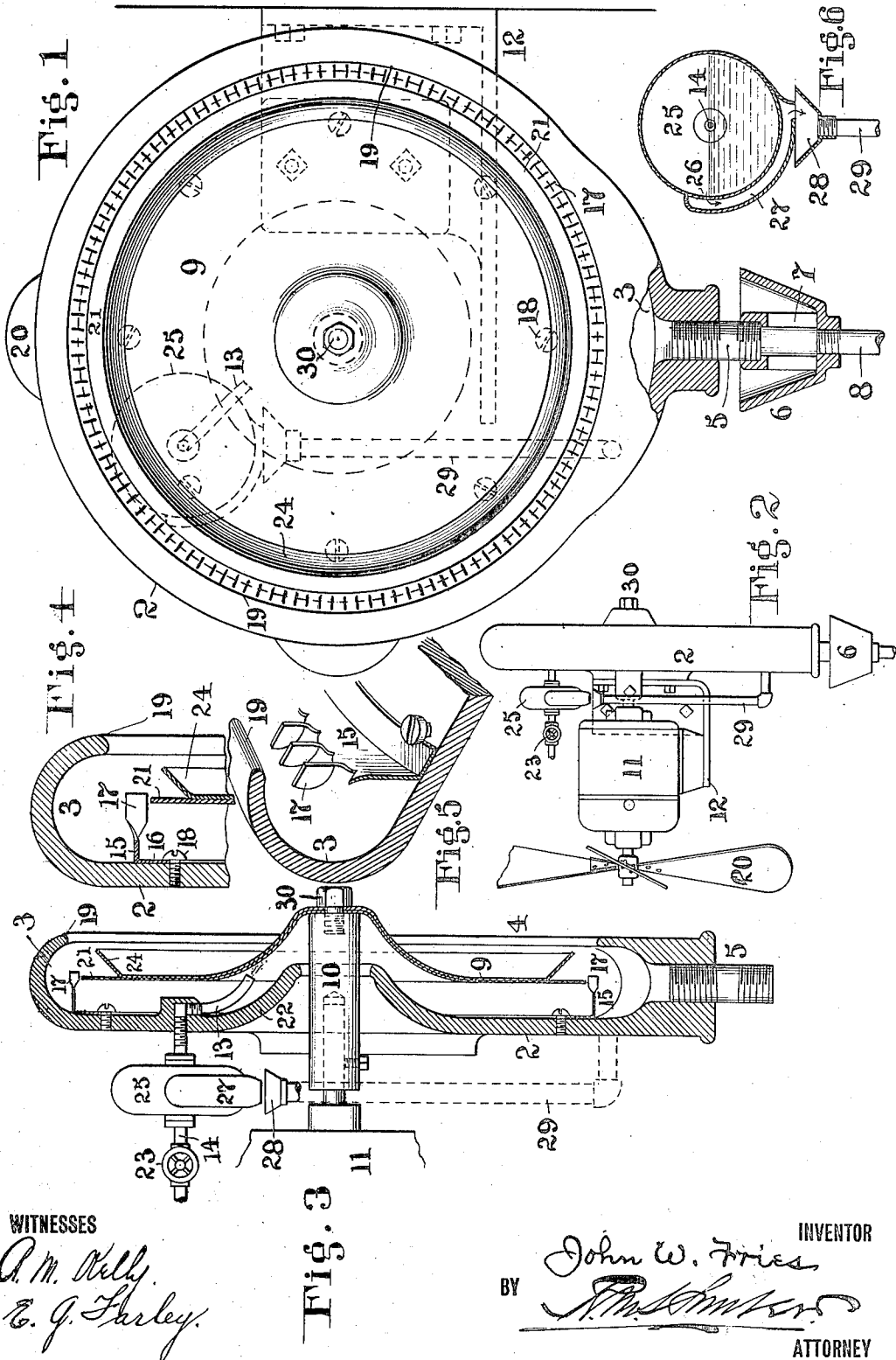


J. W. FRIES.
HUMIDIFIER.

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Patented May 10, 1910.



WITNESSES

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JOHN W. FRIES, OF WINSTON SALEM, NORTH CAROLINA.

HUMIDIFIER.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN W. FRIES, a citizen of the United States, and a resident of the city of Winston Salem, in the county of Forsyth and State of North Carolina, have invented an Improvement in Humidifiers, of which the following is a specification.

My invention has reference to humidifiers and consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings which form part thereof.

