chalking" of paints. R. KEMPF (Farben-Ztg., 1929, 35, 650–652).—The significance of "chalking" as a stage of failure of paints is discussed. The usual method of observing chalking, *i.e.*, rubbing the finger tip over the surface, is shown to be subject to various inaccuracies. The method of applying damp, black paper to white paints, using a definite pressure in a suitable apparatus (details of which are given), was developed. After trials of various black materials, *e.g.*, filter paper, various textiles, developed photographic paper, the last-named was found the most satisfactory. Chalking is rated by the amount of whitening of the paper, and five arbitrary grades are defined and illustrated by photographs, as are the results of typical tests according to this method. For paints other than white, the damp paper applied must be of a suitably contrasting colour.

S. S. WOOLF.

Detection of benzene in varnishes. E. H. JACKSON (Chemist-Analyst, 1929, 18, 15).—The fraction b.p. 65–100° is washed and nitrated; the nitrobenzene is reduced with zinc and hydrochloric acid, the aniline being liberated with sodium hydroxide and detected with bleaching powder. Toluene does not interfere.

CHEMICAL ABSTRACTS.

Can shellac be substituted by cellulose lacquer for wood polishing? R. FREUND (Farben-Ztg., 1929, 35, 653–654).—Cellulose wood-finish is dearer than French polish in initial cost, and its consumption per unit area of wood is greater. Nevertheless, owing to its rapidity and ease of working, it is the more economic proposition. Both are equally subject to shrinkage, a fault that is shown to be dependent on the wood and not on the finish.

S. S. WOOLF.

Waste lithopone. STROKOV.—See VII.

See also A., Jan., 45, **Oxidation products of ether** (MARIE and LEJEUNE). 57, **Fossil resin** (CORTELEZZI). 79, **Amorphous resins and lacs from s-triphenylbenzene** (VORLÄNDER and others). 81, **Chromotrope CR lakes** (ROSENHAUER and others).

PATENTS.

Preparation of pigments and the like. J. W. C. CRAWFORD, G. E. SCHARFF, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 318,937, 9.3.28 and 9.1.29).—Water is removed from water-wet pigment pastes by adding to the paste a non-reactive and substantially non-miscible liquid, *e.g.*, benzene, toluene, and subsequently heating the mixture, the water being distilled off in azeotropic mixture with the non-reactive liquid. The latter is removed from the condensate by suitable means, *e.g.*, in an automatic separator, and returned to the wet pigment, the process being repeated. In place of benzene etc. a mixture of this with ethyl alcohol may be used, in which case the ternary condensate is allowed to settle and the upper layer (mainly benzene) is separated and returned to the still. If higher alcohols be used, a water-benzene mixture distils over first and the alcohol is recovered subsequently by distillation. The speed of dehydration may be increased by agitating the mixture and by the addition of a small amount of a suitable wetting, dispersing, or emulsifying agent. The dehydrated suspension prepared as above may be finally dried below 50° at normal or under reduced pressure, and may be reduced to a very fine state of division with moderate grinding. High-boiling solvents, *e.g.*, tricresyl phosphate, and softening agents, *e.g.*, castor oil, may be introduced originally, or at any intermediate stage.

S. S. WOOLF.

Manufacture of white lead. E. C. WALKER, Assr. to NAT. LEAD Co. (1,732,490, 22.10.29. Appl., 1.8.21).—In the American modification of the Dutch process of making white lead the lead grids are laid on the inclined floor of a spiral stack in order to relieve the overburden on the lower grids and prevent collapse of the charge when corrosion is nearly complete.

A. R. POWELL.

Producing pigmentary base products for lead paint. A. V. BLOM (U.S.P. 1,736,066, 19.11.29. Appl., 5.4.27).—An alloy of 85% Pb, 13% Sb, and 2% Sn

is melted in a flat pan-shaped hearth under a layer of calcium resinate equal to 0.5% of the weight of alloy, and a slow current of air is drawn through the metal from numerous small tuyères in the hearth of the furnace by applying suction to an opening in the cover.

A. R. POWELL.

Manufacture of oil lacquers and varnishes. I. G. FARBENIND. A.-G. (B.P. 296,679, 296,991—2, [A] 3.9.28, [B, c] 7.9.28. Ger., [A] 2.9.27, [B, c] 10.9.27).—Oil varnishes (paints) with high lustre, good covering power, and good brushing properties are obtained by incorporating in the customary raw materials a small quantity (about 3%) of (A) an aliphatic carboxylic acid unsaturated in the $\alpha\beta$ -position, *e.g.*, crotonic, acrylic, and sorbic acids, or their halogen, hydroxy-, or alkyl substituted derivatives; or (B) a monobasic hydroxy-carboxylic acid of the type $R'\text{-CH(OR)CO}_2\text{H}$, where R and R' denote a hydrogen atom, or alkyl, aryl, or aralkyl groups, or esters or salts thereof, *e.g.*, tolyloxy-acetic acid, glycollic acid; or (C) an amide of a carboxylic acid (or carbonic acid) or *N*-substitution products, *e.g.*, methylolbutylurethane, methylolbenzamide. It is possible to incorporate in such varnishes considerably more pigment than is allowable by the customary manner of working.

E. LEWKOWITSCH.

Manufacture of lacquers, filling or priming compositions, etc. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 322,466 and 322,537—322,543, [A—H] 2.6.28).—Such coating compositions, are based on mixtures of nitrocellulose (A—D) or lower fatty acid esters of cellulose (E—H) with synthetic resin condensation products of aliphatic dibasic acids with polyhydric alcohols (A, E), aromatic dibasic acids with polyhydric alcohols containing 4—6 hydroxyl groups in their molecule (B, F), aromatic dibasic acids with glycols (C, G), aromatic dibasic acids with hydroxyalkyl ethers of polyhydric alcohols containing 3 hydroxyl groups in their molecule (D, H).

S. S. WOOLF.

Preventing the deposition of driers in linseed oil varnishes. I. G. FARBENIND. A.-G. (B.P. 299,361, 13.9.28. Ger., 24.10.27).—The linseed oil to be used for the varnish is prepared (before or after the addition of the driers) by admixing the oxides (or hydroxides, carbonates, or metals) of calcium, magnesium, zinc, or cadmium in amount at least equivalent to the free fatty acids of the oil (*e.g.*, 0.1—0.5% as a rule) and heating to about 100°; the soaps formed are removed by filtration.

E. LEWKOWITSCH.

Protective coating. J. E. THOMAS, ASSR. to CHICAGO WHITE LEAD & OIL Co. (U.S.P. 1,733,564, 29.10.29. Appl., 20.1.26).—An article coloured with a red aniline-dye stain has a protective coating, comprising a varnish vehicle and a sufficient quantity of an organic pigment, *e.g.*, paranitraniline-red, litho-red, toluidine-red, or madder-lake, to give the same colour as the stain and to prevent fading.

F. G. CLARKE.

Liquid coating composition [varnish for paper shells]. W. H. WOODFORD, ASSR. to REMINGTON ARMS Co., Inc. (U.S.P. 1,733,177, 29.10.29. Appl., 10.9.27).—Paraffin-coated cartridge cases are dipped in a 25% solution of an ester gum (glyceride of colophony or

copal) in acetone. A perfectly waterproof coating is obtained in a few seconds after exposure to the air.

A. R. POWELL.

Purifying and decolorising rosin with resorcinol. NEWPORT Co. (B.P. 294,526, 15.6.28. U.S., 25.7.27).—Resorcinol is added to a heated solution of rosin in a solvent relatively immiscible with resorcinol, *e.g.*, petroleum naphtha. On agitation and cooling, the resorcinol mass containing the impurities and colouring matter originally present settles out, and the purified rosin solution is decanted off and subjected to distillation. The resorcinol is recovered by water-extraction.

S. S. WOOLF.

Phenolic resin and its manufacture. G. W. MILLER, ASSR. to BAKELITE CORP. (U.S.P. 1,717,614, 18.6.29. Appl., 1.3.27).—Cresol is condensed at 110° with furfuraldehyde in presence of lime or other basic condensing agent; the fusible resin produced is then incorporated with a non-reactive fusible resin, preferably a phenolic resin, and a further addition of lime at 150° is made, together with stearic acid or other lubricating agents.

R. BRIGHTMAN.

Production of phenolic condensation products. F. KURATH, ASSR. to ECONOMY FUSE & MANUF. Co. (U.S.P. 1,726,671, 3.9.29. Appl., 19.2.26).—Phenol-aldehyde "resoles" in the fusible stage, containing enough aldehyde (etc.) to yield a hard resin on heating, are treated with sufficient furfuramide to fix this aldehyde (etc.) within the mass in substantially non-volatile and reactive form.

C. HOLLINS.

Mouldable resin composition containing a fabric filler. BAKELITE CORP., ASSEES. of C. L. CHAMBERLIN (B.P. 316,275, 31.8.28. U.S., 27.7.28).—The material comprises a woven fabric, *e.g.*, coutil, impregnated with a fusible resinous binder (which may be a reactive phenolic resin) and divided into dry flakes of sizes (*e.g.*, $\frac{1}{8}$ — $1\frac{1}{2}$ in. \times $\frac{1}{8}$ — $1\frac{1}{2}$ in.) small enough to allow flow in the mould and large enough to prevent the flakes sticking in irregular masses; the cut pieces of fabric are impregnated in a kneading machine with a solution of the resin and dried. The laminated moulded products have a high shock-resistance.

