Jan. 17, 1928. 1,656,414

W. G. R. BRAEMER

HUMIDIFYING APPARATUS

Filed Dec. 17, 1924 2 Sheets-Sheet 1

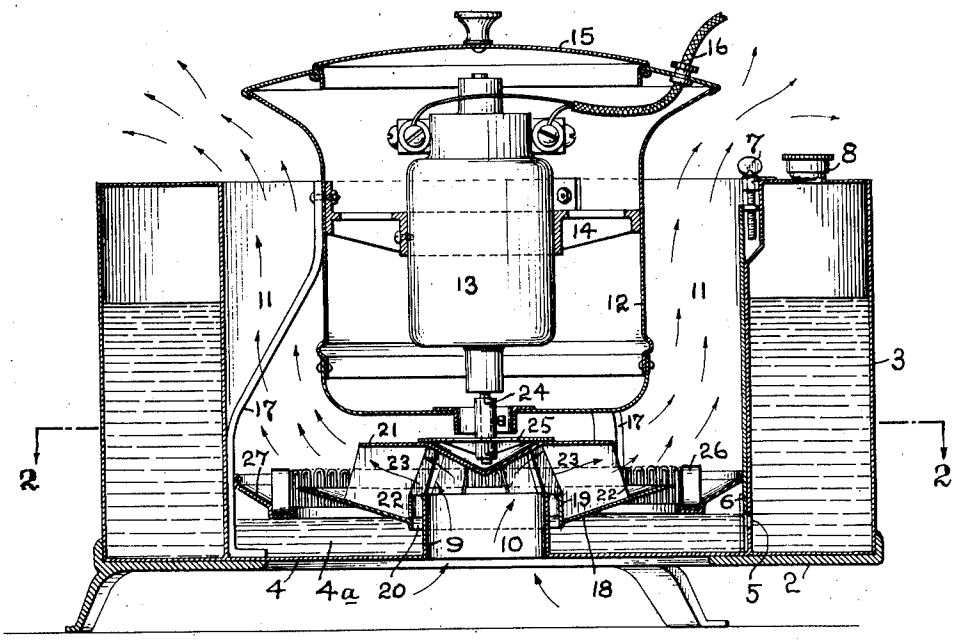


FIG. 1

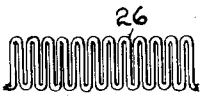


FIG. 3

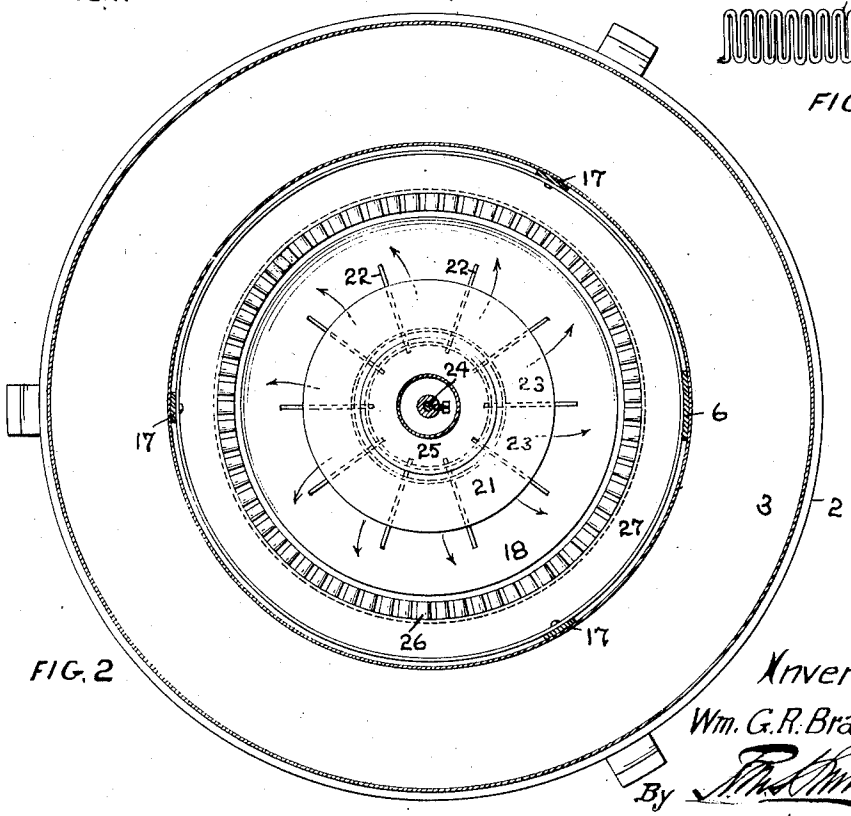


FIG. 2

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FIG. 4

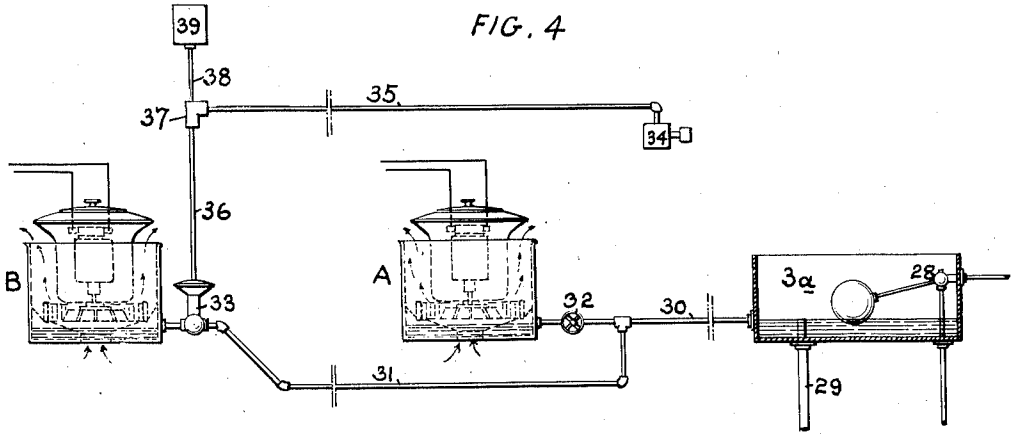
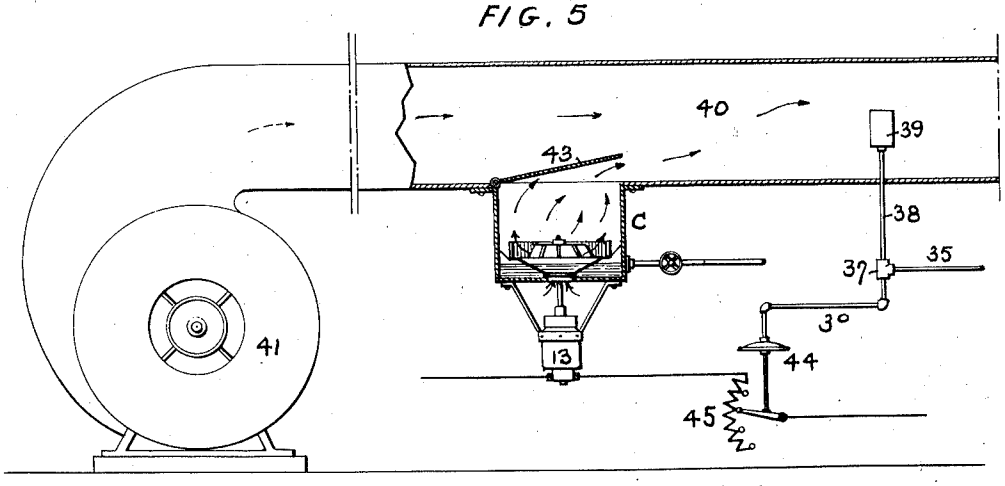


FIG. 5



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UNITED STATES PATENT OFFICE.

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HUMIDIFYING APPARATUS.

Application filed December 17, 1924. Serial No. 756,386.

The object of my invention is to provide an efficient yet inexpensive means for direct humidification of the air in isolated rooms or where it is needed; and more especially, my invention is adapted as a portable device which may be shifted from room to room or place to place, as the humidity changes in the confined air may necessitate.

Where steam or hot water radiators are employed as the means of heating rooms, such as in office buildings, hotels and apartments, the air is liable to become overheated, and, as a consequence, take on a condition of low relative humidity, with the resulting effect of producing a dry burning sensation of the skin of the occupants of the room or apartment. To overcome this objectionable condition, it has been customary to set trays of water upon the radiators, a practice which is both troublesome and unsatisfactory.