The object of my invention is to provide a construction of humidifier which shall, by mechanical means, transform a stream of water or other fluid into a fine vapor or mist and dissipate it into the atmosphere, the construction of the humidifier being simple, inexpensive, durable, and not liable to clog or to get out of repair.

My invention has utility for supplying the requisite humidity to the atmosphere in textile mills, cigar factories and stores and any and all places where an increase in humidity is desired.

My invention consists of a rapidly revolving disk upon which a jet of liquid is delivered, combined with an annular series of dissipating blades or obstructions arranged about the periphery of the disk and against which the water is mechanically projected under centrifugal force by the rotary action of the disk and by which it is sub-divided into a fine spray or vapor or mist whose density is proportional to the speed of the disk and impact of the liquid upon the blades, the said apparatus being provided with means for causing the radial currents of air caused by the rotating disk to be diverted out of impingement upon the annular row of dissipating blades whereby the said blades are maintained free from deposits of lint and the aqueous vapors permitted to leave the blades before being subjected to such air currents.

More specifically, my invention comprises a case closed at the back and open at the front with a surrounding gutter and a drainage outlet, combined with a rotating disk, having an annular oblique air shield or flange near its periphery, a motor to rotate the disk at a high rate of speed, an annular row of stationary blades or obstructions shielded by the closed back of the case and surrounding the disk against which the fluid is projected and vaporized or pulverized,

means for supplying the water or other fluid to the side of the disk opposite to that provided with air shield or flange, and a dissipating blower for producing a current of air for carrying off the vapors after they have been expanded into the air.

My invention also comprehends details of construction which, together with the features above specified, will be better understood by reference to the drawings, in which:

Figure 1 is a front elevation of a humidifier embodying my invention; Fig. 2 is a side elevation of the same upon a smaller scale; Fig. 3 is a sectional side elevation of the same upon the same scale as Fig. 1; Fig. 4 is an enlarged sectional view of a portion of Fig. 3; Fig. 5 is a perspective view of the impacting blades and part of the casing; and Fig. 6 is a sectional elevation of the means for controlling the fluid supply and cleansing it.

2 is a circular fixed case with an inwardly directed gutter 3 at its periphery and is open at its front as indicated at 4. The bottom of the gutter 3 terminates in a drainage tube 5 connecting with a waste pipe 8 through a funnel shaped casting 6, which latter has vent openings 7 surrounded by an upwardly extending circular flange. The waste water passes from the gutter through the pipes 5 and 8, and any air, carried down by the water, escapes from the vent apertures 7. The funnel 6 prevents the escape of any water not in the form of vapor. The rear and central part of the case 2 is formed with an opening having a forwardly extending conical flange 22.

12 is a bracket to which the case 2 is bolted and by which it may be suspended from a post or other part of a building. This bracket may be of any shape desired.

11 is an electric motor which is bolted to the bracket 12 and has its shaft extending centrally with the opening within the flange 22 of the case 2.

A disk 9 is arranged within the case 2 and has a rearwardly extending hub 10 fitted upon the motor shaft and secured thereto by a set screw or other suitable means. The disk has a thin peripheral edge. The disk 9 is provided on its front with an annular obliquely arranged flange 24, a little distance from the peripheral edge of the disk, to deflect the radial currents of air outward away from the peripheral edge and past the annular edge 19 of the casing.

In this way the radial currents in front do not pass into the gutter 3 and this is also for other reasons stated hereinafter. This disk 9 is preferably made of two spun disks of copper, the rear one 21 having its peripheral edge straight and the forward or front disk 21^a having its peripheral edge bent into the annular oblique flange 24 above referred to. A single clamping screw 30 may be employed to fasten the disks to the hub 10.

Surrounding the disk 9, and close to it, is an annular cylinder 15 having a flange 16 resting against the case and secured thereto by screws 18, and also having its forward edge provided with a series of blades 17, annularly arranged close to and about the periphery of the disk 9. In practice, I form the cylinder 15 of copper spun into shape, slitted on its edge and the slitted portions twisted into a radial direction to form blades, as shown. These blades receive the liquid thrown off of the peripheral edge of the disk and subdivide it into vapor. The blades 17 are within the gutter 3 but are directed toward the open face of the case 2 so that the vapor may pass freely away. Moreover, the blades 17 are considerably within the rim forming the gutter so as to leave radial space beyond the blades for the passage of the vapor or mist and yet permit the collection of the unvaporized water in the gutter. While I have shown a convenient and inexpensive manner of making the blades, it is to be understood that they may be formed in any way desired so long as they act as obstructions and receive the impact of the liquid and break it up into vapor or mist. When the vapor is formed, it escapes between the annular flange 24 and the front edge 19 of the gutter where it is blown outward with the gentle blast directed by the said annular flange, and this dissipation of the vapor or mist may be further effected by the air currents forced around the outside of the case as hereinafter described.

