

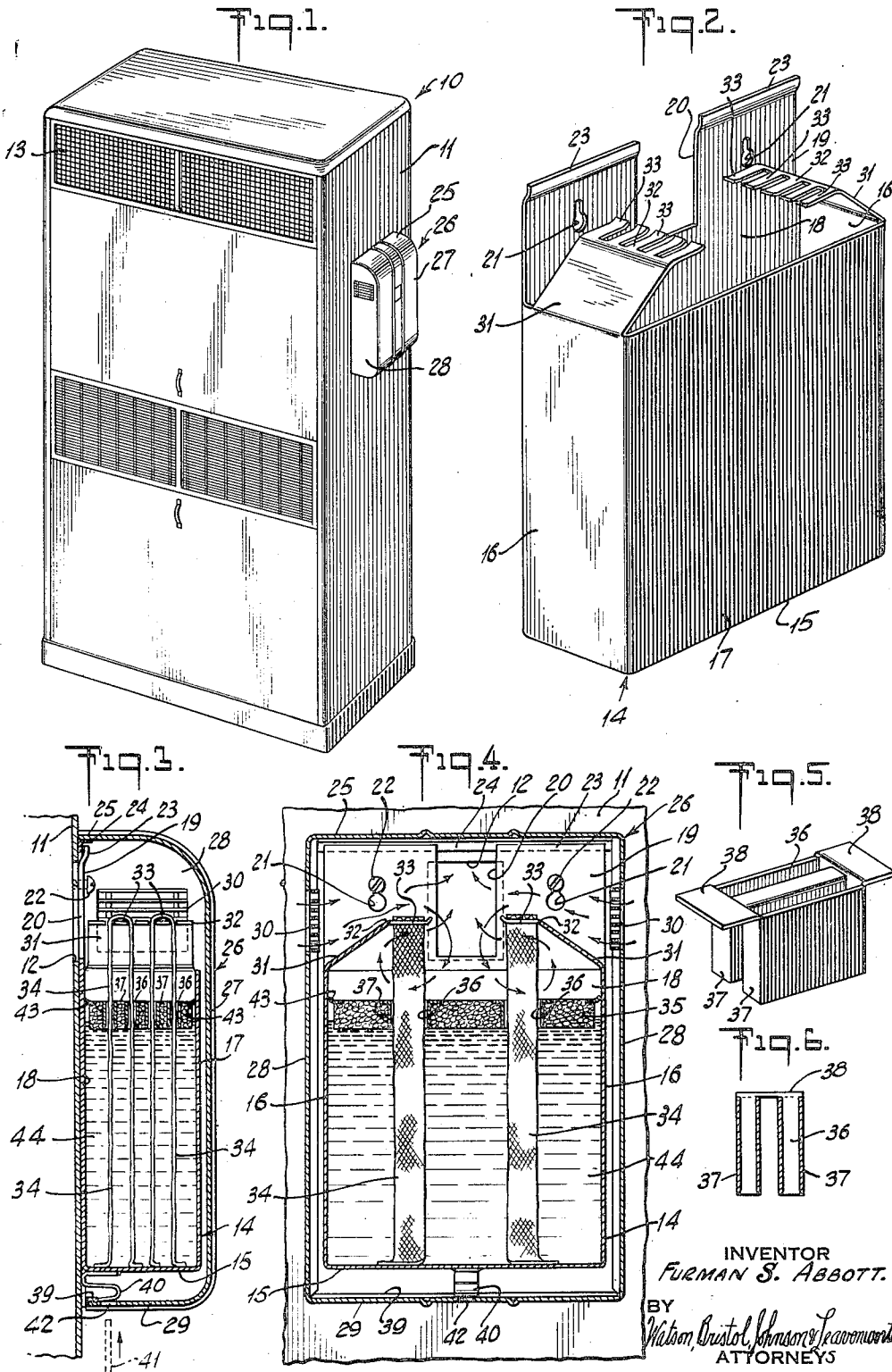
Jan. 17, 1950

F. S. ABBOTT

2,494,640

LIQUID DIFFUSER

Filed Nov. 2, 1946



UNITED STATES PATENT OFFICE

2,494,640

LIQUID DIFFUSER

Furman S. Abbott, Montclair, N. J., assignor to
Airkem, Inc., New York, N. Y., a corporation
of New York

Application November 2, 1946, Serial No. 707,402

5 Claims. (Cl. 261-104)

1

The present invention relates to liquid diffusers and, more particularly, to such devices adapted to disperse vapors from liquids into passing currents of air created by any suitable means, such as a fan.

