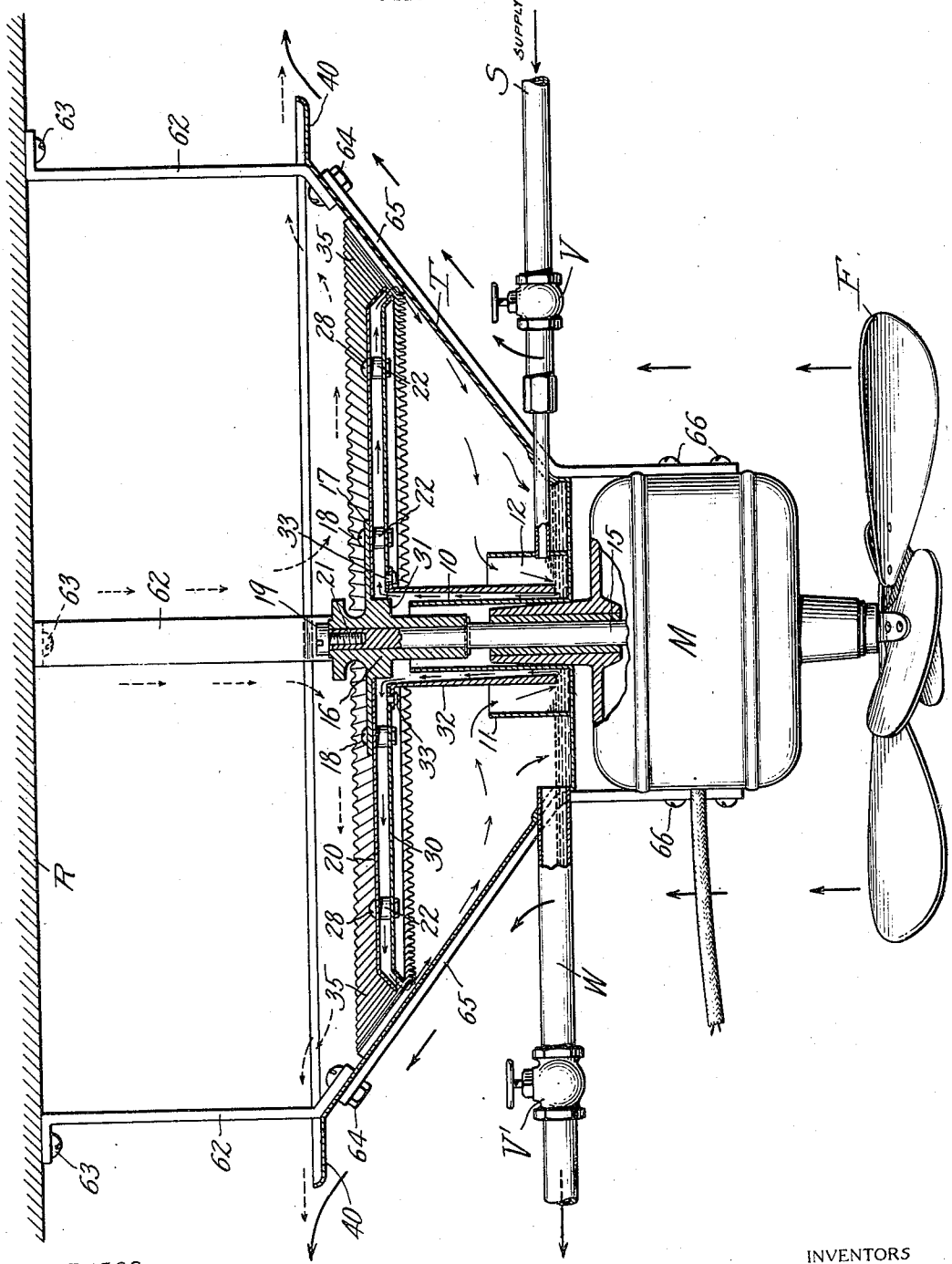
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S. W. CRAMER ET AL

HUMIDIFIER

Filed Nov. 13, 1925



WITNESS

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UNITED STATES PATENT OFFICE.

STUART W. CRAMER, OF CRAMERTON, AND WILLIAM B. HODGE, OF CHARLOTTE, NORTH CAROLINA, ASSIGNORS, BY DIRECT AND MESNE ASSIGNMENTS, TO WM. B. HODGE COMPANY, OF CHARLOTTE, NORTH CAROLINA, A CORPORATION OF NORTH CAROLINA.

HUMIDIFIER.

Application filed November 13, 1925. Serial No. 68,904.

