

and heat gently in the water-bath. The heat may be removed when hydrochloric acid begins to escape, and the reaction continues spontaneously. When no more hydrochloric acid is evolved, which may ensue in three or four hours, the reaction is completed by heating for 12 hours in the oil-bath to 135° to 145°. It is then let cool, the solid product of the reaction is broken up and dissolved in dilute caustic soda. It is well to boil for a considerable time. When the residue no longer diminishes in volume, we filter and precipitate the acid coloring matter by means of hydrochloric acid. The precipitate is washed with cold water, dissolved in the quantity of carbonate of soda needful to saturate the acid, and evaporated to dryness. The soda-salt of benzylated fluorescein constitutes chrysolin.

Chrysolin appears, as a mass, with green metallic reflections, but is red-brown when reduced to powder. It is soluble in water and alkalies; its solutions, which present a magnificent green fluorescence, are precipitated by acids in yellow flocks. It yields bromated, iodated, and nitro-derivatives, which are all beautiful coloring matters.

Chrysolin may be fixed directly upon silk and wool. Wool, however, is preferably mordanted in a beek of acetate of lead and alum. Cotton is mordanted with sulphate of alumina and dyed at a hand-heat.

The shade of chrysolin approaches that of turmeric, and it resists the action of light well.

Yellow coloring matters may also be obtained by replacing the chloride of benzyl with the chlorides, bromides, and iodides of the fatty series. Methyl-resorcin, prepared by heating under pressure the resorcinol of soda in alcoholic solution with chloride of methyl, yields also a yellow coloring matter.—*Moniteur Scientifique*.

#### LABORATORY NOTES.

By T. A. EDISON.

HARD rubber or vulcanite, placed for several weeks in nitrobenzol, becomes soft and pliable like leather, and easily broken.

2. The vapor of chloral hydrate is a solvent of cellulose. I have found the corks of bottles containing the crystals eaten away to the depth of a quarter of an inch, the cork being resolved into a black semi-liquid. Certain kinds of tissue paper are partially dissolved in time, if thrown in a bottle containing the crystals.

3. A very difficult substance to dissolve is gum copal. I have found that aniline oil dissolves it with great facility.

4. Hyposulphite of soda is apparently soluble to a considerable extent in spirits of turpentine. Large crystals of "hypo" melt down to a liquid after several weeks, and if the bottle be shaken, partially disappear. The turpentine smell nearly disappears.

5. The vapors of iodine, in the course of several months, will penetrate deeply into lumps of beeswax.

6. If to a solution of bisulphide of carbon there be added twice its bulk of potassic hydrate in sticks, and the bottle be well sealed, the whole will, in two months, become an intense reddish, syrupy liquid, with scarcely any free bisulphide of carbon.

7. Some substances in solution form crystals or deposits on the sides of the bottles containing them, generally above the water line. Among such solutions in 100 c. c. of rain water may be mentioned a 14-grm. solution of acetate of uranium, 8-grm. do. of proto-acetate of copper, 5-grm. do. acetate of morphine, 10-grm. do. of formate of copper, 20-grm. do. of tannate of iron. These deposits invariably take place on that part of the bottle most exposed to light. This phenomena may be due to heat, but deposits or films occur in some solutions within the liquid as well as above it—especially noticeable with tannate of iron, the film of which adheres strongly to glass.—*American Chemist*.

#### NEW METHOD OF DETERMINING PHOSPHORUS, ARSENIC, SULPHUR, CHLORINE, BROMINE AND IODINE IN ORGANIC SUBSTANCES.

By M. G. BRUGELMANN.

