and Mr. Tutton. This substance has been shown by the exhibitors to be represented by the formula P_2O_5 . It crystallizes in monoclinic prisms melting at 25.5 deg., and boils in an atmosphere of nitrogen or carbon dioxide at 173 deg. Cold water dissolves it with extreme slowness, forming phosphorous acid. With hot water, strong caustic alkalies, chlorine, bromine, and alcohol, it reacts with great energy, generally with inflammation. Oxygen slowly converts it, at ordinary temperatures, into phosphoric oxide, and under diminished pressure the combination is attended with a faint luminous glow similar to that observed in case of phosphorus. No ozone, however, is formed. At slightly higher temperatures the oxidation is brought about instantly with production of flame. Phosphorous oxide possesses the smell usually attributed to phosphorus, and which is identical with that noticed in match manufactories. It is highly probable, as Schonbein surmised, that the element phosphorus is without smell, and that the smell ordinarily perceived is due to a mixture of ozone and phosphorous oxide. Phosphorous oxide is highly poisonous, and it is not improbable that phosphorus necrosis is caused by this substance.

Photographs of the spectrum of the nebula in Orion, exhibited by Prof. J. Norman Lockyer, F.R.S. These photographs were taken in February with the thirty-inch reflector at Westgate-on-Sea, the exposures varying from two to three hours. The one taken with a three hours' exposure (February 10) shows about 50 lines between λ 500 and λ 373, but many of them are only visible with difficulty, especially in artificial light. The Henry Draper memorial photograph of the spectrum of P Cygni was shown for comparison, and it was seen that all the bright lines were among the brightest in the nebula. This argues in favor of the view that stars with bright-line spectra are of a nebulous character.

Photograph of the two clusters (33 and 34 H VI.) in the sword handle of Perseus, showing remarkable coronal and festoon-like groupings among the stars on several parts of the photograph, exhibited by Mr. Isaac Roberts. These clusters are quite free from nebulosity, and in this respect they differ from other clusters which Mr. Roberts has photographed; for those clusters are involved in faint but distinct nebulosity.

The larvæ of amphioxus, exhibited by Prof. E. Ray Lankester, F.R.S.

A selection from the butterflies collected in the great equatorial forest of Africa by Mr. William Bonny, one of Mr. Stanley's staff, exhibited by Mr. Henley Grose-Smith. Little was known of the Lepidoptera of this part of Africa; few of the species collected by Mr. Bonny have been previously recorded from that region and nine are new to science. The collection includes, among others, the great *Papilio antimachus*, also *Papilio zalmoxis*, and many west African species.

Collection of iridescent crystals of chlorate of potash, to illustrate the production of color and its intensification by reflection from multiple thin plates, exhibited by Dr. Alex. Hodgkinson.

Dr. Alexander Muirhead exhibited: (1) some patterns of Dr. Lodge's lightning protector for cables and for telegraphic work generally. In these instruments a series of air gaps, separated by self-induction coils, are offered to the lightning or other high tension currents which have got into the line. The greater part of the flash jumps the first air gap, most of the residue jumps the next, and so on, until after four or five divisions nothing is left which can break down the thinnest insulation, or appreciably affect even a delicate galvanometer connected to the protected terminals.—(2) Muirhead's portable form of the Clark standard cell, in cases, with thermometer.—(3) Standard condenser, one-third microfarad, with Dr. Muirhead's certificate.—(4) Set of Thomson & Varley slides, small. (5) Saunders' capacity key, suitable for Dr. Muirhead's capacity test. (6) Saunders' reversing key.

Specimens of aluminum and alloys manufactured by the Aluminum Company, limited, exhibited by Sir Henry E. Roscoe, F.R.S. Pigs of aluminum, 99 per cent. pure. Castings in aluminum, rough and finished. Specimens of aluminum, soldered. Aluminum wire, sheet and drawn rod. Aluminum medals, plain and gilt. Cast aluminum bronze and brass, showing (a) tensile strength and elastic limit; (b) twisting stress; (c) thrusting stress, long specimens; (d) thrusting stress, short specimens. Stampings in aluminum bronze, rough. Ten per cent. aluminum bronze, twisted cold. Five per cent. aluminum bronze, worked hot and cold. Aluminum brass, worked hot and cold. Aluminum bronze and brass sheet.

