

scale are a long room or series of rooms in a line, at one end of which should be fitted a fan behind a good filter of cotton-wool, a long pipe with a series of Bunsen burners set along it, so that when all were lit a line or sheet of flame would be produced which might be gently passed along and made to play on every part of the floor, walls, and roof of the room, beginning near the end at which the fan works and going gradually toward the door; by this means any spores adhering to the walls would be destroyed, and no air could pass back to pollute the walls or floor which had been thus purified. A stove might be arranged at the door end of the room, by which cotton garments to cover the ordinary clothes of the surgeons and attendants might be heated to a temperature presumably sufficient to destroy or paralyze the vitality of any spores which might have been adhering to them, and where the knives and other appliances used might be previously heated, and where water used in washing the wounds might be previously heated under pressure. With such an arrangement at a hospital it seems to me that one interesting mode of investigation into some most important subjects might be commenced.

[NATURE.]

CHEMICAL NOTES.

Origin and Formation of Boracic Acid.—M. Dieulafoy (*Comp. Rend.*, lxxxv., 605) finds that under certain conditions by spectrum analysis $\gamma_{\text{boracic acid}}$ gramme of boron, and by the color imparted to a hydrogen flame $\gamma_{\text{boracic acid}}$ gramme, may be detected. He considers boracic acid to be a normal constituent of sea-water and salt marshes lying above beds of carnallite. M. Dieulafoy finds that this acid may be recognized in a drop of sea-water weighing about 0.0378 gramme, and that the minimum quantity found in the Mediterranean is two decigrammes per cubic meter of water. He arrives by geological reasoning at conclusions differing from those of Dumas and others with regard to the origin of this body in the lagoons of Tuscany, and thinks that the source of boracic acid in this district may be found in a relatively modern formation.

The Action of certain Antiseptic Vapors on the Ripening of Fruits.—MM. Lechartier and Bellamy give an account in the *Comptes Rendus*, lxxxiv., 1035, of some experiments they made on the fermentation of apples when inclosed in vapors such as carbolic acid, camphor, and potassium cyanide. From their results it appears that no fermenting action took place in the apples surrounded by vapor of carbolic or hydrocyanic acids, and a slight action only in the one surrounded by camphor vapor. The camphor vapor, in fact, diminishes without entirely destroying the vitality of the cells. In this journal, also, there is an account of experiments performed in the same direction by M. Gayon. He incloses the apples in vapors of chloroform, ether and carbon disulphide, and his results agree with those of the first observers. The chloroform and ether act in the same manner as the carbolic and hydrocyanic acids; the carbon disulphide in the same way as camphor, permitting partial fermentation only.

A Problem in Chemical Affinity.—In his work on "Gasometric Methods," Prof. Bunsen details an interesting series of experiments on the phenomena accompanying the explosion of hydrogen and carbon monoxide with a volume of oxygen insufficient for its complete combustion. From the results he deduces the conclusion that the ratio between the products of combustion ($\text{H}_2\text{O} : \text{CO}_2$) can always be expressed by small whole numbers (1 : 2, 1 : 3, 1 : 4, &c.), and that it alters suddenly from one figure to the next by gradually increasing the amount of hydrogen. Deeming the nine experiments upon which the conclusion was based as insufficient for the establishment of a general principle, Prof. Horstmann, of Heidelberg, describes in the *Verhandlungen des heidelb. naturf. med. Vereins* an extensive series of observations designed to test the truth of the law. Among his results the following facts are of interest: In exploding CO with gradually increasing quantities of $\text{H}_2 + \text{O}$, while the ratio between H and CO increased from 0.25 : 1 to 2.33 : 1, the ratio between H_2O and CO_2 gradually increased from 0.8 : 1 to 4.5 : 1, with no evidence of a predilection for rational numbers. Experiments on a mixture of CO and H, with gradually increasing amounts of O, led to the same results, showing no such regularity in the division of O between the two combustible gases as Bunsen's law would indicate. When aqueous vapor is present in the mixture, less H and more CO unites with O, while the presence of CO_2 reverses the case. By gradually increasing the amount of O in the explosive mixture, it was noticed that the ratio between the resultant H_2O and CO_2 increased until it attained a maximum, when 35 per cent. of the combustible gases were oxidized, and then sank regularly to the ratio denoting complete combustion. The oxygen appears to be divided among the two gases according to the following law:—The ratio between the resultant H_2O and CO_2 is equal to the ratio between the residual H and CO multiplied by a co-efficient of affinity which is independent of the ratio between the combustible gases but dependent on the relative quantity of O present. This co-efficient of affinity varied between 4 and 6.4, showing that always more H relatively than CO is consumed, and hence that the affinity of O to H is greater than that to CO.