A general object of the present invention is the provision of such liquid diffuser which is readily and economically constructed and assembled and which efficiently delivers into air currents vapors of the liquid from wick means in a controlled manner so that as the amount of liquid in the device is depleted by such evaporation fresh, relatively unclogged portions of the wick means are exposed to the air currents to assure efficient evaporation or delivery of the vapors at a predetermined rate.

A more specific object of the invention is to provide such a device characterized by a container in which one or more strips of wicking are suspended with the surface of the body of liquid in the container substantially and efficiently blanketed by float means so as efficiently to limit substantially all evaporation to the portions of the depending wick exposed above the float means, the float means being provided with a way or ways for the depending wicking strip or strips to permit free descent of the float means with depletion of the liquid during evaporation thereof from the exposed portion of the wicking whereby, as the float means descends with liquid depletion, fresh portions of the wicking will be exposed above the float.

Another object of the present invention is to provide such a device for efficient delivery of vapors from a liquid containing minute particles, some of which may tend to clog a long-exposed portion of wicking, with float means therein substantially limiting vapor delivery to strip wicking depending past the float means via a notch or hole therein into a body of the liquid therebeneath, the parts being so dimensioned and related as to assure the exposure therein to passing air currents of a substantially uniform amount of fresh wicking surface immediately above the float means with descent of the latter during progressive evaporation of the liquid saturating portions of the wicking exposed thereabove, to offset progressive downward clogging of the wicking.

A further object of the present invention is to provide in such a device baffle means which, in directing the passage of air currents between an inlet and outlet, create eddy currents that are temporarily diverted from the main currents

2

into contact with wick means exposed above float means upon the surface of a body of liquid, so that the eddy currents will in a suitably controlled manner pick up vapors from the wick means and carry them back into the main currents of air travelling between the inlet and outlet.

A still further object of the present invention is to provide a structural embodiment of the device which is readily constructed and permits efficient use and operation thereof in a variety of air conditioning or various draft air circulating systems.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction, combination of elements and arrangement of parts, which will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawing, in which:

Fig. 1 is an elevational perspective of a typical air conditioning unit suitable for use in a room for recirculation of air therein and equipped at its inlet with an embodiment of the present invention;

Fig. 2 is an enlarged perspective view of a container construction of the embodiment of the device of the present invention shown in Fig. 1;

Fig. 3 is a side sectional elevation of an embodiment of the device shown in Fig. 1 which includes the container of Fig. 2, and with parts of the air conditioning unit on which the device is mounted shown partly in section and with parts broken away;

Fig. 4 is a front elevational section of the structure shown in Fig. 3;

Fig. 5 is an enlarged perspective view of sleeve structure for lining the wick holes in the float of the embodiment of the present invention shown in Figs. 3 and 4; and

Fig. 6 is a vertical sectional view of the sleeve structure shown in Fig. 5.

Referring to the drawing similar numerals identify like parts throughout.

The embodiment of the present invention shown by way of example in the drawing may be employed to advantage in connection with a self-contained air conditioning unit adapted for treating and tempering air in a room. Such a

3

unit, as is well known, may include a fan for forced air circulation, means for adjusting the humidity and, if desired, cooling the room air as it is circulated through the unit. Such a unit 10 is shown by way of example in Fig. 1 which may include an end wall 11 having, as shown in Figs. 3 and 4, an inlet passage 12 therein through which room air is to be drawn into the unit and after circulation and treatment therein discharged through suitable outlets, such as 13. The inlet passage 12, if desired, may be dampered in any suitable manner for control of the rate of volume of passing air.

The device of the present invention may be mounted upon the air conditioning unit 10 at its inlet 12 to an advantage and, for this purpose, may comprise a container 14 substantially rectangular in cross section including a bottom 15, substantially vertically disposed opposed side walls 16, 16, front wall 17 and back wall 18.

