Jan. 19, 1937. M. SIMPSON 2,068,518

NEBULIZER

Filed Feb. 26, 1934 2 Sheets-Sheet 1

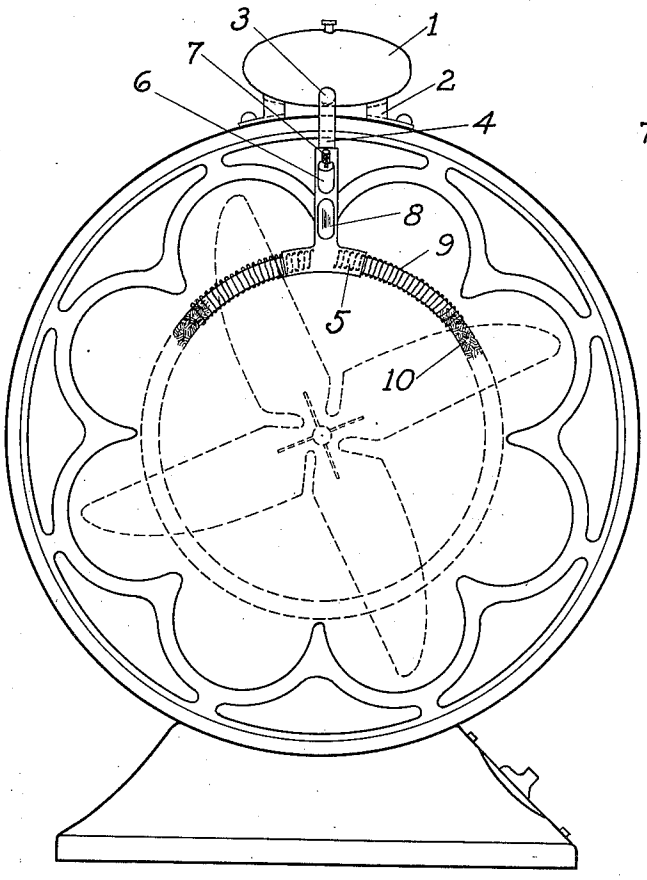


Fig. 1

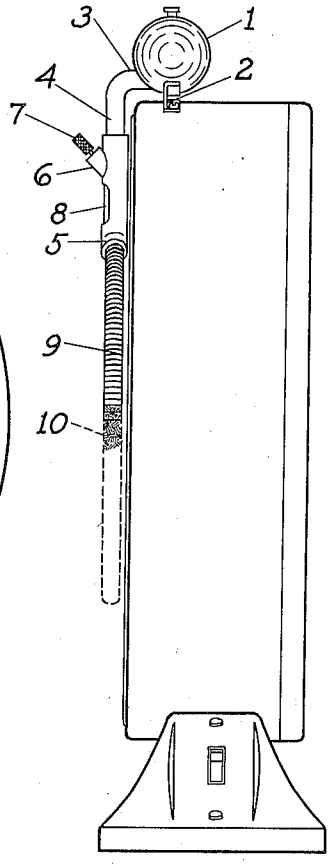


Fig. 2

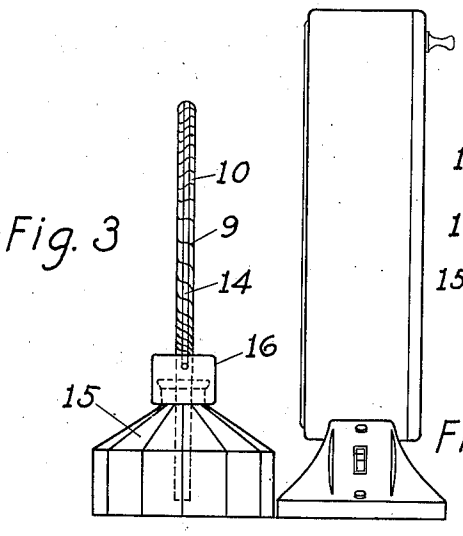


Fig. 3

Fig. 4

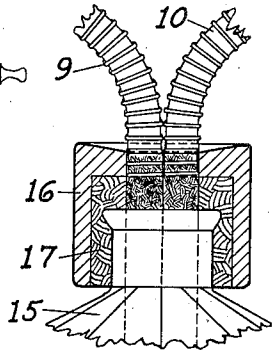


Fig. 11

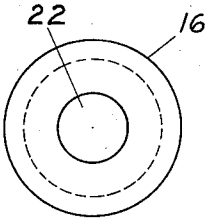


Fig. 12

INVENTOR.
MANNING SIMPSON
BY
W. S. Babcock
ATTORNEY.