By use of my improvement, a fine mist is quickly and effectually formed and projected into the air so as to be at once absorbed therein whereby the desired relative humidity may be speedily obtained.

My invention consists of a revolving disk driven by a small electric motor (adapted to receive its electric energy from a lamp socket similarly to an electric fan), said disk automatically forming a thin film of water which is thrown off from its perimeter by centrifugal force, and which, striking baffling means arranged about the disk, is mechanically transformed into a fine mist, the water supply being contained in a reservoir preferably forming an air guiding wall about the disk and having means which automatically causes the water to be supplied to the revolving disk in such a manner that a definite quantity of water can be insured to the disk when revolving at a predetermined speed and thus provide for a predetermined vapor volume. Moreover, the revolving disk is so constructed that it performs the dual function of providing the water film and creating a strong radial air current which carries the mist or vapor produced out into the room.

My invention also comprises other details of construction which, together with the features above stated, are fully described hereinafter and pointed out in the claims.

Referring to the drawings: Fig. 1 is a vertical section of a humidifier embodying my invention; Fig. 2 is a horizontal section of the same on line 2—2 of Fig. 1; Fig. 3 is an edge view of one form of baffle adapted to my invention; Fig. 4 shows my invention when a plurality of the humidifiers are operated from a common source of water; Fig. 5 is a vertical section showing the adaptation of my humidifiers to supplying humidity to a current of air being supplied to a distant room or place.

Referring more particularly to the construction of the portable humidifier shown in Figs. 1, 2 and 3, the base 2 may be a suitable casting formed with legs or otherwise to support it at a distance above the table or ground upon which it may rest so as to permit air to freely pass below the apparatus. This base 2 supports a tank or reservoir 3 which is preferably formed as an annular compartment in which water may be placed through an inlet 8 which is normally sealed. The bottom of the tank is closed by a plate 4 at the center of which a vertical air aperture 10, is provided having a vertical circular wall 9 and forming between said circular wall and the annular tank 3 an annular water holding working tank 4^a, the same being in communication with the interior of the annular tank 3 by an orifice 5. Under ordinary conditions, the water in the supply tank 4^a will remain at a definite level governed by the position of the upper air controlling edge of the orifice 5. If the water in the tank 4^a becomes lowered, it will permit a bubble of air to pass within the reservoir tank 3 and thus causing the displacement of a corresponding portion of water from said reservoir tank 3 into the working tank 4^a to maintain its predetermined level. The working level in this tank 4^a may be adjusted by a vertical adjustment of the gate valve 6 which controls the upper level of the orifice 5. This gate valve 6 may be adjusted in any suitable manner and the adjusting screw 7 is provided by way of example. The feeding of the water from the annular reservoir 3 into the working tank 4^a is accomplished by gravity of the water tending to flow from the higher level to the lower and governed by the admission of air into the closed reservoir above the water to modify the vacuum therein from time to time to permit the flow under the action of

gravity while restricting it by the extent of vaccuum within the annular reservoir above the water therein. As the level of the water in the working tank 4^a descends sufficiently to allow a bubble of air to pass the opening 5 and rise into the reservoir, the entrance of such bubble will permit an equivalent quantity of water to flow from the reservoir through the water passage and thus maintain automatically the desired level of the water in the working reservoir. I do not confine myself to the particular construction of parts shown for allowing the water to enter the working reservoir and the air to enter the compartment above the main reservoir, as these obviously may be modified while retaining the mode of operation.