The back wall 18 of the container 14 is preferably provided with a vertical extension 19 having a notch 20 therein to serve as an outlet passage. The back wall extension 19 has a pair of keyholes 21, 21 to cooperate with headed screws 22, 22 fixed on the air conditioning unit side wall 11 for support of the device of the present invention, with the notch 20 located in communicative relation to the inlet 12 of the unit 10.

The upper edges of back wall extension 19 of container 14 are bent outwardly to provide cover supporting lips 23, 23, behind which is removably engaged a bracket 24 fixed to the under-side of top 25 of a cup-shaped cover 26. The cover 26 has a front wall 27, side walls 28, 28 and a bottom wall 29. The back of cover 26 is open and is to be closed by inner parts of the device and/or the air conditioning unit side wall 11 when the device is mounted in the position shown in Figs. 1, 3 and 4. The cover 26 functionally serves as a cap or cover for the top portion of the container 14 and ornamentally decorates the remaining portion of the device. Of course, the container 14 itself may be modified in such manner as to provide the structural functions of the cover 26 or may include structural elements providing the same desired functional features, indicated hereinafter.

As previously indicated the notch 20 in the container back wall extension 19, in cooperation with the top 25 of the cover 26, provides an outlet passage for this embodiment of the present invention. Inlet passages for entrance of air into the device at the top portion of the container 14 are provided by means of grilled openings 30, 30 in the top portions of the side walls 28, 28 of the cover 26. Thus in operation of the air conditioning unit 10 with air suction applied at the inlet opening 12 in the side wall 11 thereof, currents of air will be drawn through the grilled openings 30, 30 from opposite sides toward the center and through the notch 20 in the container back wall 18.

The container 14 has an extension 31 on each side wall 16 thereof, each of which, though it may be made separate from and fastened to or supported on its side wall, preferably is made integral therewith as shown. Each extension 31 is bent inwardly to provide an upwardly extending oblique baffle plate terminating in a lip portion 32. Each oblique baffle plate 31 extends from a point below the bottom portion of the grilled opening 30 adjacent thereto upwardly so that its lip portion 32 is higher than a straight

4

line extending between the bottom portions of the inlet 30 and the outlet 20, and the opposed lip portions 32, 32 of the two oblique baffle plates 31, 31 are laterally spaced apart to provide a passage therebetween communicating with the main portion of the container therebelow. Accordingly, as air is drawn in from opposite sides through the grilled inlets 30, 30 some of it will spill over the lip portions 32, 32 to create eddy currents in the space beneath the baffle plates 31, 31. The air in these eddy currents, after turbulence in the space beneath the baffle plates 31, 31 there to pick up vapors, will be drawn out to again join the main currents of air passing between the inlets 30, 30 and the outlet 20, as indicated by the arrows in Fig. 4.

The lip portion 32 of each oblique baffle plate 31 is preferably slotted to provide suspending means or fingers 33—33, some of which may serve to support loops of wicking strips 34—34. The wicking strips may be made of any suitable material, such as loosely matted felt or woven lamp wicking. The wicking strips 34—34 preferably are so supported as to be laterally spaced apart to assure efficient exposure of substantially all of the surfaces thereof to the eddy currents of air. Each wicking strip 34 is preferably of such length as to extend down to, or in the vicinity of, the bottom 15 of the container 14 so that substantially all of a body of liquid in the container may be drawn up by capillary action into the upper portions of the wicking.

A float means 35 is located in the container 14 and, preferably, in plan is shaped similar to the lateral cross section of the main portion of the container, but is of at least slightly lesser overall lateral dimensions so as to provide for free descent, or up and down movement, in the container with the surface of the liquid. The float means 35 may be formed as a unitary body of any suitable material which will assure its buoyancy in the liquid, such as a mass of vitreous substance in which air bubbles or spaces are trapped or sealed. Such material is preferred as contrasted with wood or the like to avoid development of soggyiness or saturation which, due to a resultant wetting of the top surface of the float might tend to detract from the balanced operating conditions of the device. Of course such float means may be in the form of a frame structure to which may be fastened a body of buoyant material in any suitable shape.

