

Jan. 2, 1934.

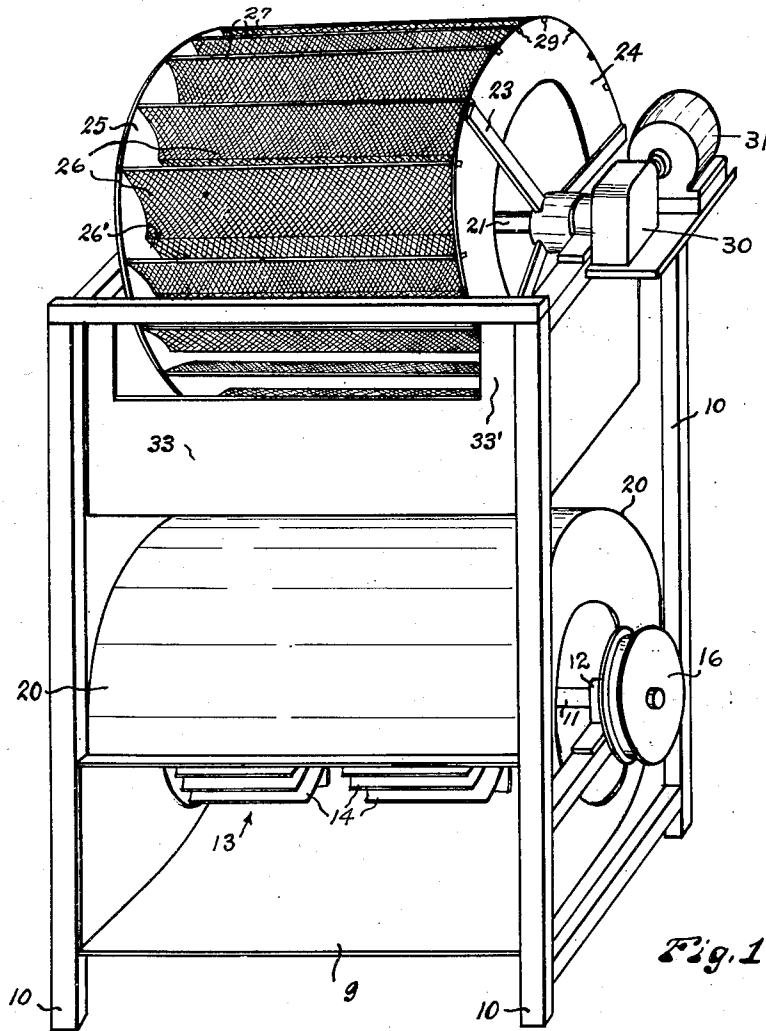
C. E. CAREY

1,942,085

AIR CONDITIONING DEVICE

Filed Aug. 11, 1931

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

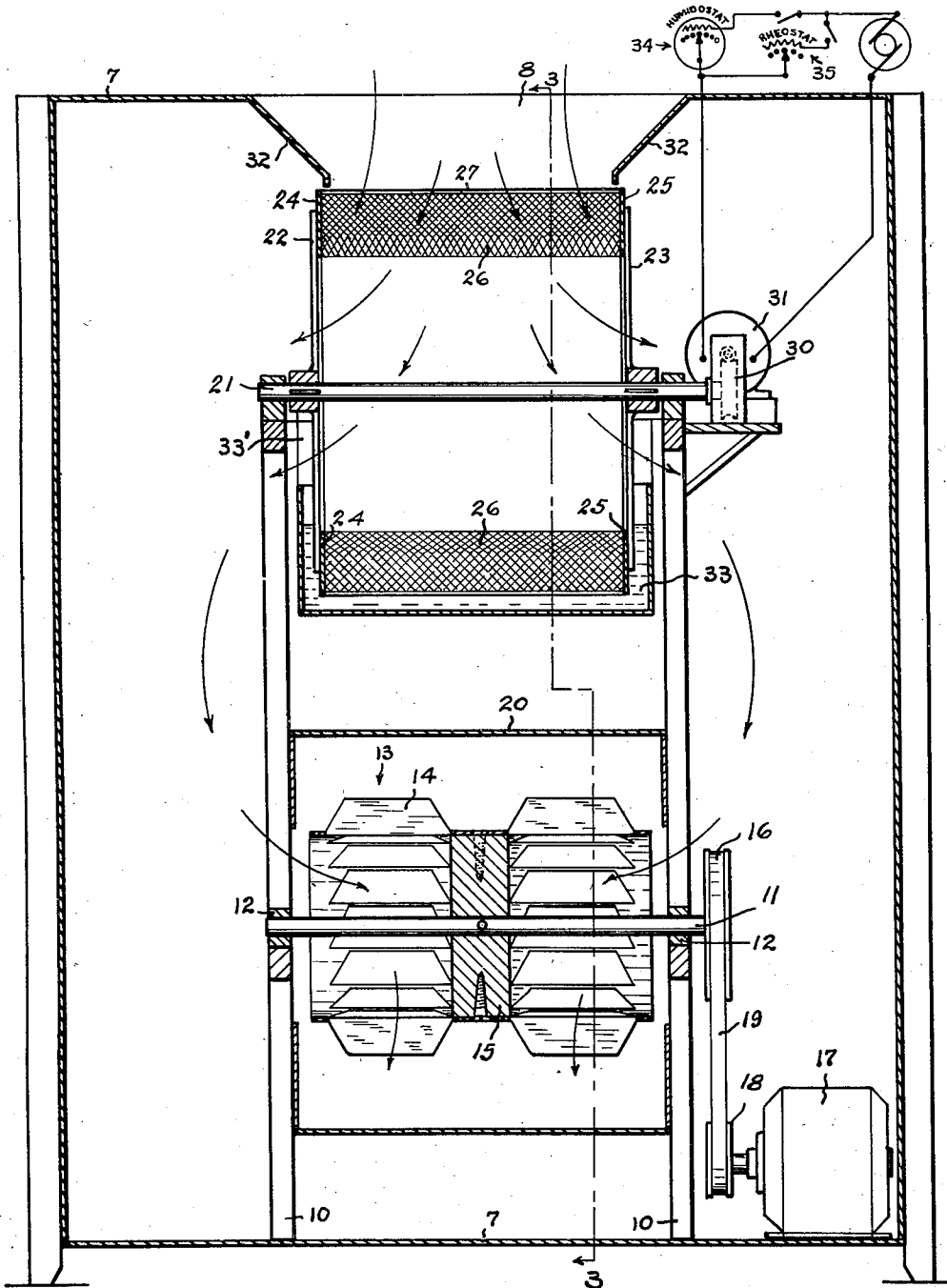


Fig. 2

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3 Sheets-Sheet 3

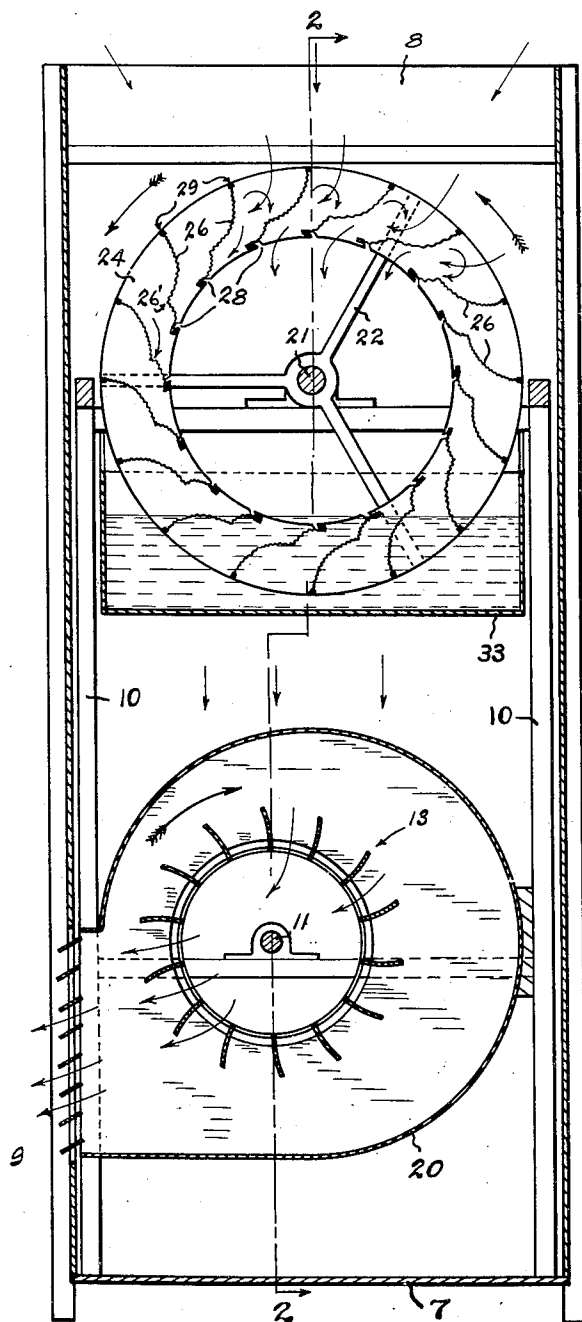


Fig. 3

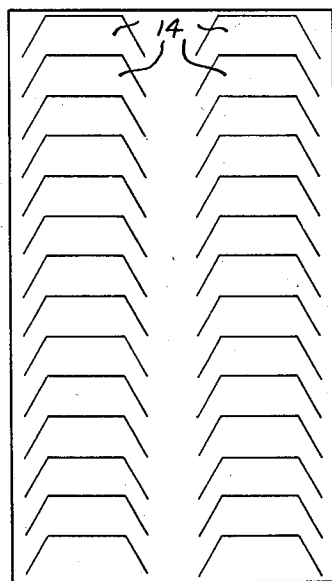
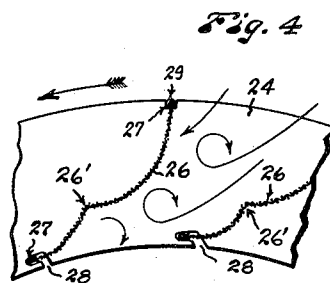


Fig. 5

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UNITED STATES PATENT OFFICE

1,942,085

AIR CONDITIONING DEVICE

Charles Edward Carey, Seattle, Wash.

Application August 11, 1931. Serial No. 556,402

10 Claims. (Cl. 183—25)

My invention relates to a device for conditioning air and humidifying and washing gases. More particularly, my invention relates to a device having moving moistened surfaces and having means for passing a flow of air in contact with said moistened surfaces in order that all of the air may be thoroughly cleansed and humidified.

