ON A NEW METHOD OF GENERATING FORMALDEHYDE GAS FOR FUMIGATING PURPOSES.

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The method of generating formaldehyde gas for fumigating purposes, which I shall describe, has been devised with the object of overcoming certain difficulties which attach to the methods generally in use, and which have prevented the adoption of formaldehyde as a fumigating agent in municipal work. "Formaldehyde generators" are complicated and rather expensive machines, very liable to get out of order, and requiring frequent repairs and replacement. The time required to generate sufficient gas by means of these machines to fumigate an apartment, is a further objection. The use of solid polymerized formaldehyde (paraform), which is vaporized by means of a burning charcoal cone, obviates some of the difficulties which are encountered with the machines. Unfortunately, paraform as a fumigating agent leaves much to be desired as to efficiency. This is due to several causes, chief of which are the absence of moisture, the complete combustion of a large part of the paraform, and the volatilization of the paraform as such, instead of its decomposition into simple (gaseous) formaldehyde. The use of burning fuel in a sealed apartment also presents a constant source of danger and frequently causes damage to carpets and furniture.

The method of generating formaldehyde gas from its aqueous solution, which is the subject of this paper, consists in utilizing the property of lime of combining with water, and thus to remove the solvent and liberate the gas. The addition of lime to aqueous formaldehyde, however, is not an efficient means of generating formaldehyde gas for two reasons:

(1) The mere ebullition of such a solution does not suffice to expel the gas.

(2) Calcium hydroxide reacts with aqueous formaldehyde, forming carbohydrates as akrose, formose, and their decomposition product, methylenitan.

The first of these difficulties is avoided in the process about to be described by using a sufficient quantity of lime to combine with all the water contained in the formaldehyde solution. The lime is used, not as a calorific body but as a dehydrating agent.

The second difficulty mentioned is overcome by the addition of a substance such as sulphuric acid or aluminum sulphate, which reacts with lime to form an insoluble compound. It has been found, as was to be anticipated, that the reaction between calcium hydroxide and formaldehyde is dependent upon the hydroxide being present in solution, thus facilitating molecular contact and chemical reaction. The bodies mentioned (sulphuric acid, sulphate of alumina, etc.), by keeping the reacting mixture free from calcium hydroxide in solution, prevent condensation of the formaldehyde.

When sulphuric acid is used, the fumigating liquid is made by adding to the commercial 40 per cent. formaldehyde solution about one-third of its volume of commercial sulphuric acid. Eight fluidounces of this mixture, with one pound of lime, are required for each one thousand cubic feet of the apartment to be fumigated.

A serious objection to the sulphuric acid mixture is that upon standing the formaldehyde is converted into solid polymerized formaldehyde (paraform), which separates out in the form of a deposit closely adherent to the bottle. The use of this mixture has therefore been abandoned in favor of a mixture containing aluminum sulphate instead of sulphuric acid, as this mixture does not deposit paraform.

The mixture is made by dissolving 20 to 25 pounds of commercial aluminum sulphate in 5 gallons of hot water, and mixing this solution with fifteen gallons of 40 per cent. formaldehyde solution. Eight fluidounces of this mixture and one pound of lime are used for 1,000 cubic feet. It is necessary to use a lime which slacks rapidly with cold water, as this mixture is not so vigorous in action as the sulphuric acid mixture. The lime should be used in the form of coarse powder or small lumps.

The method has the advantages of not requiring any special form of apparatus, of cheapness, and freedom from danger of fire. In municipal practice it has given most excellent results, over 90 per cent. of successful fumigations, tested by *Bacillus pyocyanus* being obtained. This high degree of success is doubtless largely due to the great rapidity with which the gas is evolved, a sufficient quantity to fumigate an ordinary apartment being liberated in from five to ten minutes.

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