The float means 35 is preferably provided with a suitable way or ways for free passage of wick means or a plurality of strips of wicking. Such ways may take the form of vertically extending holes 36—36 which, if desired, may be lined with suitable sleeves 37—37 having smooth inner surfaces. As shown in Figs. 5 and 6, the sleeves 37—37 may be made in pairs for economy in production from molded plastic material or sheet metal, each unit including a pair of the sleeves 37, 37 and end flanges 38, 38 adapted to rest upon the top of the float 35 to support the sleeves in a pair of adjacent holes 36, 36. The passages provided by the sleeves 37, 37 are each preferably of a lateral cross sectional shape similar to that of each wicking strip 34 and of slightly larger dimension so as to assure free slippage of the wicking strips through the holes in the float 35. The lining of the holes 36—36 in the float 35 with the plastic or metallic sleeves 37—37 also avoids any tendency for sharp projections of the substance from which the float 35 is made catching into the wicking material and interfering with free up and

5

down movement of the float. Obviously the ways for the wicking may, if desired, be formed as notches in the edges of the float means with the strips of wicking hung adjacent the inner faces of the side walls of the container, or vertical channels may be formed in the container side walls to receive the wicking strips with the edges of the float means riding closely adjacent the inner faces of the strips in the channels.

The cover 26 preferably has a rear edge 39 of bottom 29 reversely turned to cooperate with a spring latch 40 fixed to the bottom 15 of the container 14 so that, with the cover bracket 25 positioned behind the lips 23, 23 of the back wall extension 19 of container 14, the cover 26 may be snapped into secure position, shown in Figs. 3 and 4, with the free end of the spring latch 40 engaged in front of the reversely turned edge 39. The cover 26 may be readily removed for replenishing the liquid in the container, or for removal and replacement or cleaning of the wicking strips, by projecting a suitable instrument, such as a pencil or the like indicated in dotted lines at 41 in Fig. 3, through a hole 42 in the cover bottom 29 to press the free end of spring latch 40 upwardly, so as to free it from in front of the reversely turned edge 39. The cover 26 may then be swung outwardly at the bottom and then lifted free upwardly to expose the container 14 and other elements of the device.

In order to assure efficient blanketing of the liquid surface, thereby substantially limiting diffusion of vapors to the vaporizing space below the baffle plates 31, 31 and above the float 35, the latter may be equipped with suitable flexible wiping elements or flanges 43—43 of rubber, or the like, substantially to ride against the inner surfaces of the side walls and the front and back walls of the container 14. Such flanges, as shown in Figs. 3 and 4, may be mounted in flexed positions on the top of the float 35 with their free edges contacting the inner surfaces of the container's walls. By proper selection of material for such flanges and suitable proportioning of the dimensions thereof, one may assure that substantially no vapor diffusion will occur in the vaporizing space other than by means of wicking exposed therein above the float. Such wiping elements 43—43, in addition to serving to close off spaces between edges of the float and inner surfaces of the walls of the container 14, may also be employed to wipe liquid from the latter as the float descends, thereby confining the liquid to an area below the top of the float 35.

In operation of the embodiment of the device of the present invention shown in Figs. 1 to 6, inclusive, efficient employment in diffusion of vapors and into circulating air may be accomplished in the following manner. With the cover 26 removed, and with clean wicking strips 34—34 mounted in the device threaded through holes 36—36 in float 35 in the indicated manner, a quantity of liquid which it is desired to diffuse into the air may be poured into the container to run down through the holes in the float to beneath the latter there to collect as body 44 of liquid. Of course the buoyancy of the float 35 causes it to rise to an elevated position, such as that indicated in Figs. 3 and 4, with a relatively small vaporizing space provided between the top surface of the float and the baffles 31, 31. The upper portions of the wicking strips 34—34 are exposed in this space with the float 35 efficiently blanketing the surface of the liquid thereby assuring that substantially the only liquid exposed to adjacent air currents in

6

that space will be that saturating the wicking as a result of capillary action.