Halogen Derivatives of Amines.—An attempt has frequently been made by chemists to replace the hydrogen in the hydrocarbon group present in amines, by Cl, Br, or I. These efforts have hitherto resulted simply in the substitution of the basic H atoms of the amine by halogens—as $\text{C}_2\text{H}_5\text{NCl}_2$ —or in complete decomposition. A. Michael (*Berl. Ber.*, x., 1644) has devised a method for accomplishing this end, which consists in first replacing these basic H atoms by acid residues, and then exposing to the action of a halogen ethyl-phthalimide, $\text{C}_6\text{H}_4(\text{CO})_2\text{N} \cdot \text{C}_2\text{H}_5$, yields in this way with Br a tribromo-ethyl-phthalimide.

Double Salts with Cyanide of Gold.—C. G. Lindbom publishes in the *Univ. Arsskrift* of Lund an exhaustive account of these compounds, which may be regarded as salts of the two acids, $\text{HCy} \cdot \text{CyAu}$ and $\text{HCy} \cdot \text{CyAu} \cdot \text{Cy}_2 + 14\text{aq.}$, neither of which, however, can be obtained pure for analysis on account of their tendency to decompose. Most of the auro salts unite directly with a molecule of the halogens; for example aurocyanide of sodium, NaCy_2Au , forms bromo-aurocyanide of sodium, $\text{NaCy}_2\text{AuBr}_2 + 2\text{aq.}$ Aurocyanide of ammonium, AmCy_2Au , is decomposed at 100° .

The Fourth Nitro-benzoic Acid.—Prof. F. Fittica has discovered lately a new nitro-benzoic acid, making the fourth of the isomeric acids, which has been contested by other chemists, especially as it fails altogether to harmonize with

the theories at present accepted in regard to the structure of benzene derivatives. In the October session of the Deutsche Chemische Gesellschaft he strengthens his position by announcing the discovery of a fourth nitro-benzaldehyde, obtained by the action of H_2SO_4 on benzaldehyde and ethylic nitrate, which on oxidation is changed into the new nitro-benzoic acid, $\text{C}_6\text{H}_4\text{NO}_2\text{COOH}$.

Influence of Isomerism on the Formation of Ethers between Acids and Alcohols.—In the September session of the Russian Chemical Society, Prof. H. N. Menshutkin presented an elaborate paper on this subject based on observations of the formation of acetic ethers. The process consisted in inclosing molecular weights of an alcohol and acetic acid in glass tubes, immersing it in a glycerin bath at 154° for a certain time, and then rapidly cooling it, and titrating the unaffected acetic acid with baryta water. The results show that in regard to the rapidity and limits of etherification the primary alcohols are sharply divided from the secondary, and the latter from the tertiary, and the saturated alcohols from the non-saturated. A regular decrease in the rapidity coincides with an increase in the molecular weight of the alcohol. As in many other series of experiments, methylic alcohol shows considerable deviations from the laws governing its higher homologues. In the case of non-saturated alcohols the rapidity is less than that of the corresponding primary alcohols, but greater than that of the corresponding secondary alcohols.

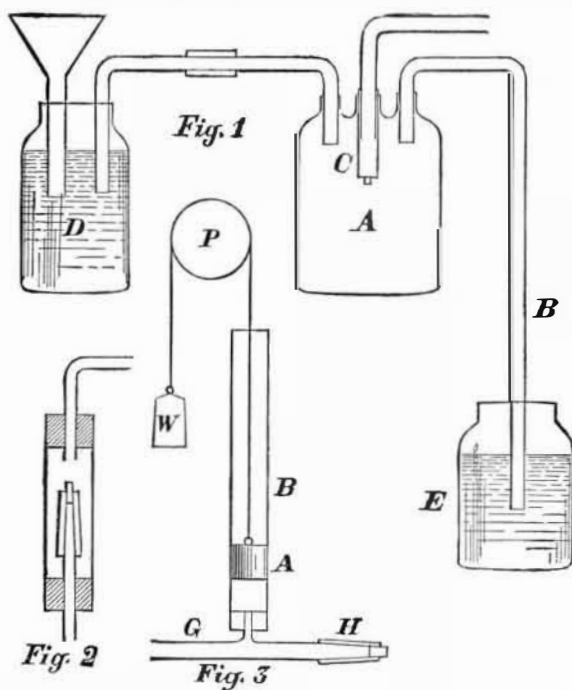
Phosphides of Tin.—Since the introduction of phosphorus bronze, the compounds of phosphorus and the metals are receiving more attention. S. Natanson and G. Vortmenn describe (*Berl. Ber.*, x., 1459) several methods of preparing phosphides of tin, viz., throwing P on molten tin, melting a mixture of vitreous phosphoric acid, charcoal and tin, and passing phosphorus vapors over molten tin in a hydrogen stream. These processes all yield a crystalline silvery white compound, containing from $1\frac{1}{2}$ to 3 per cent. of P, and leaving on treatment with HKO a residue of pure SnP.

