HYDROCARBONS PRODUCED BY ACIDS UPON CAST-IRON.

By M. S. CLOEZ.

THE treatment of a white cast-iron containing 0.04 of combined carbon, and about 0.06 of manganese, with hydrochloric acid of sp. gr. 1.12, occasions the formation of gaseous and liquid hydrocarbons, homologues of ethylene, absorbable in bromine, and capable of combining readily with hydrochloric acid. There are also produced formenic compounds insoluble in and not attacked by sulphuric acid. To prevent the ethylenic carbides from combining with hydrochloric acid it is best to treat the cast-iron with sulphuric acid, mixing 1 part of acid at 66° B. with 5 parts of water. A gentle heat may be applied to promote the action. On treating in this manner 200 kilos. of cast-iron the author obtained 640 grms. of oily carbides, condensed in the first washing-bottles; 2,780 grms. of bromated ethylenic products; 532 grms. of formenic hydrocarbons isolated by the action of sulphuric acid; 3,800 grms. of insoluble residue, supposed to be dry; and, lastly, 408 grms. of oily products extracted from the insoluble residue by alcohol, and separated from the latter by water. The formenic hydrocarbons, which the author describes in the present paper, after purification were submitted to fractionated distillation. The first products went over at 155°, and the temperature rose rapidly to 160°, where it remained for a time stationary. All that passed over below 170° was kept separate, as also the portion volatilized between 175° and 190°, and thus from 20° to beyond 300°. By repeated and delicate fractionations seven distinct products were obtained, with constant boiling-points, and with corresponding chemical and physical properties. All these products are already known, and appear identical with some of those extracted from the petroleum oils by MM. Pelouze and Cahours. They are the highest terms of the formenic series. The first hydrocarbon is the hydride of decyle, $C_{10}H_{22}$, boiling between 155° and 160°. The second, found in small quantity, is the hydride of undecyl, $C_{11}H_{24}$, boiling between 178° and 180°. The remainder are the hydrides of dodecyl, of tri-decyl, of penta-decyl, and of hexa-decyl. The identity of these complex carbides, obtained by the reaction of mineral compounds without the intervention of any life, supports the opinion of certain geologists relative to the origin of the petroleum oils. From a purely chemical point of view, with reference to the synthesis of so-called organic bodies, the reproduction of a great number of these species may be effected from setting out from the ethylenic or formenic hydrocarbons yielded by cast-iron.

THE BURLING PROCESSES OF FREZON AND JOLY.

By J. DELONG.

WHEN the destruction of the burls is effected by means of muriate of alumina, the vegetable matter is scarcely changed in color, but it is broken up on the application of friction or pressure, and, what is a remarkable fact, the hardest substances are the most readily attacked—first straws, then hemp, linen, and cotton; thus experiments made by regulating the temperature and the time of the exposure of the goods in the stove lead us to believe that it may be possible, on an industrial scale, to remove foreign vegetable matters without touching the cotton.

Two objections have been made to the "Joly" system (the use of muriate of alumina), which it is well to discuss here.

It has been said that white goods, burlled by Joly's process, are not sufficiently white to be sent to market in that state. This was formerly true, but is now no longer the case, and this is the explanation:

At Albeuf so few white goods are intended to be sold in that state that M. Joly had probably not turned his attention to this detail, but having sold his process to Bellot, Dourne & Co., of Reims, this defect has been there examined, and made to disappear.

In Joly's process, as well as in the acid process, the wool or the woollen stuffs are exposed for a certain time to a temperature of 212° to 248° Fahr., but at this heat white wool turns slightly yellow. This is no inconvenience for pieces which are to be dyed, but it is, of course, injurious for such as have to be kept and sold as whites. To obviate this evil the heat of the stove has been reduced, and the pieces are left in it for a longer time. White pieces burlled by Joly's process and exposed to a maximum temperature of 194° Fah. were found perfectly freed from vegetable matter, and were at the same time of a dazzling whiteness.

As for the second fault, if well founded, it would be quite as applicable to the system of Frézon as to that of Joly. It refers to a difficulty which may be encountered in fulling.

