triphenylchlormethane, even in minute quantities, gives, on the addition of metals (silver), a beautiful greenish-blue solution which changes, on warming, first to a violet-red and finally to a genuine fuchsine-red. On cooling, the blue color is restored; on exposure to air the solution is at once decolorized.

I shall continue the study of this reaction and shall extend it to other derivatives of triphenylhalogenmethane.

ANN ARBOR, MICH.,
September, 1903.

[CONTRIBUTION FROM THE CHEMICAL LABORATORY OF THE NORTH CAROLINA DEPARTMENT OF AGRICULTURE.]

AN EFFICIENT ASBESTOS OR GRAPHITE MUFFLE.

BY J. M. PICKEL AND C. B. WILLIAMS.

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AT THAT point in the determination of potash in fertilizers, where ammonium salts and the excess of sulphuric acid are driven off, it was formerly the practice in this laboratory to accomplish the volatilization by placing the platinum dish on the top of the glass chimney of an Argand gas-burner, such as is commonly used for illuminating purposes. To afford air-vent and gas escape, the dish rested on small wires (of iron) bent over the edge of the chimney. A battery of ten or twelve of these burners was aligned on the same gas-pipe.

After excess of acid was evaporated and the ammonium salts more or less volatilized, the dishes were removed from the Argand burners to the blast-lamp, and there, at a red heat, the volatilization completed and the organic matter destroyed. In hope of obviating the necessity of transferring the dishes to the blast, one of us (Pickel) introduced, during the winter of 1900, the following modification:

The chimneys were cut down to a length of about 4 cm., and the dishes brought into close proximity with the flame. The dishes were, moreover, enclosed in asbestos cups, in the bottom of which were cut round holes of such diameter as to fit snugly over the chimneys which were thus made to support the cups. An asbestos lid, having a vent hole of about 2 cm. diameter, covers each cup. Each platinum dish rested on a pipe-stem triangle, or

other suitable support placed on the bottom of the cup. It was found that the dish, thus muffled, could, after excess of acid had been driven off by a low flame, be easily brought to a red heat by merely turning up the flame; all ammonium salts could be volatilized completely, and organic matter destroyed, thereby obviating the use of a blast-lamp, except in rare cases. As the intense heat generated in the muffle softened, and, after a few days, distorted the glass support, it was, therefore, dispensed with, and a small asbestos cylinder, having in its side a narrow slot, or small, round hole through which to see and regulate the flame, substituted.

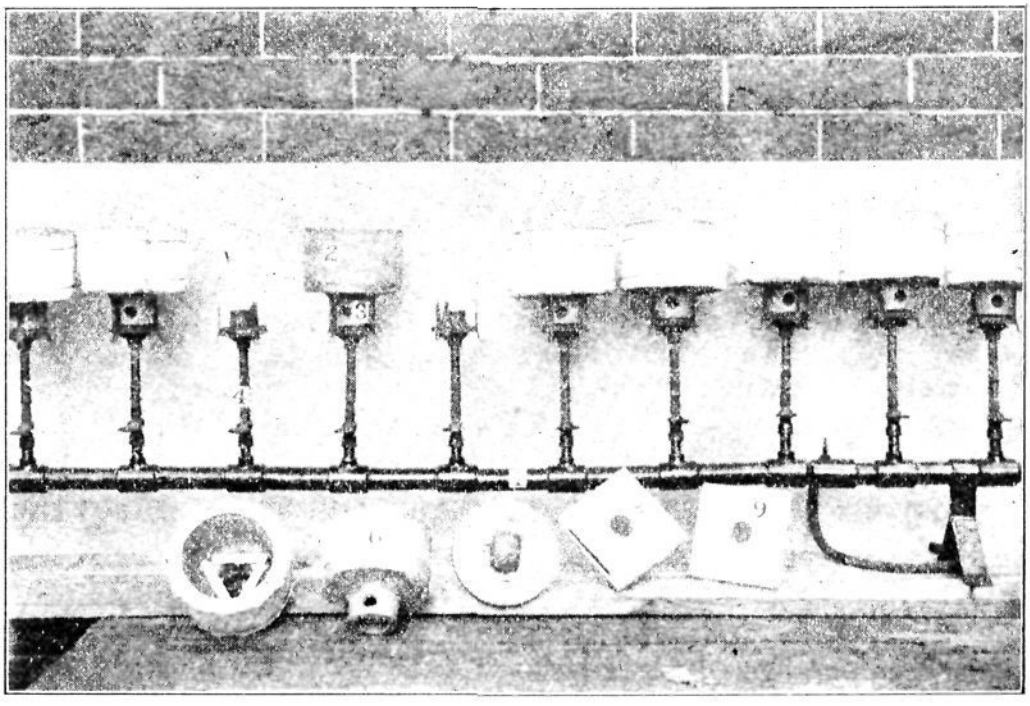
The material used in making this little muffle was asbestos board of about 0.6 cm. thickness. After cutting the board to proper shape and size, it was saturated with water, and, while wet, formed into a cylinder by rolling it around a tin can, or bottle, or other suitable core, and left till dry. The bottom was then fitted in and the whole held securely together by wires bound around near the top and bottom.

