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APPARATUS FOR SAMPLING LIQUIDS

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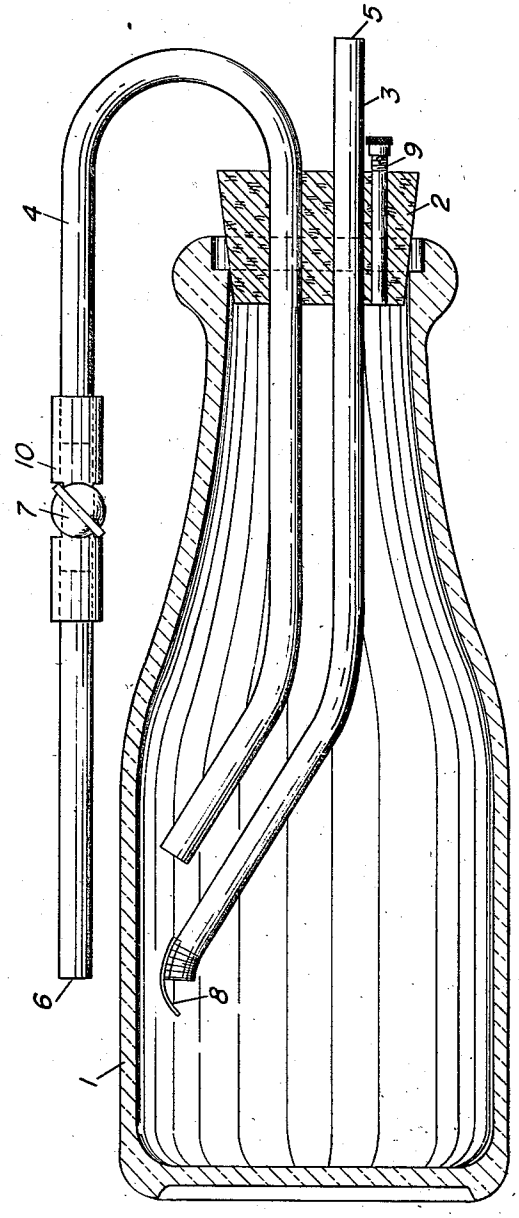


Fig. 1

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APPARATUS FOR SAMPLING LIQUIDS

Alvin G. Anderson, Greenville, S. C., assignor to Claude R. Wickard, as Secretary of Agriculture of the United States of America, and to his successors in office

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2 Claims. (Cl. 73—21)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

This application is made under the act of March 3, 1883, as amended by the act of April 30, 1928, and the invention herein described, if patented, may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment to me of any royalty thereon.

This invention relates to the sampling of liquids and more particularly to devices for use in obtaining such samples.

Bodies of liquids flowing in a turbulent state may contain foreign matter, such as sediment, organic matter, other solid particles in suspension, or soluble salts in solution. The concentration and distribution of such foreign matter in a particular liquid may vary from one point to another and change over periods of time. To obtain information relative to the actual concentration of such matter and their variations in bodies of liquids, it is necessary to obtain samples thereof at specific points without contamination from other points.

The general object of this invention is the provision of a simple inexpensive apparatus for collecting such samples.

In the accompanying drawing there is illustrated a longitudinal section of an embodiment of my invention, which is explained in the following description, and, considered together, a full and complete understanding of this invention may be had by those skilled in the art.

The embodiment referred to comprises essentially a container 1 having a removable stopper 2, through which two tubes 3 and 4 are disposed. The tube 3 terminates at a point 5 toward the front of the container, while the tube 4 is bent backward, terminating toward the rear at a point 6, which, in use, is normally above the point 5. The outer portion of the tube 4 is provided with a valve, such as a pinch clamp 7 on a flexible tube 10 forming a part of tube 4. The tube 3 is provided with a check valve, such as a rubber flap 8 on the inner end. If desired, an additional valve 9 for air may be provided through the stopper 2 but it is not indispensable.

To use this apparatus, the valve of tube 4 is closed and air under pressure is forced into the container through the tube 3 or through the valve 9. If the air is introduced through the valve 9, tube 3 is closed temporarily by placing a finger over the outer end thereof. The pressure in the container is thus increased to a point where it is equal to or greater than the sum of the hydrostatic and hydrodynamic pressures at the depth of the sample chosen for the body of liquid. Then the tube 3 is opened to the atmosphere which causes a sudden reduction in pressure therein and forces its check valve to close, thereby sealing the pressure in the container and preventing the escape of air therefrom. This is done to balance the hydrostatic and hydrodynamic pressure of the liquid which will subsequently be encountered at the depth of sampling to prevent the sudden initial inrush of liquid that would occur if the air pressure in the container was considerably less, such as at atmospheric pressure. By balancing the pressure in this way, the rate of inflow throughout the entire filling period is uniform and proportional to the velocity of flow. The apparatus is lowered in the body of liquid to the sampling point with the open end of the tube 3 facing upstream and the open end of tube 4 facing downstream. The pinch clamp 7 is then opened. If the pressure in the container is greater than the hydrostatic pressure at the point 6 of the tube 4, air will escape until the pressure in the container is equal to this hydrostatic pressure. When this results, the check valve opens automatically due to the slight excess of hydrostatic pressure and hydrodynamic pressure between the points 5 and 6. As a result of this differential pressure, liquid flows into the container at a rate proportional to the velocity of flow of the body of water being sampled. When a sufficient quantity of sample has been obtained, the pinch clamp 7 is closed and the entire apparatus lifted out of the liquid. No liquid will enter the container as the apparatus is raised, because the pressure in the container will always be greater than the hydrostatic pressure of the liquid between the point of sampling and the surface of the liquid.

Since the rate at which the liquid will flow into the container will be proportional to the velocity of the flow of the body of liquid being sampled, the apparatus may be calibrated so that it can be used to measure the velocity of flow at the same time that a sample is obtained.

Having thus described my invention, I claim:

1. A liquid sampling apparatus comprising a container for holding a sample of liquid, said container being capable of holding air under pressure, a tube for admitting liquid in the container, a second tube for the escape of air from said container, the outer openings of said tubes facing in opposite directions at different elevations, and a valve for each of said tubes, the valves of said first tube being a check valve to prevent the escape of air under pressure in the container.

2. A liquid sampling apparatus comprising a container for holding a sample of liquid, said container being capable of holding air under pressure, a tube for admitting liquid in the container, a second tube for the escape of air from said container, the outer openings of said tubes facing in opposite directions at different elevations, a valve for each of said tubes, the valve of said first tube being a check valve to prevent the escape of air under pressure in the container, said container having an air inlet independent of said tubes, and a valve for said inlet to prevent air in the container escaping therethrough.

ALVIN G. ANDERSON.