This may happen in consequence of defective washing after burling. It is evident that, if the goods are not perfectly cleansed, there will remain a hydrate of alumina, which will combine with the soap, rendering it insoluble, and remaining as an inert and very injurious matter, not easy to remove. But we must never forget that if the washing is thoroughly performed this accident need not be feared: on the contrary, certain manufacturers, among whom may be mentioned M. Bertrand de Louviers, profess that they can perform the fulling process more quickly and easily with burlled cloths than with such as have not undergone the operation.

The action of acids upon vegetable matters is well known; but what is the action of the muriate of alumina in Joly's system of burling?

The chemical experts, Salvétat and Barral, have justly remarked that the muriate of alumina has no relation with the acids, whether vegetable or mineral; that burling with this salt can only be ascribed to a specific property quite independent of the influence which the muriatic acid would exert if employed in the free state, and completely unknown till it was discovered and applied by Joly.

This answer establishes the difference between the acids and muriate of alumina as it may be traced in their effects.

If the goods on coming from the stove are left in a moist place for a day, the vegetable impurities are no longer capable of being broken up by friction or pressure.—*Le Jacquard*.

ULTRAMARINES.

By E. GUINOT.

ON following the successive phases of the furnacing of ultramarine, as generally prepared at present, we observe various colors, which succeed each other in the following order: brown, green, blue violet, red, white. These colors are the result of the progressive oxidation of the original mixture of materials. When the furnace containing the crucibles reaches a red heat the sulphur melts and produces immediately polysulphides with the sodium. The com-

pounds thus formed present various colors, but they are so unstable in presence of air and water that they cannot be defined. They appear to owe their coloration exclusively to the sulphides which saturate the mass. The first stable product is the brown; it appears at the moment when, as the fire gets hotter, blue flames issue from the crucibles, indicating that the sulphur is becoming converted into sulphurous acid. When the flames cease to appear this transformation is completed, and if the crucible is then withdrawn from the furnace it is found full of a green substance. When the heat reaches 700° the blue begins to form. If the heating is now continued, allowing the air still to enter in excess as before, the product takes a violet shade, then red, or rather rose, and becomes ultimately white. This white ultramarine, if mixed with a little charcoal and heated to redness, reproduces red, violet, blue, green, or brown, according to the proportion of charcoal added. By prolonging the heating, and consequently the oxidation, any one of these products derived from the white ultramarine may be made to pass anew through the scale of changes—the brown, for instance, being successively converted into green, blue, rose, and white. If for charcoal we substitute hydrogen, sal-ammoniac, or other reducing agent, the same results are obtained. These facts seem to indicate that the progress of coloration follows that of oxidation. The proof of this is found on the examination of the products obtained at different stages of the heating. Sulphur produces the coloration because if some other member of its group be substituted the ultramarine changes its color. The soda, if it does not directly produce the coloration, is still necessary, since if any other substance is substituted the coloration of the product is hindered. Finally, ultramarine is not a unique compound; there are a whole series of ultramarines, some colored (sulphur, selenium, and tellurium ultramarines), others colorless (potassic, calcic, and lithic ultramarines), and the study of these bodies may possibly throw a new light upon the chemical composition of the pigment.

CHEMICAL PHENOMENA PRODUCED BY ELECTRICITY.

By M. BERTHELOT.

OZONE is formed equally under the influence of both electricities, the oxygen in each tube only being in contact with the internal armature. The proportions are very variable but as a rule the positive electricity produces in the majority of cases the more ozone. In none of the experiments made with the Holtz machine has the author observed the smallest trace of nitrogen compounds produced from mixtures of oxygen and nitrogen, whether moist or dry. With the effluve of Ruhmkorff's apparatus traces have been observed, but only at the highest tensions. Acetylen, on the other hand, is produced in notable quantity in the vapors of organic compounds inclosed along with nitrogen in tubes containing a metallic armature, influenced by the discharges of the Holtz machine. The absorption of nitrogen by organic compounds is effected equally by both electricities, and at the weakest as well as at the strongest tensions, though the time required in the former case is longer. Along with the nitrogenous compounds there is formed not a trace of ammonia, nitric or nitrous acid, or hydrocyanic acid.

DETERMINATION OF TELLURIUM.

By M. L. KASTNER.