A further object of my invention is to provide means whereby the humidity of the cleansed air may be definitely predetermined and may be varied according to the requirements. A still further object of my invention is to provide moistened surfaces of such a shape that the air contacting these surfaces will be whirled so that all the foreign particles such as dust, smoke, fumes and the like will contact the moistened surfaces and such foreign particles will be removed from the air. A still further object of my invention is to provide means whereby the direction of the flow of air is suddenly interrupted and changed, permitting the heavier foreign particles in the air to be removed.

A further object of my invention is to provide means to circulate air through my cleansing device so that a large volume of air may be cleansed and humidified and to provide means for producing positive air flow throughout the device.

The above mentioned general objects of my invention, together with others inherent in the same, are attained by the device illustrated in the following drawings, the same being preferred exemplary forms of embodiment of my invention, throughout which drawings like reference numerals indicate like parts:

Figure 1 is a perspective view, with the outside housing removed, of humidifying devices constructed in accordance with my invention.

Fig. 2 is a vertical mid-section of the same substantially on a broken line 2—2 of Fig. 3.

Fig. 3 is a vertical section substantially on broken line 3—3 of Fig. 2.

Fig. 4 is a fragmentary view on a larger scale of a part of the rotor which carries the moistened foraminous walls.

Fig. 5 is a development of the fan showing the way the vanes are cut from a piece of sheet metal preparatory to forming the sheet metal into a cylinder and bending the vanes outwardly.

