ABSTRACTS.

GENERAL AND INORGANIC CHEMISTRY.

Remarks on the Principle of Maximum Work.—M. BERTHELOT.

The author regards his recent work on the distribution of bases between HCl and HF as an additional demonstration of the value of the above principle in the prediction of chemical reactions. Two fundamental data are necessary, viz., a knowledge of the quantities of heat disengaged by the reaction within a given system and a knowledge of the dissociation which limits the reaction and determines an equilibrium. There is no absorption of heat in chemical reactions, apparent absorption is due to physical phenomena which accompany the reaction, such as change of state, dissociation, change of specific heat, etc., all of which obey the known laws of physics and thermodynamics. Thermodynamical theorems in which the transformation of heat into work is limited by the temperature at which this transformation is effected are applicable only to chemical phenomena in which there is a reversible intervention of calorific energies, *e. g.* of dissociation or change of state, and possibly also, in cases in which there is a difference of specific heat between the initial and resulting bodies. Chemical affinity, so far as it can be measured by the heat disengaged in a reaction, is expressed by the sum of two terms; one expressing heat disengaged at 273° C., for example, the other variable with the absolute temperature. The second term is eliminated or reduced to its lowest value in such reactions as the union of perfect gases uniting without change of volume, or of solids in which the specific heat and the volume, respectively, of the compound are the sums of those of their elements. The factor of heat disengaged which varies with temperature can only acquire a notable importance in such cases as the above on condition that there is no limit to the action of dissociation. That all bodies do not tend to dissociate at all temperatures, has been demonstrated, however, by experiments which the author describes.

Dissociation is absolutely *nil* in water at common temperatures and union of its elements is equally impossible within the same limits. The limit of temperature at which combination or dissociation first become possible is an absolute limit and shows the existence of a law of discontinuity in chemistry which must not be forgotten in the theoretical application of thermodynamics to chemical phenomena. The law of definite proportions is another illustration of the same discontinuity.

Dissociation is necessary to the establishment of an equilibrium. Many chemical changes take place by a series of reactions in which intermediate compounds are successively formed and broken up. The equilibrium between salts, etc., in solution is principally maintained by the dissociation of such intermediate compounds. In order that an equilibrium may result it is necessary that the dissociable compound shall be produced by the reaction, which corresponds to the thermal maximum, and that the dissociation shall result in products which, by their action upon the system, can regenerate the dissociable body. These conditions are realized in the dissociation of $KHSO_4$ in presence of HCl. The dissociation of hydrated sodium acetate into water and acetic anhydride, on the contrary, yields no product which can react on NaCl, and there is, therefore, no reciprocal reaction between sodium acetate and HCl. The author refers to his own discoveries of the acid salts of the hydracids, the double salts of the halogens and the per-salts of the same, all of which throw light upon this subject. The supposed endothermic reactions between the halogens are shown to be really exothermic and to depend upon the existence of intermediate double salts, which are more stable at higher temperatures than the simple chlorides, bromides, etc. (*Bul. Soc. Chim.*, **43**, *264*.) A. A. B.

Alloys of Indium and Gallium. L. DE BOISBAUDRAN.

The violent action of water on the alloys of aluminium and gallium makes interesting the examination of the alloys of gallium with the third metal of the same family, indium.

The points of complete fusion are difficult to determine, because, beginning at the temperature where the first signs of liquiaction are manifest, the fluidity increases gradually, the metal remains more or less pasty for a long time, and thus forms a mixture of liquid and crystalline grains.

The following alloys were prepared:

2 In+Ga (In=227.0 and Ga=69.9, by weight).

Alloy white, granulated, easily sliced with a knife, softens and crumbles easily at 46°, gives signs of fusion at 56°, viscid at 75°.

In+Ga (In=113.5, Ga=69.9).

Alloy white, nearly solid, but much less hard than the preceding. Hard at 16°, creamy at 45°, liquid at 60° to 80°.

In+2 Ga (In=113.5, Ga=139.8). Soft, pasty, white alloy. Hard at 16°, buttery at 18°, liquid from 60° to 80°.

In+4 Ga (In=113.5, Ga=279.6. White alloy. Commences to melt at 16.5°, creamy at 35°, liquid at 50°. (*Comptes Rend.*, **100**, *701.*) C. E. M.

On the Decomposition of Salts by Water. H. LECHATELIER.

The general principles previously enunciated by the author on the subject of the decomposition of salts by water (*Comptes Rend.*, Nov. 10, 1884), lead to the two following consequences :

1st. The quantity of free acid necessary to arrest the decomposition of a dissolved salt increases indefinitely with the proportion of this salt contained in the liquid.