THE tellurium precipitated by sugar is collected on a small filter and washed. It is then transformed into tellurous acid by moistening with a mixture of 2 vols. nitric acid, 1 vol. water, and 3 drops of sulphuric acid per 10 c.c. of mixture. The tellurous acid in acid solution is evaporated to dryness in a porcelain capsule and weighed.—*Zeit. für Anal. Chemie*.

[NATURE.]

CHEMICAL NOTES.

Mineral Oil in a Lava of Mount Etna.—In the basaltic zone which reaches from the foot of Mount Etna, in a south-south-easterly direction, near the village of Paterno, there is a prehistoric doleritic lava containing olivine, which surrounds the clay deposits of a mud volcano and which has been examined by Sig. Orazio Silvestri. Under the microscope the lava shows an augitic principal mass with a quantity of olivine and many white transparent crystals of labradorite. The lava contains numerous round or irregular cavities, which are coated with arragonite and which are filled with mineral oil. This oil, of which there is about 1 per cent. by weight in the whole mass, was taken from one of the cavities at 24° C. At about 17° C it begins to solidify and is of a yellowish green tint by transmitted light, while by reflected light it is opalescent and light green. Chemical analysis of the liquid proved it to contain:

Liquid hydrocarbons (boiling point 79°-28).	17.97 per cent.
Hydrocarbons solidifying under 0° (h. p. 280°-400°).....	31.95 " "
Paraffin, melting point 52°-57°.....	42.79 " "
Asphalt (leaving 12 per cent. of ashes)	2.90 " "
Sulphur.....	4.32 " "
	99.93

Formation of certain Bodies at Temperatures above that of their Decomposition.—MM. Troost and Hautefeuille have lately demonstrated that under certain circumstances it is incorrect to suppose that bodies undergoing decomposition or rather dissociation at a low temperature may not exist as definite compounds at higher temperatures. Their arguments are founded on the decomposition of silicon sesquichloride (Si_2Cl_6) at 800°, which may be represented as— $2Si_2Cl_6 = 3SiCl_4 + Si$;

If, however, the reaction be carried on at a temperature above 1200° the following change takes place— $3SiCl_4 + Si = 2Si_2Cl_6$.

If the tube in which this reaction takes place be cooled suddenly, the sesquichloride is found, but if cooled slowly it undergoes gradual decomposition. They also find that although ozone is converted into oxygen at 250°, if a silver tube, inclosed in a porcelain tube, be kept at about 1300°, a deposit of dioxide of silver is produced, due to the formation of ozone. They state that the ozone can be recognized by the usual tests, if the gas be rapidly drawn off and quickly cooled. They have also examined certain similar phenomena in the production of oxide of silver at 1400°.

New Modes of Forming Ethylen Oxide.—In the *Comptes Rendus*, lxxxv., 624, Mr. H. Greene mentions the results of experiments on the action of certain metallic oxides on the

bromide, iodide, and chloriodide of ethylene. Oxide of silver has a rapid action on ethylen iodide at a temperature of 150°, forming ethylen oxide; its action on ethylen bromide produces the same result, but requires a higher temperature. Ethylen bromide and chloriodide both act upon sodium oxide at 180°, the latter of the ethylene compounds being the one found most advantageous by the author in preparing ethylen oxide. He has also studied the action of these substances on the oxides of the diatomic metals barium and lead. These oxides do not give ethylen oxide when heated with bromide or chloriodide of ethylene. These experiments show on the one hand the analogy between the silver and sodium oxides, confirmed by the isomorphism of their anhydrous sulphates and chlorides, and on the other their difference from the group of diatomic oxides.

Iodates of Cobalt and Nickel.—Prof. F. W. Clarke describes these salts, which were prepared by dissolving the carbonates in aqueous iodic acid, and allowing the solution to evaporate spontaneously, when salts of the composition, $Co_2O_3 \cdot 6H_2O$ and $Ni_2O_3 \cdot 6H_2O$ crystallize out. If the solution of the carbonate of cobalt in iodic acid is evaporated rapidly, then the iodate of Rammelsberg, containing $1\frac{1}{2}$ molecule of water, may be obtained, but not otherwise. The cobalt iodate loses four molecules of water at 100°, but the remaining two molecules cannot be driven off without partial decomposition of the salt. The specific gravities of the two salts are almost identical, the cobalt iodate at 21° being 3.6893, the nickel iodate at 22° being 3.6954. No numbers of the solubilities of the two salts are given by Prof. Clarke, but these, when obtained, will be of some interest.

