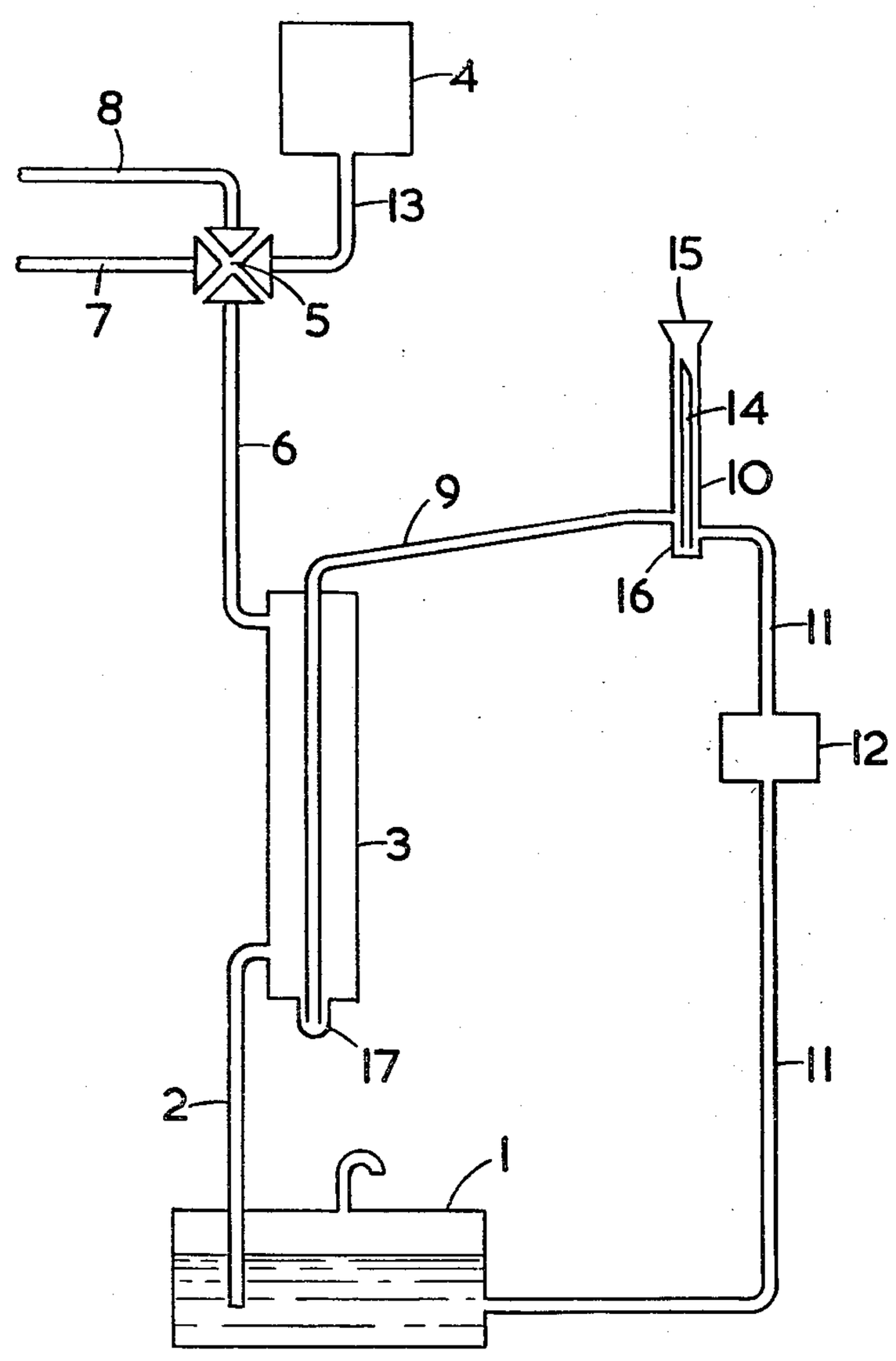
Aug. 8, 1961 H. F. PARKER ET AL 2,995,037

APPARATUS FOR SAMPLING LIQUIDS

Filed July 29, 1957



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2,995,037
Patented Aug. 8, 1961

2,995,037

APPARATUS FOR SAMPLING LIQUIDS

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Filed July 29, 1957, Ser. No. 674,962
Claims priority, application Great Britain Aug. 11, 1956
2 Claims. (Cl. 73—421)

This invention relates to apparatus for sampling liquids, particularly radioactive liquids, and has for an object to provide inherently safe means for liquid sampling.

Apparatus according to the invention comprises a vented container for holding a liquid to be sampled, a reservoir above the container, a vacuum vessel, a vessel providing a sampling cavity, a multiposition valve system, a pipe connection from the upper regions of the reservoir via the valve system to the vacuum vessel, two pipe connections from the lower regions of the reservoir, one to said container and the other to the sampling cavity, and an overflow pipe connection from the sampling cavity back to said container arranged to function so that with the valve system in its first position the vacuum vessel can be evacuated whilst disconnected from the reservoir, with the valve system in its second position the pressure in the vacuum vessel can be brought into equilibrium with the pressure in the reservoir so that the reservoir partly fills with liquid from said container, and with the valve system in a third position atmospheric pressure can be introduced in the reservoir to drive liquid back to said container both directly and via the sampling cavity to flush it.