14 is a pipe for supplying liquid, (usually water) and connects with the back of the case 2 and in communication with a nozzle 13 inside of the case and discharging upon the rear face of the disk 9 near its center. This nozzle 13 is arranged between the disk and interior back wall of the case, as shown in Fig. 3. The aperture at the rear of the case is formed by the inwardly directed conical wall 22 which permits such air as may be required being drawn into the machine. This aperture may be omitted if desired.

The end of the motor shaft most distant from the disk 9 is preferably provided with a fan or blower 20 which produces a current of air over the periphery of the case 2 to dissipate the vapor or mist and carry it out into the atmosphere of the room.

The extent of humidity produced depends upon the amount of water supplied by the nozzle 13 and the speed of the disk, and hence with a given speed, the humidity may be varied and regulated by controlling the supply of the water. To do this I provide a needle or other suitable valve 23 in the water supply pipe 14 which may be regulated by hand or otherwise as desired. In addition to the valve 23, I may provide a regulator 25 in the form of a drum axially journaled upon the pipe 14 and having an over flow aperture 26 discharging into a drainage duct 27, which in turn empties into a hopper 28 connecting with a pipe 29 opening into the gutter 3 of the case near the bottom. This regulator has a two-fold function, namely: to act as a reservoir to receive any material which may have clogged the valve 23 and been discharged into it by opening the valve fully to clear it, such material passing off through the waste orifice, and otherwise to regulate the pressure by adjusting the level of the overflow orifice 26 so as to cause the water to be discharged from the nozzle 13 under more or less head. In practice the supply of water to the rotating disk 9 should be accurately regulated and by the employment of this overflow regulator this adjustment and flushing of the valve may be readily done. When the regulator is set, the valve may be opened to flush it and then readjusted without having to be overcareful since the regulator insures the proper flow.

It will be understood that the water that is delivered to the back of the disk 9 is quickly spread out over its surface by the centrifugal action of the rotating disk and while traveling outward upon the surface of the disk, its speed is quickly increased and its thickness diminished so that an attenuated film of water extends all around the edge of the disk and is literally mechanically vaporized or pulverized by the violent impact which takes place by it upon the fixed blades 17. The less the volume of the water, the thinner is the film and the finer is the vapor or mist, and vice versa; and likewise, does the humidity vary, but in an inverse ratio, that is to say, with the finer film of water the humidity would be less than where the film was thicker. It will furthermore be recognized that the vaporizing or pulverizing of the water is performed in a comparatively still atmosphere, as provision is made, as hereinbefore pointed out, to prevent strong air currents or blasts to be projected upon the vapor at time of its production.

While, for compactness and symmetrical arrangement, I prefer to place the disk and fan upon opposite ends of the motor shaft, I do not confine myself to that construction as the fan may be otherwise located or may

be separate from the vaporizer or pulverizer and may in some cases be dispensed with altogether. Any other arrangement may be employed for creating an air current for dissipating the vapor or mist, as I do not confine myself to the means shown.

While I employ an electric motor 11 for rotating the disk 9 and fan 20, any other motor may be employed; or the shaft carrying the said disk and fan may be driven by any other means.

If desired, the fan may be dispensed with in cases where the vapor or mist is very fine, as the normal currents of air will suffice for its dissipation.

In modified form, my invention may be employed with the rotating disk revolving in any plane desired, the only point to be kept in mind is the proper supply of water to the disk and the drainage of surplus water. For example the machine shown, instead of being supported with the disk rotating in a vertical plane, may be so supported as to have the disk rotating in a horizontal or any other plane, as the high velocity of the disk will cause the water to properly distribute itself under any conditions. It is, of course, important that the waste water may run off by gravity and that the supply water shall be positively delivered to the disk, but it is immaterial how these are done.

In using the term "vapor" as defining the finely subdivided water, I have used it in a general sense, and to include the true gas of water as well as the fine spray, mist or fog, as aside from the gasified water, the denser mist or fog will become largely dissipated and absorbed into the air as a vapor and impart to it the hygrometric condition desired.

In the operation of my improved machine the film of liquid as it leaves the edge of the disk is thoroughly dissipated by the fixed blades so that it is converted into a fine vapor or mist and at the same time is shielded during the formation of such vapor or mist against strong drafts or currents of air which would cause the formation of large drops of liquid and its precipitation out of the machine in an objectionable manner as well as, in textile mills, forcing lint to be deposited upon and clog the dissipating blades.