E. LEWKOWITSCH.

Manufacture of plastic masses. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 322,496, 6.9.28).—The liquid acid portion, insoluble in light petroleum, of an oxidation product of paraffin hydrocarbons, waxes, etc. is esterified at 150—220° with organic compounds containing at least two hydroxyl groups in the molecule, *e.g.*, glycols, glycerol, dextrose, mixed, if desired, with organic unsaturated or hydroxy-acids or glycerides thereof, *e.g.*, linoleic acid, ricinoleic acid, plastic masses being thereby obtained. The acids may be treated with siccatives, *e.g.*, lead oxides, or with sulphur before or during the heat treatment.

S. S. WOOLF.

Manufacture of plastic masses. SINIT A.-G. (G.P. 455,551, 5.12.23).—Residues from the distillation of natural resins, or oils with b.p. above 350° obtained in tar distillation, are heated with sulphur, an inert material, *e.g.*, asbestos, and an excess of the condensation products of acetylene. The resulting plastic masses

are suitable for purposes of electrical or heat insulation. A. R. POWELL.

Synthetic plastic material. C. A. NASH, J. P. TRICKEY, and C. S. MINER, Assrs. to QUAKER OATS CO. (U.S.P. 1,736,047, 19.11.29. Appl., 13.1.23).—A mixture of 94 pts. of phenol and 104 pts. of furfuraldehyde with 1% of sodium carbonate as an activator is heated just below the b.p. until a stiff, plastic mass is produced. This is cooled, thinned by the addition of more furfuraldehyde, mixed with asbestos, moulded, and heated at 80–230° until it sets to a hard mass. A. R. POWELL.

Softening and rendering impervious materials composed of casein treated with formaldehyde or of cellulose derivatives. G. JAKOVA-MERTURI and J. A. POGGIOLI (B.P. 291,765, 7.6.28. Fr., 8.6.27).—Materials composed of casein treated with formaldehyde, or cellulose derivatives, e.g., cellulose acetate, celluloid, are softened and rendered impervious by treatment with a hot solution comprising one or more hypochlorites of the alkali metals and an alkali hydroxide, and subsequently with a hot solution of colophony and sulphur (preferably 10% of each) in an oil or fat. While soft and hot the materials may be moulded etc.; on being cooled in cold water the products harden immediately without incidence of brittleness. S. S. WOOLF.

Moulding mixture. L. V. REDMAN, Assr. to BAKELITE CORP. (U.S.P. 1,732,533, 22.10.29. Appl., 9.11.26).—The material is made by mixing casein 1 pt., carbamide 1 pt., paraformaldehyde 1 pt., ethylene glycol 0.4 pt., water 0.5 pt., and concentrated ammonia solution 0.13 pt., in a ball mill and passing the product through differential sheeting rolls whereby a tough, plastic mass is obtained. A. R. POWELL.

Carbon pigment (U.S.P. 1,730,389).—See II. Artificial cork (B.P. 322,752).—See V.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Interfacial energy between rubber and filling material. F. HARTNER (Kolloidchem. Beih., 1929, 30, 83–108).—A calorimeter for the measurement of the heats of swelling and of wetting of rubber in benzene is described. The physical properties of rubber are improved by the addition of a filling material such as lamp-black, zinc oxide, basic magnesium carbonate, or kaolin, and the effect of the filling material depends on the interfacial energy between the rubber and the filler. Using the apparatus described, a method is devised for calculating this value from measurements of (a) the heat of swelling of raw rubber in benzene, (b) the heat of wetting of the filling material by benzene, and (c) the heat of swelling of the mixture in benzene. The mechanical properties of rubber containing different amounts of filling material have also been examined. The heat of swelling of rubber increases with the age of the preparation. E. S. HEDGES.

See also A., Jan., 53, Determination of minute amounts of copper (CALLAN and HENDERSON). 91, Quebrachitol from serum of *Hevea* latex (LEVI).

PATENTS.

Manufacture of rubber compositions. J. H. REEL and H. E. CUDE, Assrs. to NAUGATUCK CHEM. CO. (U.S.P. 1,735,547, 12.11.29. Appl., 23.5.27).—An emulsion of 100 pts. of water in 15 pts. of spindle oil and 5 pts. of stearic acid is mixed at 65–90° with 100 pts. of masticated crêpe rubber in an emulsifying machine to obtain a viscous dough, which is treated with sufficient alkali to combine with the stearic acid, whereby the emulsion reverses to one of the oil-in-water type and changes from a sticky mass to a smooth, velvety product resembling concentrated latex. A. R. POWELL.

Manufacture of accelerators for rubber vulcanisation. GOODYEAR TIRE & RUBBER CO., Assees. of J. TEPPEMA (B.P. 303,827, 31.10.28. U.S., 10.1.28).—2-Thiolbenzthiazole ("mercaptobenzthiazole") is combined with nitrosodimethylaniline or nitroso- β -naphthol by melting together the ingredients. The product, (R·S)₂NR', is a vulcanisation accelerator.

C. HOLLINS.

Preservation of rubber. GOODYEAR TIRE & RUBBER CO., Assees. of A. M. CLIFFORD (B.P. 309,161, 29.1.29. U.S., 7.4.28).—The substantially non-accelerating reaction product of sulphur and an amine, particularly a secondary arylamine, is incorporated in rubber as a preservative agent. This type of product contains the grouping $S < \begin{smallmatrix} R \\ R' \end{smallmatrix} > NH$, where R and R' are hydrocarbon radicals. Thiodiphenylamine, thiophenyl- β -naphthylamine, and thio- $\beta\beta$ -dinaphthylamine are mentioned. D. F. TWISS.

Manufacture, from latex, of an artificial gutta-percha and a non-hygroscopic rubber. E. S. ALI-COHEN (U.S.P. 1,739,566, 17.12.29. Appl., 10.9.28. Holl., 20.1.27).—See B.P. 313,373; B., 1929, 652.

XV.—LEATHER; GLUE.

Chrome tanning. IX. Effect of rendering chrome-tanning liquors basic with sodium carbonate. E. STIASNY, E. OLSCHANSKY, and S. WEIDMANN (Collegium, 1929, 565–574).—Normal chromium salts were rendered basic by calculated amounts of sodium hydroxide and carbonate and the basicity of the product was determined by the usual method and also by oxidising and precipitating with barium chloride. In the usual method the boiling during the acid titration removes some of the carbonate groups from the carbonato-complexes, thus giving a higher basicity figure. By the precipitation method the basicity figures were 25% (calc. 33%) and 47.1% (66.6%). The oxidation method is applicable to basic chromium chloride and nitrate solutions only. For basic carbonato-chromium sulphate liquors, a portion of the liquor is boiled with a measured quantity of N-ammonia solution and N-ammonium chloride and about 6.8 g. of barium chloride, filtered into 30 c.c. of N-hydrochloric acid, diluted to 1 litre, and 100 c.c. of the filtrate are mixed with formaldehyde and titrated with 0.2N-sodium hydroxide. From the titration figure thus obtained the total acid radicals in the chrome liquor can be calculated and the

actual basicity determined. Close agreement has been shown between this formaldehyde titration method and indirect methods of determining the carbonate and sulphate ions in the complex salts. The more basic the carbonato-chromium sulphate compound, the greater is the difference between the basicity figure as given by the usual method of determination and the actual basicity as obtained by the formaldehyde titration method. These differences diminish slowly on ageing such liquors, but rapidly by boiling. The carbonato-chromium complexes change into hydroxo-complexes, hence the differences between rendering the chrome liquor basic with sodium hydroxide and carbonate, respectively, disappear. The carbonato-complexes are not formed to the same extent if the chrome liquor is vigorously stirred during the addition of the sodium carbonate solution, or if the chrome liquor is boiled before adding the sodium carbonate. Less carbonato-complex is formed with chromium sulphate than with chromium chloride solutions. Less carbonato-complex is formed in a chromium chloride solution to which sodium sulphate has been added. D. WOODROFFE.

The Luckhaus quick-tanning process. L. JABLONSKI (Collegium, 1929, 574—578).—The pelts are suspended from the upper cover of a cylindrical vessel which may revolve on an axis passing through the cylinder to the bottom end. The upper cover is provided with pipes leading to a pump; the lower end is fitted with inlet and exit tan-liquor pipes and with a heating device. The upper cover carrying the pelts is fitted into the cylinder, which is then evacuated, whereby liquor is drawn in from the bottom. The tan liquor is maintained clear by filtration, and a quick tannage ensues. The efficacy of this and other quick-tanning processes is attributed to the opening up of the pelt fibres rather than to evacuation of the pelt itself. Alcohol-dehydrated pelt tans quickly until the pores are filled; tannage then ceases. Synthetic tannins tan more quickly than natural tannins, but they do not give weight. D. WOODROFFE.

Rapid method of determining the chromium in used chrome [tanning] liquors. F. FEIGL, K. KLANFER, and L. WEIDENFELD (Collegium, 1929, 589—594).—A quantity of the filtered chrome liquor sufficient to contain about 0.02—0.04 g. Cr is mixed with 10 c.c. of 20% sodium hydroxide solution and 25—30 c.c. of saturated bromine water, boiled for 5 min. until pure yellow in colour, 10 c.c. of a 2% solution of potassium thiocyanate are added, and the mixture is boiled for a further $\frac{1}{2}$ —1 min. The chromium in the product is then determined iodometrically. In presence of iron the solution is acidified with phosphoric acid, otherwise sulphuric acid is employed. Acidification should follow addition of the potassium iodide solution, otherwise momentary reduction will occur. The method is applicable to the determination of chromium in chrome-tanned leathers. The excess of hydrogen peroxide in these oxidation processes can also be removed by boiling the oxidised chrome liquor with 5 c.c. of a 5% solution of nickel nitrate for 3 min., but this method is not as good as the other for liquors containing a large amount of dissolved protein matter. D. WOODROFFE.