Jan. 19, 1937. M. SIMPSON 2,068,518

NEBULIZER

Filed Feb. 26, 1934 2 Sheets-Sheet 2

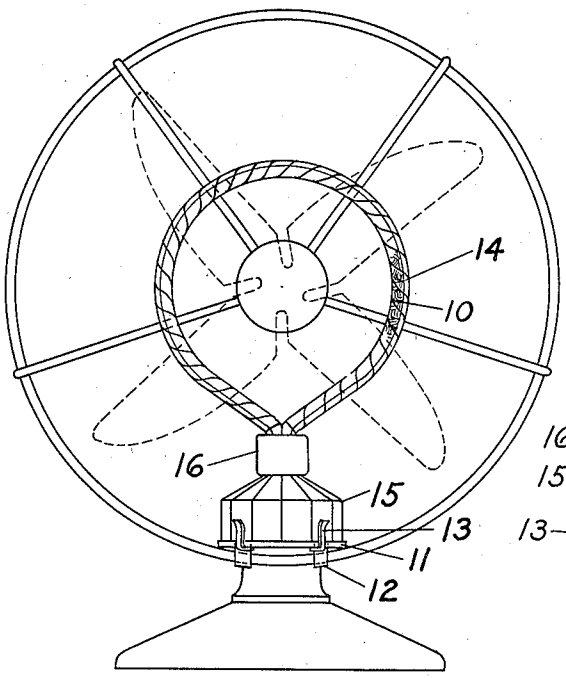


Fig. 5

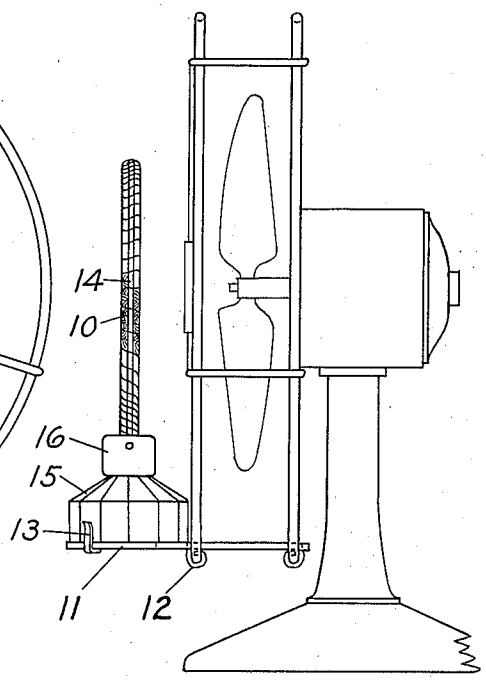


Fig. 6

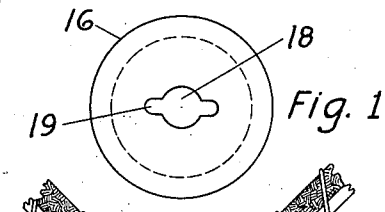


Fig. 10

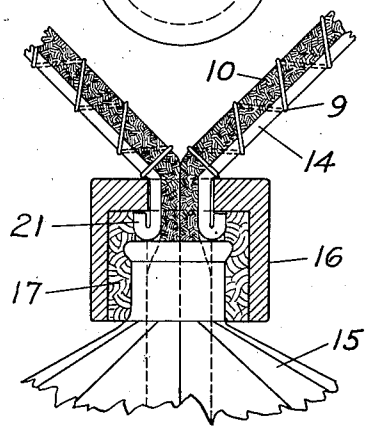


Fig. 9

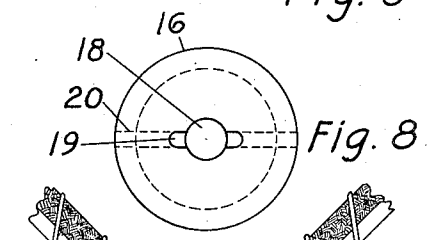


Fig. 8

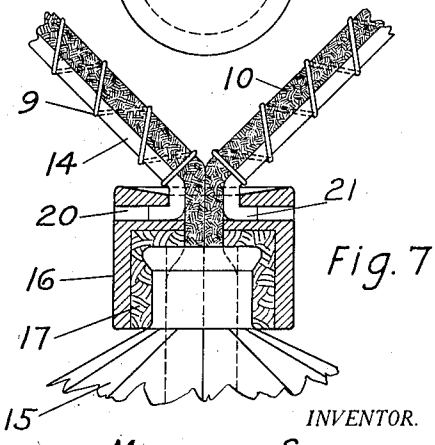


Fig. 7

INVENTOR.
MANNING SIMPSON
BY
W. S. Babcock
ATTORNEY.

Patented Jan. 19, 1937 2,068,518

UNITED STATES PATENT OFFICE

2,068,518

NEBULIZER

Manning Simpson, Columbus, Ohio, assignor of one-half to Hugh K. Martin, Franklin County, Ohio

Application February 26, 1934, Serial No. 712,927

13 Claims. (Cl. 299—20)

The invention to be hereinafter described relates to fan-draught actuated nebulizers.

Many constructions and arrangements have been resorted to for the purpose of utilizing the draught of the ordinary electric fan to nebulize or atomize a liquid, and, by the air currents of the fan, distribute it through the body of air affected by the fan. There are perforated pads or discs, perforated pipes or tubes, frames of various shapes carrying absorbent materials, etc. Some feed by gravity and some by capillary attraction. They are relatively uneconomical, inefficient, difficult to keep in operative condition, obstructive to the fan draught, awkward to properly position, bulky, expensive, or otherwise objectionable. Such nebulizers are variously intended for use in treating and modifying the air of a given room, closet, compartment or other place. For instance, people subject to colds may be greatly benefited by sitting in a room the air of which is treated by a suitable curative substance so nebulized. Colds are very common and for that reason mentioned, but a practical nebulizer of the type of the present invention is equally applicable in every case in which a nebulized atmosphere is appropriate. Wherever clothes are stored, as in clothes closets and the like, subject to moth damage, a nebulizer of the type of the present invention is very useful. By thoroughly treating the air of the storage place with a suitable moth deterrent, with the clothes on their hangers or otherwise in place, they are all quickly, easily, and thoroughly moth proofed at negligible cost, in minimum time, and with least effort. These two widely different applications or uses are given simply as types—one medical and the other industrial. Obviously, the invention may be readily used for creating a perfumed, attrative, pleasing, or other desirable atmosphere for various gatherings; or for creating a disinfecting or other protecting atmosphere for hosiptals, sick rooms, etc.

The main objects of the present invention are to avoid the above and other deficiencies and provide a simple, efficient, compact and economical device applicable to and cooperating with the average household fan of either the stationary or oscillating type, to use the fan draught to nebulize a given substance and, through its circulating currents, thoroughly treat the air of the particular location with the nebulized substance, for the particular result sought.

In order to more clearly disclose the construction, operation and use of the invention, reference should be had to the accompanying drawings forming part of this application. Throughout the several figures of the drawings like reference characters designate the same parts in the different views.