When air currents are drawn through the device from the grilled inlets 30, 30 to the outlet 20, incoming currents of air will be partially baffled by the oblique baffle plates 31, 31 so that at the lip portions 32, 32 some of the air will spill over down between the lip portions of the baffle plates into the vaporizing space therebeneath. As a result, eddy currents are created in the spilled-over portions of the entrance air and as that air turbulently passes about and between the upper portions of the wicking strips in that space, vapors from the liquid saturating the wicking will be picked up by the eddy currents and then carried away with them into the main currents of air as the eddy currents return to the latter and pass out therewith through the outlet 20. This provision for eddy currents is an important feature of the present embodiment of the invention since it avoids direct contact between high velocity air and the liquid-saturated wicking. In this fashion the rate of vapor diffusion or evaporation is efficiently and desirably reduced to a desired value. However, it will be understood that the present invention is not limited to the employment of such baffle means since obviously it may be practiced with a structure wherein all of the air drawn through the device is caused to pass directly over the top of the float 35 past the upper portions of wicking suspended thereabove, since in such apparatus if a certain rate of controlled vapor diffusion is desired this may be accomplished by careful adjustment of the velocity and/or volume of air forced or drawn through the device.

The device of the present invention may be efficiently employed to diffuse into air a deodorant or suitable air freshener, e. g., the product of Paschal U. S. Patent No. 2,326,672 of August 10, 1943, so that the air circulated through the air conditioning unit may not only be conditioned as to temperature and humidity but also as to perceptive odor. Such liquid or air freshener may contain very fine particles of solid material such as chlorophyll, and some of those particles may have a tendency to collect in the pores of the wicking rather than to admix with and be carried off by the passing air currents. As a result, the wicking exposed above the float 35 may gradually have it porosity and capillarity reduced to an increasing degree. Consequently, the rate of diffusion of vapors may be reduced at a similar rate if no provision is made for accommodating this characteristic action. The present invention adequately takes care of this feature since, as the body 44 of liquid is depleted, the float 35 gradually descends, thereby permitting exposure above it of additional fresh portions of unclogged wicking while effectively blanketing the surface of the body of liquid. Thus as quantities of clogging material are gradually built up in the uppermost portions of the wicking, fresh unclogged areas thereof are gradually exposed in progressive fashion above the descending blanketing float. Proper proportioning of the parts with respect to a given set of conditions can readily assure that the rate of clogging and the rate of exposure of fresh areas of wicking are so related as to maintain a uniform rate of vapor diffusion with effective blanketing of the liquid surface by the float.

It will be obvious that variations in this rate of diffusion may be attained by provision for variable exposure of wicking surfaces, such as by

foreshortening some of the strips thereof so that certain strips can be freed from contact with the liquid at certain levels as the amount of liquid is progressively depleted. Further, some of the strips may be suspended with their top ends located at different levels by means of suitable suspending members, such as metallic rods or strips of non-porous material, e. g., flexible metallic foil, bands of rubber, etc. Further it will be understood that the device of the present invention may be employed to advantage with the use of an embodiment equipped with only a single wicking strip or with a number thereof fewer than those indicated by way of example in the accompanying drawing. And of course the invention is not limited to the employment of a rectangular container and a similarly shaped float substantially fitting therein, since the virtues of the invention may be obtained with containers having various other lateral cross sectional shapes and with floats similarly shaped, or differently shaped when provided with means substantially to seal off the surface of the liquid from the air space thereabove except, perhaps, in the immediate vicinities of the wicking surfaces. Further, wiping of the wicking may be provided by closely associating the surfaces of the holes through the float with the wicking surfaces, or by providing on the float additional members, which may be similar to wiping elements 43-43, to wipe the wicking surfaces as the float descends.

It will thus be seen that the objects set forth above, among others, are efficiently attained and, since certain changes may be made in the above construction and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

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

1. A liquid diffuser comprising, in combination, a container for a body of evaporable liquid, float means in said container for free descent with the surface of such body of liquid as the body thereof becomes depleted by evaporation and for substantially blanketing the liquid surface, means to direct currents of gaseous fluid across a top portion of said container, means to suspend a strip of wicking in said container in relatively fixed position, and a strip of wicking supported on said suspending means and extending down past said float means toward the container bottom with a top portion exposed above said float means to be accessible to passing currents of gaseous fluid for transfer to the latter of vapors from the liquid as it saturates the wicking whereby as said float means descends with depletion of liquid additional fresh portions of the wicking strip are exposed above said float means.

