

### A NEW AND VERY POWERFUL ELECTRICAL OZONIZER.

At the last meeting of the American Chemical Society, Prof. Leeds gave an account of an extended series of experiments, which had led to the construction of a new electrical ozonizer. The objects in view in these experiments were, in the first place, to convert as large a percentage of the air or oxygen operated upon into the form of ozone as possible; and secondly, to employ large volumes of the air thus ozonized. The first result had been obtained by Sir Benjamin Brodie and Prof. Von Babo, the former of whom had in one trial converted as much as 6.5 per cent. of a confined volume of oxygen into ozone. But the amounts of gas experimented upon by these two investigators were extremely small, from 100 to 300 c.c., and therefore, not capable of utilization for practical purposes. It was necessary to discover, if possible, some method of ozonizing to a maximum a large volume of oxygen flowing with a rapid current.

In preliminary experiments, the various forms of electrical ozonizers hitherto proposed were tried under uniform conditions, and the comparative results so obtained were noted. The electricity was derived from an induction coil, arranged to give about 60 sparks of 30 to 80 mm. in length per minute. Using such a coil, Houzeau's, Boillot's, Von Babo's, Wills', and different forms of Siemens' ozonizers were tried, and found inadequate to meet the wants above specified. The experiments, however, established the following principles of construction for an induction tube, giving satisfactory results: 1st. The amount of ozone increased with the intensity of the electrical charge upon the unit of surface. 2d. The smaller the interval between the electrified surface, the greater the amount of ozone produced. 3d. The quantity increased with the prolongation of the interval during which the air or oxygen was subjected to the electrical action up to a certain point when it arrived at a maximum, dependent upon the circumstances of the experiment.

These principles were finally embodied in the construc-

22.8 mgrms.; when 6 elements were used, to 51.74 mgrms.; and when 12 elements were used, to 69.93 mgrms.

To obtain the best results with such a battery the following precautions should be observed: 1st. The connections at *dd* should preferably be made by grinding the end of one inlet tube into the corresponding exit tube, and the other joints should be made, not by sealing wax, but by fusing the glass. 2d. The number of elements used should be proportional to the strength of the coil, the maximum effect being obtained when the whole interior is luminous, but without sparks in a darkened room. 3d. The feeble induction should be replaced by one giving a large number, as well as a great length of sparks. 4th. The exterior foil should be covered with an outer enveloping tube of glass. 5th. The temperature of the ozonizing battery should be prevented from rising, by placing it within a refrigerating chamber and surrounding it by dry air kept at 0°.

### KREATININ AND KREATIN.

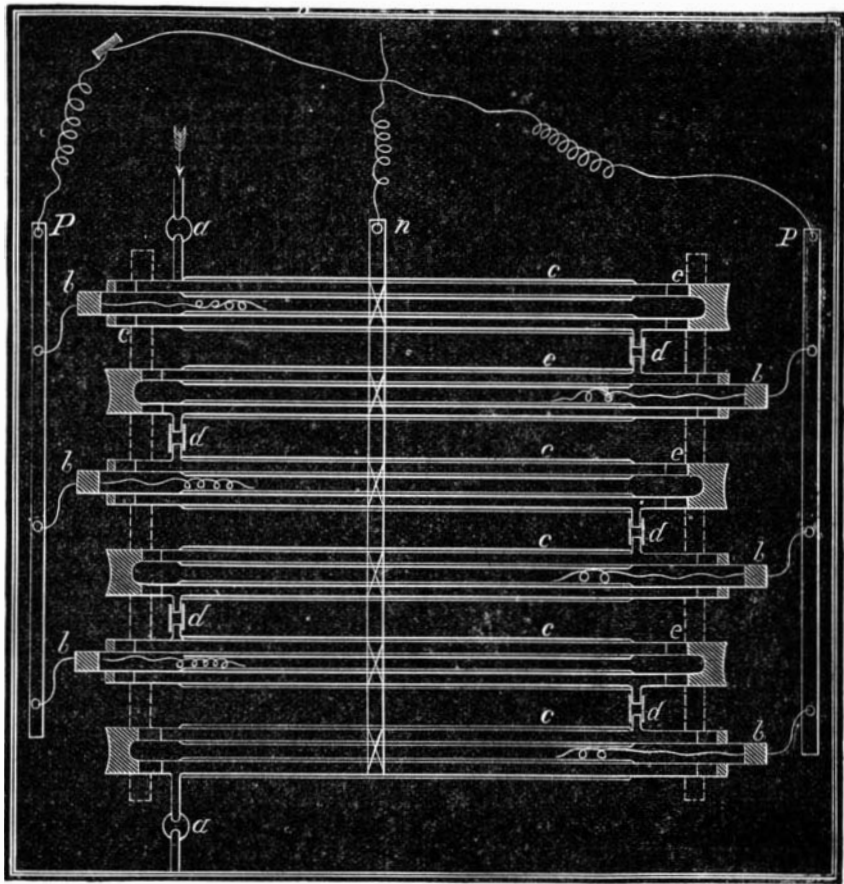
By TH. WEYL.