In the drawings:—

Fig. 1 is a front view of one form of the invention;

Fig. 2 is a right hand side elevation of Fig. 1;

Figs. 3 and 4 are side elevations of a preferred form of nebulizer element, container and fan, in relative positions for use;

Fig. 5 is a front view showing the container of Fig. 3 mounted on a fan guard;

Fig. 6 is a right hand side elevation of Fig. 5;

Fig. 7 is an enlarged fragmentary front view of the container of Fig. 3 and anchor cap, with nebulizer in place;

Fig. 8 is a top plan view of the anchor cap of Fig. 7;

Fig. 9 is a view similar to Fig. 7, showing a modification;

Fig. 10 is a top plan view of the anchor cap of Fig. 9;

Fig. 11 is a view similar to Fig. 7, showing a further modification; and

Fig. 12 is a top plan view of the anchor cap of Fig. 11.

In order to simply, easily, quickly, continuously and directly nebulize the particular liquid by the current of air from the fan, such current should impinge directly upon the liquid, in finely divided form, as the current leaves the fan and has its full force. For this direct contact, the element carrying the liquid should be immediately in the path of the current and as close as practical to the fan guard and source of the air blast. However, it must not obstruct the flow to any appreciable extent. Otherwise, the nebulized liquid can not be distributed by the air currents, or even adequately nebulized. So, the construction, mounting, and disposition must all cooperate to produce adequate nebulization and efficient distribution.

In the form shown in Figures 1 and 2, the invention has been applied to a fan of well known construction and widely distributed under the name of Crosley temperator. This fan has a cylindrical casing or housing in the front of which is secured the wire heating element, not shown in the drawings. On the top of this casing is suitably supported a small container 1 of glass or other suitable material, provided with a suitable filling opening on its upper side. This container, preferably, is made of generally elliptical form

and has its opposite ends mounted in small brackets 2 carried by the casing. These brackets are of such length as to space the under side of the container from the casing so that the fingers of the user may pass about the container and between it and the casing, the container thereby constituting a handle by which the fan, as a whole, may be carried from place to place. Of course, the container is removably connected, in any usual and well known manner in its brackets, so that it may be removed and replaced at will. From the lower forward part of the container extends a short outlet pipe 3 from which depends a pipe 4 directed radially toward the center of the fan. Pipe 4, in turn, has a T-connection with an arcuate pipe 5 the arc being concentric with the axis of the fan. As will be seen, the T formed by the pipes 4 and 5 is inverted, with the head arcuate instead of straight or truly flat. A short off-set branch 6 in pipe 4, at a sharp acute angle, provides a suitable mounting for a small needle-valve 7 of usual and well known type for regulating the flow through pipe 4. Below the needle-valve 7, a sight or observation glass 8 is inserted in pipe 4 so that the rate of flow may be readily observed and the valve 7 adjusted accordingly. The nebulizer element, itself, comprises a spirally wound or coiled wire 9, band, ribbon, or the like, enclosing a core or wick 10, preferably of fibrous or other suitable material, and having its ends suitably secured in any practical manner within the ends of the T-head 5. This core must have capillary properties, for purposes to be later disclosed. So mounted, the liquid flowing, by gravity, through pipes 4 and 5 will pass into the core ends and, by gravity, absorption and capillary attraction, pass into and moisten the core or wick. As shown in Fig. 1, the wire 9 and its core are directly in the path of the fan blast which is driven with full force between the coils of the spiral wire, through the moistened wick or core, and directly against and through the finely divided liquid in the wick or core, nebulizing it and thoroughly impregnating the stream of air with such nebulized liquid. The core or wick provides a liquid conductor or carrier of high efficiency while, at the same time enabling maximum nebulization by the fan current. The wire coil provides maximum surface exposure of the fibrous core to the air current and greatest possible freedom for nebulization, while at the same time providing adequate support to the core or wick. By enclosing a fibrous core or wick within a spirally wound wire, a nebulizer element of minimum material and area is provided, with corresponding minimum resistance or obstruction to the air flow of the fan. If desired, though not essential, the nebulizer element may be secured at several points, to the wire guard of the fan or to parts carried by the cylindrical casing. This may be done in any suitable manner. A simple wire clip, not shown, may be passed about the nebulizer and around a wire member of the guard, for instance, as will be readily understood. Or the nebulizer may be simply permitted to swing suspended from the T-head 5. In either case, it will assume an approximately circular form directly in front of the fan, and will be struck by the full force of the fan-blast. In this form, the support is from above and the shape of the element will be maintained by the coil of the wire, gravity, and the T-head 5. If desired, a spreader ring, similar to that hereinafter described in connection with other forms of the invention, may be used to further assure the shape, but that is not really necessary in this form, unless a weak wire coil is used. In that case, a spreader ring would be necessary. A simple and efficient way of securing the coil in the ends of the T-head is to screw-thread the T-head ends, either interiorly or exteriorly, preferably interiorly for appearances. The coil is light and its normal outside cross-sectional diameter is approximately that of the T-head. Consequently, by expanding the coils sufficiently to receive the T-head ends, the spring contraction will be sufficient for the coils to grip the threads, or by compressing the coil sufficiently to be received within the T-head, the expansion will be sufficient to hold it in place. In both cases, as will be readily understood, this is a yielding hold which, by moderate pull or force, may be separated for renewal or substitution. When a frame or spreader is not used within in the coil, wicks or cores may be removed or replaced from the respective coils at will, by simply threading them therethrough. In this form, the container also constitutes a handle by which the fan and its attachments may be lifted and carried about. On the other hand, by simply removing the screws of brackets 2, the entire attachment may be quickly removed and another attached in its place.