In my machine the casing is closed at the back so as to prevent any objectionable drafts of air across the dissipating blades or obstructions, and consequently the vapor or mist which leaves the machine is required to be of such fineness as to be capable of being readily absorbed into the atmosphere to give to it the desired humidity. The employment of the blower or fan is only to cause the surrounding air to be kept into motion so that, as each portion of the air absorbs the desired amount of the vapor or mist, fresh bodies of

air will be brought successively into reasonable distance of the dissipating means to take up the moisture as fast as it is produced. While employing under some conditions the blower, provision is made to prevent the said blower acting upon the vapor or mist while in the act of being formed by the disk and the radial obstructions, said protection being secured by placing the fan behind the closed back of the casing in which the said disk and dissipating obstructions are located. Even though the fan is located in other positions, it is not permitted to blow upon the vapor or mist at time of its production. The function of the fan is simply to put the atmosphere outside of the machine into motion, so that the moist air may be conveyed away and drier air brought in contact with the machine, but without disturbing or interfering with the normal action of the vapor or mist producing devices, or upon the vapor or mist itself during its production. The radial blades 17 by which the water is dissipated, are unobstructed at their radial extremities, so that the vapor or mist after being produced is not projected against the solid wall, or into a pocket which would tend to condense, but the construction is such that, as soon as the vapor or mist is formed, it is free to pass on in a radial direction and also forward without resistance, and in this manner be retained in its vapor or mist form. As the rapidly rotating disk and discharge of water cause a radial flow of air upon its front face toward the circular row of dissipating blades and as this air reaches the disk at its center in front and hence from the air in the room there would be two objections to its presence, namely the driving of the aqueous vapor or mist back into the annular chamber 3 and its condensation and the forcing of floating particles of lint upon the dissipating blades, and these objectionable results are avoided by directing the said air outward from near the periphery of the disk by the annular oblique flange 24 hereinbefore described. In this way the dissipating blades are maintained in a clean condition and the vapor or mist which leaves the machine may be as fine as desired.

I have shown my invention in the form which I have found most desirable in commercial use; and while I prefer the structures shown I do not restrict myself thereto as the details may be modified without departing from the spirit of the invention.

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

1. In a humidifier, the combination of a rotatable disk having its outer portion provided with a laterally directed annular flange on one face, means to rotate the disk at a high velocity, means for delivering a

liquid to the face of the disk opposite to that provided with the annular flange, and an annular row of obstructions arranged about the circumference of the disk and close to it against which the film of liquid driven outward from the disk by centrifugal force is projected and subdivided into vapor or mist and at the same time protected against outward air currents from the disk by the air guided action of the laterally projecting flange.

2. In a humidifier, the combination of a rotatable disk having its outer portion provided with a laterally directed annular flange on one face, means to rotate the disk at a high velocity, means for delivering a liquid to the face of the disk opposite to that provided with the annular flange, an annular row of obstructions arranged about the circumference of the disk and close to it against which the film of liquid driven outward from the disk by centrifugal force is projected and subdivided into vapor or mist and at the same time protected against outward air currents from the disk by the air guiding action of the laterally projecting flange, and a shielding case arranged around the annular row of obstructions and provided with an annular flange extending toward the disk so as to terminate approximately in alinement with its laterally projecting flange.

3. In a humidifier, the combination of a rotatable disk having its outer portion provided with a laterally directed annular flange on one face, means to rotate the disk at a high velocity, means for delivering a liquid to the face of the disk opposite to that provided with the annular flange, an annular row of obstructions arranged about the circumference of the disk and close to it against which the film of liquid driven outward from the disk by centrifugal force is projected and subdivided into vapor or mist and at the same time protected against outward air currents from the disk by the air guiding action of the laterally projecting flange, a shielded case arranged around the annular row of obstructions and provided with an annular flange extending toward the disk so as to terminate approximately in alinement with its laterally projecting flange, and means for creating a forced current of air around the outer edges of the shielding case for carrying away the vapor or mist which escapes from the case.

4. In a humidifier, the combination of a rotatable disk having its outer portion provided with a laterally directed annular flange on one face, means to rotate the disk at a high velocity, means for delivering a liquid to the face of the disk opposite to that provided with the annular flange, an annular row of obstructions arranged about the circumference of the disk and close to it against

which the film of liquid driven outward from the disk by centrifugal force is projected and subdivided into vapor or mist and at the same time protected against the outward air currents from the disk by the air guiding action of the laterally projecting flange and an inclosing case closed on one side and open on the other in front of the disk and provided with an annular gutter immediately outside of the annular row of obstructions and terminating in an edge inwardly directed to approximate alinement with the laterally projected flange of the disk.