2d. The decomposition of a dissolved salt increases or diminishes with elevation of temperature, according as that decomposition absorbs or disengages heat. *Comptes Rend.*, **100**, *737.*) C. E. M.

The Chromium and Manganese Compounds corresponding to the Red and Yellow Prussiate of Potash. O. T. CHRISTENSEN.

The author has examined the methods proposed for the formation of these salts, noting the conditions favorable to large yields, improvements in the older methods, etc. He also appends remarks upon the colors of the respective double cyanides. (*Jour. f. prakt. Chem.*, **31**, *163.*) F. P. V.

Hand-regulator for Projection of Spectra by Electric Light. J. WALTER.

To avoid the troublesome and difficult manipulation at present in use, the author uses a brass disc provided with sockets for carbon pencils around its periphery. These points can be soaked in the desired salt solutions and brought into the circuit as desired. For full description and for diagrams, reference must be had to the original article. (*Jour. f. prakt. Chem.*, **31**, *116*.) F. P. V.

◆

ORGANIC CHEMISTRY.

Extraction of the Green Material of Leaves: Definite Combinations formed with Chlorophyll. E. GUIGNET.

Isolated by the various known processes, chlorophyll is very soluble in alcohol, as well as in benzol and naphtha. However, green leaves or dried, either in a stove or in vacuum, will not abandon the chlorophyll to naphtha, but only a mixture of various yellow or uncolored materials. This singular fact cannot be explained, as might appear, by supposing that chlorophyll is contained in envelopes insoluble in naphtha, but soluble in alcohol.

In fact, dried leaves, pulverized and warmed with 95 per cent. alcohol give a deep green solution. In a mixture of ice and salt this solution forms an abundant deposit of uncolored or yellow matter insoluble in naphtha; it is probably this more or less complex substance which constitutes the envelopes containing the chlorophyll. What confirms this supposition is that dried and pulverized leaves, exhausted with naphtha, end with yielding a little chlorophyll to this solvent. Without doubt the envelopes, although but slightly soluble, finish however by being attacked by large quantities of naphtha. Besides, the finest green granulations contained in the leaves yield a little chlorophyll to naphtha, probably because they are not inclosed in resisting envelopes. This can easily be verified by crushing spinach leaves with a little distilled water, and passing the liquid through a fine sieve; some green grains are carried through and are deposited at the end of 24 hours.

They give a green solution with naphtha after drying on the stove.

Chlorophyll is very unstable in the presence of acids diluted with water, and even under the influence of pure water. By pouring upon water the solution obtained by treating the leaves with concentrated alcohol, chlorophyll is precipitated gradually by diffusion, but in the form of brown flakes which appear completely altered. By replacing the water with 50 per cent. alcohol, the chlorophyll is precipitated in deep green flakes (without any indication of crystallization) but the product thus obtained is necessarily very impure. Chlorophyll is, on the contrary, very stable in the presence of bases; it acts like a true acid, as Fremy long ago stated. With different bases, chlorophyll gives compounds which appear very well defined. The salts of potash and soda are very soluble in water, that of lead is insoluble; but the former are insoluble in absolute alcohol as well as in naphtha.

A combination of chlorophyll and soda is easily obtained by the following process :

The decoction of leaves in concentrated alcohol (first purified by cooling and filtration at 10° C.) is agitated with a tenth of its volume of naphtha. Then a volume of water equal to that of the alcohol is gradually added. The chlorophyll, insoluble in the diluted alcohol, remains in solution in the naphtha, which it colors a deep green, and can easily be separated. The alcohol retains the yellow matter, tannin, various salts, etc. The naphtha is added to a solutin of soda in 95 per cent. alcohol and vigorously agitated. This combination is of a green, so deep that it appears black; it remains dissolved in the small quantity of water which contains the alcohol. The naphtha retains several yellow or colorless materials. The sodium compound is purified by washing several times with absolute alcohol to remove the excess of soda; it is not decomposed by water, even when heated; and gives the same absorption bands with the spectroscope as chlorophyll. (*Comptes Rend.*, **100**, *434*.) C. E. M.

On the Decomposing Action exercised by Aluminium Chloride on Certain Hydrocarbons. C. FRIEDEL and J. N. CRAFTS.

Triphenylmethane when heated for ten minutes at about 120° C., with a third of its weight of Al_2Cl_6, is almost entirely decomposed;

the only product isolable by distillation is benzol; the residue is an asphaltic hydrocarbon.

If triphenylmethane is heated for ten hours at a temperature below the boiling point of benzol, with seven or eight times its weight of Al_2Cl_6, diphenylmethane is obtained which is easily isolated by distillation; the quantity being one-third of the triphenylmethane employed.