The construction and arrangement above disclosed is applicable with slight obvious modifications to either stationary, oscillating, or rotating fans. Where, instead of the cylindrical casing, an open wire guard or frame of usual and well known type is used, it is only necessary to secure a small plate to the guard in about the same relative position as the brackets 2 and then, by brackets 2, secure the container 1 to such plate. It is not believed that further illustration, as by drawings, along that line, is necessary or would add anything to this disclosure.

A preferred form of the invention for moving fans, such as the oscillating or swinging type and the rotating type, has the position of container and nebulizer element reversed, relatively to that above described. In it, the liquid is fed by capillary attraction, instead of both by capillary attraction and by gravity. Otherwise, it is substantially the same in construction, operation and use. In it, the container 1 constitutes a simple bottle of appropriate form, construction and size. In this form, the nebulizer element is similar in size, and relative position to that of the other arrangement above disclosed and therefore extends considerably above and laterally beyond the container, with corresponding leverage relatively to the container in which it is, as hereinafter disclosed, mounted. This bottle is mounted on a plate 11 which is suitably removably secured to the wires of the fan guard by small ears or tongues 12 stamped or punched from the plate in such manner that they may be bent from the plate and around the wires to secure the plate to the wires. This constitutes a platform or support for the container, at the lower side or bottom of the fan guard, as shown in Fig. 5. As shown in Fig. 6, this plate projects sufficiently far forward from the fan guard to provide adequate support for the bottle. To securely maintain the container on the support during swinging or rotation of the fan, spring clips or fingers 13 are provided on the plate edge at intervals. Their lower ends are spot welded or otherwise suitably secured to the plate at or near its edge, and they are slightly inwardly deflected so that their upper free ends project somewhat within the boundary of the plate. The

tips of their free ends are backwardly and outwardly curved. The plate is, of course, proportioned to the base or bottom or other maximum corresponding cross-sectional area, of the container to be seated thereon. Consequently, in placing the container on the plate 11, the spring fingers are spread sufficiently to receive the container, thereby yieldingly gripping it and holding it securely in position while, at the same time permitting its ready removal and replacement. Also, these spring fingers, engaging three sides of the container, as they do, counteract all probable outward tipping tendency of the container, due to the considerable leverage of the nebulizer element, as it is struck by the fan blast. Obviously, the nebulizer element, in this form, may be positively connected to the wires of the guard by clips or other well known and suitable means, if desired.