2. A liquid diffuser comprising, in combination, a container for a body of liquid, float means in said container for free descent with the surface of such body of liquid as the quantity thereof becomes depleted by evaporation, flexible wiping elements mounted on said float means bridging across to the inner walls of said container to

assure substantial blanketing of the liquid surface by said float means, said float means having a way extending from the top side to the bottom side thereof, means to direct currents of air across a top portion of said container, means to suspend a strip of wicking in said container in relatively fixed position, and a strip of wicking supported on said suspending means and passing through the way in the float means while permitting free descent of the latter, said wicking strip extending down toward the container bottom, the portion of said wicking strip above said float means being accessible to the air currents for transfer to the latter of vapors from the liquid as it saturates the wicking whereby as said float means descends with depletion of liquid additional fresh portions of the wicking strip are exposed above said float means.

3. A liquid diffuser comprising, in combination, a container for a body of liquid having a substantially uniform lateral cross-section from the vicinity of the top thereof to the vicinity of the bottom thereof, float means in said container of a shape in plan substantially the same as the lateral cross-sectional shape of the mid-portion of said container but of slightly less lateral dimensions for free descent with the surface of such body of liquid as the quantity thereof becomes depleted by evaporation and for substantially blanketing the liquid surface, said float means having a way extending from the top side to the bottom side thereof, means to direct currents of air across a top portion of said container, means to suspend a strip of wicking in said container in relatively fixed position, and a strip of wicking supported on said suspending means and passing through the way in the float means while permitting free descent of the latter, said wicking strip extending down toward the container bottom, the portion of said wicking strip above said float means being accessible to the air currents for transfer to the latter of vapors from the liquid as it saturates the wicking whereby as said float means descends with depletion of liquid additional fresh portions of the wicking strip are exposed above said float means.

4. A liquid diffuser comprising, in combination, a container for a body of liquid having a substantially uniform lateral cross-section from the vicinity of the top thereof to the vicinity of the bottom thereof, float means in said container of a shape in plan substantially the same as the lateral cross-sectional shape of the mid-portion of said container but of slightly less lateral dimensions for free descent with the surface of such body of liquid as the quantity thereof becomes depleted by evaporation and for substantially blanketing the liquid surface, said float means having a plurality of holes vertically extending therethrough, means to direct currents of air across a top portion of said container, means to suspend a plurality of spaced-apart strips of wicking in said container in relatively fixed position, and a plurality of spaced-apart strips of wicking supported on said suspending means and passing through the holes in the float means while permitting free descent of the latter, said wicking strips extending down toward the container bottom, the portion of said wicking strips above said float means being accessible to the air currents for transfer to the latter of vapors from the liquid as it saturates the wicking whereby as said float means descends with depletion of liquid additional fresh portions of

the wicking strips are exposed above said float means.

5. A liquid diffuser comprising, in combination, a container for a body of liquid having substantially vertically disposed side walls and of a certain lateral cross-sectional shape, a cover for the top portion of said container having laterally-spaced inlet and outlet openings therein at the same general elevation, an oblique baffle plate extending upwardly from a side wall of said container below the inlet opening terminating in an elevated lip portion higher than straight lines extending between the bottom portions of the inlet and outlet openings, float means in the main portion of said container below said baffle plate of a shape in plan complementary to and of slightly less overall dimension than the lateral cross-section of said container for free descent with the surface of such liquid as the latter evaporates, and a strip of wicking supported on said lip portion depending down into the main por-

tion of said container through a hole in said float means with the hole being of substantially the same cross-sectional shape as said strip but of slightly greater lateral dimensions to permit free descent of said float means.

FURMAN S. ABBOTT.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
847,840	Smith	Mar. 19, 1907
872,330	Cunningham	Dec. 3, 1907
888,393	Dunning	May 9, 1908
1,035,492	Subert	Aug. 13, 1912
1,225,684	Shaver	May 8, 1917
1,606,472	Kieffer et al.	Nov. 9, 1926
2,083,607	Joseph	June 15, 1937
2,417,743	Eberhart	Mar. 18, 1947