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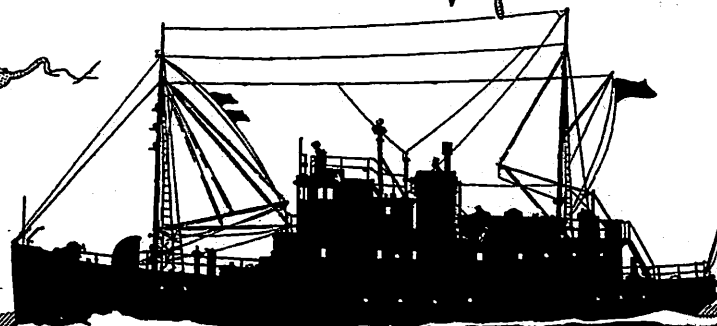
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RICHARD H. FLEMING
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A SIMPLE SEMIAUTOMATIC REAGENT DISPENSER

by

Ralph W. Riley and Francis A. Richards

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Seattle 5, Washington

A simple, reliable, and accurate device for repetitive delivery of small, equal volumes of liquid can be constructed quickly and inexpensively from readily available materials. The device has been found useful in chemical analyses aboard ship, where large numbers of determinations may be required. More specifically, it is a marked improvement over other reagent dispensers the authors have used in the determination of inorganic phosphate by the Deniges-Atkins method as described by Wooster and Rakestraw (1951).

The construction and method of operation are shown in the figure. Four sizes of syringes have been used (0.25, 1.00, 5.00 and 10.00 ml), but 2-mm bore stopcocks were used for all. The delivery volumes can be adjusted to any fraction of the nominal volume of the syringe used. The ground glass tip of the syringe can be cut off; the syringe will then fill and deliver more rapidly, and it is simpler to clear the line of bubbles.

The necessary hydrostatic head is supplied by mounting the reagent reservoirs approximately one meter above the stopcocks. Polyethylene tubing has been found satisfactory for connecting the reservoirs to the side arms of the stopcocks.

It is usually necessary to apply a drop of a liquid to the top of the syringe plunger for the first operation. Sulfuric acid (50%, V/V) has been found satisfactory in the phosphate determination. So little of this lubricant reaches the body of the syringe that it has no appreciable effect on the analyses. With the larger volume syringes, it has been necessary

to increase the clearance between the barrel and the plunger by a slight lapping with fine carborundum (Grit No. 320), however, care must be exercised not to cause leakage.

Ten successive deliveries of nominal 0.2 ml volumes of stannous chloride reagent gave an average of 0.2006 ml, with a maximum deviation from the average of 0.003 ml, and a standard deviation of ± 0.0016 ml, or about 0.8% of the nominal delivery volume. Similar values for ten successive deliveries of nominal 1.00 ml volumes gave a maximum deviation of 0.004 ml from the average, and a standard deviation of ± 0.0020 ml, or about 0.2% of the nominal volume. Using distilled water and a syringe of nominal delivery volume of 10.00 ml, the maximum deviation from the average of ten deliveries was 0.006 ml, and the standard deviation was ± 0.006 ml.

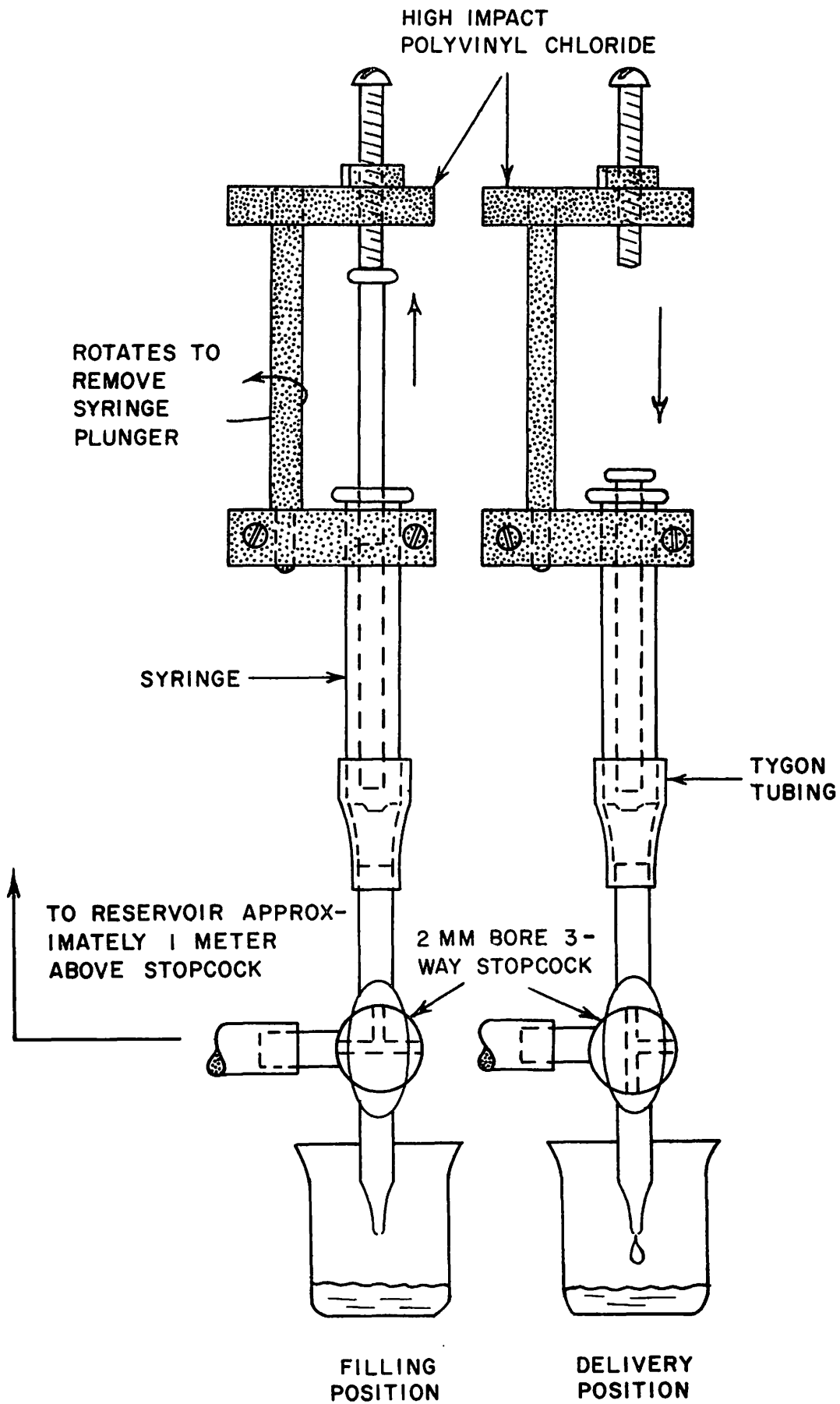
The device has been used only with acid solutions and distilled water. Special precautions would be necessary with strongly basic materials.

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