18 is a disk of annular form and more or less conical shape and is provided at its inner part with a cylindrical wall 19 which is concentric to the tubular wall 9 of the tank structure 4, and forms a water seal 20 between the said parts 9 and 19. The inner and lower portion of the cone disk 18 is normally in the water contained in the working tank 4^a, as clearly shown. This cone shaped disk is integrally formed with an upper disk 21 of smaller diameter and connected with it by means of radial blades 22 forming between them air passages 23, said air passages being in communication at their inner ends with the tubular passage 10 so that the air currents may pass upwardly through the working tank 4^a as indicated by the arrows, when the cone disk and its connected parts are revolved. Secured to the disk 21 is a hub portion 25 which is secured to the motor shaft 24 and by which it is revolved at a high speed. The motor 13 is shown as an electric motor and is secured to a transverse supporting frame 14 having a plurality of downwardly extending leg portions 17 which rest upon the bottom 4 of the working tank 4^a, the weight being sustained by the base frame 2. 12 is a casing which surrounds the motor 13 and protects it from moisture and also acts as a central filling piece to the inner space 11 formed by the annular reservoir tank 3. The upper part of this casing 12 may flare outwardly so as to cause the moist air to spread on being delivered from the upper part of the humidifier. An electric circuit is provided by the flexible conductor chord 16 which may lead to a lamp socket in the ordinary manner adopted with electric fans, so that the humidifier may be set anywhere in the room which is found convenient and coupled to the electric lighting circuit for insuring the operation of the motor. 15 is a cover plate over the casing 12 for permitting access to the motor when desired. It is manifest that this arrangement of parts provides an annular air passage into which the moist air currents are received at the lower part and caused to flow outwardly at the top so as to rapidly spread into the room atmosphere.

The general configuration of the reservoir tank 3 and the housing of the motor may be in any form to obtain an artistic design and it is evident that these may be shaped to form an artistic urn, vase or other object.

When the cone shaped disk 18 is driven at a high speed, it draws air upwardly through the central tubular passage 10 and forces it radially outward through the passages 23 simultaneously with the production of a film of water on its under conical surface, which film of water is thrown off from the extreme perimeter of the disk and caused to impact upon the annular row of baffle means 26, so that said film of water is broken up into a fine mist and is at once carried forward by the air currents and thus absorbed by said air currents and supplied to the air of the room, in which it is further dissipated and absorbed. The annular row of baffle means 26 may be formed in any suitable manner and I do not restrict myself in this respect. The particular construction shown consists of a ribbon of sheet metal bent backward and forward upon itself, as indicated in Fig. 3, and this, when bent into a circular form, is supported in an annular groove in the bottom of an annular supporting frame 27 which is arranged slightly above the water in the tank 4^a and is secured to the leg portions 17. In this manner, the lifting out of the casing 12 will remove with it the revolving cone shaped disk 18 as well as the frame 27 and the annular row of baffle means 26, thereby providing ready access to the working parts and also for permitting proper access to be had to the tank structure, both for repairs and for cleaning.

The film of water which is formed upon the under surface of the revolving cone shaped disk 18 is formed by the centrifugal action of the disk upon the water, and the quantity of water lifted and thrown outward is proportional to the speed of rotation of the disk as well as to the level of the water in the working tank 4^a. Assuming that the speed is kept constant, as in the case of an electric fan, the vapor production may be increased by raising the valve gate 6 or decreased by lowering it, and thereby raising or lowering the level of the water in contact with the disk. As shown in Fig. 1, the gate is adjusted for a maximum water film with the motor revolving at a given speed and this film may be decreased by the lowering of the gate 6. This provides means in the portable humidifier to insure a desired quantity of moisture being delivered into the atmosphere. It will be understood, however, that where desired, the adjustment for increasing or decreasing the amount of moisture delivered into the air may be auto-

matically performed by means which controls the flow of water to the operating tank 4ª or which controls the speed of the motor, and hence of the disk 18, as is indicated in Figs. 4 and 5, to which reference will now be made. In these figures, the humidifiers shown at A, B and C are of the same general construction as shown in Figs. 1 and 2. That is to say, they have the revolving cone shaped disks and baffle means as well as the working tank with the central aperture for the air to pass to the revolving disk, said air passing through the bottom of the humidifier through the central passage thereof as indicated by the arrows.