Specimens illustrating ancient copper and bronze from Egypt and Assyria, exhibited by Dr. Gladstone, F.R.S. The collection consists of borings from tools found by Mr. Flinders Petrie, at Kahun, in Egypt, and which belong to the XII. Dynasty—about B. C. 2500; also from other tools found at Gornb, which belong to the XVIII. Dynasty—about B. C. 1450. There are also fragments of Egyptian bronze figures from Bubastis, and of Assyrian bronze from the gates of the palace of Shalmaneser II., at Balawat, about B. C. 840, as well as two pieces of slag from the old copper mines of the Sinaitic peninsula, which were worked by the Egyptians in very early times, and discontinued after the XVIII. Dynasty. The principal point illustrated is the fact that the earliest metal implements were of copper, containing a very little arsenic and tin, probably as accidental impurities, and that afterward tin was added to the copper in increasing proportions with the object of producing a hard alloy.

Mr. Percy Newberry exhibited by permission of Mr. W. M. Flinders Petrie: (1) Three pages of an ancient Egyptian book on medicine written on papyrus, by a scribe named Usertes Sen, in the twenty-sixth or twenty-fifth century before Christ. This papyrus, together with a number of others of the same date, referring to miscellaneous subjects (letters, legal documents, accounts, a fragmentary treatise on mathematics, etc.), was recently discovered by Mr. W. M. Flinders Petrie, during excavations in a ruined town of the XII. Dynasty, at Kahun, in Central Egypt. It contains directions for the use of midwives, written in black and red ink, in hieratic characters (a cursive or written form of hieroglyphics).

The black ink is used in the body of the work for the symptoms, diagnoses, and prescriptions, and the red ink is used at the heads of the sections.

The following translation of the last two and a half lines of the first page will serve to show the kind of directions given in this ancient work:

"Treatment of woman * who is pained in her legs and in all her limbs, as one who is beaten. Say with regard to her, * it is the growth of the at (vulva). Do thou with regard to her * thus: Let her eat grease until she is cured."

(2) Facsimile of an unpublished papyrus preserved in the British Museum containing medical prescriptions written in the Egyptian hieratic writing of the XIX. Dynasty (B. C. 1400-1200). This papyrus is chiefly interesting from the fact that it contains prescriptions copied from an earlier work, now lost, which is said (by the ancient copyist) to have dated from the IV. Dynasty (circa B. C. 4000). Facsimiles of these two papyri, together with translations, notes, etc., will shortly be published, under the editorship of Mr. F. Ll. Griffith and Mr. Newberry.

Egyptian spear head of bronze, bearing the name and titles of Kames, a king at the end of the XVII. Dynasty (circa 1750 B. C.) exhibited by Dr. John Evans, Treas. R.S. The blade is cast, and the socket is made of hammered bronze, and these two pieces that form the weapon seem to have been "burnt" together.

M. Richard Freres, Paris, exhibited: (1) Continuous recording hair hygrometer. This is the latest form of the Saussure hair hygrometer, so much used on the Continent, owing to its working satisfactorily when most other hygrometers fail, viz., near 32° F. In some of Saussure's instruments more than one hair was used, but in none did the apparatus give a continuous record. In the present hygrometer, the expansion and contraction of a bundle of hairs raise and lower a pen, which leaves on a paper-covered cylinder a continuous record of the humidity of any position, garden or sick room in which it may be placed.

(2) Curves produced by the anemometers on the summit of the Eiffel tower, and on that of the Central Meteorological Office at Paris. These show (1) that the average velocity of the wind on the top of the tower (994 feet) is about three and a half times that at 66 feet, and (2) that the hour of greatest average velocity on the summit was eleven P. M., whereas at 66 feet (as at most observatories) it was one P. M.; so that the times of maximum and minimum are almost precisely reversed.

