

May 20, 1930.

F. T. BOGARD

1,758,997

AIR PURIFIER AND COOLER

Filed Dec. 15, 1928

2 Sheets-Sheet 1

FIG. 1.

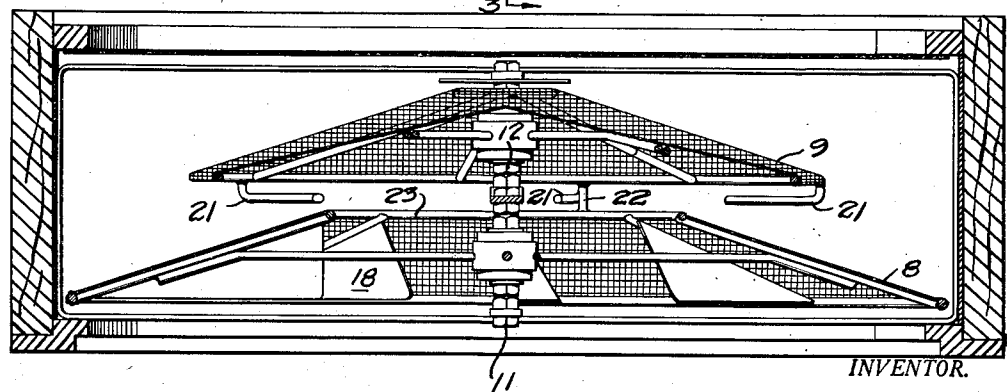
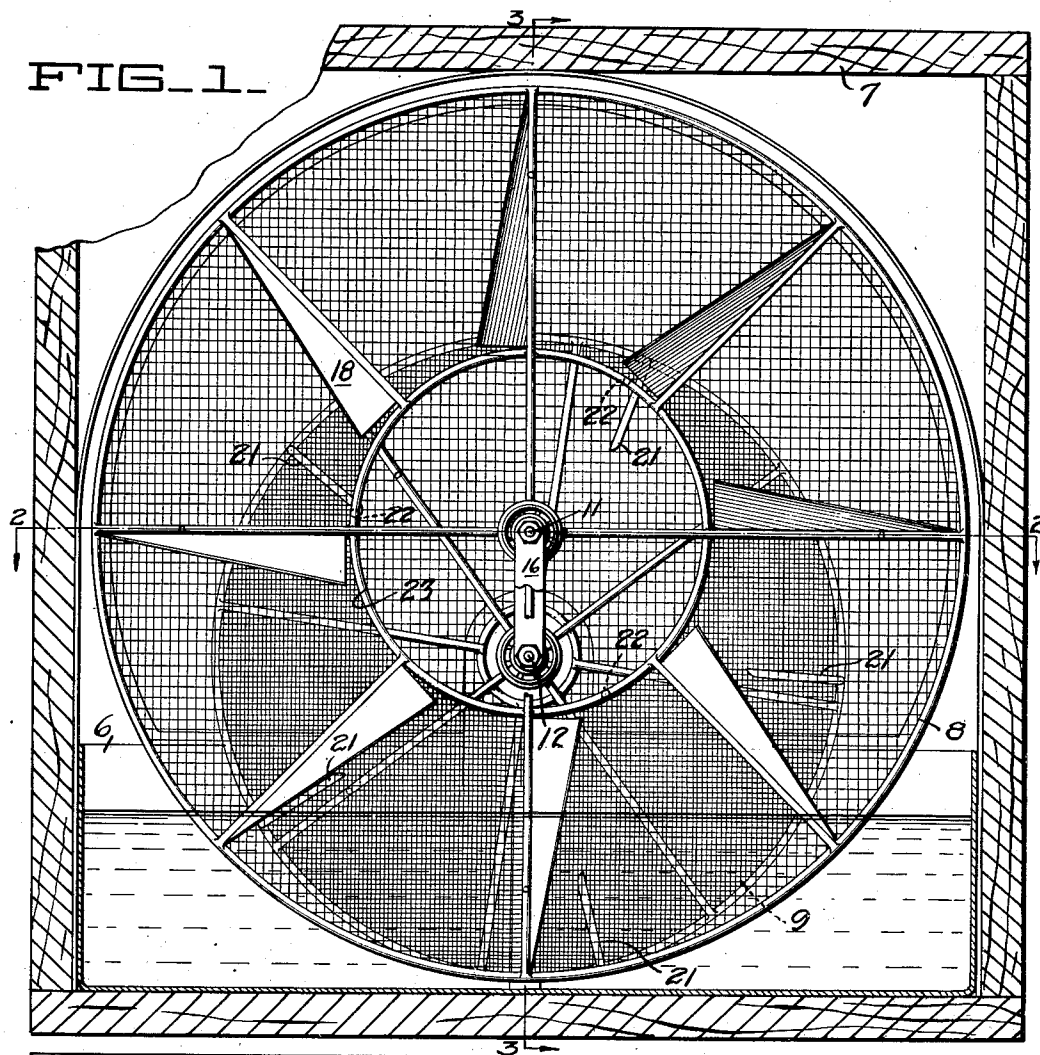