5. In a humidifier, the combination of a motor, a disk secured to one end of the motor shaft and provided with an annular flange near its periphery having its surface arranged obliquely to the plane of the disk, means for supplying liquid to the disk, and an annular row of obstructions arranged about the peripheral edge of the disk against which the film of liquid is projected by the rotating disk.

6. In a humidifier, the combination of a motor, a disk secured to one end of the motor shaft and provided with an annular flange near its periphery having its surface arranged obliquely to the plane of the disk, means for supplying liquid to the disk, an annular row of obstructions arranged about the peripheral edge of the disk against which the film of liquid is projected by the rotating disk, and a shield interposed between the fan and the annular row of obstructing parts.

7. In a humidifier, the combination of a motor, a disk secured to one end of the motor shaft and provided with an annular flange near its periphery having its surface arranged obliquely to the plane of the disk, means for supplying liquid to the disk, an annular row of obstructions arranged about the peripheral edge of the disk against which the film of liquid is projected by the rotating disk, and a shield interposed between the fan and the annular row of obstructing parts, said shield extending circumferentially around said parts on the outside and having an inwardly directed flange terminating substantially in the vicinity of the obliquely arranged flange of the disk.

8. In a humidifier, the combination of a rotating shaft, a rotating disk secured to the shaft, having a peripheral edge in the plane of rotation, a conical part secured to the front of the disk and forming an oblique annular flange at a short distance from the peripheral edge of the disk, means for supplying liquid to the back of the disk, and an annular row of obstructions arranged about the periphery of the disk for transforming the film of liquid therefrom into vapor.

9. In a humidifier, the combination of a rotating shaft, a rotating disk secured to the

shaft, having a peripheral edge in the plane of rotation, a conical part secured to the front of the disk and forming an oblique annular flange at a short distance from the peripheral edge of the disk, means for supplying liquid to the back of the disk, an annular row of obstructions arranged about the periphery of the disk for transforming the film of liquid therefrom into vapor or mist and a shield around the said peripheral edge of the disk and the obstructing devices and terminating in the vicinity of the annular oblique flange portion of the disk.

10. In a humidifier, a rotating disk structure comprising two circular sheet metal disks secured one upon the other, one of said disks having a peripheral edge in the plane of rotation, and the other of said disks having its peripheral edge bent at an angle to the plane of rotation, combined with an annular row of obstructing devices for transforming the film of water into vapor or mist arranged about the edge of the disk in the plane of rotation, and means for supplying liquid to the disk.

11. In a humidifier, a rotating disk, combined with an annular row of obstructions arranged about the periphery of the disk, a shield surrounding the said obstructions, means for supplying liquid to the disk, and means for causing a current of air to flow in a radial direction in front of the disk and guided outward away from the disk before reaching the peripheral edge thereof.

12. In a humidifier, a rotating disk, combined with an annular row of obstructions arranged about the periphery of the disk, a shield surrounding the said obstructions, means for supplying a liquid to the disk, means for causing a current of air to flow in a radial direction in front of the disk and guided outward away from the disk

before reaching the peripheral edge thereof, and means for directing a forced current of air around the outside of the shield to convey the vapor to a distance.

13. In a humidifier, the combination of means for subdividing a fluid into vapor or mist, with means for supplying fluid to the humidifier consisting of a nozzle, a valve for supplying liquid to the nozzle, and an intermediate chamber between the nozzle and valve having an overflow.

14. In a humidifier, the combination of means for subdividing a fluid into vapor or mist, with means for supplying fluid to the humidifier consisting of a nozzle, a valve for supplying liquid to the nozzle, and an intermediate chamber between the nozzle and valve having an overflow and so constructed that the level of the overflow may be adjusted to different heights to vary the pressure of the fluid supplied to the humidifier.

15. In a humidifier, the combination of means for subdividing a fluid into vapor or mist and having a waste passage for the surplus water not converted into vapor, with means for supplying fluid to the humidifier consisting of a nozzle, a valve for supplying liquid to the nozzle, an intermediate chamber between the nozzle and valve having an overflow and so constructed that the level of the overflow may be adjusted to different heights to vary the pressure of the fluid supplied to the humidifier, and a discharge from the overflow into the waste passage of the humidifier.

In testimony of which invention, I hereto set my hand.

JOHN W. FRIES.

Witnesses:

H. ALLIE WHITE,
S. E. BUTNER.