If a few c.c. of recent human urine are mixed in a test-tube with a few drops of a very dilute solution of sodium nitro-prusside, and if dilute soda-lye is then added drop by drop, a beautiful ruby-red color appears, which in a few minutes changes to an intense straw-yellow. This reaction seems characteristic of kreatinin. As kreatin is converted into kreatinin by boiling with dilute sulphuric acid, the reaction may serve also for the detection of this substance.

### ALKALINE AMALGAMS.

By M. BERTHELOT.

THE author considers these amalgams as of great importance as the type of compounds resulting from the union of two solid constituents, such as the metallic alloys, the cryohydrates, the fats, butters, resins, etc. Are these products formed by the simple mixture of certain definite compounds,



*aa.* Small sulphuric acid wash-bottles. *bb.* Corks closed by melted sealing wax. *cc.* Outside coating of tin foil. *dd.* Connections of paraffined cotton cloth. *ee.* Rings of glass. *pp.* Copper strips connecting with inner coating and one pole of coil. *u.* Copper strip fastened to all the outer coatings and the other pole.

### OZONIZING BATTERY.

tion of an ozonizer, which may be termed an ozonizing battery, the arrangement of which will be best understood from the accompanying engraving. It is made up of a series of induction tubes, each tube being what might be called an ozonizing element. Each element is made of a tube of thin hard glass, 60 cm. long and 21 mm. inside diameter, with the inlet and outlet tubes 6 cm., from each extremity. The space between these two latter tubes is coated with tin foil. The inside tube is a little longer, one end being rounded; the other, after the interior has been coated with tin foil, is closed with a dry cork, through which the copper connecting-wire passes. The space between the rounded end of the inner tube and the outer tube is nearly filled by a ring of glass cut from a tube of suitable bore, and the space closed by dipping in molten sealing wax. In coupling the elements together, the exit tube of the first is joined to the inlet tube of the second by a wrapping of strips of muslin, which are bound by flower-wire and made gas-tight by a coating of molten paraffine applied with a brush.

Six of these elements are connected together and supported on a frame, constituting what we may term an ozonizing battery. One of these frames is fitted on above another, the end elements of the two batteries being suitably connected, and in this way, by repetition of similar parts, an induction tube of as great length as desired can be made and handled without inconvenience. Or the electrical charge can be divided between several ozonizing batteries, and the supply of oxygen as well, so that a number of currents of ozonized gas can be made use of at the same time. The first inlet tube of a battery and the last exit tube are made of parts of small sulphuric acid wash-bottles, by means of which the rubber or kerite connections with the other parts of the apparatus are protected from backward diffusion of the ozonized gas on the one hand, and a convenient attachment is made upon the other.

When 1 liter of oxygen was made to flow through the apparatus in half an hour, the spark length being 45 mm., the ozone obtained amounted, when 3 elements were used, to

associated sometimes with each other, sometimes with one of the components in excess, in the manner of two powders mechanically mixed, and then brought into a coherent mass by external pressure? Or are the properties of each of these definite compounds modified more profoundly by the presence of an increasing dose of the other definite compound or by that of the component in excess, so that the properties of the total mass cannot be represented by the pure and simple sum of those of the two definite bodies supposed to be mixed? These questions the author endeavors to solve by thermo-chemical methods.

### ASPIDO SPERMIN.

By G. FRAUDE.

ASPIDO SPERMIN, an alkaloid of the quebracho bark, crystallizes in small white prisms with strongly shining surfaces, readily soluble in alcohol and ether, but dissolving sparingly in water, and melting at 205° to 206°. The taste of the solutions resembles that of quinine.

### VIRGINIA.

PROF. SONNENSCHNEIN has given the somewhat singular name of "Virginia" to a substance which he has extracted from the residues of the distillation of petroleum. He describes it as a semi-transparent mass, yellowish, and fatty, and displaying, when heated, a blue fluorescence. It melts at 47°, and is partially soluble in ether.

### HYDROCARBON FROM ROSIN OIL.

By W. KELBE.

If the highest boiling products of the dry distillation of rosin are heated with sulphur to 200°, a crystalline body is obtained, consisting of 91.5 per cent. carbon and 8.5 hydrogen.

### CONSUMPTION.

By CHARLES G. POLK, M.D.

#### TUBERCULAR CACHEXIA.

TUBERCULOSIS may be defined to be a dyscrasia or cachexia, constitutional in its extent, expressed in deficient vital force, and consequent upon impaired or deranged nerve influence, furnished by the nerve masses which immediately and especially preside over the nutritive and the respiratory apparatus, and not only produce abnormal manifestation of their functions, but lead to structural change and disintegration of tissue.

