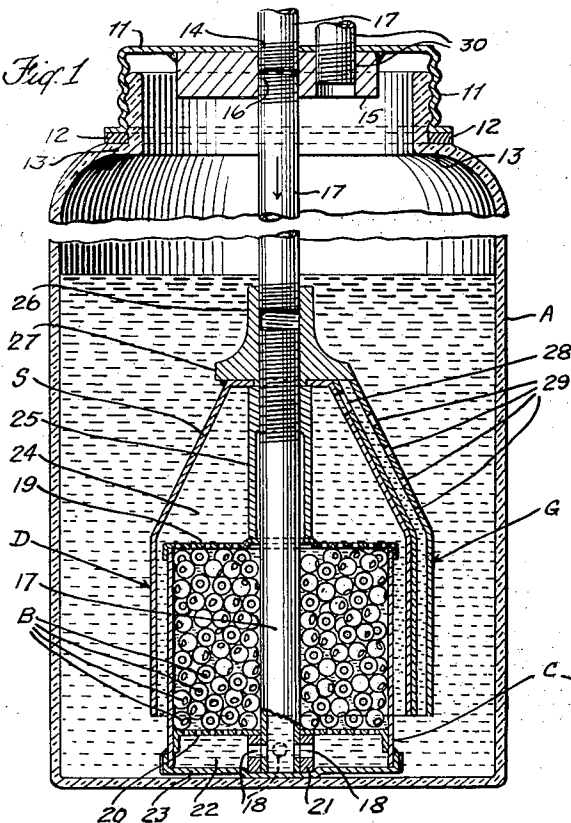
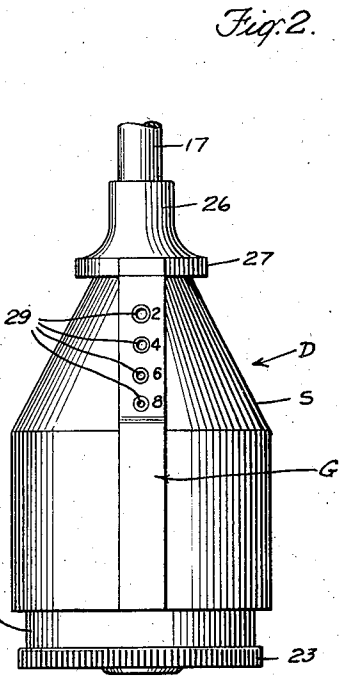


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G. D. STONE
HUMIDIFIER

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INVENTOR
Gerald D. Stone.
BY *E. H. Greenwald*
ATTORNEY

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HUMIDIFIER

Gerald D. Stone, Evanston, Ill., assignor, by
mesne assignments, to Union Carbide and Car-
bon Corporation, a corporation of New York

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This invention relates to humidifiers and more particularly relates to a humidifier for use with respirable gases such as are used in oxygen therapy.

5 An object of this invention is to provide a humidifier having means for breaking up a gas into small bubbles for intimate contact with a volume of water or other humidifying liquid so as to increase the moisture of the gas. Another
10 object of this invention is to provide a humidifier of simple construction and having a minimum number of parts so that it may be readily cleaned and repaired. Still another object is to provide means for measuring the flow of gas through the humidifier. These objects together
15 with others will be apparent from the following description and the accompanying drawing, in which

Fig. 1 is a sectional view showing one embodiment of this invention; and

20 Fig. 2 is an elevation of the diffuser showing the flow gauge.

One embodiment of this invention, as shown in Fig. 1, comprises a closed jar or vessel in which is contained a bell-shaped diffuser and a closely
25 associated flow gauge, both being submerged under water and connected by a gas conducting conduit with a source of gas supply. The diffuser may contain a large quantity of glass beads or
30 other material that is capable of converting a body of gas into small bubbles so as to absorb a maximum amount of moisture on passing up through the water in the jar. The bubbles of gas are directed into a gauge which may be attached
35 to the side of the diffuser and conveniently positioned for measuring the rate of flow of the gas and for enabling the flow to be readily visible to an observer.

It is preferred to employ a Mason jar or other
40 transparent glass vessel A which may be tightly sealed against leakage of gas and yet permit observation of the flow through the jar. A cover 11 is screwed onto the top of the jar A and is clamped against a washer 12 which seats on a
45 shoulder 13 at the base of the threaded neck of the jar. In order to provide an inlet opening 14 through the cover 11 a metal block 15 may be soldered or otherwise secured to the under side of the cover and have a drilling 16 extending
50 centrally therethrough. The drilling 16 is tapped at either end to receive sections of a conduit 17 which is arranged to convey gas from a convenient source of supply, such as a commercial cylinder, to the interior of the jar A.

55 The conduit 17 leads to the bottom of a dif-

fuser D where it emits gas through a plurality of radial ports 18. The diffuser D may comprise a cylinder C supported on the bottom of the jar or suspended from the cover and it may have a quantity of glass or porcelain beads B com-
5 pactly contained therein for breaking the gas into bubbles as it flows upward through the interstices between the beads. A large surface area of the gas will thus be exposed to the water in the jar A in order to absorb a greater per-
10 centage of moisture than would otherwise be possible for a given set of temperature and flow conditions. The beads B may be contained between screens or perforated plates 19, 20 the
15 lower of which screens is held above the port openings 18 in the conduit 17 by an annular ring 21. The ring 21 is soldered to the end of the conduit and is bored to complete the port open-
20 ings. The ports 18 allow gas to flow to a space 22 which is formed between the lower screen 20 and a cover 23 that encloses the lower end of the cylinder, so that the gas flowing into the space
25 22 may be evenly distributed to all parts of the screen 20 and may filter upwardly through the mass of beads B.

