Feb. 10, 1925. 1,526,170

L. H. MILLIGAN

GAS TREATING APPARATUS

Filed Oct. 2, 1923

Fig. 1

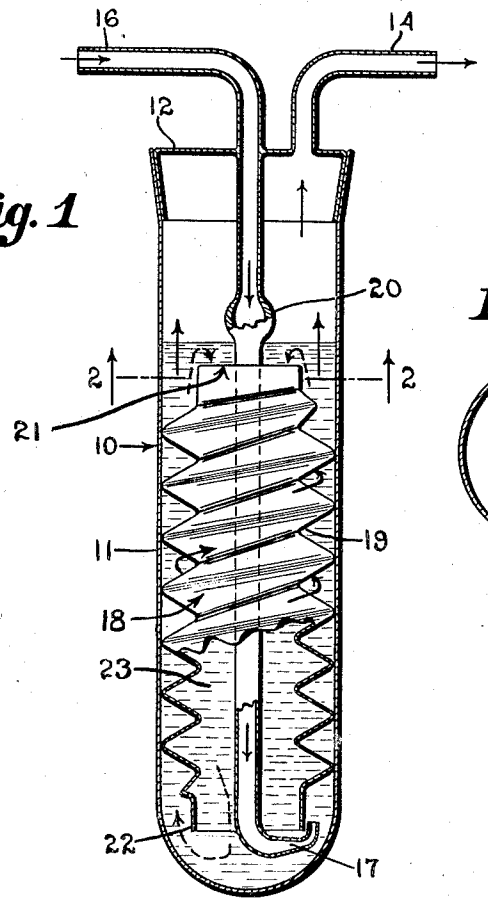
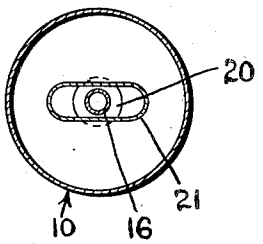


Fig. 2



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Patented Feb. 10, 1925. 1,526,170

UNITED STATES PATENT OFFICE.

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GAS-TREATING APPARATUS.

Application filed October 2, 1923. Serial No. 666,210.

To all whom it may concern:

Be it known that I, LOWELL HAINES MILLIGAN, a citizen of the United States of America, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Gas-Treating Apparatus, of which the following is a full, clear, and exact specification.

My invention relates to chemical apparatus and more particularly to apparatus used in the laboratory for treating a liquid with a gas.

It is essential that apparatus of this type, such as is used for washing gas, be so constructed that all of the liquid may circulate freely and come into intimate contact with the gas and that the gas be not permitted to collect in pockets or to escape without full contact with the liquid.

One common method of washing gas involves bubbling the gas through a body of liquid. The laboratory requirements imposed on such gas washing apparatus are severe: the apparatus should be strong and of convenient form; measurements must often be quantitative and for this purpose the parts of the apparatus must be removable and capable of being cleaned thoroughly and easily; and the apparatus must ordinarily be made of glass.

It is the prime object of my invention to provide an apparatus of this type which overcomes the difficulties heretofore experienced and satisfies the exacting requirements of the analytical laboratory, which gives complete contact between gas and liquid and which may be economically manufactured and readily taken apart for cleaning or replacement.

Further objects will be readily apparent in the following description of my invention and the statement of the advantages attendant upon its use.

Referring to the drawings in which like reference numerals indicate like parts:

Fig. 1 is a vertical sectional view, with parts in elevation, illustrating one embodiment of my invention; and

Fig. 2 is a section thereof on the line 2—2 of Fig. 1.

In accordance with my invention, I provide a closed container having inlet and outlet tubes for conducting the gas therethrough. The outlet tube collects gas from the space above the liquid while the inlet tube passes to a point adjacent to the bottom of the container. In order to afford adequate time within which the gas may be in contact with the liquid while bubbling upwardly therethrough, I provide a helical passage, into the lower end of which the inlet tube opens. This construction forces the ascending stream of gas to travel in an extended and circuitous path in contact with the liquid. The walls of the apparatus are so arranged that the liquid carried upwardly by the ascending gas is permitted to return to the bottom of the vessel for further contact with the gas.

To this end, I preferably form the apparatus of three principal parts, which are removable relative to one another, one of these parts comprising the container, a second an inlet tube and a third cooperating with the other parts to form the helical passage for the ascending liquid. While these parts may obviously be interchanged in their relative locations and assembled in different arrangements to accomplish the objects of my invention, I have deemed it necessary to illustrate but one of the forms which the invention may take.

In order to provide a helical passage for the ascending liquid, I utilize two walls concentrically placed, one of which has a helical groove formed therein. In the drawing, I have illustrated this grooved member as being the inner member located within a smooth walled container. As there shown, the container 10, which may be made of desirable material such as glass, may compirse a tube or bottle of suitable shape which has an extended cylindrical portion 11 and an open end which is closed by a suitable stopper 12. As illustrated, this stopper may be made of glass which is ground to fit the open end of the container and form a tight closure therefor. An outlet tube 14 opens through the stopper into the space in the upper portion of the container. This tube is shown as being made of glass and formed integral with the stopper.