Chemical Action of Light.—In a late number of the *Annales de Chimie et Physique*, M. Chastaing advances, in connection with a variety of observations on this topic, the theory that the chemical action of the various colored rays on inorganic substances is dependent on refrangibility, blue and violet acting as reducing agents, red and yellow causing oxidation. Prof. H. W. Vogel attacks this opinion vigorously in the last session of the German Chemical Society, claiming that the nature of the substance causes the action to be one of reduction or oxidation. The union of H and Cl, which takes place so rapidly in violet light, is regarded as purely analogous to oxidation, and he alludes to Timiriazeff's late experiments, showing that the reduction of CO_2 by plants proceeds more rapidly in red light than in green.

APPARATUS FOR RAPID FILTERING.

I.

To one of the necks of the Wolff bottle, A, Fig. 1, is attached a glass tube, B, about $\frac{1}{2}$ an inch in diameter, and from 3 to 6 feet long, dipping below in a jar, E, containing water. The middle neck carries a tube, C, which is an inverted Bunsen rubber valve (shown in Fig. 2), described in Thorpe's Quantitative Analysis, p. 62. The third tubulure connects the Wolff bottle with the flask D, which carries the funnel. A rubber connector between the two enables the operator to empty the filtrate, wash the precipitate,



APPARATUS FOR RAPID FILTRATION.

II.

cleanse the flask D, etc. By suction, with the mouth at the tube C, a pressure of from 1 to 2 lbs. on the square inch may be obtained, as shown by the rise of the water in the tube B, and can easily be kept within certain limits.

By the addition of the following, the pressure, as indicated by the water column D, Fig. 1 (or other suitable manometer), may be kept uniform. B, Fig. 3, is a glass tube at least an inch in diameter, to which is fitted a weighted solid plunger piston, A, more than counterbalanced by the weight W. The lower end of the tube B is connected to one of the arms of the "T" or "Y," G. Another of these arms terminates in a rubber valve, H (as above), opening outward, and the third arm is connected with the tube C, Fig. 1. When the weight W is lifted, the piston sinks, the air being driven out at H, and the subsequent rise of the piston creates a pressure which may be modified by the addition or subtraction of small weights from W. The valve C in Fig. 1 prevents the fall of the water-column, etc., when it is necessary to raise the weight W.

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Racine College, January, 1878.

PAINTS WITHOUT POISON.

By M. E. TURPIN.

A SOLUTION of the potassic or sodic eosin of commerce, treated with an acid, yields precipitate of eosic acid, insoluble in water. This precipitate, if washed until the water begins to turn rose-color, is insoluble in the hydrate of the oxide of zinc, and forms thus a very rich lake, which may vary from a rose to a deep red, according to the quantity of eosic acid employed. This acid, dissolved in a solution of sodic carbonate and precipitated with potash-alum, likewise gives a very rich lake. These lakes resist elevated temperatures and sulphurous emanations, and may be used in the coloration, in the mass, of vulcanized India-rubber, withstanding perfectly the degree of temperature required for vulcanization and the disengagement of sulphureted hydrogen which ensues during the reaction. The colors obtained with these lakes are in this case incomparably finer than the shades obtained with mercuric sulphide (vermillion) and antimoniac sulphide, and may serve as substitutes for these colors in painting, and have the advantage of being harmless. Pure fluorescein likewise forms a yellow lake with hydrated zinc oxide. If eosin and fluorescein are employed conjointly they yield lakes capable of replacing the reds and oranges obtained from lead, as minium, orange minium, etc. Zinc chromate, if treated with a potassic solution of eosin and the eosic acid liberated by the addition of alum, yields, on evaporation to dryness, lakes remarkable for the brightness of their shades, which may range from a pale yellow to a lively red, and which may serve as substitutes for the poisonous chromates of lead. These products, although attacked by water, may be advantageously employed in painting, for they are absolutely indecomposable by oils and essences, cover well, and can be prepared cheaply. With the aid of these new colors and certain others, the author has reproduced approximately, with non-poisonous colors, the chromatic table of M. Chevreul.