This invention relates to a humidifier and more particularly to an improved apparatus by means of which a mist of water is created and distributed throughout the surrounding atmosphere to be evaporated therein and which, at the same time, collects within itself the drops of water too large to be totally evaporated.

An object of our present invention is to provide an apparatus for humidifying the surrounding atmosphere by means of which the water is drawn up from its supply, thrown outwardly in the form of a mist of very fine particles or drops into the surrounding atmosphere and disseminated throughout the atmosphere by means of a separate and independent and comparatively forceful draft of air into which the mist is first thrown and totally evaporated therein.

Another object of our invention is to so construct the apparatus that the particles of water which are too large to be entirely evaporated in the surrounding atmosphere will fall directly into the tank and into a local downwardly moving draft or stream of air which positively carries them downwardly into the tank. These larger drops are thus prevented from being thrown from the tank onto the floor.

With these and other objects in view the invention comprises the apparatus described and set forth in the following specification and claims.

The various features of the invention are illustrated in the accompanying drawing in which the figure is a vertical sectional view, partly in elevation, of a humidifier, embodying the preferred form of our invention.

The present invention embodies an improved construction of the type of apparatus shown in the application Serial No. 755,662, filed December 13th, 1924, by Stuart W. Cramer, for "humidifier", which resulted in Patent No. 1,564,949, issued Dec. 8, 1925, and in application Serial No. 756,421, filed by us on December 17th, 1924, for "humidifier". This improvement embodies the use of a pair of spaced disks for atomizing the water. It has been found that through the improvement the mist of water which is thrown from the apparatus into the surrounding atmosphere is composed of particles of sufficient fineness to be entirely evaporated therein, and that the particles of water which are too large to be so evaporated are retained within the apparatus, and returned to either the supply or to the waste, as the case may be. An objectionable wetting and consequent damp floor below the apparatus are thus avoided.

By means of the improved construction of double diaphragm in co-operation with the wall of the supply tank the diaphragm on being rotated about its axis will create two local drafts or streams of air, one drawn from the atmosphere on top of the diaphragm which will be thrown outwardly over the top of the diaphragm into the surrounding atmosphere, and the other drawn from the atmosphere within the tank upwardly through the tubular portion extending from the diaphragm to the water supply and leading to the space between the two plates forming the double diaphragm, then radially through this space, then deflected downwardly into and to the bottom of the tank by means of the inclined peripheral edges or lips depending from each diaphragm plate, again passing upwardly to the center of the space between the diaphragm plates, and so on, continuously during the rotation of the diaphragm.

Referring more particularly to the drawings, M is a motor, and F is a propeller fan, T is a hat shaped copper tank placed in an inverted position, the motor and tank being supported from the roof R by means of preferably four depending hangers 62 (one not shown), suitably bolted to the roof at 63. The foot of each hanger is bolted at 64 to the upper end of a supporting bar 65, which bar is in turn suitably secured by bolts 66 to the casing of the motor M. The flanged side or bottom of the hat-shaped copper tank T rests upon the bars 65 and is secured between the feet of the hangers 62 and the upper ends of the bars 65 by the aforesaid bolts 64.

The supply tank is provided with a central aperture at the bottom thereof, bordering which is an up-turned flange 10. Surrounding and concentrically disposed to said flange 10 is an up-turned flange 11, thereby forming within the flanges and the bottom of the tank an inner water supply tank or compartment 12. The water at the bottom of the tank, except that within the inner supply tank or compartment 12, is waste

and is delivered from the tank through the waste pipe W, which is preferably provided with a valve V'. A supply pipe S, provided with a valve V, extends through the side wall of the tank T into the inner supply tank 12 through its outer wall 11, all as clearly shown.

The motor shaft 15 has splined to it a thimble fitting 16, which is provided with a flange 17, suitably secured to the upper disc or plate 20 of the double diaphragm structure by means of a series of bolts 18. The thimble fitting 16, which is fitted over the upper portion of the motor shaft 15, is secured in place by the head of a screw bolt 19, as clearly shown, the shank of which operatively engages a screw-threaded cavity 21 in the top of the motor shaft 15.

The lower disc 30 of the double diaphragm structure is secured to the upper disc by means of the aforesaid series of bolts 18, and a second series of bolts 28, each of which is provided with a similar shaped spacer element 22, the height of which measures the distance between the two discs forming the double diaphragm. The lower plate 30 of the double disc diaphragm is provided with a central opening 31, and secured to the edge of this opening is a cylindrical element 32 which is flanged at its upper end by means of which it is secured to the lower disc 30 by bolts or rivets 33. A passage is thereby formed through the element 32 from the inner supply tank to the space between the diaphragm plates or discs.