FIG. 2.

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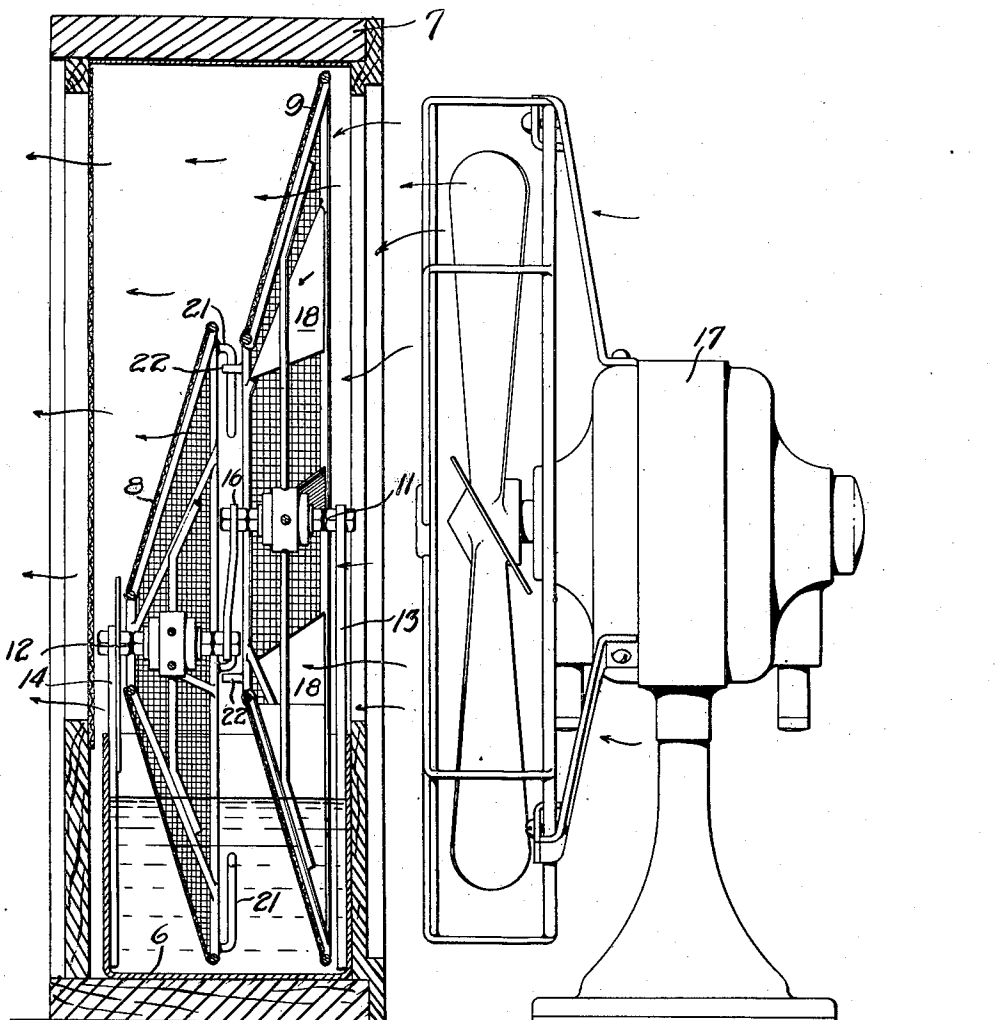