A battery of twelve of these little muffles was used throughout the greater part (two or three months) of a fertilizer season, and 500 or 600 potash determinations made with them. All incinerations of cotton-seed meal, cotton-seed hulls and tobacco stems were made in them, the usual larger and cumbersome muffles for that purpose being entirely dispensed with. Slightly changed in form, the muffles are, of course, equally suitable for use with a Bunsen burner. They were thus found efficient for roasting small assays of sulphurous gold ores, the finely powdered ore being contained in an ordinary evaporating dish.

Although the idea of these muffles—a separate muffle for each dish or crucible—grew out of the desire to facilitate the work of volatilization and incineration, it is not new. (The Erdmann furnace, which is figured and described in the chemical catalogues as a clay cylinder on a tripod over a Bunsen burner, involves the same idea.)

The efficiency and convenience of these little muffles for incinerations, ash determinations, roastings and volatilizations, and the ease with which any one can make them for himself, should create for them a place in the laboratory. But for daily use, year in and year out, they are not sufficiently durable when made

of asbestos, as above described. One of us (Williams) sought to remedy this defect, first, by constructing the muffles of metal (copper) and covering them inside and out with asbestos. But these, although in other respects satisfactory, were lacking in durability; the metal oxidized rapidly, and the asbestos needed renewal every few months. The material finally adopted (by him) was graphite, with a jacket of asbestos on the outside. This has proved altogether satisfactory. A battery of twelve of these graphite muffles, aligned on the same gas-supply pipe, and each heated by an Argand gas-burner, has now been in daily use for about two years in our laboratory, and has entirely superseded the usual form of muffle, for incinerations, ash determinations and the like. A point of special convenience with this piece of apparatus is that one or more, up to a dozen determinations may be made at one time, and that each is under separate control and regulation. The lids in use consist of an asbestos board, a plate of aluminum and a sheet of platinum riveted together; the asbestos forms the top of the lid and the platinum



the bottom, its object being cleanliness. But less-costly graphite covers answer quite as well. In the center of each lid is a vent-hole of about 3 cm. diameter. The muffles may be of any size. Ours have the following dimensions: The main body or re-

ceptacle, diameter (internal) and depth (internal), each 9.5 cm.; thickness of wall, 1 cm.; the small cylinder support, length, 3.5 cm.: diameter (adjusted to the size of burner in which it is to rest), in our case, 5.2 cm. outside, and 3.5 cm. inside.

These muffles may, of course, be used with any common Bunsen burner by placing them on a tripod.

The accompanying cut shows the parts of the battery of muffles: 1 is the gas-supply pipe, 2.5 cm. in diameter; 4 is a smaller pipe, provided with an air-hole and gas-cock, which feeds the Argand burner above; 2 shows the muffle in position and without asbestos covering; at 3 is a small hole through which the gas is lighted, and through which the flame may be seen and regulated; 5 gives an inside view of the muffle; 6 shows the under part of a muffle; 7 shows the top side of a graphite lid, the central vent-hole of which is hidden by its handle; and 8 and 9 are top and bottom views of the asbestos-aluminum-platinum lids.

REVIEW.

RECENT WORK IN INORGANIC CHEMISTRY.

By Jas. Lewis Howe.

Few notable papers have appeared during the past year on theoretical inorganic chemistry. Perhaps the most important is one by Abegg[1] on a new theory of valence. The author assumes the existence of two kinds of valence, with opposite polarity, in each atom. These he calls normal valence and contra-valence. The sum of the valences of an atom is eight. Thus chlorine has a negative normal valence of one and a positive contra-valence of seven. Negative contra-valences are much weaker than positive, since positive electrons are much more firmly attached to matter than the negative. The inert gases have a normal valence of zero and an (unexercised) contra-valence of eight. In his paper, Abegg applies these conceptions to the so-called molecular compounds.

In two papers,[2] Werner has developed his theory of primary and secondary valences with reference to the constitution of the ammonium and the oxonium compounds. Locke[3] has again attacked the theory of electro-affinity of Abegg and Bodländer, and holds that while the electro-affinity of the elements bears a close and interesting relation to the properties of many salts, it does not furnish a rational principle for chemical classification.

Erdmann claims[4] that the distinction enunciated by him in

[1] *Vid. Skrift.* I. 1902, No. 12.

[2] *Ann. Chem.* (Liebig), **322**, 261, 296.

[3] *Am. Chem. J.*, **28**, 403.

[4] *Ztschr. anorg. Chem.*, **32**, 404.