(3) Isochronous regulator for electric contacts. An instrument for making and breaking electrical contact at equal intervals of time.

Chætopoda, Medusæ, Ascidians, Nudibranchs, and other Invertebrata, prepared as lantern slides, showing not only the general form, but also much of their anatomy, exhibited by Mr. H. C. Sorby, F.R.S. The success of the method depends on the fact that when soft-bodied animals are dried on glass the extreme edge dries first, and adheres firmly, so that on further drying the animal does not contract irregularly, but becomes thin and flat, and shows like a drawing projected on the plane of the glass.

In many cases the natural color is well seen, but in other cases artificial staining is used, which brings out the anatomical structure to great advantage. In some cases the specimens are best seen by reflected light, and it is then well to use a photographic slide, taken under such conditions. Some details may also be brought out to greater advantage by means of a properly developed photograph.—*Nature*.

AN IMPROVED COIL FOR MILK ANALYSIS.

By CHARLES RICE, New York.

THE advantage of employing the so-called Adams' coil (of thick blotting paper) in the estimation of milk solids, and particularly of milk fat, is generally recognized; careful trial experiments having shown that, by its use, about 0.2 per cent. more of fat can be extracted from milk than by any other method.

RICE'S MILK COIL AND WEIGHING TUBE.

While this fact is undisputed, there remain, however, some slight drawbacks, chiefly mechanical or manipulative, which not seldom inconvenience the operator. These drawbacks arise both from the material the coil is usually made of and from its shape.

The coils are made of thick blotting paper, the kind generally preferred being that known as "white demy blotting, mill 428, 38 lb." The best "Treasury" blotting paper is also used. Now, unless the coil is made rather loosely, which is accomplished sometimes by rolling up a thread with the strip of paper, it is not always easy to cause the milk to sink into the coil with sufficient rapidity. Moreover, the shape at either end is not conducive to a rapid absorption, and there is not seldom a loss from milk running down the side or escaping through a central passage.

Several modifications of Adams' coil have been proposed from time to time, one involving the use of asbestos, another that of cotton, but on trial I have found them to offer no material advantages.

A good milk coil, or cartridge, should possess the following properties:

1. It should have a shape which permits the whole amount of the milk taken for analysis (say 5 to 10 gm.) to be applied, or poured upon it quickly, without risk of loss.

2. It should be so porous that it will readily permit the escape of water, during drying, for the estimation

* In red ink.

of solids, and afterward readily admit the ether in the estimation of fat.

The material which I have found to answer best for this purpose is the so-called "absorbent gauze," also known as "bleached hospital gauze," used for surgical dressings. It is a light, open mesh cotton fabric, having about 40 fine shreds to the linear inch, and weighing about 1½ av. ounces per square yard.

The milk coils, or cartridges, which I have been in the habit of using, consist of a small roll of this gauze inclosed in a wrapper of blotting paper, and their mode of preparation is as follows:

Spread out a square yard of the gauze on a flat surface, fold it twice in one direction to reduce it to 36×9 in., then fold it upon the long side in laps of 1¼ in. in width, so that when the whole is folded it will present a strip of 1 yard in length and about 1¼ to 1½ in. in width, and will consist of some 18 to 20 layers.

Now begin to roll the strip upon the narrow end, like a bandage, but not too tight, until about 5 or 5½ in. of the gauze have been rolled up: cut the strip slantingly—that is, not perpendicular to its body, but under an angle, so as not to cause "bunching" when wrapped in paper. Place the roll upon a strip of thick blotting paper 4 in. long and 2¾ in. wide, and roll the latter over it so as to have it (the paper) project at one end about one-fourth inch over the gauze coil and about three-fourths inch at the other; then tie the coil with two threads. It will thus be 2¾ in. long and about ¾ in. in diameter.