One means for introducing gas into the bottom of the container may comprise an inlet tube 16 which passes centrally through and is preferably fixed to the stopper. It however is clear that the stopper and the inlet and outlet tubes may be so arranged as to be separable from one another if de-

sired, as for instance by employing a rubber stopper with glass tubes passing through holes in it. This tube 16 extends to a position adjacent to the bottom of the container, and in order that gas may be directed therefrom in a desired direction this tube is preferably provided with an extension of crook neck 17.

To form the helical passage through which the gas issuing from the inlet tube may pass, I provide an open ended hollow tube 18 which has a helically shaped groove 19 formed in its wall. While this tube may be made in various ways, it is conveniently manufactured by blowing glass in a suitably shaped mold so that it may have relatively thin walls throughout and the introduction of excessive cooling strains in the material thereof will thus be avoided.

This helical tube 18 is made of such size that it fits fairly snugly within the cylindrical portion 11 of the container so as to form an endless passage for the gas. The gas inlet tube 16 passes centrally through the helical tube and is preferably arranged to support the latter on the outwardly extending portion 17, which is so shaped that gas issuing therefrom escapes only into the helical passage between wall 11 and tube 18.

Since the ascending gas tends to lift the helical tube, I preferably provide means for limiting or preventing such movement. In the construction illustrated this is accomplished by making an enlargement or bulb 20 in the tube 16 just above the tube 18 and the top of the latter is drawn in to form an elongated opening 21 which is narrower than the diameter of bulb 20. This opening is sufficiently long to permit passage of the outwardly extending portion 17 of tube 16 when the device is to be assembled. The lower end 22 of tube 18 may be cylindrical in shape and constricted to provide plenty of room for the gas. Since the inlet tube is smaller than the diameter of the inside of the helix tube, an uninterrupted passage 23 is thereby provided for the downward movement of the liquid.

The parts may be assembled easily by passing tube 16 downwardly through tube 18 and moving the two tubes relatively to hook part 17 over the edge of wall 18 and then inserting these assembled pieces into the container.

It will be understood that when liquid is placed in the container and gas is passed through the tube 16 and the crook neck 17, the gas will pass in the directions indicated by the full line arrows, i. e., downwardly through tube 16 and upwardly around tube 18 through the helical passage to the outlet. The liquid will travel, as indicated by the arrows in broken lines, downwardly through the passage 23 to the bottom of the container and then upwardly with the gas. The pitch of the helix is such that the gas moves upwardly continuously and cannot cling permanently to the walls of the helical passage.

Since the various parts of the apparatus are separable from one another, they may be made of different or the same materials as is convenient. Also it is not necessary that the parts be made with great accuracy, since they interfit comparatively loosely with one another, hence the apparatus may be made of strong material and be rugged and serviceable. The parts may be easily removed and washed out quantitatively. This apparatus insures a thorough contact of the gas with the liquid for a considerable period of time, a rapid and complete circulation of the liquid, and contains no gas pockets to delay or prevent rapid displacement of the gas.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. An apparatus for treating liquid with a gas, comprising a container having a gas exit and walls therein including an inlet tube and a tube separate therefrom which define a helical passage for an ascending column of liquid and gas, a return passage for the liquid, and a gas inlet opening into the bottom of the helical passage.

2. An apparatus for treating liquid with a gas, comprising a container having a gas exit, a gas inlet tube arranged to conduct gas to the lower part of the container, and a wall cooperating with said container to define a helical passage for an ascending column of liquid and gas, said apparatus having a separate passage for the return flow of liquid.

3. An apparatus for treating liquid with a gas, comprising a container having a gas outlet therefrom, an open-ended, hollow, helically grooved tube within and cooperating with the container to form a helical passage for an ascending column of liquid and gas, and a gas inlet tube to introduce gas at the bottom of the helical passage.

4. An apparatus for treating liquid with a gas, comprising a container having a gas outlet, a removable, helically grooved, open-ended tube cooperating with the inside of the container to form a helical passage, and a gas inlet tube extending downwardly through the open-ended tube and arranged to conduct gas to the helical passage, said inlet tube and inner wall of the open-ended tube defining a return passage for liquid.

5. An apparatus for treating liquid with a gas, comprising a container having a gas exit, an open-ended tube within the container, said parts being constructed and arranged to form a helical passage, a separate gas inlet tube extending centrally through said open-ended tube and being arranged to

introduce gas into the lower end of said passage, and means to limit the upward movement of the open-ended tube.

6. An apparatus for treating liquid with a gas, comprising a container having a gas exit, a removable open-ended tube therein and forming therewith a helical passage, a stopper for the container, and a gas inlet tube supported from the stopper and extending centrally through and supporting the open-ended tube, said inlet tube being arranged to discharge gas into the helical passage.

7. An apparatus for treating liquid with a gas, comprising an open-ended container having a gas exit, a stopper therefor, a removable open-ended tube within the container and forming therewith a helical passage, a gas inlet tube supported from the stopper and extending through the open-ended tube, and an extension on the lower end of the inlet tube which supports the open-ended tube and directs the inflowing gas into the helical passage, said inlet tube having an enlarged portion and the open-ended tube a constricted opening which cooperate to limit the upward movement of the open-ended tube.

Signed at Worcester, Massachusetts, this 25th day of Sept., 1923.

LOWELL H. MILLIGAN.