Determination of insoluble matter in tannin extracts. E. STIASNY (Collegium, 1929, 578—583).—Very wide variations in the results are obtained in the determination of insoluble matter by the filter-paper and filter-candle methods owing to the influence of the method of dissolving the extract for analysis. It is extremely difficult to ensure that different analysts shall dissolve the extract in exactly the same way. Much better concordance has been obtained by the sedimentation method of determining the insoluble matter. The vessel in which the tannin solutions are cooled should contain 10 litres of water for each flask placed therein, not more than six of which should be present. Water kept at 18°, with as little variation as possible, should be allowed to flow through the container at such a rate that it would fill the container in 10—12 min. at most. The flasks should be 10 cm. apart, be immersed in water up to the neck, and be moved about during the first 15 min. D. WOODROFFE.

Tanning value of *Anogeissus latifolia* leaves. ANON. (Bull. Imp. Inst., 1929, 27, 452—455).—Examination of three samples of leaves from *Anogeissus latifolia* ("Dhawa"), grown in India, gave: moisture 12.3—14.0%; insoluble matter 33.7—44.5%; extractive matter (non-tans) 10.0—13.8%; tannin 32.2—38.5%; ash 3.9—4.4%; tintometer readings (solution containing 0.5% of tannin in 1-c.c. cell), red 1.5—1.9, yellow 4.9—6.5. Leather produced by the three samples was similar and of light colour and good quality. E. H. SHARPLES.

Determination of proteolytic bating enzymes. M. BERGMANN and O. DIETSCHKE (Collegium, 1929, 583—589).—The bating material (10 g.), after digestion with 500 c.c. of water for 30 min. at 18° with frequent shaking, is filtered and 25 c.c. of the clear filtrate are mixed with 75 c.c. of a 15% solution of ammonium sulphate, the mixture is heated for 15 min. in a water-bath at 35°, a specially prepared, grey gelatin strip is immersed in the preparation for 20 min., then washed in running water, and dried with alcohol, and the bleaching of the colour is compared with that of standard strips treated with enzyme preparations of known concentration, from which that of the particular bating material can be deduced. D. WOODROFFE.

Utility of the Zeiss step-photometer in tannery laboratories. A. KÜNTZEL (Collegium, 1929, 549—560).—The relative proportions of normal colour, white, and black can be obtained by examining coloured black or white leathers with the Zeiss step-photometer. It can also be used for colorimetrically determining the concentration and purity of dye solutions, and the colour value of vegetable tan liquors. Its suggested use for measuring the brightness of the glaze on a leather is not good. It can be used to show the relationship between constitution and colour of different chrome and vegetable tanning solutions, and with the addition of a nephelometer it can be used to determine the precipitation point of chrome tanning liquors. D. WOODROFFE.

Viscosity measurements as a method of testing glues. E. SAUER and O. BOCK (Z. angew. Chem., 1929,

42, 1176—1178).—The viscosities of mixtures of solutions of two grades of glue in various proportions are less than those of its constituents, supposing a linear relation to exist. The viscosity of glue solutions decreases rapidly when they are kept at 100°, the final values for various samples being from 40 to 72% of their initial viscosities.

J. A. V. BUTLER.

Kepayang oils. GEORGI and TEIK. *Allanblackia Stuhlmannii* seeds. ANON.—See XII.

See also A., Jan., 33, **Hydrophile properties of collagen** (MEUNIER and LE VIET).

PATENTS.

Printing plates (B.P. 291,063).—See XI. **Leather polish** (B.P. 322,969—70).—See XII.

XVI.—AGRICULTURE.

Soil profile studies. II. Methods used in the profile survey of New Jersey soils. J. S. JOFFE and L. L. LEE (Soil Sci., 1929, 28, 469—479; cf. Joffe, B., 1929, 730).—Factors of importance in the examination of soil profiles are discussed. Methods of sampling for volume-weight determinations and for the physical and chemical examination of individual horizons are presented.

A. G. POLLARD.

Biochemical and biophysical factors in forest soils. D. FEHÉR and S. VAGI (Bot. u. Forstl.-Chem. Inst. kön. ung. Hochschule Berg- u. Forstingen. Forstl. Vers., Sopron, 1926, 28; Proc. Internat. Soc. Soil Sci., 1929, 4, 259—261).—The carbon dioxide content of forest air is greater than that of the free atmosphere, but decreases with the height above ground to about 8—10 m., where it approximates to that of the free air. Soil acidity is less important in forest soils than in arable areas, and only becomes injurious when acid humus and peat begin to be formed. At this stage the p_H value of the soil is sufficiently low to cause injury to the trees. Bacterial numbers decrease with soil p_H values, there being an accelerated depression at about p_H 4.0. The proportion of carbon dioxide in the air layer immediately in contact with the soil surface is directly related to bacterial activity.

A. G. POLLARD.

Microflora of forest soils. R. BOKOR (Bot. Inst. kön. ung. Hochschule Berg- u. Forstingen. in Sopron, Forstl. Vers., 1926, 28; Proc. Internat. Soc. Soil Sci., 1929, 4, 257—258).—Bacteria in forest soils are less numerous than in similar soils under cultivation, although the number of species represented is not markedly different. Soil reaction largely controls the number of organisms present. In soils of similar p_H value, bacterial numbers increase with the humus content and air capacity of soils, and these two factors are sufficient to explain differences in bacterial flora of soils bearing different species of trees. The absolute water capacity of a soil increases directly with the proportion of soil particles less than 0.5 mm. in diam. The absolute air capacity increases with the proportion of particles greater than 2.0 mm. in diam. and decreases as the number of particles of 0.01 mm. in diam. increases. Under similar physiological conditions bacterial numbers vary in-

versely as the number of soil particles of 0.01 mm. in diam. An increase in the latter leads to a predominance of anaerobic bacteria and the occurrence of soil acidity. Free nitrogen-fixing organisms tolerate a greater degree of acidity in forest soils than in cultivated soils. The number of pectin- and cellulose-destroying organisms varies inversely with the absolute air capacity of the soil. Among anaerobic organisms butyric acid-producing types exist in considerable numbers. Nitrifying organisms are restricted by the acid reaction of the soil and are dominated numerically by denitrifying species. Active bacterial activity occurs to a depth of 50—60 cm. below the soil surface.

A. G. POLLARD.

Microflora of Hungarian alkali soils. R. BOKOR (Mikrobiol. Lab. Bot. Inst. kön. ung. Hochschule Berg- u. Forstingen. Forstl. Vers., Sopron, 1928, 30, 206—209; Proc. Internat. Soc. Soil Sci., 1929, 4, 251).—Methods for the examination of alkali soil microflora are described. Solonetz soils have a characteristic flora (with a predominance of actinomycetes) which is not altered by the usual ameliorative processes applied to these soils. Highly organic manures are valuable on such soils.

A. G. POLLARD.

Physical and chemical examination of Danish heath soils, with special reference to the colloid and nitrogen contents. F. WEIS (Kgl. Danske Vidensk. Selskab. Biol. Medd., 1929, 7, 9; Proc. Internat. Soc. Soil Sci., 1929, 4, 254—257).—Among the many soils examined fertility was generally associated with a high proportion of fine particles. Light dressings of lime, insufficient to increase the p_H value of the soils, caused a rapid increase in ammonification and nitrification for a short period. The nitrogen content of the humus decreased with increasing depth from the surface. During the podsolisation of heath soils, sols of alumina, ferric hydroxide, and silica are formed and carried downward, being subsequently precipitated as gels to form a hardpan. Ferric hydroxide sol is precipitated first, followed in order by alumina and silica. Fertility decreases with the extent of podsolisation. The amount and distribution of inorganic colloids is a measure of the value of these soils for cultivation.

A. G. POLLARD.

Nature of acidity of mineral soils. S. OSUGI (Proc. III Pan-Pacific Sci. Cong., 1926 [1928], II, 1960—1971).—The inversion of sucrose by mineral acid soils is attributed to the surface action of soil particles; the p_H of the aqueous extract is not sufficiently low. The clay extract has a higher p_H than that of the coarser parts, and a higher p_H exists in the adsorbed water film of the soil.

CHEMICAL ABSTRACTS.

I. **Microbiological analysis of soil fertility.**

II. **Rôle of phosphorus in nitrogen fixation.**

III. **Microbiological determination of the soluble**

phosphate requirement of soils. J. ZIEMIECKA (Rocz. Nauk Roln. i Leśnych, 1929, 21; Proc. Internat. Soc. Soil Sci., 1929, 4, 239—240).—I. The "direct" method of Winogradsky for examining microbiological processes in soils allows of precise measurements of the phosphate and lime requirements of soils by means of the activity of *Azotobacter*.

II. The amount of easily soluble phosphate utilised by *Azotobacter* per unit of nitrogen fixed decreases with

the amount of phosphate available. The minimum amount of phosphate necessary per 20 mg. of nitrogen fixed and per 2 g. of mannitol decomposed is 9.39 mg. P_2O_5 in the form of potassium dihydrogen phosphate. The phosphorus of tricalcium phosphate and of basic slag is utilisable by the organisms to a limited extent.

III. On phosphate-deficient soils the activity of *Azotobacter* is increased by phosphatic fertilisers. This forms a basis for the measurement of the phosphate requirement of non-acid soils. A. G. POLLARD.