Diphenyl heated with Al_2Cl_6 gives benzol and some black, resinous products.

Hexamethylbenzol is easily attacked by Al_2Cl_6 at a moderate temperature; when one-tenth of Al_2Cl_6 is employed, a regular disengagement of a non-chlorinated gas is produced; the gas is more carburetted than methane or ethane, and is not absorbed by bromine. After treatment with water, pentamethylbenzol and less methylated carbon compounds can be isolated by fractional distillation.

Naphthaline distilled with one-fourth its weight of Al_2Cl_6, at between 100° and 160° C., produces isodinaphthyl and a mixture of liquid hydrocarbons. (*Comptes Rend.*, **100**, *692.*) C. E. M.

The Formation of Phenylangelic Acid and Phenylmethacrylic Acid, and the Behavior of Acetylphenyllactic Acid. F. L. Slocum.

A repetition of Perkin's experiments on the action of benzaldehyde on a mixture of acetic anhydride and sodium butyrate at 100°, instead of 180°, yielded no cinnamic acid but phenylangelic acid only. The reaction thus takes place between the aldehyde and the sodium salt, and not between the aldehyde and the anhydride. The formation of cinnamic acid at the higher temperature the author explains by the probable formation of sodium acetate and the reaction of the aldehyde upon this. By the action of benzaldehyde upon a mixture of acetic anhydride and sodium propionate only phenylmethacrylic acid is formed if the substances are carefully purified. On a mixture of acetic anhydride and sodium acetate, benzaldehyde reacts only at a temperature of 125°–145°, produciug cinnamic acid. The author shows that phenyllactic acid and acetylphenyllactic acid cannot exist at this temperature when mixed with acetic anhydride in excess, consequently they could not be formed by the reaction. (*Annalen*, **227**, *53.*) F. P. V.

p-Methylisatoic Acid and its Derivatives (*Preliminary Notice*). W. Pariaotovie.

P-methyl-isatoic treated with acetic anhydride yielded an ethyl-derivative, $C_{11}H_9NO_3$, melting at 172°. A nitro- derivative was gotten by treating a solution of it in strong sulphuric acid, with potassium nitrate. The substance suspended in glacial acetic acid is oxidized by chromic acid, and yields an acid, $C_9H_7NO_3$, which stands to *p*-methylisatoic in the same relation as Kolbe's isatoic acid stands to isatin. This *p*-methylisatoic acid is with difficulty soluble in cold or warm water—more easily in boiling alcohol—crystallizes easily from acetone, and suffers decomposition at 215°. The action of hydrochloric acid, nitric acid, ammonia and aniline upon this acid has been examined. (*Jour. f. prakt. Chem.*, **31**, *122.*)

F. P. V.

Action of Phosgene upon Glycolchlorhydrin. J. Nemirowsky.

Liquid phosgene acting upon ethylenchlorhydrin causes the formation of hydrochloric acid and chlorethylchlorformic ether. This reaction takes place in closed tubes, without warming. The ether is a colorless, fuming liquid, with pungent, irritating odor. It is easily soluble in alcohol and ether, and boils at 150°–160°. It does not suffer decomposition on heating with water. With ammonia, hydrochloric acid and chlorethylenoxycarbonylamide are formed. The corresponding anilide compound was also formed. By treatment with conc. potash solution an anhydride of ethoxyloxycarbonylphenylamine was apparently formed. By heating this with fuming hydrochloric acid, in closed tubes at 170°, chlorethylphenylamine is obtained. The author is examining these substances still further. (*Jour. f. prakt. Chem.*, **31**, *173.*) F. P. V.

Derivatives of Orthoamidobenzamide. A. Weddige.

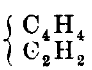
Acetylorthoamidobenzamide is formed by mixing 1 mol. acetic anhydride with 2 mols. orthoamidobenzamide. It crystallizes in colorless needles, melting at 170°–171°, and gives crystallizable salts with acids. Anhydroacetyl orthoamidobenzamide is gotten by heating the compound just mentioned until no more water is given off. It forms yellow needles, melting at 228°. A formyl derivative of orthoamidobenzamide is gotten with formic acid free from water, and on heating this it changes to an anhydride, melting at 209°. (*Jour. f. prakt. Chem.*, **31**, *124.*) F. P. V.

A Chinolin Homologue (*Preliminary Notice*). C. Beyer.

On heating aniline with acetone, nitrobenzol and hydrocholric acid in a tube, a base was formed which, on nearer examination, proved to be a chinolin derivative—$C_{11}H_{11}N$. The platinum compound, the picrate, and chromate were analysed. The base, separated from the picrate by means of ammonia, is a slightly yellow oil with the chinolin smell. The author is engaged upon a more thorough examination of the base. (*Jour. f. prakt. Chem.*, **31**, *47.*)
F. P. V.