ARTIFICIAL PRODUCTION OF CORUNDUM, RUBY, AND VARIOUS CRYSTALLINE SILICATES.

By MM. E. FREMY AND FEIL.

THE authors begin by forming a fusible aluminate and heating it to bright redness with a siliceous substance; the alumina is in this case slowly liberated from its saline combination in presence of a flux, and crystallizes. They attribute the crystallization of the alumina to different causes, either to the reduction of this base by the gases of the furnace, or to the formation of a soluble silicate when the alumina is displaced by silica, or to a phenomenon of liquidation, which produces a very fusible silicate and sparingly fusible alumina. The displacement of alumina by silica seems the best method for effecting the crystallization of the former earth. The authors place in a crucible of refractory earth a mixture of equal weights of alumina and red lead, and on calcining at bright redness for a sufficient time they find in the crucible, when cold, two distinct layers; the one is vitreous and consists of lead, the other is crystalline and often presents nodules filled with fine crystals of alumina. In this process the crucible acts by means of the silica which it contains. To avoid the loss of the product the authors generally use a double crucible. Colorless crystals of corundum are produced by the method just described, but the color of the ruby may be obtained by adding from two to three parts of bichromate of potash, and that of the sapphire by using a small quantity of oxide of cobalt mixed with a trace of bichromate of potash. The crystals of ruby thus obtained are generally covered with silicate of lead, from which they have to be freed by prolonged heating in hydrogen and subsequent treatment with acids and alkalis. In certain cases crystals have been found almost pure and presenting all the characters of natural corundum and ruby. By the action of equal weights of silica and fluoride of aluminium kept at a red heat for several hours the authors obtain a silicate of alumina, agreeing in its composition and properties with dysthene, and on substituting boric acid for silica they produce a crystalline borate of alumina.

DETERMINATION OF OILS.

PROF. R. H. THURSTON, in a recent lecture before the Master Car Builders in this city, described an interesting method of determining the quality and kind of any oil. He said: "Procure a perfectly clean basin and pour into it perfectly clean water. Drop on the surface a drop of the oil which it is desired to analyze. The oil will spread over the surface of the water, but owing to its tenuity and inability to cover all the surface, will break up into a regular lace-like pattern, spaces of clear water intervening between the lines of oil. The same oil will present the same peculiar lace work at each trial. Different oils have different patterns of lace work, by which they may be at once recognized. To secure a permanent pattern of any oil, by which to compare experiments, the following method is useful: Place a piece of blotting paper lightly on the floating lace work. It will immediately absorb the oil. Then place the same paper on a surface of ink. The parts covered by the oil will be protected from the inks, while the other portions will absorb the inks. A perfect pattern of the peculiar lace work will thus be secured for future use."

PHOTOGRAPHY IN COLORS.

JOSEPH ALBERT, photographer to the court at Vienna, has finally succeeded in inventing photography to render the natural colors in the picture by a photographic steam press of his own construction without the aid of a pencil. An expert painter could hardly give the colors of the object more faithfully in living reality and with the distinctness to the nicest shades than in these colored photographs by the Albert press. The secret of the invention consists in the analysis of the white light into the three colors, yellow, blue, and red, and in the recovery of the three colors ready for the press. On a plate, chemically prepared so as to receive but the yellow parts of the light, and the tones of the colors of the object to be reflected, the first photograph is taken, when a negative of that plate is at once put under the press, whose cylinder is rubbed over with yellow paint. None but the tones of the yellow colors are now seen in the impression. After that the object is photographed on the plate made to reflect but the blue colors. This plate now under the press reflects a blue impression, the cylinder being rubbed over with blue paint. In the same manner he receives but the tones of the red colors by means of a third plate. Printing the individual pictures of the yellow, blue, and red over each other, a picture is produced true to nature, the colors intermixing by having been printed over each other. The idea, long entertained and prosecuted by Albert, to photograph colors, may no longer be considered as not feasible. It is very hard at the present time to foretell how great a revolution this new invention will produce in the many departments of art.