Permeability of soils. GANOSSIS (Compt. rend. Acad. d'Athènes, 23.11.28; Proc. Internat. Soc. Soil Sci., 1929, 4, 236—237).—Treatment of soils with sodium chloride, nitrate, or carbonate rendered them impermeable at varying periods after treatment. This effect was reversed by subsequent treatment with chloride, nitrate, or sulphate of calcium, chloride or nitrate of potassium, or with hydrochloric or nitric acid. Repeated dressings of organic manures tend slowly to diminish soil permeability. Clay soils treated with potassium carbonate acquire properties more resembling those of sandy soils. A. G. POLLARD.

Freezing, thawing, and soil humidity in woods and fields. N. A. KATSCHINSKY (Proc. Sci. Res. Inst. Physico-math. Fac., 1st Moscow State Univ., 1927; Proc. Internat. Soc. Soil Sci., 1929, 4, 232—236).—The nature of the thawing process in soil together with the soil-water movements accompanying it are discussed. A. G. POLLARD.

Development of the phenomenon of soil drought. L. S. LITVINOV (Agric. Exp. Sta. Perm, No. 2, 1928; Proc. Internat. Soc. Soil Sci., 1929, 4, 246—250).—Plant injury during drought is not a characteristic of any particular soil-moisture content, but arises when the water-holding power of the soil just exceeds the suction force of the plant roots as demonstrated by the cessation of "bleeding" from the cut stem of the plant. The decrease of moisture content of soils under constant climatic conditions is paralleled by the amount of plant "bleeding," and by examining the latter the period of drought injury to the plant may be forecast. The moisture content at which plant injury begins varies with the soil type and the species of plant. A. G. POLLARD.

Measurement of carbon dioxide production in soils. D. FEHÉR (Bot. Inst. Roy. Hung. High Sch. Eng. Mines and Forests in Sopron, 1927, 29, 237—243; Proc. Internat. Soc. Soil Sci., 1929, 4, 228—229).—Lundegårdh's bell apparatus is adapted for measuring the carbon dioxide respiration of soils. A. G. POLLARD.

New apparatus for the mechanical analysis of soils by displacement. J. H. GOLLAN (Bull. Soc. Chim. biol., 1929, 11, 940—942).—An apparatus is described whereby analyses of soils are effected to comply with the standard of the International Soil Conference (Washington). C. C. N. VASS.

Influence of increasing amounts of calcium sulphite and sulphate on the germination and young development of grain plants. K. SCHARER and W. SCHROFF (Landw. Versuchs-Stat., 1929, 108,

217—251).—Experiments on the yield of wheat, rye, barley, and oats are recorded.

CHEMICAL ABSTRACTS.

Stimulating effect of external applications of copper and manganese on certain chlorotic plants of the Florida Everglades soils. O. C. BRYAN (J. Amer. Soc. Agron., 1929, 21, 923—933).—Copper or manganese sulphate was applied to the leaves of cow-peas or sorghum or to the soil with equal success. Plants grown on the copper-treated soil contained appreciable quantities of copper. CHEMICAL ABSTRACTS.

Increasing protein content of pasture grasses by frequent light applications of nitrogen. C. R. ENLOW and J. M. COLEMAN (J. Amer. Soc. Agron., 1929, 21, 845—853).—With frequent mowing the protein content was higher. The protein content of pasture grass can be maintained at a high level by frequent light applications of a nitrogenous fertiliser. Rainfall, rather than available soil nitrogen, is a limiting factor in forage production. CHEMICAL ABSTRACTS.

Sunn hemp. S. D. TIMSON (Rhodesia Agric. J., 1929, 26, 668—682).—*Crotalaria juncea* contains 53% H_2O ; the dry matter contains N 2.31, P_2O_5 0.26, K_2O 1.26%. The seed contains H_2O 8.6, protein 31.2, other nitrogenous compounds 3.4, fat 4.3, starch 41.1, fibre 8.1, ash 3.3%. The seed may contain an alkaloid, but does not contain cyanogenetic glucosides. CHEMICAL ABSTRACTS.

Nitrogen fixation by the root-nodule bacteria of the Leguminosæ. E. W. HOPKINS (Soil Sci., 1929, 28, 433—447).—The nitrogen-fixing power of various cultures of *Rhizobia* in the absence of a host plant was examined. No positive results were obtained. A. G. POLLARD.

Sugar beet culture on sandy soils. S. L. LOUWES, J. HUDIG, C. MEIJER, O. J. CLEVERINGA, and F. DECHERING (Z. Pflanz. Düng., 1929, 8B, 608—614).—On sandy soils sugar beet yields are largely influenced by the "lime condition" of the soil, being adversely affected by both deficiency and excess of lime. The examination of the "lime condition" and the selection of suitable fertilisers for these soils are discussed. A. G. POLLARD.

Sugar beet trials with various nitrogen fertilisers in 1928. H. RÖSSLER (Z. Pflanz. Düng., 1929, 8B, 599—605).—In the field trials recorded the efficiencies of Chili saltpetre, sodium nitrate, calcium nitrate, and a mixture of Leuna saltpetre and potassium nitrate were, in general, of the same order, but in each case the percentages of dry matter and sugar were rather higher in the case of sodium nitrate. A. G. POLLARD.

Influence of nitrogen manuring on the yields from mineral soil pastures. MÖLLER and PÖCKER (Z. Pflanz. Düng., 1929, 8B, 582—591).—Trials of meat and milk production indicate the value of the intensive pasturing system. The nature of the nitrogen fertilisers used largely affected the results obtained. Urea was rapid in action, and calcium nitrate still more rapid, but its action was short-lived. Best results were obtained with Nitrophoska. Part of the nitrogen

dressing is preferably applied in the summer. Nitrogen fertilisers ensure good pasture in dry seasons.

A. G. POLLARD.

Nitrogen manuring of fish-ponds. E. WALTER and O. NOLTE (Z. Pflanz. Düng., 1989, 8B, 605—608).—Polemical against Kuhnert (B., 1929, 448).

A. G. POLLARD.

Nutritive requirements of milch cows in relation to the composition of the milk produced. N. HANSSON (Proc. VIII World's Dairy Cong., 1928, 190—197).—The results of tests carried out over a period of 20 years are summarised.

CHEMICAL ABSTRACTS.

Potassium nitrate [as a fertiliser]. F. MÜNTER (Z. Pflanz. Düng., 1929, 8B, 591—599).—In certain cases Nitrophoska (a ternary mixture of ammonium chloride, ammonium phosphate, and potassium nitrate) showed unduly low efficiency when used with sugar beet. The physiologically acid nature of ammonium phosphate is probably responsible for this. With sugar beet on neutral or acid soils ammonium phosphate is much less effective than either superphosphate or basic slag, but on chalked, neutral soils it produced higher yields than either of these fertilisers. In pot cultures and field trials potassium nitrate proved as efficient a source of nitrogen as sodium nitrate for potatoes, tobacco, sugar beet, and barley, but slightly inferior with wheat.

A. G. POLLARD.

Nitrate changes in a fertile soil as influenced by sodium nitrate and ammonium sulphate. N. PORGES (Soil Sci., 1929, 28, 449—455).—Variations in the nitrate content of a soil rich in nitrogen following treatment with sodium nitrate and ammonium sulphate are examined. The increased nitrate contents of the soil after incubation are irregular, and may correspond either to more or less than the amount of nitrogen added. A portion of the nitrate added to soil is rapidly converted into an insoluble condition, but becomes available at later periods. The fate of this nitrogen is discussed. The sum of the nitrogen removed by crops and that removed by leaching is approximately 70—77% of that originally available. Treatment of soil with sodium nitrate or ammonium sulphate leads to the mineralisation of part of the original soil-nitrogen.

A. G. POLLARD.

Available phosphorus of soil resulting from moisture and temperature variations, Big Horn Mts., Wyoming. T. J. DUNNEWALD (J. Amer. Soc. Agron., 1929, 21, 934—936).—The available phosphorus decreases with increase in rainfall, and in the lower soil zones of all the profiles as compared with the surface zones where most of the organic matter has accumulated.

CHEMICAL ABSTRACTS.

Value of raw sewage sludge as a fertiliser. J. F. MÜLLER (Soil Sci., 1929, 28, 423—432).—Chemical analyses and pot experiments show dried, raw sewage sludge to have notable value as a fertiliser. The addition of soluble nitrogen to reduce the C : N ratio of the mixture below 8 largely increases its crop-producing power. Supplementing with phosphate and small amounts of potash appears desirable. The water-

holding capacity of sandy soils is markedly improved by treatment with sludge.

A. G. POLLARD.

Values of sewage sludge as fertiliser. KLEBERGER and T. SCHRADER (Z. Pflanz. Düng., 1929, 8B, 577—581).—Examination of the clarification sludge from the process described, both by analysis and by Neubauer's method, showed it to be a valuable general fertiliser. The contained phosphorus exists mainly in colloidal organic combination. Soils repeatedly fertilised with the sludge would probably need rather more frequent liming than normally.

A. G. POLLARD.

Chemical and microbiological principles underlying the transformation of organic matter in stable manure in the soil. S. A. WAKSMAN and R. A. DIEHM (J. Amer. Soc. Agron., 1929, 21, 795—809).—In the decomposition of stable manure the pentosans and celluloses are diminished much more rapidly, and the lignins less rapidly, than is the total organic matter. Only the soluble nitrogen undergoes rapid nitrification in the soil. The organic nitrogen present originally in the manure, and that synthesised by the micro-organisms in the compost, become available only slowly.

CHEMICAL ABSTRACTS.