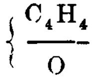
Substitution of Bromine for Phenolic Hydrogen. Bromated Tribromophenol. E. Werner.

When bromine water is made to act on ordinary phenol, orcine, resorcine, or on the oxybenzoic acids, three atoms of hydrogen are replaced, and, in presence of excess of the reagent, a fourth atom, which is the phenol or hydroxyl hydrogen. The latter stage of the reaction is .ordinarily impeded by the formation of flocks of precipitate. The difficulty is avoided by the following process, which rests upon the method of Benedikt : An equivalent of phenol dissolved in 60 litres of water is treated with an equal volume of bromine water containing at least 20 grms. of bromine per litre. The latter is added rapidly to the solution of phenol, the solution is stirred slightly, allowed to rest, and stirred again, when the upper layers of the liquid become clear. The bromated tribromophenol is then deposited in crystalline scales, which, when purified, yield 78 % Br. (Theory for $C_6H_2Br_3OBr$=78.05.) This product readily yields an atom of HBr under the action of potassium iodide, or of soda solution, or even by prolonged contact with cold alcohol, while the remaining atoms of bromine are more strongly held. The thermo-chemical study of the reaction between bromine and phenol indicates that the three atoms of benzol hydrogen replaced correspond to 26.3, 20 and 22.1 Cal. respectively, while the fourth, or phenol hydrogen, yields only 5.3 Cal. The latter, therefore, is replaced only after the substitution of three atoms of B_2 for H in the nucleus, and the two remaining atoms of hydrogen in the nucleus can be replaced only by an indirect process. The author applies these facts to an hypothesis regarding the structure of benzol. The two hydrogen atoms unreplaced may represent an acetylene group distinct from the remainder of the molecule and separately replaceable: *e. g.*



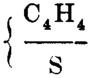
$$\left\{\begin{array}{l} C_4H_4 \\ C_2H_2 \end{array}\right.$$

Benzol.



$$\left\{\begin{array}{c} C_4H_4 \\ \hline O \end{array}\right.$$

Furfurane.



$$\left\{\begin{array}{c} C_4H_4 \\ \hline S \end{array}\right.$$

Thiophene.

$$\left\{\begin{array}{c} C_4H_4 \\ \hline NH \end{array}\right.$$

Pyrrol.

(*Bul. Soc. Chim.*, **43**, *372.*) A. A. B.

A New Method of Measuring the Heat of Combustion of Carbon and of Organic Compounds.—MM. Berthelot and Ville.

The method of explosion with compressed oxygen in a strong receiver or "calorimetric bomb," yields results which are difficult to attain by methods previously in use. The combustion is perfect if oxygen at seven atmospheres be used and in such quantity that not more than 30–40 per cent. of it shall be consumed. Ignition is effected by a platinum wire rendered incandescent by electricity. The calorimetric measurements proper requires only 3–4 minutes instead of 15–20, as heretofore. In the combustion of carbohydrates and of the soft charcoals used in gunpowder, in which carbonization is imperfect, an excess of energy is exhibited as compared with that of the hydrogen and carbon which these bodies contain and the water which they furnish by decomposition. Black charcoal, obtained at higher temperatures, conforms closely in its heat of combustion to pure carbon. (*Bul. Soc. Chim.* **43**, *262.*) A. A. B.

Studies on Commercial Picolin. A. Ladenburg and C. F. Roth.

Commercial picolin, boiling from 125–145° C., was fractioned several times, and finally separated into two distinct fractions, which boiled respectively at 132–135° C. and 139–142° C. These the authors look upon as α and β-picolin. These two fractions were used in all further experiments. (*Ber. d. chem. Ges.*, *1885*, *47.*)

J. H. S., Jr.

On Acetonylacetone. C. Paal.

Acetonylacetone may be obtained by heating in a sealed glass tube for 1½ hours to 150–160° 1 pt. of pyrotartaric acid with 5–6 pts. of water.

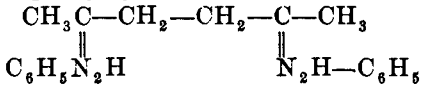
The tube, on being opened, contains a yellow mass, mixed with a little resinous substance. This mixture is now treated with sodium carbonate, which causes the double ketone to separate and float on top of the sodium carbonate solution. The ketone may be obtained pure by fractioning it twice. This ketone consists of a colorless liquid, of pleasant ódor, boiling undecomposed at 187–188° C. It is soluble in all proportions in water, alcohol and ether, but insoluble in KOH+aq. and Na_2CO_3+aq. H_2SO_4 in the cold, on prolonged action, decomposes it.