The nebulizer element of this invention comprises the minimum number of parts, all of which are of exceptionally simple, practical, efficient and low cost construction, and all of which may be very readily had in any locality. The absorbent wick or core through which the liquid is distributed throughout the nebulizer element, either by capillary attraction or by gravity and capillary attraction, may be had in quantity anywhere. The coil wire cage, envelope or housing for containing the core or wick, holding it in position and maintaining its shape, may be obtained in a wide variety of sizes, strengths and grades, practically anywhere. And the wire or rod, or ribbon for the spreaders may be had in any size, shape, construction or characteristic desired, at any place. It is then only necessary to take these readily obtainable parts, cut them to the right lengths, properly bend or shape them, assemble the parts, and you have the complete nebulizer element, which is then either inserted in the T-head ends, or through the opening in the respective anchor cap, as desired.

While the coil formation of wire 9, properly proportioned, may be relied upon to adequately sustain the substantially circular shape of the nebulizer element, as it hangs from the T-head above, it will be found that the coil must be made considerably heavier and stiffer to be self sustaining in shape and position, when it stands in the bottle neck of the container, because the force of gravity acts entirely upon the nebulizer to collapse it rather than acting upon and being sustained by the T-head. Accordingly, in all forms in which the coil wire 9 and enclosed core or wick 10 is to be self sustained, a wire frame 14 is provided. This is simply a rod, wire, bar or plate, shaped to the contour or outline and measurements to be given to the completed nebulizer element. It is of sufficient strength and rigidity to certainly maintain the desired shape and position of the completed nebulizer element. It also acts as a suitable support for the core or wick 10. It is, of course, constructed of the minimum cross-sectional area and weight, consistent with the adequate maintenance of its shape and position in performing its function as a spreader. Since the spreader maintains the shape and position of the nebulizer, the coil 9, in its capacity as a cage for the core 10, may be greatly reduced in its number of coils per unit measurement of length, and in the cross sectional area of its wire. The coils may be much more widely spaced, as in Figs. 7–10, where the spreader is combined with the coil, because the spreader provides the strength and stiffness otherwise required of the coil. For the same reason, a less resilient or softer wire, as well as one of less diameter and more widely spaced coils, may be used in cooperation with such a frame. In fact, with such a frame, the coil may be of such a character as would be entirely inadequate without the spreader. In all cases in which the spreader is used, the wire coil 9 is wrapped spirally about the spreader and contacting core, securely binding the core and spreader together, while leaving the core or wick thoroughly exposed between the widely spaced coils, for the full effect of the fan blast. In all cases in which the nebulizer is supported from below rather than from above, the frame 14 provides not only the necessary stiffness or rigidity for maintaining the shape and position of the nebulizer element but also provides ample resistance to the air blast of the fan to prevent deflection of the nebulizer element.

The spreader or frame is of springy or resilient material which may be readily contracted to bring its free ends together but which, when released, will spread those free ends considerably apart, as will be readily understood. This characteristic is used in removably securing the frame in operative position in the liquid container, as will be presently disclosed—see Figs. 7–10. A preferred form of container is the short bottle 15 of large cross-sectional area or base, relative to its height. A container so proportioned may be readily and easily placed directly in front of the fan, either on a plate 11, carried by the fan guard, or, for stationary fans, on any suitable support in front of the fan and as close to the fan guard as practical. In such position it will not appreciably obstruct the fan draught, nor will it raise the nebulizer element beyond its best position for use. The broad base will greatly counteract and offset the leverage of the nebulizer element and prevent tipping over or upsetting.