The cut represents a section of one of these coils, *b* being the gauze coil, *a* and *c*, respectively, the larger and smaller free compartment, *d* is the overlap of the paper cover, and *e e* the strings.

The larger compartment (*a*) of this cartridge serves as a funnel, into which the full quantity of the milk to be tested is poured at once. A coil of this kind—intended for the smallest size of Soxhlet's extractor—will easily take from 8 to 10 gm. of milk, and the latter will never entirely soak down to the bottom of the paper wrapper. If it should soak to the bottom of the gauze coil, this will do no harm, as it is one-fourth inch above the end of the paper.

These coils may easily be prepared in quantity, then extracted in ether, and kept in a drying oven, so as to be ready for instant use.

I am in the habit of using very light glass weighing tubes, with snugly fitting covers, each being numbered both on the body and on the cap. A cartridge, perfectly dry, is first weighed in one of these tubes, and all subsequent weighings of it are made in the same tube. The milk to be examined is weighed in a separate stoppered graduated tube, then a suitable quantity of it, judged by guess and experience—corresponding to say about 8 gm.—is poured into the compartment *a* of the coil, which had previously been taken from the weighing tube. The graduated tube is weighed again, and the difference corresponds to the milk taken for analysis. The coil at once absorbs the milk, and is then transferred on a capsule to the drying oven. When dry it is weighed for determination of solids, and the fat then determined by extraction with ether in the usual manner.

The size of these cartridges may, of course, be varied according to the size of the extractor in which they are to be used.

I am quite certain that those who will try the gauze coils will prefer them to anything else heretofore proposed.—*American Druggist*.

SOAP ANALYSIS.

THIS branch of analytical work may be successfully cultivated by any pharmacist, provided he lives in a district where the use of quantities of soap for the purposes of the cloth manufacturer is on a scale which would secure an amount of analysis that would be likely to return reasonable compensation for his time and trouble. Private families rarely require their soap analyzed, being content to take on trust the assertion of the enterprising manufacturer or to rely on the more accurate knowledge derived from personal experience and observation.

Soap is extensively used in every manufacturing town for the purpose of cleansing and purifying the fabrics, and it is of the utmost consequence that it should be of a uniform character. This can only be ascertained by analysis; and however much confidence manufacturers may have in the firms which supply the soap, there is, in the nature of things, frequently occasion to have recourse to the chemist. For the purpose of ascertaining the value of soaps as detergents, the following points must be kept in view: Whether the soap is for use in the toilet, or whether it is to be employed in the general cleansing of fabrics; and for the latter purpose, the quality and delicacy of the fabrics and colors of such fabrics must be taken into consideration.

The composition of soap from a chemical point of view is essentially that of a salt—that is the product of the chemical union of a base and an acid. The acid constituent of soap is generally a mixture of stearic, palmitic, and oleic acids, the basic portion being either potassium or sodium. The potassium salt of these acids is usually known as soft soap, and the sodium salt as the ordinary hard or yellow soap of commerce. The alkali may exist in several conditions, either combined with the fatty acids, or uncombined, as carbonate, or more commonly as caustic alkali. The care with which the soap has been made, and its age, determine to a large extent the condition in which the alkali occurs.

Soap analysis is partly gravimetric and partly volumetric. For the former a balance is necessary, but as the quantities employed are not very minute, the Stone's balance already referred to will answer the purpose satisfactorily. The apparatus mentioned in our last article are also necessary in soap testing, and in addition to these a water bath will be required. Standard solutions of hydrochloric and nitric acids are necessary, and these are most convenient when prepared of normal strength. Normal hydrochloric acid ought to contain exactly 36.37 grains of pure acid in 1,000 grain measures, and is prepared as follows: Into a 10,000 grain flask are placed 1,808 grains of hydrochloric acid s. g. 1.1, and distilled water is added till the 10,000 grain mark is reached, at the required temperature (16° C.) This furnishes a solution approximately normal, and its exact strength may be determined by titration with an accurately weighed quantity of pure sodium monocarbonate. The solution of nitric acid requires