Diisonitrosoacetonylacetone.

$$CH_3C{=}N(OH)CH_2{-}CH_2{-}CN(OH){-}CH_3.$$

Obtained from the above by treatment with hydroxylamine chloride. Crystallizes in white, prismatic crystals. It is easily soluble in mineral acids, free alkali, hot water, alcohol and ether, but very difficultly soluble in benzole.

Diphenylhydrazinacetonylacetone.



$$\begin{array}{lcl} CH_3C{-}CH_2{-}CH_2{-} & & C{-}CH_3 \\ \quad \| & & \| \\ C_6H_5N_2H & & N_2H{-}C_6H_5 \end{array}$$

Obtained by heating a mixture of acetonylacetone and phenylhydrazin together. Crystallizes in white, glistening leaflets ; melting point 120° C. It is easily soluble in alcohol, ether and benzole. Nearly insoluble in petroleum ether. (*Ber. d. chem. Ges., 1885, 58.*)

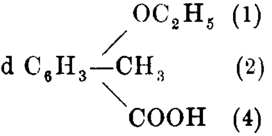
J. H. S., Jr.

On Mononitro-α-naphthoic Acid. A. E. Ekstrand.

A concentrated, glacial acetic acid solution of α-naphthoic acid is treated with an excess of fuming nitric acid, heated a few hours on the water bath and allowed to cool. The solution by degrees becomes filled with small needles, which are almost pure mononitro-α-naphthoic acid; M. P. 239°. The filtrate is diluted with water and the precipitate is digested with soda solution. HCl is now added and throws down an abundant precipitate of nitro-compounds. The precipitate is dissolved in alcohol, and on cooling. first deposits more of the compound which melt at 239° C., and then, upon concentration, deposits a compound crystallizing in hard prisms, which melt at 215° C. This body is an isomeric nitrocompound. (*Ber. d. chem. Ges., 1885*, **73.**) J. H. S., JR.

On the Action of Alcohol on Diazo-Compounds. I. REMSEN.

In reference to the oxidation of nitro metaxylene $C_6H_3\ NO_2\ (1)\ (CH_3)\ (2)\ (CH_3)\ (4)$, Kuhara and the author obtained the following nitrotoluic acid, $C_6H_3\ \overset{1}{(NO_2)}\ \overset{2}{(CH_3)}\ \overset{4}{COOH}$. On trying by Griess's reaction to convert this body into the corresponding toluic acid, a new acid, differing entirely from metatoluic acid, was obtained. Further investigation showed that this new acid was

ethoxymetatoluic acid 

$$C_6H_3\begin{matrix}-OC_2H_5 & (1)\\ -CH_3 & (2)\\ -COOH & (4)\end{matrix}$$

Palmer has recently found that if the diazo-compound of amidotoluenesulphonic acid be boiled with alcohol, it is partly converted into toluenesulphonic acid, and partly into ethoxytoluenesulphonic acid. This divergence from the usual behavior of the diazo-compounds when boiled with alcohol, depends entirely, it is thought, upon atmospheric pressure. Experiments are now in progress to demonstrate this fact. (*Br. d. chem. Ges., 1885*, **65.**)
J. H. S., JR.

On the Absorption of Chlorine by Carbon and on its Combination with Hydrogen. MM. BERTHELOT and GUNTZ.

Melsens has shown that, when wood charcoal previously saturated with chlorine, is exposed to an atmosphere of hydrogen, there is a reduction of temperature. The authors have investigated this paradoxical case and find the result to be due to a simultaneous volatilization of chlorine which is expelled from the charcoal. The condensation of chlorine by charcoal is accompanied by a disengagement of heat much greater than that due to its liquefaction, a result, which is in accordance with the behavior of SO_2, NH_3 and N_2O under similar circumstances. This excess of heat, however, is only 6.78 Cal. for an atomic wt. of chlorine in grammes while the heat of formation of HCl is +22.0. Analysis of the products of the experiment in a given case indicates that seven times as much chlorine is disengaged in the free state as is combined with hydrogen. Calorimetric experiments indicated a cooling effect of —32.4 Cal. for each atom of chlorine absorbed. e. g. $+22.0-6.8=15.2$, and $-(7\times 6.8)+15.2=-32.4$. The result, as in all cases of endothermic reaction, is due therefore not to a true chemical reaction, but to the intervention or a foreign energy which in this case is quite independent of the reaction. (*Bul. Soc. Chem.*, **43**, *259.*) A. A. B.

ANALYTICAL CHEMISTRY.

Determination of Mixtures of Milk Sugar and Cane Sugar. A. W. Stokes and R. Bodmer.