The outer surface of the element 32 is cylindrical whereas the inner surface is frusto-conical, the base of the cone being co-extensive with the opening 31 at the center of the lower disc 30.

The inner surface of the wall of the tank T is provided with a series of corrugations 35 spaced outwardly from and extending above and below the peripheral edges of the plates or discs forming the double diaphragm. Each of the discs or plates 20 and 30 are bent at its periphery to form a depending flange or lip. These flanges or lips are parallel to each other and each extends towards the wall of the tank at such an angle that the elements of generation of the flanges and of the wall of the tank, are at approximate right angles to each other so that water thrown radially outward will tend to strike the corrugated portion 35 at an approximate right angle.

The structure embodying our invention having been described, its operation and function will now be set forth.

Upon energizing the motor by closing the electric circuit a powerful draft of the surrounding air will be produced by the propeller fan F and sent upwardly against the bottom of the copper tank T, and the lower surface of its upper flange 40. It will thus spread and be extended outwardly radially into the surrounding atmosphere, all as indicated by the large heavy arrows. At the same time, the double disc will rotate about its axis and will create thereby two local drafts or streams of air, one will be drawn from the air immediately above the disc and will pass by centrifugal force radially outwardly over the upper surface of the disc against the corrugations 35 and continue upwardly and outwardly until it is merged with the aforesaid propeller-created strong draft of air, as indicated by the arrows in broken lines.

The second local draft of air will be drawn from the air in the bottom of the copper tank and pass upwardly through the tubular extension 32, passing outwardly in the space between the two discs and downwardly between the bent peripheral flanges of the aforesaid discs, and thus downwardly into the tank, which, upon continual rotation of the discs comprising the double diaphragm, will create a continuously moving current of air, as above described, all as indicated by the arrows in solid but light lines. The water will be supplied to the inner tank 12, through the supply pipe, so that it barely immerses the lower edge of the depending tube 32. Upon the rotation of the diaphragm about its axis due to the operation of the motor the water seal against the lower end of the tube 32 will be broken, if, in fact, a real seal ever exists at all, and a film of water will be caused to rise along the inner conical surface of the depending tube, and will pass outwardly by centrifugal action through the space between the discs, and in its passage will strike the spacer blocks 22, and will then continue outwardly between the flanged lips and downwardly on to the corrugations 35, thereby being broken into a mist, the particles of which vary in fineness. At the same time the outwardly flowing local draft of air passes radially across the upper surface of the upper disc, and this local draft of air will take up the very fine particles of water at the periphery of the diaphragm and carry this fine mist on over the edge of the tank out into the propeller created outwardly moving, forceful draft of normally conditioned air, for dissemination into and evaporation by the surrounding atmosphere. It will be apparent that the film carried outwardly over the surface of the plate 30 and thrown from this plate will strike the downturned rim of the upper plate 20 at an angle and will then be deflected downwardly and outwardly in approximately a right angle to the corrugated surface 35, thus insuring an impact that will most effectively break up the film of water into the finest particles, and will not cause these particles or the larger particles to be projected upwardly with very great velocity into the

atmosphere above the plate. Should the water tend to gather into streams on the plate 30 rather than to flow in a spreading film, such streams will be spread in a film as they strike the downturned rim of the plate 20.

Those particles of moisture which are too heavy to be thus evaporated, will drop from between the flanges of the disc and will be immediately engaged by the local draft or stream of air indicated by the solid but lighter arrows, which will carry the drops back either into the waste or perchance some of them may be carried over into the inner supply tank 12, but, in either event, these drops are thus prevented from being splashed over the edge of the tank with the resulting dropping upon the floor beneath the tank.

The water is supplied to the inner tank 12 in such proportions to the amount used that the upper surface of the water therein takes substantially the form shown in the drawing when the humidifier is in operation.

As changes of construction could be made within the scope of our invention, it is intended that all the matter contained in the above description or shown in the accompanying drawings be interpreted as illustrative and not in a limiting sense.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. Apparatus of the type described which comprises a lower horizontal rotating disk, a tube depending from said disk and having an opening to the upper surface of said disk concentric with the axis of rotation of said disk, means for supplying water to said tube, an upper disk mounted slightly above said rotating disk and having the edge turned downwardly at an angle and extending below the plane of said lower disk, whereby water thrown from the edge of said lower disk will strike the down-turned edge of the upper disk at an angle and be deflected outwardly therefrom in a thin film.

2. Apparatus of the type described which comprises a lower horizontal rotating disk, a tube depending from said disk and having an opening in said disk concentric with the axis of said disk and opening onto the upper surface of said disk, an upper disk spaced slightly above said rotating disk and having an edge turned downwardly at an angle and extending below the plane of said lower disk, means for supplying water through said tube to the upper surface of the lower of said disks whereby water supplied to the upper surface of the lower of said disks and thrown outwardly from said lower disk strikes the down-turned edge of said upper disk at an angle of incidence and is deflected downwardly therefrom, and a common rotating support for said disks.

