it can be screwed to a sampling pipe. Its inner surface must be perfectly smooth so that there is no chance for accumulations of dust before the filter is reached. Part 4 is a loose nut which holds Parts 1 and 3 together while in use.

The apparatus may be used in any position but the preferred arrangement is horizontal. When the gas to be filtered contains moisture the filtering device must be heated to about 100° C. by enclosing it in an asbestos-lined box,

termining the amount of precipitate as copper, cuprous and cupric oxides, the following method was adopted since it proved the most satisfactory and yielded the best of results if reasonable attention was paid to details. It might be said, further, that as such work often has to be done at odd times it is desirable to maintain a supply of sugar tubes¹ and only to titrate when there are a number of tests on hand. By exercising a little care the same tubes can be used repeatedly without change of felt.

Fig. 1.

heated with an electric light, or by any other available means. The nipple on the exit end of Part 1 is provided with threads so that it can be removed and replaced with aluminium tubes, containing a dehydrating agent, in case it is desired to determine moisture in the gas (see Fig. 2).

The advantages of this apparatus as to simplicity are easily seen. Gravity seems to cause the heavy particles of dust to settle on the bottom of the shell, while the lighter particles form a porous coating on the upper surface. This action prevents the filter paper from becoming clogged as

The process consists of heating an aliquot of the "sugar solution with the mixed Allihn's solution (30 cc. of "white," 30 cc. of "blue" and 60 cc. of water) and filtering by aid of suction through a sugar tube with an asbestos felt supported by glass wool. The cuprous precipitate is transferred to the tube, washed with hot water until free from alkali and then with alcohol. The copper is dissolved in 5 cc. of concentrated nitric acid, thoroughly washed with hot water, and the filtrate run into an Erlenmeyer flask by means of suction. The solution is evaporated to small

Fig. 2.

long as heat enough is applied to keep the paper dry. About twice as large samples of gas can be passed through this apparatus as through any other we have ever tried. We have also found the number of grains of dust per cu. ft. to be higher when determined by this apparatus than with the others.

Thus far the device has been used for filtering blast furnace gas only, but there is no reason why it cannot be used to filter air or any other gas. The apparatus described is now being made and sold by E. H. Sargent & Co., whom I desire to thank for the loan of that shown in the illustrations.

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VOLUMETRIC DETERMINATION OF COPPER IN SUGAR ANALYSIS.¹

The co-operation of the laboratory in the experiments conducted by other departments of the Station has often rendered necessary quantitative determinations of reducing sugar, sucrose, lactose and starch in a variety of products. The final step in every case is the determination of the cuprous oxide precipitated from Allihn's solution by the reducing action of the sugar. After a rather long study of different methods of filtration and the various ways of de-

termining the amount of precipitate as copper, cuprous and cupric oxides, the following method was adopted since it proved the most satisfactory and yielded the best of results if reasonable attention was paid to details. It might be said, further, that as such work often has to be done at odd times it is desirable to maintain a supply of sugar tubes¹ and only to titrate when there are a number of tests on hand. By exercising a little care the same tubes can be used repeatedly without change of felt.

The process consists of heating an aliquot of the "sugar solution with the mixed Allihn's solution (30 cc. of "white," 30 cc. of "blue" and 60 cc. of water) and filtering by aid of suction through a sugar tube with an asbestos felt supported by glass wool. The cuprous precipitate is transferred to the tube, washed with hot water until free from alkali and then with alcohol. The copper is dissolved in 5 cc. of concentrated nitric acid, thoroughly washed with hot water, and the filtrate run into an Erlenmeyer flask by means of suction. The solution is evaporated to small

¹ An adaptation of the Low zinc-acetate method.

¹ Eimer and Amend, No. 3263.

E. B. HOLLAND.