A volumetric, method especially applicable to condensed milk. Pavy's ammoniated cupric solution is used, viz.: Cupric sulphate (crystallized), 34.64 grms.; Rochelle salt, 170 grms.; caustic potash, 170 grms., made up to a litre. 120 c. c. of this solution are added to 400 c. c. of ammonia (Sp. Gr. .880) and made up to a litre. 10 c. c. of this solution equals .005 grm. glucose.

The milk or other solution is diluted so that 6–12 c. c. decolorize 40 c. c. of the blue liquid, and run from a burette into a 100 c. c. flask containing 40 c. c. of the cupric solution, previously boiled. A second trial is made with .2 c. c. less of the sugar solution, and the result is thus proven correct to .1 c. c. Another portion of the sugar solution is then boiled for ten minutes with a 2 per cent. solution of citric acid, by which all cane sugar is inverted while milk sugar remains unaffected, even after 30 minutes' boiling. The boiled liquid is cooled, neutralized with ammonia and titrated as before. The two results permit the determination of milk sugar by difference. The authors have found that milk sugar has 52 per cent. of the reducing power of glucose upon the cupric solution. The process is rapid and accurate, the end reached is sharply marked and the cupric solution will retain its standard value for an indefinite time. (*The Analyst, April, 1885.*) A. A. B.

Some Laboratory Apparatus. H. LANDOLT.

The following apparatus is described :

1. Combination of a water-bath and hot-water funnel.
2. Apparatus for the concentration of very dilute solutions.
3. Device for subliming. (*Ber. d. chem. Ges.*, *1885*, *56.*)

J. H. S., JR

Soldering and Repairing Platinum Vessels. J. W. PRATT.

The author uses auric chloride in powder instead of metallic gold for soldering platinum surfaces. Practical suggestions and directions are given for repair and construction of plantinum apparatus used in the laboratory. (*Chem. News*, **51**, *181.*) A. A. B.

Abstracts of American Patents Relating to Chemistry.

(*From the Official Gazette of the U. S. Patent Office.*)

April 28th, 1885.

316,451.—Process of manufacturing carbonated malt beverages.—C. H. Frings.

316,457.—Hard rubber filtering case.—E. K. Haynes.

Consists of a case or shell of hard rubber, containing suitable filtering material.

316,465.—Method of purifying and odorizing natural gas.—J. Kountz.

The gas is first passed through lime and water, then through sulphuric acid, and finally brought into contact with asafœtida.

316,471.—Manufacture of derivatives of aurine.—C. Lowe.

316,520.—Gas generator.—J. Bowes.

316,580.—Composition for fuel.—C. H. Sternberg.

Consists of rosin, asphaltum, coal slack, powdered coal, or ground cinders, soot, powdered dry manure, sawdust, wood shavings or ground corn cobs.

316,609.—Composition for purifying gas.—J. Duke.

Consists of monocalcic phosphate calicum sulphate and charcoal or pulverized peat.

316,663.—Refining oils.—A. Rock.

Mineral and vegetable oils are treated with lime or other alkaline earth or earths, and a body rich in oxygen, such as chromic acid, chromates, manganates, etc.

316,703.—Lubricating compound.—D. D. Wass.

A mixture of paraffine, mineral oil, talc and alcohol.

316,723.—Furnace for roasting copper and other ores.—C. A. Bartsch.

316,794.—Apparatus for distilling wood.—E. Koch.

316,799.—Condiment.—R. F. Maier.

A compound table salt consisting of sodium chloride, hypophosphite and sulphate, potassium chloride, and calcium hypophosphite.

316,824.—Ice machine.—T. L. Rankin.

316,863.—Method of generating carbonic acid gas.—C. E. Avery.

Carponic acid is generated by the reaction of the alkaline bicarbonates with calcium sulphate, in presence of water.

May 5th, 1885.

316,961.—Apparatus for creosoting wood.—L. Hansen and A. Smith.

The logs are dried by steam in a closed cylinder, and impregnated with creosote by pressure.

316,964.—Roofing compound.—H. C. Hawes and J. E. Green.

A mixture of red lead and ground iron ore with coal tar, hydraulic cement, rosin, gypsum and alum.

317,010.—Phosphate fertilizer.—W. S. Pierce.

The insoluble phosphates of iron, alumina, lime, and other bases are dried and pulverized, mixed with ammonium sulphate and the mixture treated with strong sulphuric acid ; the resulting product is then dried.

317,060.—Apparatus for extracting paraffine from oils.—R. A. Williams and J. Bragg.

317,129.—Process of preserving wood.—L. Hansen and A. Smith.