Extraction of adsorbed cations from soil by electrodialysis. B. D. WILSON (Soil Sci., 1929, 28, 411—421).—The adsorption of calcium, potassium, magnesium, and aluminium from solutions of their acetates by electrodialysed soil was unaltered by previously rendering the dialysed soil alkaline with calcium or magnesium acetate. Equivalent amounts of calcium, magnesium, and potassium were adsorbed from individual solutions, and in subsequent electrodialysis calcium and potassium were removed in equivalent amounts, but in much greater quantity than was magnesium. Soil adsorbed aluminium when the clay complex was saturated with hydrogen or with calcium, but was only recovered in minute amounts by electrodialysis. Electrodialysed soil removed quantities of calcium, potassium, and magnesium from mixed solutions, equivalent to those removed from individual solutions. The degree of adsorption of the cations and the rapidity of their removal by electrodialysis were in the order $K > Ca > Mg$.

A. G. POLLARD.

Superphosphate. HALE.—See VII. **Determination of moisture.** LAMPE.—See XI. **Sunflower seeds.** USPENSKI.—See XII.

See also A., Jan., 107, **Sugar-beet pulp etc. as nutriment for swine** (WOODMAN and others). 120, **Permeability of plant-cell membranes to sugar** (IRAMDAR and VARADPANDE). **Absorption of potash and phosphoric acid by cereals in early growth** (SCHRADER). **Physiology of apples** (BROWN). **Determination of sulphur and phosphorus in plants** (BERTRAND and SILBERSTEIN). **Determination of manganese in plant ash** (GARNIER).

PATENTS.

Manures or fertilisers. E. J. BURBAN (B.P. 291,461, 2.6.28).—Treatment of rock phosphate with nitric acid (d 1.20—1.27) gives a product which, when mixed with calcium phosphate, and limestone or quick-

lime to neutralise excess acidity, is claimed to be useful as a weed-killer and fertiliser. [Stat. ref.]

E. HOLMES.

Manufacture of granular mixed fertilisers containing ammonium nitrate. J. Y. JOHNSON. From I. G. FARBERIND. A.-G. (B.P. 322,424, 21.9.28. Cf. B.P. 320,708; B., 1929, 1026).—Melts containing ammonium nitrate and, e.g., ammonium phosphate, potassium salts, but no calcium carbonate, are granulated by centrifugal spraying at a temperature 15–35° above their solidifying point. Suitable forms of apparatus are described.

L. A. COLES.

Production of fertiliser compound. A. MARTIN and J. JOHNSTON, JUN. (U.S.P. 1,733,745, 29.10.29. Appl., 28.10.26).—Humus fertiliser is made by finely grinding vegetable waste, fermenting the mass for 10–14 days in an open vat, agitating every 24 hrs. and keeping the mass warm, and mixing the product with an equal amount of sawdust.

W. G. CAREY.

Preservation of flowers, foliage, and the like. H. J. VALENTINE (B.P. 322,806, 12.9.28).—The materials are first treated with a preservative (e.g., alcoholic solution of boric acid and resin) having an acid reaction for colours red to pink or an alkaline reaction for colours blue to white. Coatings are then applied, in turn, of a waxy material, a resinous binding material, and a suitable colloid (gelatin, albumin, etc. subsequently hardened with formaldehyde). Preservatives and a filler (e.g., zinc oxide) may be incorporated in one or both of the coatings.

A. G. POLLARD.

Herbicide solution of hygroscopic chlorate. R. N. CHIPMAN (B.P. 322,438, 30.8.28. Cf. B.P. 273,268; B., 1929, 448).—Mixed aqueous solutions of sodium chlorate and rather more than the equivalent amount of calcium or magnesium chloride are claimed as useful non-drying herbicides. For use against plants of marine ancestry insufficient water to hold in solution all the sodium chloride formed is used in the manufacture.

E. HOLMES.

Treatment of phosphate rock (U.S.P. 1,736,553).—See VII. **Pest-destroying agents** (B.P. 322,179).—See XXIII.

XVII.—SUGARS; STARCHES; GUMS.

Sugar beet culture. LOUWES and others. **Sugar beet fertilisers.** RÖSSLER; also MÜNTER.—See XVI.

See also A., Jan., 36, **System strontium oxide-sucrose-water** (REINDERS and KLINKERBERG). 69, **Composition of cholla gum** (SANDS and KLASS). 72, **Starches and their amyloses** (TAYLOR and WALTON). **Structure of starch** (KARRER and VON KRAUSS). 115, **Fermentation of dextrose, lævulose, and arabinose** (PEDERSON).

PATENT.

Starch conversion product. D. J. BLOCK, Assr. to W. D. STEIN (U.S.P. 1,733,574, 29.10.29. Appl., 21.1.27).—See B.P. 282,178; B., 1928, 170.

Cellulose from sugar cane (B.P. 322,763). **Adhesive** (G.P. 455,014).—See V.

XVIII.—FERMENTATION INDUSTRIES.

High-temperature yeasts. STAIGER and GLAUBITZ (Z. Spiritusind., 1930, 53, 2–3).—Samples of sterile malt wort were seeded at 30°, 35°, 40°, 45°, and 50° with corresponding quantities of *Saccharomyces Pombe*, *S. Thermitonum*, and a distillery yeast, termed Race M, and the yields of alcohol and acid and the biological strengths of the yeasts compared after a fermentation of 72 hrs. The results differed little at 30° and 35°, and an optimal amount of alcohol was obtained at 35°. At 40° the yields of alcohol were lower and *S. Pombe* and *S. Thermitonum* were slightly more resistant than was the distillery yeast. At 45°, although less active, *S. Thermitonum* showed a marked superiority over the other two yeasts, whilst at 50° the fermentative activity of all three was destroyed. By seeding the yeasts at 25° and raising the liquid slowly to the same five temperatures as in the first experiment, the yield of alcohol and biological stability were greater, and decreased but little until 45° was reached. As before, the greater yields of alcohol at the higher temperatures were obtained with *S. Thermitonum*. At 50° the fermentative activities of all three yeasts were again reduced almost to zero.

C. RANKEN.

Influence of black mould on the production of amylase in green malt. J. DEHNICKE (Z. Spiritusind., 1930, 53, 1–2).—The occurrence of black mould may be due to weather conditions during the harvest or to damp storage of the barley. The mould generally appears on the green malt about the ninth day of growth, and by checking the production of amylase and destroying the amount already secreted, the diastatic power of the malt on the ninth day may be halved after 16 days of growth. The increase in acidity of the malt due to the mould is so small that the destruction of the amylase cannot be attributed to that cause. To minimise the loss due to the lowered saccharifying power, the malt may either be used in its short grown condition before the attack of the mould, or, if longer grown, washed with water at 25–30° before crushing. With either method the proportion of malt to potatoes in the mash will require to be raised above normal. It is preferable to treat the suspected barley by adding disinfectants such as formalin, montanin, or sulphuric acid to the steep water.

C. RANKEN.

Separation of protein-tannin during the boiling of wort. B. D. HARTONG (Woch. Brau., 1929, 46, 543–545).—The separation of hop tannin from the boiled wort was greater than that of malt tannin, and the precipitation of protein was greater with hop tannin than with malt tannin. The higher the concentration of hop tannin in the wort, the less was the content of total tannin after boiling owing to the coagulated hop tannin-protein compounds adsorbing and removing part of the malt tannin. Owing to oxidation being relatively restricted during boiling in the brewery copper the precipitation of tannin from the hopped wort was less than when the wort was boiled in laboratory experiments. A shorter duration of boiling also diminished the amount of tannin separated. The introduction into the copper of special apparatus to increase the turbulency of the boiling produced increases in the precipitation of

the protein-tannins. Under such conditions the hop tannins could be completely separated, leaving only malt tannins in solution. Such a beer is less sensitive to the influence of chilling. C. RANKEN.

Separation of fusel oil during rectification.

B. LAMPE (Z. Spiritusind., 1929, 52, 389).—Effective separation of fusel oil from the alcoholic distillate by means of added water or sodium chloride solution takes place when the content of alcohol is about 42% by wt. Under normal conditions the alcohol content of the distillate in the lowest three compartments in the rectifier varies between 40 and 45% by vol., and the spirit tapped from these compartments gives a high yield of fusel oil in the separator. Under certain conditions, depending on the composition of the mash and the working methods, the spirit from these compartments may yield little or no fusel oil owing to the concentration of the alcohol being very much less than 42% by wt., and the optimum zone for fusel oil may be reached only in the fourth and fifth compartments from the foot of the rectifier. Accordingly, to get optimum results the compartments from which to draw the alcoholic distillate during rectification should be determined in each case by practical experiment. C. RANKEN.

Development of distillation processes for producing ethyl alcohol. G. T. REICH (Chem. and Met. Eng., 1929, 36, 716–719).—Consequent on the increased price of molasses and the production of synthetic methyl alcohol, improved methods of distillation of ethyl alcohol have been necessary. The tendency has been in the direction of lower fuel consumption in the stills combined with a better recovery of by-products. Amongst the systems described are those of Barbet, Chute, and Reich. C. A. KING.

Detection and determination of formic acid and formaldehyde in vinegar. H. C. S. SNETHLAGE (Chem. Weekblad, 1929, 26, 611–612).—Reduction with magnesium ribbon under specified conditions, and application of the Schiff-Elvove test permit the detection of 0.01% of formic acid. Formaldehyde, if present, is removed by distillation after neutralisation.