In Fig. 4, I have indicated means for supplying a plurality of the humidifiers with water from a common source and have shown the water supply to one of the humidifiers as controlled by a humidistat arranged in the room or compartment in which the humidifier is located. In this construction, 3ª is a reservoir in which water is maintained at a constant level by a float valve 28 and an overflow pipe 29. The water from this reservoir tank is supplied by pipes 30 and 31 to the respective humidifiers A and B which, in this case, would simply be provided with the working tank 4ª which should be positioned to insure a uniform level of water therein, so that any lowering of the water level in either of the humidifiers will automatically insure a further water supply thereto. 32 and 33 are control valves by which the respective humidifiers may be shut off from operation, when desired. I have shown the valve 33 of the humidifier B as being an automatic valve of the usual type which may be closed by spring action and opened by a pressure diaphragm. The pneumatic pressure which is employed for closing the valve is supplied by the air pump 34 through an air main 35 to a branch line 36 leading to the valve and operating through the choke device 37, the same being provided with a bleed pipe 38 controlled by the humidistat 39 and operating in such manner that whenever the humidity in the room becomes excessive, the valve bleed 38 is shut off so that the air pressure builds up in the branch pipe 36 and causes the diaphragm valve 33 to be shut off and in that manner reduce the water supply to the revolving cone disk and thereby reduce the amount of moisture which passes into the atmosphere. Humidistats or hygrostats with the connecting means for automatically operating the control valves are well known and, therefore, no claim is made to the details of such apparatus. Any suitable means for accomplishing this purpose may be employed, as desired.

Referring to Fig. 5, 40 represents a conduit through which air is caused to flow from any suitable source, either by a pressure blower 41 or by an exhauster, both of which are common expedients in practice of air conditioning apparatus as employed in buildings. The air passing through the conduit 40 may be supplied with moisture by the humidifier indicated at C, the construction of which is similar to that previously described with the exception that, in this case, the motor 13 is supported below the vaporizing means instead of above it, as in Fig. 1, this being more convenient for access to the motor. The humidifier C has its upper portion opening into the conduit 40 at 42 and if the air circulation through the conduit is under pressure from a pressure blower, then there should be an inclined baffle plate or board 43 extending partly over the open upper portion of the humidifier C to prevent the air from blowing down into the humidifier. If the air circulating in the conduit 40 is induced by an exhauster in place of the pressure blower, then the baffle 43 may be omitted, as in that case there would be no interfering pressure in the conduit. The circulation in this case would assist the passage of the humidified air from the humidifier into the conduit. In this particular case, I have shown means for regulating the speed of the motor and, therefore, the spraying disk under the control of a humidistat substantially as in the case of Fig. 4, except that in this instance, the diaphragm motor 44 operates a circuit controller 45 for changing the speed of the electric motor. The humidistat is shown at 39 and the pipes 35, 36 and 38 and choke device 37 for operating the diaphragm motor correspond also to those shown in Fig. 4. In this case, however, I have shown the humidistat in the conduit, but it is manifest that it may be in the room or place where the humidifier air is ultimately received. In case of too much humidity, the humidistat may close the vent pipe 38 and build up a pressure on the diaphragm motor to increase the resistance in the motor circuit for slowing down the motor, and thereby reducing the amount of aqueous vapor produced by the humidifier. If the amount of moisture is reduced to too great an extent, the humidistat relieves the air pressure and the speed of the motor is increased, thereby producing more moisture in the air. In this manner the humidity condition of the air passing through the conduit may be reasonably controlled to suit predetermined requirements.

No claim is made in the present application for the plurality of humidifiers operating from the common source of water supply with or without automatic controlling means for controlling the supply of water nor to the employment of a conduit through which air currents are passing in association with a humidifier receiving fresh air, humidifying the same and discharging it into

the conduit to mix with the circulating air therein, more particularly, as shown in Figs. 4 and 5, as the same will form subject matter of a separate application.

It will now be apparent that I have devised a novel and useful construction which embodies the features of advantage enumerated as desirable, and while I have in the present instance shown and described the preferred embodiment thereof which has been found in practice to give satisfactory and reliable results. it is to be understood that I do not restrict myself to the details, as the same are suspectible of modification in various particulars without departing from the spirit or scope of the invention.

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

1. A humidifier comprising an annular casing forming a water reservoir and having in the lower part of the space within the annular reservoir an open annular working tank having a vertical central air passage through it and in communication with the water space of the annular reservoir by a normally open water and air passage means whose uppermost edge determines the water level in the working tank, combined with a rotatable annular disk of general conical shape whose central portion is submerged in the water of the working tank and whose upper portion extends above the level of the water in said tank and is provided with a plurality of radial passages for sucking a current of air through the central air passage in the annular working tank and producing currents radially toward the perimeter of the disk, an electric motor arranged within the central space of the annular water reservoir for rotating the disk, an annular row of baffling means arranged about the disk to break up the water film thrown into contact with them by the revolving disk, and a support for the annular row of baffling means.