3. Apparatus of the type described which comprises a lower horizontal rotating disk, a tube depending from said disk and having an opening therethrough concentric with the axis of rotation of said disk and permitting a flow of liquid from said tube to the upper surface of said disk, an upper disk mounted slightly above said rotating disk and having its edge turned downwardly at an angle and extending below the plane of said lower disk, whereby the water thrown outwardly from said lower disk is deflected downwardly and outwardly, and an annular impinging surface against which said deflected water strikes at approximately a right angle.

4. Apparatus of the type described which comprises, a pan having flaring walls, an annular corrugated surface on the upper face of said wall, and means for drawing water from said pan and throwing it centrifugally outwardly, a deflecting surface for deflecting said centrifugally thrown water downwardly and outwardly against said corrugated surface by impact at an angle with said deflecting surface, and means for circulating air upwardly from said pan thence outwardly to said corrugated surface and downwardly to said pan.

5. Apparatus of the type described which comprises, a pan having outwardly and upwardly flaring walls, a pair of spaced horizontal plates the outer edges of which terminate a short distance from said flaring walls, the upper of said horizontal plates having its edge inclined downwardly and outwardly therefrom at an angle to reflect liquid thrown from said lower plate against said upwardly flaring wall, a central tube depending from the central portion of the lower of said plates, means for supplying liquid to said depending tube, and means for rapidly rotating said plates and tube about the axis of said tube.

6. Apparatus of the type described which comprises, a pan having an outwardly and upwardly flaring outer wall, a central annular inner wall extending upwardly from said pan, a motor and fan mounted beneath said pan and having a shaft projecting upwardly through said central annular inner wall, a pair of horizontal spaced plates mounted on the upper end of said shaft and extending to within a short distance of said flaring wall, and a central tube depending from the lower of said spaced plates and encircling said upwardly projecting shaft.

7. Apparatus of the type described which comprises, a pan having an outwardly and upwardly flaring outer wall, a central annular inner wall extending upwardly from said pan, a motor and fan mounted beneath said pan and having a shaft projecting upwardly through said central annular inner wall, an annular corrugated surface near the upper edge of said flaring wall, a pair of

horizontal spaced plates mounted on the upper end of said shaft and extending to within a short distance of said flaring wall, and a central tube depending from the lower of said spaced plates and encircling said upwardly projecting shaft.

8. Apparatus of the type described which comprises, a pan having an outwardly and upwardly flaring outer wall, a central annular wall extending upwardly from said pan, a motor and fan mounted beneath said pan and having a shaft projecting upwardly through said central annular inner wall, an annular corrugated surface near the upper edge of said flaring wall, a pair of horizontal spaced plates mounted on the upper end of said shaft, a tube depending from the central portion of the lower of said plates and dipping into said pan about said shaft, and an annular wall in said pan forming a central cup receiving the lower end of said tube, and means for supplying water to said cup and for drawing off water from the annular space about said cup.

9. Apparatus of the type described which comprises, a pan having upwardly and outwardly flaring walls, a central opening in its bottom wall, a central annular flange about said central opening of said pan, to prevent escape of water through said opening, a motor and fan mounted beneath said pan and having a shaft projecting upwardly through said annular flange, a pair of horizontal spaced plates mounted on the upper end of said shaft and extending to within a short distance of said flaring walls, the outer edges of said plates being turned angularly downwardly to within a short distance of said outwardly flaring walls, and means for supplying a stream of water centrally between said horizontal plates.

10. A method of humidifying air which comprises projecting a flat sheet of water radially outwardly from a central position by centrifugal force, flattening and deflecting said stream of water sharply downwardly and outwardly, breaking said deflecting sheet of water into fine particles by impact, permitting the heavier of said particles to settle out by gravity while permitting the lighter of said particles to rise upwardly, and causing a slight circulation of air outwardly with said water, then downwardly to sweep said heavier, settling particles from said lighter particles.

11. A method of humidifying air which comprises generating a blast of air and deflecting and spreading said blast of air radially outwardly, projecting an annular body of water radially outwardly by centrifugal force, flattening and sharply deflecting said annular stream of water and breaking it into fine particles by impact out of contact with said spreading blast of air, permitting the heavier of said particles to settle downwardly and the lighter particles to move into said spreading blast of air, and creating a circulation of air outwardly with said centrifugally projected water, thence downwardly to sweep the larger, settling particles of water from the lighter particles.

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