S. I. LEVY.

See also A., Jan., 113, **Proteolytic enzymes of green malt** (LINDERSTRÖM-LANG and SATO). 114, **Fermentation of maize by *Clostridium acetobutylicum*** (STILES and others). **Fermentation of dihydroxyacetone** (VIRTANEN and others). 115, **Fermentation of dextrose, laevulose, and arabinose by organisms from spoiled tomato products** (PEDERSON). 121, **Amylase from *Zea mais*** (PATWARDHAN). **Enzymes from seeds of *Casalpinia bonducella*** (PATWARDHAN).

PATENTS.

Production of products from organised substances. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 322,465, 2.6., 2.11., and 8.11.28).—The cellular structure of organised substances such as yeast is decomposed by autolysis or by protracted enzymic treatment, the enzymes required being added, if necessary, in the form of bacterial cultures. After filtration of the water-soluble from the water-insoluble products, sterols and

other products are extracted from the latter by organic solvents, preferably after treatment with alkali.

C. RANKEN.

Pasteurising apparatus for beer, wine, etc.

GEBR. SCHÄFFLER MASCHINENFABR. (G.P. 456,091, 21.2.25).—The apparatus comprises a series of travelling vats which pass in succession through a pasteurising chamber. This chamber is provided with circulating vessels from which heating or cooling liquids are passed through the jackets of the vats on the countercurrent principle so as to bring the contents gradually to the correct pasteurising temperature and just as gradually to cool them again. A. R. POWELL.

Denaturant [for ethyl alcohol].

S. ISERMANN, J. W. ORELUP, and E. OHLSSON (U.S.P. 1,730,850, 8.10.29. Appl., 24.5.27).—Use of a chlorophenol, or preferably of a mixture of *o*- and *p*-chlorophenols, is claimed. F. G. CLARKE.

Butyl [alcohol] acetonic fermentation process.

W. J. EDMONDS, Assr. to COMMERCIAL SOLVENTS CORP. (U.S.P. 1,740,162, 17.12.29. Appl., 3.4.26. Renewed 24.5.29).—See B.P. 268,749; B., 1928, 345.

Separation of liquids (B.P. 304,756).—See I. **Detergents** (F.P. 630,409).—See XII.

XIX.—FOODS.

Activated milk. HOFFMAN (Proc. VIII World's Dairy Cong., 1928, 460–462).—An apparatus for the irradiation of milk with ultra-violet light without causing change of flavour is described. With raw milk, a protective gas (e.g., nitrogen) may be used, but this is superfluous with pasteurised milk in which vitamins-A and -C have already been destroyed. Experiments illustrating the prophylaxy and cure of rickets in rats by feeding activated milk are described.

CHEMICAL ABSTRACTS.

Ash and non-fatty solids content, sp. gr., and determination of refractive index of the calcium chloride serum in individual samples of milk.

L. BÉM (Proc. VIII World's Dairy Cong., 1928, 767–768).—No strict relation between the refractive index and the other values was observed. After 12–18 hrs. the average increase in the refractive index was 0.5°. In general, morning milk has a higher ash content and a smaller solids-not-fat content, sp. gr., and refractive index than has midday or evening milk.

CHEMICAL ABSTRACTS.

Reductase time and bacterial count of milk.

A. VAN RAALTE and M. M. LERNER (Chem. Weekblad, 1929, 26, 613).—The reductase time and number of bacteria show no absolute parallelism, but examination of 186 samples showed that a milk with a shorter time than 3½ hrs. has a count of more than 1 million per c.c.

S. I. LEVY.

Determination of nitrates and nitrites in whey.

E. OHLSSON and H. FREDHOLM (J. Assoc. Off. Agric. Chem., 1929, 12, 429–434).—In the absence of nitrites, nitrates in whey may be determined by extraction with ether for 60–70 hrs. in Widmark's rocking apparatus (cf. A., 1928, 96, 1064), and, after removal of residual

ether, reducing the nitric acid with a zinc-copper couple in the presence of magnesia, distilling the ammonia into boric acid, and titrating with hydrochloric acid against bromophenol-blue (cf. Scales and Harrison, A., 1917, ii, 41; 1920, ii, 386; 1921, ii, 345). If nitrite be present in addition to nitrate, nitric acid is determined by extraction as before, firstly, after removal of the nitrite by precipitation with 2:4-diamino-6-hydroxypyrimidine sulphate (cf. Hahn, A., 1917, ii, 382), and, secondly, after oxidation of the nitrite with potassium permanganate, the difference in the determinations being the nitrate originally present as nitrite. The errors in check analyses did not exceed 1.4%.

H. J. DOWDEN.

Fermentation taste of butter. A. I. VIRTANEN (Valion Lab. Julkaisuja, 1929, 12 pp.; Chem. Zentr., 1929, ii, 361).—The bacterial causes of fruity and putrefactive taste of unsalted or slightly salted butter were investigated.

A. A. ELDRIDGE.

Digestibility trials on Indian feeding stuffs. IV. Punjab hays (II). V. American and Indian cotton seeds. P. E. LANDER and L. C. DHARMANI (Mem. Dept. Agric. India, 1929, 10, 169–180, 181–192).—IV. Examination of daily nitrogen balances in feeding experiments with four hays collected from Rawalpindi, Murree, Lahore, and Amballa showed that only the last hay was of a maintenance standard for Montgomery heifers. This hay was mostly made from "Anjan grass," *Pennisetum Cenchroides*, Rich, and was relatively rich in phosphates, potash, total ash, and protein. (Cf. B., 1928, 835.)

V. American cotton seed, var. 285 F., 289 F., and 4 F., of *Gossypium hirsutum*, is richer in fat and protein than *Desi* cotton seeds (*G. indicum*). Digestibility coefficients of the various seeds do not vary very much, but the digestible starch equivalent and digestible protein per 100 lb. of cotton seed, and the protein ratio, reveal the superior value of var. 285 F., and to a smaller extent that of the other American varieties. The adhering lint on the American varieties of seed had no ill effects on the cattle used in the tests. E. HOLMES.

Detection and determination of nitrates and nitrites in meat foods. H. C. S. SNETHLAGE (Chem. Weekblad, 1929, 26, 612).—Modifications of the diphenylamine method are described for the detection. For determination of the nitrate, the colorimetric brucine method is most suitable, and of the nitrite, the Griess-Romijn reagent is suitable for a colorimetric method.

S. I. LEVY.

Simplification of analytical methods. H. C. S. SNETHLAGE (Chem. Weekblad, 1929, 26, 603–604).—It is suggested that time and expense might be saved, in the examination of foods and drugs, by the adoption of short methods known to give results having a constant relation to the results obtained by the methods legally prescribed, the latter being employed only in cases of doubt or special importance.

S. I. LEVY.

Rapid determination of moisture. B. LAMPE (Z. Spiritusind., 1929, 52, 387–388).—The moisture content of the substance is deduced from its dielectric constant, which is determined in a special form of apparatus described by the author. Advantage is

taken of the fact that the dielectric constants of starch, sugar, proteins, and fats are all less than 10, whereas that of water is relatively high, at 81. At present the method is confined to the determination of moisture in cereals, fruits, and vegetables, and the results differ by less than 0.5% from those obtained by the use of the steam drying-oven. The grain need not be ground and potatoes require only to be mashed. In the determination, which occupies only a few minutes, the substance is placed between the metal plates of a condenser, and owing to a greater quantity of the substance being used for the measurement than is possible with other methods, a better average sample with its increased accuracy is permitted.

C. RANKEN.

Composition of some Philippine fruits, vegetables, and forage plants. A. VALENZUELA and P. J. WESTER (Philippine J. Sci., 1930, 41, 85–102).

Ghee substitutes. NORMANN. *Erucastrum elongatum* seed oil. BELYAEV. *Allanblackia Stuhlmannii* seeds. ANON.—See XII. Combined sugar in egg-white. KITAMURA. Detection of saponins in food. KOFER and others.—See XX.

See also A., Jan., 118, **Vitamin-A** of head lettuce leaves (KRAMER and others). 119, **Vitamin-C** from lemon juice (GRETTE and KING). 121, **Girasole** and **chicory** (TRAUB and others). **Theosterols** of cacao (LABBÉ and others).

PATENTS.

Manufacture of butter. E. PERKS (B.P. 322,416, 25.4.29).—Cream in a thin layer is subjected to continuous vibration of suitable amplitude and frequency, churning being thereby effected. E. B. HUGHES.

Treatment of grain, cereals, flour, and the like. N. V. ELECTROCHEM. IND. (B.P. 307,426, 6.3.29. Holl., 7.3.28).—The product (grain, flour, etc.) is treated with a current of air which has been passed through a solution containing persulphuric acid and ammonium chloride.

E. B. HUGHES.

Material for improving baking processes. AKTIEBOLAGET PRACTIC Co., LTD. (G.P. 455,114, 24.8.24).—Milk containing lactic bacteria, nutrients such as ammonium sulphate, and lactose is maintained at 30–40° for 24 hrs., diastatic ferments are added, and the mixture is kept at 30–35° for a time such that the acidity does not exceed 1%. The product stimulates fermentation when used in the preparation of dough.

L. A. COLES.

Preservation or conservation of meat. H. WATKINS-PITCHFORD (B.P. 322,254, 7.9.28. Addn. to B.P. 291,818; B., 1928, 622).—The method of injection described in the prior patent is modified.

F. R. ENNOS.

Centrifugal separators [for cream]. J. and A. PERSONS (B.P. 307,075, 1.3.29. Belg., 2.3.28).

[Portable roller] mills for fine grinding [of grain]. K. BERBEKA (B.P. 322,383, 19.1.29).

XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Combined sugar in serum-albumin, egg-white, and peptone. K. KITAMURA (J. Kyoto Prefect. Med. Coll., 1927, 3, 20–24).—Serum-albumin (Kahlbaum)

contained 1.2—2.6% of combined, but no free, sugar. Egg-white contained 0.43—0.54% of free, and 0.20—0.36% of combined, sugar. Teruuchi or Witte peptone contained 0.6—1.0% of free, but no combined, sugar.

CHEMICAL ABSTRACTS.

Santonin from Scottish-grown *Artemisia*. J. COURTS (Pharm. J., 1929, 123, 603—604).—The air-dried leaves and flower-heads of *Artemisia maritima*, L. (?), grown in Scotland yielded 0.81% of santonin.

E. H. SHARPLES.

Loss of alkaloids during desiccation of plants. A. GUILLAUME (Compt. rend., 1929, 189, 706—708).—For the desiccation of *Lupinus mutabilis*, the optimum conditions which avoid loss of volatile alkaloids are stabilisation with alcohol vapour and subsequent drying at 70°. Without previous stabilisation, the highest yield of alkaloids is obtained by drying the plant at 70—80°.

A. A. GOLDBERG.

Aldehyde-oxidation reactions for phenols, particularly the opium alkaloids. C. C. FULTON (J. Assoc. Off. Agric. Chem., 1929, 12, 434—441).—An extensive study has been made of phenol-aldehyde colour reactions in the presence of strong acid, and of the modifications produced by subsequent oxidation, especially in the case of the opium alkaloids. The oxidising reagents are prepared by mixing with 3 c.c. of concentrated sulphuric acid (a) 0.5 c.c. of bromine water, (b) 1 c.c. of 10% ferric sulphate solution, (c) 1 c.c. of dilute nitric acid (5 drops of concentrated acid in 50 c.c. of water), or (d) 1 c.c. of dilute nitric acid (1:30). By mixing the aldehyde and the oxidant, a "combination" reaction occurs which reproduces the effects of the reagents when used separately. As a development of earlier work (cf. A., 1928, 1386), the "combination" reagents recommended are (i) 0.8 c.c. of 10% ferric sulphate solution added, while cooling, to 6 c.c. of Marquis' reagent (2 drops of 37% formaldehyde in 3 c.c. of concentrated sulphuric acid), and (ii) 0.8 c.c. of 10% ferric sulphate solution added to 6 c.c. of Marquis' reagent diluted about 800 times with sulphuric acid; the characteristic colours given by morphine, codeine, ψ -morphine, and papaverine are described. Alkaloids such as cotarnine or hydrastinine, which contain an aldehyde group, or those, such as narcotine, narceine, or hydrastine, which yield an aldehyde on hydrolysis, can be made to give colour reactions with phenols, particularly with ψ -morphine.

H. J. DOWDEN.

Detection of saponins in medicine and food. L. KOFLER, R. FISCHER, and H. NEWESLY (Arch. Pharm., 1929, 267, 685—699).—Strips of filter paper are covered with an alcoholic solution of cholesterol up to 3 cm. from the lower end and the alcohol is allowed to evaporate; the strip is then immersed in the solution and capillarisation allowed to take place. Any saponin present combines with the cholesterol, whilst other substances rise unaffected. The lower portion of the filter paper is washed with water, dried, and boiled for 2 hrs. with xylene, when the saponin-cholesterol compound is decomposed and the cholesterol dissolved away. The strip is then washed with ether, dried, and placed in blood-gelatin, when a hæmolytic area replaces that in which the cholesterol was present, and

no hæmolysis is produced in the remainder of the strip. The cholesterol-saponin compound is insoluble in water. This test is very sensitive and has been applied to a number of articles of food and to medicaments.

A. I. VOGEL.

Valuation of Ceylon citronella oil. A. W. R. JOACHIM (Perf. Ess. Oil Rec., 1929, 20, 475—477).—A comparison of the analyses of 15 different market grades and of six standard grades of Ceylon and Java citronella oils showed that (a) there is no relationship between the total geraniol content of Ceylon oils and their density, refractive index, and optical rotation; (b) citronella oils with very great differences in geraniol content have very different physical properties; (c) the geraniol content of Ceylon oils varies from 55% to 64%; (d) the quality of Ceylon oils judged by their geraniol contents bears little relationship to their behaviour in Schimmel's adulteration test, and that the test is unreliable since pure, unadulterated oils containing, at times, high percentages of geraniol do not pass the test. Of the 21 oils, only one passed the "raised" Schimmel's test.

E. H. SHARPLES.

Cymbopogon oils from India. ANON. (Bull. Imp. Inst., 1929, 27, 458—460).—Samples of oils distilled from *Cymbopogon clandestinus* and from a new, hitherto undescribed, species of *Cymbopogon* had the following respective constants: d_{20}^{25} 0.9319, 0.9734; $\alpha_D +45.96^\circ$, -48.67° ; n_D^{20} 1.495, 1.497; acid value 3.0, 4.9; ester value before acetylation 11.3, 10.7; ester value after acetylation 167.1, 178.1; aldehydes and/or ketones 18%, 11%; solubility in 70% alcohol at 15° 1:2.1 vols., 1:1.8 vols.

E. H. SHARPLES.

Petrolatums. TSCHERNOZHUKOV; TARASOV.—See II. **Activated milk.** HOFFMAN. **Analytical methods.**—SNETHLAGE.—See XIX.

See also A., Jan., 45, **Electrolytic reduction of arylarsinic acid** (NAKADA). 61, **Differentiation of α - and β -glycerophosphates** (FLEURY and MARQUE). 67, **Determination of citronellal** (WATERMAN and ELSBACH). 85, **Homologues of ephedrine** (FOURNEAU and SÁENZ DE BURUAGA). 87, **Homologous salols** (KRAUZ and REMENEC). 98, **Microchemical reactions for strychnine** (WAGENAAR). **Sinomenine, disinomenine, acutumine, and sinactine** (GOTO and SUDZUKI). **Microchemical test for alkaloids** (ROSENTHALER). 111, **Pharmacology of some p-hydroxybenzoic acid esters** (SCHÜBEL and MANGER). 116, **Tetraiodophenolphthalein as antiseptic and germicide** (NICKEL). **Quinoline derivative as antiseptic** (ARMITAGE and GORDON). 117, **Substitutes for insulin** (KAUFMANN). 118, **"Progynon"** (BUTENANDT). 121, **Liquorice root and extract** (HOUSEMAN and SWIFT).

PATENTS.

Manufacture of α -amino- β -arylpropionic acids and their substitution products. F. HOFFMANN—LA ROCHE & Co. A.-G. (B.P. 318,582, 4.3.29, Ger., 6.9.28).—The Erlenmeyer synthesis (A., 1893, i, 580) is shortened by the use of hydriodic acid (preferably with acetic anhydride and red phosphorus), by means of which the azlactone may be hydrolysed, the resulting benzamido-

cinnamic acid reduced, and the benzoyl group removed in one operation. The azlactone from hippuric acid and 3:5-di-iodo-4-anisoxymethylbenzaldehyde is converted by boiling with hydriodic acid (*d* 1.7), acetic anhydride, and red phosphorus into α -amino- β -(3:5-di-iodo-4-anisoxyphenyl)propionic acid, from which thyroxine is obtained by iodination. C. HOLLINS.

Manufacture of basic derivatives of substituted quinolinecarboxylic acids. SOC. CHEM. IND. IN

BASLE (B.P. 294,118, 16.7.28. Switz., 15.7.27).—4-Carboxy-derivatives of 2-hydroxy- or 2-halogeno-quinolines or 2-quinolones, or their *C*-, *O*-, or *N*-substitution products, are esterified with aminoalcohols; the halogeno-esters may subsequently be treated with a sodium alkoxide, and *O*-ether-esters may be converted into hydroxy-esters by partial hydrolysis with dilute acid. Examples are: β -diethylaminoethyl 2-hydroxyquinoline-4-carboxylate, m.p. 125–126°, and its ethyl ether, b.p. 136°/0.02 mm. [hydrochloride, m.p. 186° (decomp.); hydriodide, m.p. 157°]; β -diethylaminoethyl *N*-methyl-2-quinolone-4-carboxylate (hydrochloride, m.p. 205°); β -diethylaminoethyl 2-chloroquinoline-4-carboxylate, b.p. 140–145°/0.01 mm.; β -diethylaminoethyl 2- β -diethylaminoethoxyquinoline-4-carboxylate, b.p. 170°/0.01 mm. (hydrochloride, m.p. 217°); ethyl 2- β -diethylaminoquinoline-4-carboxylate, m.p. 36°, b.p. 135–140°/0.015 mm. (hydrochloride, m.p. 162°; hydriodide, m.p. 143°); β -diethylaminoethyl 2-alkoxyquinoline-4-carboxylates in which the alkyl group is methyl, m.p. 23° (hydriodide, m.p. 133°), *n*-propyl, b.p. 154°/0.025 mm. (hydrochloride, m.p. 138°), allyl (hydriodide, m.p. 135°), isoamyl, b.p. 165–170°/0.05 mm. (hydriodide, m.p. 124°), *n*-heptyl, b.p. 172–175°/0.01 mm., *n*-octyl, m.p. 35°, b.p. 180–182°/0.03 mm., cyclohexyl, m.p. 41° (hydriodide, m.p. 146°), and benzyl, b.p. 210–215°/0.001 mm. (hydriodide, m.p. 105°). The carboxyl group may be in other than the 4-position. C. HOLLINS.

Cigar and tobacco flavouring and moistening substances. (SIR) G. C. MARKS. From RUMDOR CORP. (B.P. 322,340, 1.12.28).—Tobacco is enclosed in a container with a flavouring agent consisting of solidified rum (e.g., 95% of rum and 5% of sodium stearate).