2. The invention according to claim 1, wherein further, the motor is surrounded with a protecting casing which fits down into the space within the annular reservoir and provides with the wall an annular air passage for the air blown by the rotating disk structure for guiding it upwardly into the atmosphere.

3. The invention according to claim 1, wherein further, the motor is surrounded with a protecting casing which fits down into the space within the annular reservoir but arranged at a higher level than the baffling means and providing an annular air passage for the air from the rotating disk structure whereby it is guided upwardly into the atmosphere, the motor and protecting casing provided with supporting means for detachably positioning them within the central space of the annular reservoir and whereby said parts together with the disk structure may be removable as a unit.

4. The invention according to claim 1, wherein further, means are provided for raising or lowering the upper edge of the water and air passage between the annular reservoir and annular working tank for governing the water level in the working tank.

5. The invention according to claim 1, wherein further, the annular working tank is formed with a central vertical opening bounded by a circular upwardly extending flange, and the annular disk has its general surface directed obliquely upward so that the water film flows by centrifugal action in a continuous upward direction.

6. A humidifier, comprising an annular casing forming a normally closed water reservoir and having in the lower part of the space within the annular reservoir an open annular working tank having a vertical central air passage through it and supplied with water from the annular water reservoir, means communicating between the bottom of the water reservoir and the working tank for permitting the flow of water from the reservoir to the tank, and means controlled by the level of the water in the working tank for controlling the passage of air from above the level of the water in the tank into the air space above the water in the reservoir for controlling the flow of water from the reservoir to the working tank, combined with a rotatable disk of general conical shape whose central portion is tubular and submerged in the water of the working tank and encircling the vertical central air passage therein and whose upper portion extends above the level of the water in said tank and is provided with a plurality of radial passages for sucking a current of air through the central air passage in the annular working tank and producing currents radially toward the perimeter of the disk, means for rotating the disk, and an annular row of stationary baffle means arranged about the disk to break up the water film thrown into contact therewith by the revolving disk for vaporizing the same.

7. The invention according to claim 6, wherein further, means are provided for adjusting the means for controlling the level of the water in the working tank for controlling the passage of air from above the level of the water in the tank into the air space above the water in the reservoir, and thereby regulating the level of the water in the working tank.

8. A humidifier comprising an annular working tank for water providing a vertical central air passage through its bottom, combined with a rotatable annular disk structure whose central portion surrounds

the central air passage through the bottom of the tank and in contact with the water therein and whose under surface is more or less conical and with its upper portion of largest diameter directed outward and upward, said disk being provided on its upper central portion with radial blades and air passages directed toward the perimeter of the disk, an electric motor to rotate the disk, and a circular row of baffles for vaporizing the water arranged around the perimeter of the disk.

9. A humidifier comprising an annular working tank for water providing a vertical central air passage through its bottom, combined with a rotatable annular disk structure whose central portion surrounds the central air passage through the bottom of the tank and in contact with the water therein and whose under surface is more or less conical and with its upper portion of largest diameter directed outward and upward, said disk being provided on its upper central portion with radial blades and air passages directed toward the perimeter of the disk, an electric motor to rotate the disk, a circular row of baffles for vaporizing the water arranged around the perimeter of the disk, means for supplying the working tank with water, and adjustable devices for adjusting the level of the water to be normally maintained in the tank to vary the extent to which the disk is submerged.

10. A humidifier comprising a water tank, combined with a rotatable disk having a vertical axis and an opening adjacent thereto and through which air may pass upwardly and a centrally depending annular portion about the axis of rotation for causing water to be supplied from the tank to the disk and over which it flows as a film, said disk also having a plurality of air passages arranged in a more or less radial direction above the portion thereof over which the water film flows, means for supplying air upwardly through the opening of the disk whereby it is received by the air passages thereof and forced radially outward and upward thereby, an annular row of stationary baffle means arranged about the disk to break up the water film thrown in contact therewith by the revolving disk for vaporizing the same, and means for guiding the air currents away from the perimeter of the disk and baffle means and discharging the vapor into the room.

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

WILLIAM G. R. BRAEMER.