FIG. 3.

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UNITED STATES PATENT OFFICE

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AIR PURIFIER AND COOLER

Application filed December 15, 1928. Serial No. 326,247.

The invention relates to an apparatus for cooling and purifying air in a room or the like, and particularly relates to apparatus of this kind, in which the air is cooled or purified by being forced to circulate through a film of water carried on a moving screen.

An object of the invention is to provide an apparatus of the character described, in which a maximum area of water film may be produced with a minimum area of screen and the use of a minimum quantity of water.

Another object of the invention is to provide an apparatus of the character described having a multiplicity of moving screens, and which screens have driving connections between them that are not only extremely simple and efficient in operation but are conducive to most effective functioning of the machine.

A further object of the invention is to provide an apparatus of the character described which is simple and durable in construction and may be manufactured at low cost.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawings accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawings and description may be adopted within the scope of the invention as set forth in the claims.

Referring to said drawings:

Figure 1 is a vertical sectional view of the apparatus of my invention.

Figure 2 is a horizontal sectional view of the apparatus, the plane of the section being indicated by the line 2—2 of Figure 1.

Figure 3 is a vertical sectional view of the apparatus taken on the line 3—3 of Figure 1 the draft creating means being added and shown in elevation.

The apparatus of my invention as illustrated in the above-mentioned drawings, comprises a container 6 for water or other suitable liquid and is arranged together with other portions of the apparatus within a case 7, the latter being provided with openings at

opposite sides to permit of the entrance and exit of air therethrough. Preferably supported by the container so as to form a structural unit therewith, is a plurality of horizontally-rotatable axially-spaced screen discs 8 and 9 whose lower portions extend into the container for immersion in the liquid whereby during rotation of the discs a liquid film will be deposited on and carried with the discs. The disc 8 is larger than the disc 9 and is arranged to rotate eccentrically relative thereto, the axis of rotation of the larger disc being above the axis of rotation of the smaller disc so that the lower edges of the discs may be flush. As here shown, the discs 8 and 9 are respectively mounted on shafts 11 and 12 which are parallelly-disposed and axially-spaced, the outer extremities of the shafts being fixedly held by standards 13 and 14 attached to the container, while the inner extremities are fixed to a common connecting arm 16.

Forced circulation of the air through the discs is here shown arranged to be effected by means of a motor driven fan 17 which is set opposite the larger disc and preferably outside of the casing. Rotation of the discs may be effected in any suitable manner. As here shown, rotation of the larger disc is effected directly by means of the air current traversing the apparatus, suitable blades 18 being provided on the disc, which on being acted on by the current cause a rotation of the disc in a well understood manner. Rotation of the smaller disc is arranged to be effected by a driving connection with the larger disc, and in the present embodiment such connection is provided for by means which is not only simple and efficient in operation but is well adapted to enhance the most effective functioning of the apparatus. Positioned on the inner face of the smaller disc is a plurality of circumferentially-spaced radially extending bearing elements 21 whose inner extremities terminate equidistantly from the disc center. The elements 21 are arranged for intermittent engagement with bearing elements 22 which are positioned on the inner face of the larger disc and are circumferentially spaced from each other ap-