LIQUEFACTION OF NITROGEN, HYDROGEN AND ATMOSPHERIC AIR.

M. CAILLETET has communicated to the *Academie des Sciences* some further particulars on the liquefaction of gases, and at the meeting of the 31st of December a paper was read, from which we translate the following:

"Nitrogen.—Pure and dry nitrogen compressed to about 200 atmospheres, at a temperature of $+13^\circ$, then allowed to expand suddenly, condenses in the most perfect manner; it first produces an appearance like that of a pulverized liquid in small drops of appreciable volume; this liquid then gradually disappears from the sides to the center of the tube, at last forming a sort of vertical column following the axis of the tube. The duration of these phenomena is about 3 seconds.

"These appearances leave no doubt as to the true character of the phenomena. I first tried the experiment at home at a temperature of -29° , and I repeated it yesterday, the 30th of December, several times at the laboratory of the Ecole Normale, in the presence of many *surants* and members of the Academy, among whom I am happy to name, with his assent, the venerable M. Boussingault.

"Hydrogen.—Hydrogen has always been considered the most incondensable gas, on account of its low density and the almost complete agreement of its mechanical properties with those of perfect gases. Thus it was only with great doubt as to the result that I decided to submit it to the same tests which had determined the liquefaction of all the other gases.

"In my first attempts I noticed nothing particular, but, as often happens in experimental science, skill in observing phenomena results in causing signs to be recognized under conditions where they had at first escaped notice.

"This is what occurred with hydrogen. On repeating my experiments to-day in the presence of MM. Berthelot, H. Sainte-Claire Deville and Mascart, who have allowed me to quote their testimony, I have succeeded in observing indications of the liquefaction of hydrogen under conditions of proof which have left no doubt on the minds of the scientific men who witnessed the experiment. It has been repeated a great number of times. Operating with pure hydrogen compressed to about 280 atmospheres, and then suddenly allowed to expand, we saw form an extremely attenuated and subtle mist suspended in the gas and disappearing suddenly. The production of this mist, in spite of its extreme subtlety, seemed incontestable to all the scientific men who witnessed the experiment to-day, and who took care to have it repeated several times, so as to leave no doubt as to its reality.

"Air.—Having liquefied nitrogen and oxygen, the liquefaction of air is thereby demonstrated. It appeared, however, of interest to make this the subject of an actual experiment, and, as might be expected, it succeeded perfectly. I need not say that the air was previously dried, and freed from carbonic acid. The accuracy of the views expressed by the founder of modern chemistry, Lavoisier, is thus confirmed as to the possibility of causing air to assume the liquid state, and of producing matter gifted with new and unknown properties—views recalled so appropriately at the last meeting by our illustrious perpetual secretary."—*Chemical News*.

REPRODUCTION OF THE SULPHIDE, SELENIDE, AND TELLURIDE OF SILVER IN A CRYSTALLINE STATE, AND OF FILIFORM SILVER.

By M. J. MARGATTET.

SILVER, gold, and occasionally copper are met with in nature in filaments, the appearance of which recalls that of a metal passed through a wire-drawing apparatus. These three metals may be artificially obtained by the dry way in this filiform condition on reducing their sulphides, selenides, and tellurides with hydrogen. The author obtains crystalline sulphide by passing the vapor of sulphur, carried slowly along by a current of hydrogen, over silver at a dull red heat. As soon as the sulphur comes in contact with the silver, the latter is covered with crystals of silver sulphide, which increase in size and number until the silver is completely sulphureted. The current of sulphur must be very slow. The composition and the physical properties of the artificial product are the same as those of the native sulphide, Ag_2S . Its form is that of a rhomboidal dodecahedron. The selenide and telluride of silver are obtained in an analogous manner. The former is steel-gray and very brilliant, and crystallizes in the regular system in the form of a rhomboidal dodecahedron. Silver telluride is black, and is obtained in chaplets of regular octahedra, united by their summits. Crystalline silver sulphide is entirely converted into filiform metallic silver by a current of dry hydrogen at a tempera-