E. B. HUGHES.

Barbituric acid derivative. F. BOEDECKER (U.S.P. 1,739,662, 17.12.29. Appl., 21.11.25. Ger., 6.12.24).—See B.P. 244,122; B., 1927, 237.

Manufacture of 4-hydroxy-3-acetamidoaryl-1-arsonic acid. L. BENDA and O. SIEVERS, ASSTS. to I. G. FARBEIND. A.-G. (U.S.P. 1,739,820, 17.12.29. Appl., 16.7.26. Ger., 28.5.25).—See B.P. 278,789; B., 1928, 37.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Desensitising action of sodium sulphite; addition of desensitisers to developers. F. M. HAMER (Phot. J., 1929, 69, 479–480).—Solutions of sodium sulphite varying in concentration from 3.3% to 15% showed definite desensitising properties, sufficient to

account for the increased action of pinakryptol-green and safranin in sodium sulphite solution. When working with Ilford Special Rapid and Special Rapid Panchromatic plates in conjunction with metol-quinol developer, no confirmation could be obtained of the statements that safranin and pinakryptol-green act more powerfully when added to the developer (cf. Hübl, B., 1926, 612; Crabtree and Dundon, *ibid.*, 853). The preliminary bath was in fact to be preferred.

J. W. GLASSETT.

Antifogging and antisensitising effects. S. E. SHEPPARD (Phot. J., 1929, 69, 482–483).—A new representation of the combination of antifogging and antisensitising agents, such as phenazine, thioanilides, and iminazoles, with silver bromide is put forward in which it is suggested that, according to the extent of the disturbance of the electrostatic equilibrium at the interface of the silver halide with the sensitising or development nuclei, complexes of varying stability are produced by the co-ordination of the silver and halide ions at the C:N linking to form a heterocyclic ring. If the disturbance is extreme a covalent combination of higher stability may take place.

J. W. GLASSETT.

Recent advances in our knowledge of the latent photographic image. S. O. RAWLING (Phot. J., 1929, 69, 471–478).—A critical survey, together with bibliography, of the recent work on the chemical identity of the sensitivity nuclei, and the various hypotheses concerning the mechanism of the aggregation of silver at these nuclei during exposure, the nature of the latent image, the primary action of light in the formation of the latent image, and the effect of adsorbed ions on the photosensitivity of the silver halides.

J. W. GLASSETT.

Employment of by-products of saccharin manufacture in photography and photometry. W. HERZOG (Z. wiss. Phot., 1929, 27, 177–179).—The application of *p*-toluenesulphonyl chloride as a photographic developer, of esters of *p*-toluenesulphonic acid in the synthesis of sensitisers of the cyanine type, and of Chloramine as a “hypo-remover” are described.

H. F. GILLBE.

See also A., Jan., 46, **Photographic action of slow electrons** (ROSSI and BERNARDINI). 51, **Determination of iodides and bromides in chlorides** (TOMÍČEK and JÁNSKÝ). 96, **Cyanine dyes** (HAMER).

PATENTS.

Production of photographic prints. I. G. FARBEIND. A.-G. (B.P. 307,512, 9.3.29. Ger., 10.3.28).—A direct print-out material yielding full-tone negatives of the original in brown or brown-black tints is prepared by treating a suitable support, which may be coated with a gelatin layer, with a solution of the chromate of a diazo compound (monodiazotised *p*-phenylenediamine). The salt may be prepared *in situ* by successive treatments with the chromate and diazo compound solutions. The salt unchanged by the light action is readily removed without decomposition by washing in water.

J. W. GLASSETT.

Photographic printing process. O. Y. IMRAY. From I. G. FARBENIND. A.-G. (B.P. 322,430, 30.7.28).—A non-fugitive organic substance (other than a ferric salt) which is partially reduced by light action, *e.g.*, diketocompounds of anthraquinone, aminonaphthol derivatives, certain dyes, is admixed with a colloid and coated upon a suitable support. After exposure the image is physically developed by successive treatments with a solution of a silver or mercury salt and an organic reducing agent in acid solution. *E.g.*, a sensitive coating composed of sodium anthraquinone-2:7-disulphonate 2 g., gelatin 10 g., and water 100 c.c., may be developed with a 1% silver nitrate solution, followed by a solution containing *p*-methylaminophenol sulphate 0.25 g., acetic acid 3 c.c., and water 1 litre; or a coating containing a saturated solution of flavindulin-O 10 c.c., 8% gelatin solution 50 c.c., 8% chrome alum solution 1 c.c., may be used in conjunction with a 1% silver nitrate solution followed by 1% *p*-phenylenediamine solution 4 c.c., 10% acetic acid 2 c.c., water 90 c.c. Both are fixed in faintly acid 5% sodium thiosulphate solution. J. W. GLASSETT.

Kinematograph films. I. G. FARBENIND. A.-G. (B.P. 300,991, 22.11.28. Ger., 22.11.27).—For film-identification purposes, one or each margin is treated with a dye solution, *e.g.*, ultramarine (5 g.), glycol acetate (100 c.c.), cellulose acetate (2 g.). Alternatively, the margins are given a thin coating of a 1–5% solution of collodion to prevent penetration of the developing and fixing solutions, and thus provide a thin edge of unchanged silver salt. J. W. GLASSETT.

[Preparation of multi-colour screens for] colour photography. H. WADE. From COMP. D'EXPLOIT. DES PROC. DE PHOTOGRAPHIE EN COULEURS L. DUFAY ("VERSICOLOR DUFAY") (B.P. 322,432–3, 3.8.28).

Printing plates (B.P. 291,063).—See XI.

XXII.—EXPLOSIVES; MATCHES.

Microscopical examination of colloidal powders in polarised light. A. MICHEL-LÉVY and H. MURAOUR (Compt. rend., 1929, 189, 1192–1194).—Examination in the polarising microscope of numerous guncottons containing 11.7% N, and of mixtures of guncottons containing 11% and 13% N, has shown that highly nitrated cottons may be detected in mixtures from the furrowed yellow fibres parallel to the direction of stretch, as distinct from the uniform field normally obtained. In such mixtures the rate of combustion is raised (though the total nitrogen, and temperature and composition of the gases evolved, may be unchanged) owing to the formation of surface cavities by the rapid combustion of the highly nitrated portions and the consequent increase in emission surface. J. GRANT.

See also A., Jan., 74, **Salts of fulminic acid** (WÖHLER and WEBER; WÖHLER and BERTHMANN). 99, **Mercury compounds of thiophen and selenophen** (BRISCOE and others).

PATENT.

Coating composition (U.S.P. 1,733,177).—See XIII.

XXIII.—SANITATION; WATER PURIFICATION.

Reduction of biochemical oxygen demand of sewage by chlorination. H. G. BAITY and F. M. BELL (Sewage Works J., 1929, 1, 279–285).—Application of 5–7.5 pts. per million of chlorine reduced the demand by 7.4%; 8–9 pts. left 0–0.1 pt. of residual chlorine, whilst 10–15 pts. left 0.2–0.5 pt. of residual chlorine, the reduction in biochemical oxygen demand being 15.5 and 42.7%, respectively. The advantageous application of chlorine is discussed. CHEMICAL ABSTRACTS.

Zeolite water-treating system of the Beacon Street [Detroit] heating plant. J. H. WALKER and L. F. COLLINS (Ind. Eng. Chem., 1929, 21, 1020–1024).—Governing factors in the plant described were a congested site, demanding high rates of heat transfer, and nearly 100% make-up water as against 5% only in a modern power plant. Consideration of perfect elimination of scale therefore outweighed operating cost, and zeolite softeners were installed. The water leaving the softeners was dosed with 5% sulphuric acid by an automatic proportioning device. The de-aerating heaters and continuous blow-down arrangement are described. Some of the alkaline boiler-water from the blow-down was recirculated to the de-aerator to eliminate bicarbonate which was found to cause corrosion. The acid supplied contained 40 p.p.m. of sulphuric acid and 4.5 p.p.m. of phosphoric acid. After three years of work no serious difficulty has arisen, but corrosion of the zeolite tanks (probably due to carbon dioxide) has been noticed. The efficiency of utilisation of sodium chloride in regeneration is not more than 30%. Detailed analyses with p_H values and operating costs are given. (Cf. White and co-workers, B., 1927, 798.) C. IRWIN.

Air conditioning. BULKELEY.—See I. **Tar emulsions.** EADIE.—See II. **Sewage sludge as fertiliser.** MULLER; also KLEBERGER and SCHRADER.—See XVI.

See also A., Jan., 71, **Glucosides of simple and chlorinated *p*-hydroxybenzoic acids [as bactericides]** (SABALITSCHKA and SCHWEITZER).

PATENTS.

Composition for destroying noxious creatures [fumigant]. O. LIEBKNECHT (U.S.P. 1,736,448, 19.11.29. Appl., 8.1.27. Ger., 19.1.25).—A solution of chromyl chloride in carbon tetrachloride, with or without the addition of a chloronaphthalene, is claimed.

A. R. POWELL.

Manufacture of agents for combating and destroying pests. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 322,179, 27.8.28).—The agents comprise cyanides readily decomposed by moisture, *e.g.*, alkaline-earth or magnesium cyanides, together with non-reacting organic liquids (petroleum fractions, halogenated hydrocarbons, etc.), and, if desired, wetting agents and/or hygroscopic salts. L. A. COLES.

Heat exchanger for waste water (B.P. 322,366). **Air conditioning** (U.S.P. 1,735,611).—See I. **Absorptive carbon** (U.S.P. 1,736,051).—See II.