In order to securely attach or anchor the nebulizer element to the container, and in such position that the core or wick may extend within the container and feed the liquid therefrom by capillary attraction, an anchor cap 16 is provided, adapted to fit over and close the bottle neck, and having a sponge-rubber seal or gasket 17 which provides ample friction or hold to yieldingly lock or secure it to the bottle neck, exteriorly thereof. The nebulizer element may be detachably connected to this anchor cap in various ways. Two simple and highly efficient ways are hereinafter disclosed. For instance, the cap may be provided with a key-hole opening 18 adapted to be alined with the bottle neck, the short radial notches 19 communicating with radial bores 20 extending from the center of the cap through its side walls and intersecting the central key-hole slot 18. However, notches 19 do not extend beyond bores 20. Only the round center of the key-hole extends clear through the cap. In this form, the free ends of the spreader 14 are offset oppositely at sharp angles, approximately tangential to the circumference of the nebulizer element, to provide anchoring toes 21. These offsets are of such length or proportion that, in assembling, they will pass through the notches 19, as the free ends of the frame are compressed together. At the same time, the core 10, frame 14 and wire coil 9, will pass into the central portion of the key-hole slot 18. Now, as the free ends of the frame 14 are released, they spread apart slightly, removing compression from the wick or core so that its capillary action

will be unimpeded and, at the same time, moving the toes 21 into the bores 20 and the side portions of the frame 14 into the notches 19. In this way, the cap and nebulizer element are securely and positively, though easily removably, locked together. It seems hardly necessary to state that in applying the core or wick sufficient free ends are left beyond the frame 14, to extend from the anchor cap 16 to within a very short distance of the bottom of the container, so that all of the liquid in the container will be drawn therefrom by capillary attraction in well known manner. A modification of this anchor cap and frame combination comprises an anchor cap with the key-hole 18—19 extending completely through the top of the cap to the underside thereof, the cap having lateral bores 20. In this modification, the toes 21 are folded backwardly and outwardly on themselves, so that when the free ends of the frame 14 are released, after pinching together to pass through the keyhole 18—19, the frame members will seat in the notches 19 but the toe ends will move under and engage the under face of the cap, while the wick or core will pass between the frame ends and into the container. This, of course, locks the frame and anchor cap together in substantially the same manner as in the case just previously disclosed.

In instances where the nebulizer is mounted on top of the container instead of being suspended from the T-head or the like, and a spreader frame or ring is not employed, but, instead, the stiffness, strength, and closeness of the coils of the wire 9 are relied upon to maintain the nebulizer in operative position and condition, a further modification of the anchor cap is used. In such case, the hole or opening through the cap is a simple circle 22. The ends of the coil 9 and enclosed core 10 are simply compressed sufficiently to be passed through the hole and seated in it. With a sufficiently stiff wire and having coils sufficiently close, a nebulizer element of the kind herein disclosed will maintain its shape and position without the frame.

As will be clear from the disclosure, as a whole, all forms of the nebulizer element comprise a nebulizer element disposed in the path of a fan blast and having a wick or core feeding a liquid either by gravity or by capillary attraction or by both into the path of the fan blast by which the liquid is nebulized from the wick and dispersed, a wire coil surrounding and enclosing the wick in such manner as to give the greatest possible free passage of the fan blast against and through such wick.

It hardly need be stated that, according to the present invention, any desired number and variety of liquids may be used and that they may be varied at will. To completely change the atmosphere, it is only necessary to substitute any desired container and its nebulizer for the one in use. The one so substituted is simply set aside until further needed. The anchor cap, of course, is removed and a regular stopper or similar closure is substituted to close the bottle. The user, in general, may very conveniently have half a dozen or so containers and respective nebulizers therefore, with a different liquid, of course, for each. This, of course, gives a corresponding choice of atmospheres that he may create at will.

In view of the great variety of liquids usable with the invention of this application, the material of the coil 9 and frame 14 may well be constructed of some of the well known and widely used "stainless" metal alloys. Or a nickel or other resistant coat may be applied. For a wide variety of uses copper may be employed, except in excess of its inherent stiffness. Because of its softness and ductility, its use will be limited.

Where the form of Figs. 1 and 2 is used, the feed will be a drop at a time, only, as will be readily understood. It will be just enough to replenish the liquid as it is nebulized and blown away by the fan blast. Any faster feed would, of course, result in dripping from the lower side of the nebulizer element, like a leak in a pipe. So, by watching through the sight opening, the needle valve may be operated to regulate the flow just as desired.