proximately the distance separating the elements 21. As here shown the elements 21 are positioned adjacent the periphery of the smaller disc whereas the elements 22 are located inwardly of the periphery of the larger disc so that when an element 21 is adjacent the top of the disc the element 22 will engage same. It will be clear that owing to the eccentric relation of the disc mountings, during the rotation of the discs the elements 22 will move radially outward and inward on the elements 21, that is, the elements 22 will move into engagement with the elements 21 as the elements approach their uppermost positions, and correspondingly when the elements leave such positions the elements move out of engagement. In the present embodiment of the invention, it is desired for reasons which will hereinafter appear, that the smaller disc rotate slower than the larger disc, to wit, three revolutions of the smaller to five revolutions of the larger, and accordingly five elements 21 are provided to three elements 22. With this arrangement an element 21 may at all times be in engagement with one of the elements 22, since at the instant an element 22 is about to escape from the element 21 with which it is moving away from the top point of the disc, the elements 21 and 22 next approaching said point are about to become disengaged. It will thus be evident that a continuous motion will be imparted to the smaller disc and a substantially uniform speed of rotation thereof will be secured. Furthermore it is to be noted that the elements are of minimum thickness and therefore they will not hinder the passage of the current through the apparatus nor appreciably diminish the screen surface available for the cooling and purifying function. In addition it may be added that the driving connecting means may operate continuously without any lubrication other than the liquid with which the elements 21 come in contact during the movement of the discs through the container. If desired, the elements 22 may be provided with rollers (not shown) so as to reduce the friction between the cooperating elements during engagement.

It will be understood that in the operation of the device, as the screen portions emerge from the liquid in the container, the film of liquid deposited thereon is subjected to the action of the air draft, with the result that the air becomes humidified and cooled and the water in the container as well reduced in temperature. It is to be noted that if but one disc was used, then in order to obtain a maximum film surface with a minimum size of disc, the disc would have to be immersed up to its center, thus cutting off the screen surface available to the action of the draft and materially reducing the capacity of the machine. On the other hand, to increase

the size of the disc would result in a machine out of all proportion to the results obtained. By providing two or more discs, however, in the manner disclosed by me a maximum film surface will be had with a minimum size of machine. As will be seen in the drawings, the larger disc 8 is provided with a relatively large opening 23 at the center thereof, so that during the operation of the machine practically the entire surface of the smaller disc, as well as the entire surface of the larger disc, will be directly exposed to the air draft passing through the machine. In this manner the film carried on both discs will be simultaneously subjected to the direct action of the draft, so that with a minimum immersion of the discs, a maximum filmed surface thereof will be available. Thus while the container is only high enough to permit of the outer portions of the disc being immersed in the liquid, the combined film covered area of the two discs provides a surface substantially equivalent to the entire area of the larger disc. As previously explained, the speed of rotation of the smaller disc is much less than the speed of the larger disc, this being provided for in view of the fact that the penetrability of the air draft through the film covered surfaces is dependent on the speed of movement of such surfaces, and since the force of the draft is somewhat expended in going through the first disc it is desirable that the resistance encountered by the draft on the second screen be proportionally lower. It will also be evident that since the current of air in passing through the apparatus need force its way through but little more than a single wall of screen, a minimum retarding effect will be encountered by the air and therefore the power required to operate the machine will be relatively small.

As clearly illustrated in Figures 2 and 3 of the drawings, each of the discs are of concavo-convex form, with the convex face of the larger disc lying next to the concave face of the smaller disc. By reason of this design of the discs the air in passing through the machine tends to move radially inward along the film covered surface of the discs rather than straight through the same. In this manner the air particles will remain in contact with the liquid for a longer period and in more intimate relation thereby greatly increasing the efficiency of the apparatus. The converging face of the discs is also advantageous in that the current of air against the larger disc will be deflected toward the central opening and thus caused to be effectively distributed over the smaller disc.