The method proposed by the author consists in burning the organic matter in a current of oxygen and in condensing the products by an incandescent layer of pure lime, or of soda lime in the case of the determination of bromine and iodine. We operate in a tube of Bohemian glass open at both ends, of an internal diameter of 12 m.m. Here are introduced successively—First, a leaf of platinum of the width of 2 centimeters, rolled in a spiral, and forming a plug. Second, a layer of lime in granules, or soda lime, which is heaped lightly so that it may occupy all the diameter of the tube; a length of 10 centimeters is given to this layer, which is quite sufficient to retain completely the elements to be determined. Third, a second bed of platinum of a width of 6 centimeters rolled into a spiral; when the body in question contains phosphorus or arsenic, this spiral should be replaced by a layer of fragments of very small infusible glass. Fourth, a layer of asbestos of a length of 15 centimeters; this layer is indispensable to prevent explosions when we are operating upon volatile bodies or on substances emitting at a temperature slightly elevated combustible gases or vapors. Fifth, the substance introduced directly into the tube, or contained in a small boat or vial, may be in large pieces. Finally, the tube is closed by the stopper holding a very narrow tube (diameter 0.5 m.m.), through which the oxygen is transmitted; the extremity of the tube remains open. The total length of the tube is from 40 to 50 centimeters. We commence by heating the first half of the layer of lime, then oxygen is caused to enter, whilst the other half is raised to redness; at this moment we commence the combustion of the substance. The oxygen ought always to be in excess in the tube, so that the products arriving on the lime are entirely burnt; in any case the lime should not blacken. The speed of the current of oxygen is liable to variations, but on the average 100 c.c. may enter per minute.

If we burn volatile matters or substances which are decomposed at a low temperature, giving off vapors, we cannot always prevent explosions, even on heating with great precaution; in this case we commence the combustion in a current of air, and only turn on oxygen at the moment when we have driven by heat all the substance into the layer of asbestos. Substances rich in phosphorus are mixed with three times their weight of lime and placed in a large platinum boat. When the combustion is finished we break the tube at the place where the layer of asbestos touches the platinum spiral, we remove with care the smallest particles of asbestos, we clean the outside of the tube, and we heat the contents with water to clean it completely; then we add gradually nitric acid until the whole is in solution; in this way we only employ a slight excess of nitric acid. It is well understood that the tube and boat ought to be rinsed carefully in weak nitric

acid. In this solution the haloid elements are precipitated in the state of chloride, bromide, or iodide of silver, where they are determined volumetrically by Volhard's process by means of two standard solutions of sulphocyanide of ammonium and nitrate of silver, ferric sulphate serving as an indicator. Let us add, however, that a part of the iodine is found in the state of free iodine and of iodic acid, and ought to be brought back previously to the state of hydriodic acid by the addition of sulphurous acid until the liquid is decolorized.

Sulphuric acid is determined as sulphate of barium, or else volumetrically by a standard solution of chloride of barium; after the method of Wildenstein, which the author has modified slightly. Finally, the phosphoric or arsenic acids are volumetrically determined with nitrate of uranium. The lime and soda-lime are employed in the form of grains whose diameter exceeds 1 millimeter; they ought to be free from chlorine, sulphur, phosphorus, iron and aluminum. The author describes the preparation of pure lime and soda-lime; for this latter he employs 4 parts of pure lime and 1 part of pure soda prepared from sodium.

The method seems to us to present a great interest for determining chlorine, sulphur or phosphorus in substances which are poor in these elements, such as vegetable and animal products; it enables us, in fact, to burn in a short time a large quantity of matter (about 20 grms. in two hours).—*Zeitschrift für Analytische Chemie*.

ALUMINIUM NITRIDE.—Mallet has made some experiments with the object of ascertaining whether aluminium resembles iron in being capable of combining with carbon. When heated to very high temperatures with carbonate of soda, a metallic carbide was not formed. Small yellow crystalline particles, as well as crusts of yellow color, were observed on the surface or in the cavities of the aluminium regulus, and these proved to be a nitride of that metal. When amorphous the substance is pale yellow, when crystalline it is honey-yellow and transparent. The crystals are lustrous, brittle, and less hard than glass; they are not directly decomposed by water, either hot or cold, but by long exposure to moist air they become sulphur-colored and opaque, and finally crumble to a white powder (alumina), ammonia being given off. They are decomposed by acids and caustic alkalis. The composition of the pure substance was found to be;