The surface of the wood is first charred, and then the wood is saturated with wood creosote.

317,135.—Retort.—D. Jarves.

317,152.—Chemical fire extinguisher.—E. H. Lewis.

317,197.—Apparatus for manufacturing gas from wood.—G. Ramsdell.

317,206.—Battery fluid.—I. L. Roberts.

Consists of an aqueous solution of potassium permanganate and an alkaline salt.

317,229.—Salt evaporating pan.—G. H. Smith.

317,245.—Apparatus for the separation of gold from its ore by electro-chlorination and deposition.—E. P. Thompson.

317,246.—Apparatus for the electro-deposition of gold from its chlorides. —E. P. Thompson.

317,406.—Process of manufacturing gas for illuminating and heating purposes.—J. W. Mitchell.

Carbonic oxide gas is generated by forcing air through ignited fuel, and a gas rich in carbon is generated, separately by injecting a hydrocarbon and superheated steam into a heated retort. The two gases are then brought together at a temperature not exceeding 1,600°.

317,407.—Apparatus for generating illuminating and heating gas.—J. W. Mitchell.

317,423.—Apparatus for manufacturing gas.—R. B. Stapp.

Fuel is burned in the firepot for heating the oil gas generating retorts, and part of the carbonic oxide from the fuel is drawn off by a pump and forced into the gas holder. When the retorts are sufficiently heated, carbonic oxide is shut off from the holder and oil admitted to the retorts. The resulting hydrocarbon gas is drawn from the retorts and forced by the pump to the holder, where it is mixed with the carbonic oxide.

317,440.—Process of preserving wood.—J. P. Card.

Wood is treated with deodorized oil and a solution of an antiseptic.

317,444.—Apparatus for burning volatilizable hydrocarbons.—H. de Bay and C. de Rossetti.

May 12th, 1885.

317,490.—Composition for lubricating metallic Surfaces.—H. W. Belknap.

Consists of petroleum, graphite, paraffine wax, tallow and sulphur.

317,581.—Apparatus for manufacturing illuminating gas.—Silas C. Salisbury.

Steam is superheated, reheated, and dried, and then decomposed in contact with heated metal scrap. The resulting hot liberated gas is combined with hot vapors of hydrocarbons, and by means of a mixing injector the hydrocarbon vapors are forced into the rear end of the fixing retort, in which they are fixed and perfected by passage, forward through perforated partitions provided with tubes.

317,587.—Vulcanization of rubber coverings for electrical conductors.—J. J. C. Smith and M. Smith.

The covered wire is enveloped in a tight and impervious cover of tin foil. or other pliable metal and subjected to the simultaneous action of heat and pressure.

317,611.—Apparatus for the manufacture of vaporous and gaseous fuel and illuminating gas.—R. B. Avery.

317,673.—Process of preserving food.—A. G. T. Ripberger.

Provisions are protected against the intrusion of vegetable or animal organisms, by storing them, without the hermetical exclusion of air, in receptacles lined with a filtering medium—such as cotton wool—impregnated with a bitter substance and salt.

317,686.—Gas carburetor.—H. Symons.

317,730.—Method of preserving wood.—E. Z. Collings.

The wood is steamed, dried and impregnated with a preservative.

317,796.—Chlorine gas washer.—J. A. Just.

317,821.—Baking Powder.—A. McDonald.

Consists of potassium or sodium bisulphate and sodium or of potassium, carbonate, or of bicarbonate.

317,823.—Apparatus for generating carbon dioxide.—J. McEwen.

317,953.—Apparatus for manufacturing gas.—Q. F. Randall.

May 19, 1885.

317,975.—Adjustable apparatus for gas machines and mixers.—J. P. Clifford.

318,043.—Manufacture of composite pavement.—J. P. Scott.

Consists of a mixture of broken natural hydraulic limestone, and Portland or other natural cement.

318,044.—Process of grinding caustic soda.—C. Semper.

Ground salt, salt cake or dry sulphate of soda is added to the broken caustic soda, and the mixture is ground and bolted.

318,067.—Process of deoxidizing molten iron in the manufacture of steel.—N. B. Wittman.

In the Bessemer process, free silica is used for eliminating the oxide of iron at, or about the end of the blowing operation.

318,106.—Gas generating apparatus.—A. O. Granger.

Hydrocarbon oil is forced through a coil, in a steam heated chamber, and thence in the form of a fine spray or vapor into the fixing chamber to carburet the water gas.

318,161.—Oxygen gas attachment for gas burners.—C. Beseler.

318,191.—Apparatus for extracting oil from cotton seed.—G. Leder.

318,307.—Method of preparing and treating starch.—J. C. Schuman.