That these changes are produced primarily in the lymphatic glands, and by the elaboration of granules and corpuscles of a low standard of organismal endowment, which, being incapable of a higher evolution, retrograde through the various stages, awakening inflammation, ulceration, and disintegration of the organs involved. That in addition to infiltration of the organs by tuberculous or sickly leucocytes, the deranged or deficient nerve influence communicated from the medulla oblongata and base of the brain act directly upon the cell life of the organs themselves, modifying their nutritive powers, disqualifying them for the appropriation, from the blood, of their natural pabulum for the maintenance of their structural integrity, and unfitting them for withstanding the pathological processes, created by the presence of tubercle.

That deficient or deranged nerve influence emanating from the medulla oblongata, and the nerve masses which preside over the nutritive and respiratory apparatus, is the consequence of deficiency of phosphorus in those nerve masses; that the formula of phosphorus principally is the alkaloidal hypophosphite in association with glycerine, alkaline, and mineral bases.

The above view of the causation of tuberculosis, determined by the writer twenty years ago, has been confirmed by subsequent research and the results of experience. I may say that clinical observation, therapeutical demonstration, and chemical analysis, have so fully corroborated this etiology and pathogenesis of this cachexia, that its accuracy seems well proven. In fact, this theory coincides very nearly with that advocated by Churchill, in 1855, and two years prior to my own researches, "that phosphorus exists in the animal organism in the form of hypophosphorous acid, and its deficiency is the determining cause of tubercular phthisis. To sustain this hypothesis and the therapeutical treatment based on it, is the object of this paper.

The phenomena presented from the earliest manifestation of modified health, through the different stages it presents, until the final termination of tubercular disease, it seems to me, sustain the conclusion advanced in this definition of the malady, and the explanation of its causation. It embraces within its circle the hypothesis of the various interpreters of the earliest lesions presented, and enables the pathologist to link together the chain of aberrations so as to constitute a complete whole, and appear as the sequence of a common cause. Thus we find, as one of the earliest aberrations, the patient, without any visible cause, loses weight and strength, being exhausted by exertion which he had previously borne without fatigue. As this shrinkage and loss of flesh often occurs while the appetite is good and gastric digestion seems unimpaired, the cause must be sought in the deficiency of the vital processes by which food is elaborated into blood. That there is an interference with the formation of normal chyle by an acid condition of the small intestines; that the pancreatic juice is either deficient in quantity or neutralized by the acid, as pointed out by Bennett; that these lesions are the proximate consequence of a deficiency of the phosphatic nutrient of the brain and nervous system in the nerve masses, from which the eighth pair of nerves derive their sentient, nutritive, and motor functions; that this phosphatic nutrient of the brain—zooline—is a union of a nitrogenous glycerite with a sui-generis form of hypophosphorous acid, in a nascent condition; that as it emerges from this nascent form it sets in motion the entire machinery of life, and constitutes the motor power of animal existence; and that upon its adequate supply and normal formula are reposed the display of the physiological and pathological manifestations of the animal functions. Consequently, a deficiency of this alkaloidal hypophosphite in the nerve masses which preside over nutrition and respiration must lead to deranged functions, and finally to structural change in the organs which are concerned in these functions.

The above statement of the processes by which its consequences are wrought, were determined by me during the summer of 1857. I demonstrated the accuracy of these by chemical analyses of the brain and other tissues of those dead from consumption, and confirmed the scientific deductions advanced by Churchill, in 1855. I, however, advanced the idea in a lecture before the Milford (Del.) Literary Society, March, 1855, on the relation of the base of the brain to vital force and to diseases growing out of deficient vital force, and contended that consumption had its prime factor in the nerve masses which preside over digestion and respiration. Still, we must yield the authorship of the phosphorus theory of consumption to Churchill, of Paris.

I design in this paper to prove the accuracy of these conclusions by scientific deductions, and to support these scientific deductions by an accurate chemical record. The phenomenon of tuberculosis is the language of a deficient vital force, and to a large extent the expression of a feeble physical organization. Although Louis and Laennec long ago recognized a tuberculous diathesis, their descriptions were marked with inaccuracy and their value ignored by the medical world; the views of Buhl, Virchow, Addison, and Niemeyer having well-nigh overthrown them, and substituted in their stead the septicæmic theory of tuberculosis—that tuberculosis is but the consequence of a virus, generated in the caseous metamorphosis of inflammatory products, and is in no manner concerned in the primary morbid conditions.

In my investigations of the morbid anatomy of tuberculosis I have found many appearances which seem to corroborate the previous declaration of Addison, that tubercle is not a universal accompaniment of phthisis, and that autopsies of those dead with phthisis frequently do not reveal a trace of tubercle. By investigating the previous history of such cases I invariably found that all these cases had their beginning in an attack of pneumonia, bronchitis, or pleurisy, which, being neglected or uncured, had assumed a chronic form of capillary bronchitis, terminating in lung hepatization, tyrositis, ulceration, and the ultimate destruction of lung tissue.

I included these cases under the title of Chronic Pneumonia, in my thesis to the Faculty of the University of New York, 1858, and declared the necessity of drawing a line of demarkation between them and those which began insidi-