|                |        |
|----------------|--------|
| Aluminium..... | 66.16  |
| Nitrogen.....  | 33.84  |
|                | 100.00 |

which corresponds with the formula  $Al_2N_3$ .—*Ann. der Chem.*

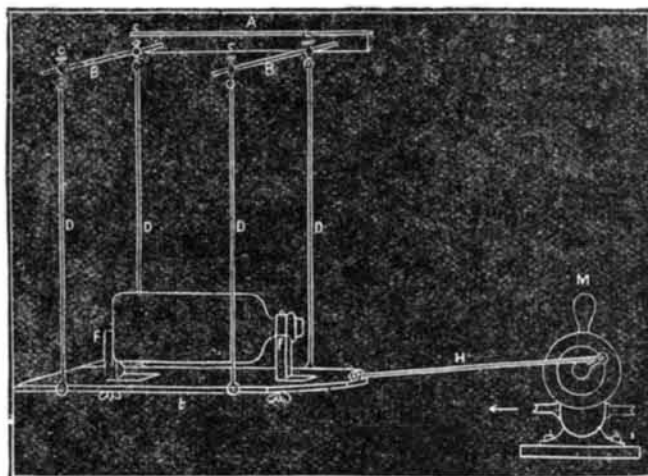
A NEW CARBO-HYDRATE IN MILK.—Ritthausen has found in milk a carbo-hydrate which is not milk sugar. It occurs only in small quantities, and is easily soluble in water; its solution forms with a small quantity of the copper solution and potash the well known blue liquid; when boiled for a long time, a little cuprous oxide is deposited; if the liquid be previously boiled with a little sulphuric acid the application of a gentle heat is sufficient to cause a copious reduction. Alcohol throws down a flocculent precipitate from an aqueous solution of the substance. When evaporated to dryness, either by the application of heat, or at ordinary temperatures over sulphuric acid, its solution leaves a gum-like viscous residue, in which the granular, non-crystalline substance can be recognized. This reaction shows that the body under consideration is not milk sugar.

#### ON MIXING EMULSIONS.

I HAVE for some time past been occupied in experimenting on a means whereby emulsions can be made in large quantities, and at the same time getting a perfect division of the nitrate of silver.

The agitation of the emulsion does not present any difficulty when made in small quantities; but when manufactured on a large scale it is inconvenient to obtain the necessary agitation. In order to remedy this I have had recourse to a mechanical contrivance constructed by M. Aloerginat, and of which the following is a description:

A is a bar of iron which is fastened to a wall, and from which projects two brackets, B B, and on each of these arms are rings, C C C C. From these rings are suspended four



rods, D, terminated at each end by a ring or hook. These rods support the platform, E, on which the bottle containing the solution is placed. F F are supports for said bottle. The whole should be so arranged as to swing easily.

The oscillating movement is obtained by means of a small hydraulic motor used for sewing machines, and which need not possess any great power. The motor is connected by means of H. A very slight degree of force is sufficient to oscillate a great quantity of emulsion when once it has been set in motion. I have under these conditions made a large quantity of emulsion, the results of which have been highly satisfactory.

I may say, after what has been published by M. Andra, that I have introduced without precaution the bromized colloid in the hot alcoholic solution of nitrate of silver, without troubling myself about the precipitate.

The precipitation of emulsion with hot water is very easy; but I think it ought to be remarked that the precipitate

should be submitted to slight pressure. It intensifies its effect, but very good results have been obtained when the emulsion has simply been drained and dried.

In order to render the desiccation more rapid, and at the same time more complete, I dry the precipitate in blotting-paper, and introduce it under a bell-glass, together with a dish containing some concentrated sulphuric acid, and make a vacuum. The product resulting from this operation is flaky, but it dissolves readily in alcohol and ether, and furnishes a fine film free from defects.