It will be understood that while I have used but two discs in the present embodiment of the invention, this number may be increased as desired, the requirement in adding extra units and maintaining the most eff-

ciency of the machine being that all of the discs but the smallest be provided with central openings and that each of the discs be eccentrically mounted with respect to the others.

It will also be understood that while the machine is primarily adapted for cooling and purifying water, it may be used for a great number of other purposes, such as, for instance, fumigating, disinfecting, perfuming, et cetera.

I claim:

1. In an apparatus of the character described, a receptacle arranged to contain a liquid, a plurality of screen discs mounted to rotate with the lower portions thereof immersed in the liquid, driving connections to rotate one disc at a greater speed than the other, and means to set up a current of air through said discs during rotation thereof.

2. In an apparatus of the character described, a receptacle arranged to contain a liquid, a plurality of axially-spaced screen members of unlike size mounted to rotate with the lower portions thereof immersed in the liquid, the axes of said members being superposed in substantially the same vertical plane and means to set up a current of air through said members during rotation thereof.

3. In an apparatus of the character described, a liquid containing means, axially spaced screen members mounted for rotation on different axes and with their lower portions within the liquid, the axes of said members being superposed in substantially the same vertical plane and means to force a current of air through the members during rotation thereof.

4. In an apparatus of the character described, a receptacle arranged to contain a liquid, axially-spaced screen-discs of unlike size mounted eccentrically of one another on parallel shafts and arranged for rotation with their lower portions within the receptacle, the central portion of the larger disc being substantially open and axially opposite a portion of the smaller disc and being arranged to lie above the liquid, and means to force a current of air through the portion of the discs above the liquid.

5. In an apparatus of the character described, liquid containing means, a screen disc mounted to rotate with the lower portion thereof immersed in the liquid, a screen disc of smaller size than and mounted eccentrically of and axially spaced from said first disc whereby the lower portion thereof will be immersed in liquid, the central portion of the larger disc being open and opposite a portion of the smaller screen, and means to force a current of air through the portions of the discs above the liquid during rotation of the members.

6. In an apparatus of the character described, liquid containing means, a screen disc

mounted to rotate with the lower portion thereof immersed in the liquid, a screen disc of smaller diameter than the first mounted to rotate in axially spaced relation to the first and about an axis below and parallel to the first whereby the lower edge thereof will be substantially flush with the lower edge of the larger disc and the lower portion of the smaller disc will be immersed in the liquid, said larger disc provided with a central opening therein having all portions thereof opposite to screen portions of the smaller disc, means for forcing a current of air through said discs, and driving connections for said discs for causing the smaller disc to rotate at a slower speed than the larger disc.

7. An apparatus in accordance with claim 6, in which the discs are of concavo-convex form with the convex side of the larger disc adjacent the concave side of the smaller disc.

8. An apparatus in accordance with claim 6 in which the discs are of concavo-convex form with the convex side of the larger disc adjacent the concave face of the smaller disc, and blades on the larger disc arranged upon the flow of air therethrough to effect the rotation thereof.

9. In an apparatus of the character described, a receptacle for liquid, a concavo-convex screen disc mounted for rotation about a horizontal axis with the lower portion of the disc immersed in the liquid, said disc having a central opening and means for forcing a draft of air through the disc and opening from the concave to the convex sides of the disc.

10. In an apparatus of the character described, a container for liquid, a pair of axially spaced shafts having their axes parallelly disposed, bearings to support the outer extremities of the shafts in fixed relation, and an arm for connecting the inner extremities in fixed relation, screen discs carried on said shafts with their lower portions immersed in the liquid, and driving connections between said discs comprising cooperating elements on said discs extending completely across the space therebetween and arranged to revolve about said arm.

In testimony whereof, I have hereunto set my hand at Oakland, California, this 10th day of December, 1928.

FRANK T. BOGARD.