Obviously, the containers may be of any size, shape, proportions, and materials desired, provided that they are suitable and practical for the purposes of the invention; and provided they have sufficient base area, when standing free, to substantially counteract the leverage of the nebulizer element they respectively support. Likewise, it is to be understood that the proportions of the containers, when standing free, shall be so chosen as to utilize the center of gravity thereof to greatest practical advantage in offsetting that same leverage.

It is thought that the construction, operation and use of the invention will be clear from the preceding detailed description.

Many changes may be made in the construction, arrangement and disposition of various details of the invention, within the scope of the appended claims and it is meant to include all such within this application, wherein only a preferred form and several modifications have been illustrated by way of example to more clearly disclose the invention and with no thought of, in the least degree, limiting the invention or this application by such illustration.

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

1. In combination, a nebulizer element comprising a resilient, open, tubular coil, a fibrous core carried therein, a bottle, an anchor cap coupling said bottle and said nebulizer element, and connections between said cap and said nebulizer element.

2. In combination, a nebulizer element comprising a resilient, open, tubular coil, a spreader for said coil, a fibrous core within said coil, a bottle, an anchor cap for said bottle, and means detachably connecting said cap to said nebulizer element with said core extending through said cap and into said bottle.

3. In combination, a nebulizer element, comprising a resilient, open, tubular coil, a resilient spreader for said coil, a fibrous core within said coil, a bottle, an anchor cap for said bottle, and means carried by said spreader and actuated by the resiliency of said spreader detachably locking said spreader to said anchor cap with said core extending through said cap and into said bottle.

4. In combination, a nebulizer element comprising a resilient, open, tubular coil, a fibrous core enclosed within said coil, a bottle, an anchor cap provided with a central opening therethrough into which said coil is compressed, and means yieldingly connecting said cap to said bottle.

5. In combination, a nebulizer element comprising a resilient, open, tubular coil, a fibrous core within said coil, a bottle, an anchor cap for said bottle, means yieldingly securing said cap to said bottle, and means yieldably and detachably connecting said nebulizer to said cap.

6. In combination, a nebulizer element comprising a resilient, open, tubular coil, a spreader for said coil within said coil and provided with bottle cap engaging locking toes, a bottle, an anchor cap for said bottle and provided with a keyhole opening receiving said coil and spreader and to be engaged by the toes of said spreader, and means yieldably and detachably securing said cap to said bottle.

7. In combination, a nebulizer element comprising a resilient, open, tubular coil, an absorbent core enclosed within said coil, a bottle, an anchor cap for said bottle provided with an opening therethrough into which said coil is compressed, and means detachably connecting said cap to said bottle.

8. In combination a bottle provided with an opening through which a nebulizer element is received and a nebulizer element compressed into said opening and held therein by its resilience and comprising a resilient, open, tubular coil and an absorbent core within said coil.

9. In combination, a bottle provided with an opening through which a nebulizer element is received, a resilient, open tubular coil having opposite ends which are compressed within said opening, and an absorbent core within said coil.

10. In combination, a bottle provided with an opening through which a nebulizer element is received, an open tubular coil having its ends compressed within said opening, an absorbent core within said coil, and a resilent spreader within said coil and provided with toes adapted to be yieldingly held in locking engagement with said bottle by the resilience of said spreader.

11. In combination, a container for a liquid, a coil receiving member communicating with said container, a resilient coil having an end compressed within said receiving member and yieldingly maintained therein by resilient engagement thereof, and an absorbent core within said coil.

12. In combination, a container for a liquid, a coil receiving member communicating with said container, a resilient coil having opposite ends, said ends each being separately compressed within said receiving member and yieldingly maintained therein by resilient engagement thereof, and an absorbent core within said coil.

13. In combination, a container for a liquid, a coil receiving member communicating with said container, a resilient coil having opposite ends said ends being compressed together within said receiving member and yieldingly maintained therein by resilient engagement thereof, and an absorbent core within said coil.

MANNING SIMPSON.