The corn is steeped in water, after which the hulls and germs are detached from the starchy portion by whipping or beating without additional water. The starch meal is then separated from the hulls and germs by sifting, reduced to a liquid with water and mashed.

318,308.—Manufacture of starch.—J. C. Schuman.

318,309.—Manufacture of grape sugar and glucose.—J. C. Schuman.

318,318.—Process of manufacturing gas.—R. B. Stapp.

318,367.—Glue.—R. Gahler.

Ordinary glue is treated with nitric acid and zinc oxide, and steamed until melted. Greasy impurities are skimmed from the surface, and nitric acid added.

318,371.—Fertilizer.—L. Hass.

May 26th, 1885.

318,458.—India rubber gas proof tubing.—T. F. Warrington.

Consists of an inner and outer coating of vulcanized rubber, and an interposed layer of metal foil.

318,484.—Manufacture of the derivatives of aurin.—C. Lowe.

318,496.—Coke oven.—H. M. Pierce.

318,497.—Process of manufacturing coke.—H. M. Pierce.

The coke oven is filled with an initial charge, which is coked by downward progression. When the coking is nearly completed a further charge is added, and so on until the oven is filled.

318,502 & 318,503.—Oil and lard rendering tank.—H. Rall.

318,548.—Process of malting, brewing, etc.—R. D'Heureuse.

The water used is first treated by blowing air through it.

318,551.—Process of making wrought iron direct from iron ores.—C. J. Eames.

The ore is reduced upon a friable graphitic hearth, composed of plumbago, pulverized firebrick and a carbonaceous, adhesive binder.

318,552.—Process of manufacturing ironsponge, wrought and steely irons directly from the ore.—C. J. Eames.

The ore mixed with lumps of graphitic carbon, is charged on a friable graphitic hearth.

318,553.—Process of manufacturing sponge and wrought iron directly from the ore.—C. J. Eames.

The ore is charged on a graphitic hearth and covered with a layer of lump graphite.

318,554.—Hearth and lining of graphite for metallurgical furnaces.—C. J. Eames.

A hearth for reducing furnaces, consisting of graphitic lumps.

318,603.—Process of separating basic compounds from slags.—G. Deumelandt.

Brief. The basic compounds are oxides, hydroxides and carbonates of lime, magnesia, alumina and iron.

The process consists, first, in treating the pulverized slag with a solution of ammonium salts, and filtering off the dissolved lime, magnesia and manganous oxide; second, in boiling the residue with a solution of ammonium salts and filtering off the dissolved alumina and ferrous oxide ; third, in oxidizing and precipitating the manganous oxide by introducing air into the ammoniacal solution ; fourth, in precipitating the salts of calcium and magnesium by the introduction of carbonic acid ; and finally in oxidizing and precipitating the ferrous oxide by introducing air in the presence of ammonia.

318,630.—Method of making hard sugar from soft sugar.—O. H. Krause.

Cakes of soft sugar, or granulated sugar, are charged with hot white liquor and then immersed in cold white liquor.

318,639.—Transforming soft sugar into hard sugar.—F. O. Matthiessen.

Particles of soft, or granulated sugar, are cemented together by crystallization of white liquor which has been introduced into the interstices between the particles of sugar.

318,640.—Apparatus for cementing granulated sugar into blocks.—F. O. Matthiessen and O. H. Krause.

318,642.—Apparatus for the manufacture of varnish.—S. W. Mayer and P. J. Bungart.

318,682.—Still for concentrating sulphuric acid.—C. A. Bartsch.

318,761.—Explosive hand grenade extinguisher.—A. F. Letson and F. Honezger.

Consists of a glass shell, holding a fire extinguishing liquid and a cork provided with a tube and bulb filled with a charge of gunpowder.

318,791.—Paint.—J. P. Perkins.

Consists of silicate slag, ground in oil.

318,792.—Method of making brick.—J. P. Perkins.

The clay is mixed with oil, preparatory to forming and burning.

318,793.—Art of making certain fermented beverages.—C. Pfandler.

In the manufacture of beer ageing is accelerated by inclosing the beer, after having passed through the main fermentation, in a storage vessel, and maintaining in the vessel a rarified atmosphere and abstracting the gaseous products of fermentation as they accumulate.

318,826.—Process of preparing dried blood.—W. G. Strype.

A solution of aluminium sulphate, or alum, is added to the blood after which it is dried.

318,851.—Preservative coating for meats.—C. Bartels.

Consists of dissolved isinglass, or gum, and an aromatic compound obtained from galangal, cubebs, aloes, angelica root, and masterwort, resin and Venice turpentine.

318,888.—Apparatus for washing, bleaching and dyeing fabrics.—J. Farmer.

W. R.