The cylinder C is preferably enclosed in or
25 covered by an outer bell-shaped shell S which is spaced from the side of the cylinder C and which forms a conical chamber 24 above the cylinder. In order to support the shell S a sleeve
30 25 may be fitted over a lower section of the conduit 17, so as to rest against the under side of the top of the shell, and a union or collar 26 having a flared base 27 may be soldered to the top of the shell.

The collar 26 is provided with screw threads
35 for receiving sections of the conduit 17. Arranged at one side of the shell S and secured to the collar is a tubular flow gauge G closely fitting the contour of the shell. An opening 28
40 leads from the chamber 24 above the cylinder to the top of the gauge G so as to allow gas to flow into the interior of the gauge. In accordance with this invention a plurality of openings
45 29 are supplied at spaced intervals on the upper sloping part of the gauge which conforms to the shape of the shell S and is readily visible because of its inclined position. These openings
50 29 are made progressively smaller toward the bottom in order to permit the escape of bubbles of gas from the lower openings only when the rate of flow is increased. The openings are so placed and sized that the rate of flow is measured in standard units, such as litres per minute, by observing the lowest of the openings from which
55

the bubbles of gas issue. In addition the edges of the openings 29 are darkly colored so that the light bubbles may be easily discernible to indicate the flow.

- 5 The gas continues to bubble upward through the water after leaving the gauge and passes to the space under the cover 11 of the jar A. An outlet 30 is provided in the block 15 and in the cover 11 to permit the gas to flow out from
10 the humidifier to an oxygen mask or other oxygen consuming equipment.

While I have found the use of Mason jars convenient, since they are readily available for replacement in case of breakage, other types of
15 containers may be used. Moreover, various changes may be made in the construction, and certain features may be employed without others, without departing from the present invention or sacrificing any of its advantages.

20 I claim:

1. A humidifier and flow meter for gases comprising a vessel containing a volume of water; means submerged under the water for diffusing the gas; an outer shell covering said diffusing
25 means and having an outlet; and a tube connected with the outlet from the shell and having a plurality of submerged openings of progressively smaller size away from the connection with the outlet.

- 30 2. Humidifier and flow meter for gases comprising a transparent container adapted to contain a liquid, and a diffusing means arranged below the liquid level of said container, said diffusing means comprising an outer casing and
35 an outlet and a tube connected with said outlet and extending downwardly, said tube being provided with a plurality of openings of different sizes, the lower openings being the smaller.

3. In a humidifier and flow meter for gases
40 a cylinder filled with beads; a bell-shaped shell supported by and covering said cylinder and having an outlet near the top thereof; and a tube leading from the outlet and conforming to the contour of the shell, said tube being provided with a plurality of spaced openings of
45 progressively smaller size toward the bottom.

4. In a humidifier and flow meter for gases a cylinder containing beads; a shell enclosing the top of said cylinder, said shell having an upper
50 conical portion and being provided with an outlet; and a tubular gauge leading from the outlet and conforming to the contour of the shell, said gauge being provided with a plurality of spaced openings adjacent the conical portion of
55 the shell.

5. In a humidifier and flow meter for gases a container; beads in said container; an upper screen covering said container and a lower screen spaced from the bottom of the container and supporting the beads; a conduit leading to the space at the bottom of the container; a
60 bell-shaped shell enclosing the top of the container and being provided with an outlet; and a gauge affixed to said shell and connected with said outlet for indicating the rate of flow of gas.

- 65 6. A humidifier for gases comprising a vessel

containing a volume of water; means for breaking up the gas into minute bubbles including a cage containing a mass of glass beads and a bell-shaped shell above and around the sides of the cage for collecting the gas after passing
5 through the beads.

7. A unitary gas humidifier and flow gauge comprising the combination of a container adapted to contain a body of water and having a gas inlet below the normal water level in said
10 container and a gas outlet above said normal water level; gas subdividing means above said inlet but below said normal water level, and adapted to subdivide gas entering the water through said inlet; and gauging means within
15 said container between said subdividing means and said outlet to gauge the flow of gas through said container.

8. A unitary gas humidifier and flow gauge as claimed in claim 7, in which said container has a transparent wall and said gauging means is below the normal water level in said container.

9. A unitary gas humidifier and flow gauge as claimed in claim 7, in combination with means adapted to collect the gas after it passes through
25 said subdividing means and then deliver such gas to said gauging means.

10. A unitary gas humidifier and flow gauge as claimed in claim 7, in combination with a gas collector between said gas subdividing means
30 and the normal water level in said container, said gas collector communicating with said gauging means and said gauging means having outlets severally located at different distances below said normal water level.

11. A humidifier for gases, comprising a vessel adapted to contain a body of water, means for conducting gas to said vessel, means for
40 conducting gas from said vessel, means within said body of water for dividing the gas into minute bubbles including a cage containing a mass of glass beads and a bell having a lower portion disposed about said cage and an upper portion of converging conical shape disposed above said cage for collecting said gas after passing through
45 said beads.

12. A humidifier for gases comprising a container having beads therein; an upper screen covering said container; a lower screen spaced from the bottom of the container and supporting the beads; a conduit leading to the space
50 at the bottom of the container; and a bell-shaped shell enclosing the top of the container and being provided with an outlet which communicates with a gauge affixed to said shell for indicating the rate of flow of gas.

13. A humidifier for gases comprising a vessel adapted to contain a body of water; means for conducting gases to said vessel; means within said body of water for dividing the gas into minute bubbles; means disposed above said dividing means for collecting the gas bubbles, said
60 means having an outlet which is adapted to lead the collected gas to a flow gauge; and means for conducting such humidified gas from the vessel.

GERALD D. STONE.