The invention will now be described with reference to the accompanying drawing which shows a schematic representation of the apparatus.

In the drawing a container **1**, holding a liquid to be sampled, is connected by a pipe **2** with the lower end of a reservoir **3**. A vacuum vessel **4** is connected via a pipe **13**, a four-port three-position cock **5** and a pipe **6** to the top end of the reservoir **3**. The cock **5** has a connection **7** to atmosphere and a connection **8** to a vacuum line, the plug of the cock being arranged to join any two adjacent ports together except, of course, ports associated with connections **7** and **8**. The valve is arranged to turn one way only by providing a suitable ratchet device. A pipe **9** connects a thimble **17** at the lower end of the reservoir **3** with a sampling cavity **10** provided with a hypodermic-type sampling needle **14** having its unpointed end disposed in sump **16** and a removable sealing cap **15**. A pipe **11** acts as an overflow for the cavity **10** so that in the sump **16**, liquid can remain in the cavity **10** after it is flushed. The pipe **11** has a baffle pot **12** and then returns to below the liquid level in the container **1**.

In the operation of the apparatus, the cap **15** is put in place and the vessel **4** connected to the vacuum line **8** to evacuate the vessel. The cock **5** is then operated to connect the vessel **4** with the reservoir **3** so that liquid in the container **1** is drawn along the pipe **2** to fill the reservoir **3** to about the half-way level. The level cannot be exceeded as it represents pressure equilibrium between the vacuum vessel **4** and the reservoir **3**. (Liquid

also rises up the pipe **11** and the increased cross-sectional area offered by the void of the baffle pot **12** causes this rising liquid to decrease its velocity and thus prevents liquid in the pipe **11** passing over into the reservoir **3** by virtue of its momentum.) The cock is moved to its third position so that atmospheric pressure is introduced into the reservoir **3**. Atmospheric pressure drives part of the liquid in the reservoir **3** back into the container **1** via the pipe **2** and part along the pipe **9**, through the sampling cavity **10** to flush it and introduce a new sample, and thence through the pipe **11** to the container **1**.

The cap **15** is now removed and the sample taken by pressing the rubber cap of an evacuated sampling bottle over the needle **14**, whereupon liquid is drawn up from the sump **16** and into the sampling bottle.

The height of the reservoir **3** is such that under extreme conditions of degree of vacuum in the vacuum vessel and specific gravity of liquid and head of liquid in the container **1**, liquid will always rise above the pipe **2** in the reservoir **1** when the cock **5** is in its second position but will never rise as high as the pipe **6**.

The thimble **17** in the bottom of the reservoir **3** ensures that only a very small quantity of an old sample is ever left in the apparatus.

We claim:

1. Sampling apparatus comprising a liquid container open to the atmosphere, a reservoir above said container, a four port cock, a conduit connected to the upper region of said reservoir and a first port of said four port cock, a vacuum vessel, a conduit connected to said vacuum vessel and a second port of said four port cock, a connection to atmosphere from a third port of said four port cock, an evacuating conduit connected to a fourth port of said four port cock, a sampling cavity, a removable sealing cover for said sampling cavity, a conduit connected to the lower region of said reservoir and said sampling cavity, a conduit for overflow from said sampling cavity connected to said container, the plug of said four port cock being movable to three positions to set up first, a connection between said evacuating conduit and said vacuum vessel to evacuate said vacuum vessel, second, a connection between said vacuum vessel and said reservoir so as to bring said vacuum vessel and said reservoir into pressure equilibrium to draw liquid from said container into said reservoir, and third, a connection between said reservoir and the atmosphere to expel liquid from said reservoir into two directions, directly back into said container and through said sampling cavity to said container so as to first flush said sampling cavity and provide a residual sample below the level of said overflow conduit connected to said cavity.

2. Apparatus comprising a liquid container open to the atmosphere, a reservoir above said container, a conduit connected to said reservoir and said container, a vacuum vessel, a multi-ported cock, a conduit connected to said vacuum vessel and a first port of said multi-ported cock, an evacuating conduit connected to a second port of said multi-ported cock, a connection to atmosphere from a third port of said multi-ported cock, a sampling cavity above the lower region of said reservoir, a draw-off conduit connected to said sampling cavity and the lower region of said reservoir, and a conduit

for overflow from said sampling cavity connected to said container, whereby with the cock in a first position said vacuum vessel is connected to said evacuating conduit to evacuate said vacuum vessel, with the cock in a second position the pressure in said vacuum vessel is brought into equilibrium with the pressure in said reservoir so that liquid is drawn from said container into said reservoir, and with the cock in a third position atmospheric air is introduced into said reservoir to force liquid into said sampling cavity.

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