The emulsion should be introduced while wet into a dish containing alcohol (forty degrees), and in a few hours placed again in concentrated alcohol. This second bath serves to remove all traces of water. It should then be dried as before, and the emulsion ought to be dissolved in the ethereal-alcoholic mixture. If it be preferred that the emulsion should be kept in powder it is dried rapidly, and can easily be dissolved.

In conclusion, I must say that during the recent hot weather I have modified the proportions of alcohol and ether indicated for emulsions. I use sixty per cent of alcohol and forty per cent of ether. This modification I found necessary.—C. BARDY, in *Bulletin de la Société Française de Photographie*.

#### THE LATE W. H. FOX TALBOT.

ONE by one our photographic fathers are departing. Following the other two members (Niepce and Daguerre) of that grand old trio to whom photography owes its existence, Mr. William Henry Fox Talbot, F.R.S., at the ripe age of seventy-seven, "rests from his labors," having died at his family residence, Lacock Abbey, Wilts, on Monday, the 17th instant.

Mr. Talbot was born in Dorsetshire, in 1800, and up to the age of thirty-three he passed his time very much in the manner one expects of a man of cultivated scientific and artistic tastes, and possessing the means of indulging in those tastes to the fullest extent. At that period it was customary for those who traveled abroad, and whose desire to make sketches of scenes met with in foreign travel transcended their ability to execute them skillfully, to carry with them a camera lucida—a small prismatic instrument which, when fixed to a table, enables any one to draw with accuracy the particular scene to which the instrument is directed. It was when amusing himself in sketching, by the aid of this instrument, the scenery on the shores of the Lake of Como, in 1833, that Mr. Talbot first experienced a strong desire to make science a handmaid to art, and to find some means by which the beautiful transcripts of nature to be seen in the camera obscura—which instrument he also utilized in connection with art—might by chemical agency be made to record themselves, if not in colors, at least in light and shade. To accomplish this object Mr. Talbot set himself to consider whether it could be effected by any of the chemical processes then known. Now what, at that epoch, was known? Thanks to Scheele, certain properties possessed by chloride of silver when exposed to light had been discovered and recorded. Writing just one hundred years ago (*Traité de l'Air et du Feu*, 1777) that *savant* says: "It is well known that the solution of silver in acid of nitre poured upon a piece of chalk and exposed to the beams of the sun grows black. The light of the sun reflected from a white wall has the same effect, but acts slowly. Heat without light has no effect on this mixture." Scheele also discovered that it was to the violet and blue rays of the spectrum that this change was due, and not to the more luminous yellow or red rays.

Various applications of this discovery were made by Wedgwood, Davy, and others, the chief result obtained being the production of profiles upon white leather that had been washed with nitrate of silver, this being produced by allowing the shadow of a rigid body to fall upon the leather when placed in the sun. But no means of fixing these shadow pictures were known, hence the pictorial results of these two experimentalists had to be kept shut up in a drawer. At this stage of such peculiar scientific knowledge Talbot entered the field of research.

The various steps through which Mr. Talbot's earliest experiments were conducted may be summarized as follows: First, he tried simple nitrate of silver solution brushed upon paper and dried, but this was found to darken too slowly. Next, he spread chloride of silver upon moist paper, but this also proved unsatisfactory. He then discovered that

the best way by which to prepare chloride of silver was by double decomposition, the paper being first impregnated with common salt and afterward with nitrate of silver. He discovered in the course of these experiments that in order to obtain the highest degree of sensitiveness with this preparation there must be an excess of nitrate of silver allowed to remain in the film. On paper prepared in this manner Mr. Talbot obtained numerous pictures of flat objects—such as leaves, lace, and analogous objects—by superimposing them upon the sensitive paper and then exposing them to light. But by means of a modification of this process—that is, by giving two successive coatings of chloride of silver with nitrate in excess, and making use of the paper while in a moist condition—images were at length obtained in the camera obscura, although a long exposure had to be given. This was accomplished in 1835, and an account of the experiment will be found in the *Philosophical Magazine* at that period.