A casing 7 is preferably formed of sheet material and may be of varying size and decoration, depending on the capacity of the device and the place of operation. Casing 7 is completely closed except for the in-take 8 and ex-

haust 9. Mounted within the casing 7 are upright members 10 on which are preferably mounted the moving parts of the device. Obviously, uprights 10 may be eliminated and the moving parts mounted upon the frame of the casing itself. Shaft 11 is journaled in bearings 12 supported on uprights 10. Mounted on shaft 11, is fan 13 preferably in the form shown, however I wish it expressly understood that I do not limit myself in the operation of my device to the use of any particular type of fan. The present fan being only a preferred embodiment and adapted particularly to the device herein shown. The fan is formed from a sheet of material, (see Fig. 5). The blades 14 of this fan are first punched from a sheet of the material. This sheet is then rolled into the shape of a cylinder and the ends secured together by welding or other means known in the art. The punched blades, which have taken on the curvature of the cylinder, are then bent outwardly into the shape shown. Thereafter disc member 15, formed of a non-resonant material, is inserted and secured within the central portion of said cylinder. Among other materials used for disc 15, I have found that hardwood has sufficient lasting qualities and sufficiently deadens all noise to be one of the desired materials. Disc 15 is non-rotatably mounted upon shaft 11. A sheave 16 is also non-rotatably mounted on shaft 11. Sheave 16 is driven by belt 19 connected to sheave 18 of electric motor 17. My fan means thus described forms an economical and highly efficient means for forcing air in the direction shown by the arrows in Figs. 2 and 3, which fan is easily built, easily balanced and runs without vibration and noise. A fan housing 20 extends around fan 13. The housing 20 is open at both ends to allow intake of air to the fan and said housing is open at the front at the location of the exhaust 9. Disc 15 acts as a separator, the air being drawn in from the respective ends of the fan and discharging through the open end of the housing. I have found in actual operation that my fan may be run at various speeds with a high degree of efficiency. However, for the particular device herein disclosed, I prefer to operate my fan at a speed of substantially 600 R. P. M. Obviously, the volume of air is directly controlled by the speed of the fan and the size of the blades and the above speed is relative compared to the other dimensions of the fan. Shaft 21 is preferably mounted above fan 13 and is journaled on uprights 10. Mounted on shaft 21 are supporting arms or spiders 22 and 23. Se-

cured to supporting arms 22 and 23 are annular rings 24 and 25 positioned adjacent the respective end portions of the shaft. Foraminous walls 26, preferably of screen like material and herein termed screens, are secured to the annular rings 24 and 25 by the insertion of screen supporting members 27, which are secured to the edges of the screens, in the slots 28 and 29 of the annular rings 24 and 25. Before they are secured to the rings 24 and 25 the screens are preferably folded substantially double along the lines indicated at 26'. They are then opened out and the screen supporting members are secured in the respective slots. This will cause the screens to form in the double arcuate shape shown in Figs. 3 and 4. The shape of these screens may be in the form of single arcs as well as in the form of double arcs as shown. The double arcs, as shown are the preferable construction because they produce a more intensified whirling action between the foraminous walls 26 than would be produced by single arcs.

The screens 26 are preferably formed of a relatively fine mesh so that the capillary action of the liquid will cause the same to tend to adhere to the surface of the screens, the size of the screen being so chosen that at the lowest operating speed the film of liquid over the screen is broken and filled with air spaces, while at higher speeds the meshes of wire are substantially all closed and a film of liquid tends to cling completely over the wire mesh.

Shaft 21 is connected through suitable reducing gears in gear box 30 with a variable speed electric motor 31. Reduction gears 30 may be of any form well known in the art and preferably establish a relatively high gear ratio between variable speed electric motor 31 and shaft 21 so that the speed of shaft 21 may be varied between one fourth of one revolution and six revolutions per minute by the operation of variable speed controllers in the circuit of the electric motor 31. In other words, the variable speed electric motor and its reduction gears are so chosen that the rotation of the shaft may be controlled by the operator at any desirable speed between one fourth of one revolution per minute to six revolutions per minute. Baffle plates 32 are positioned above the rotating moistened foraminous walls 26 in such a position that all of the air passing thru the intake 8 is directed to and must pass adjacent the moistened walls. Detachably secured below moistened walls 26 is a liquid pan 33. This pan is preferably detachably secured as by hangers 33', so that the dirt, which is washed from the air, may be emptied out of the pan at the necessary times. The level of the liquid in this pan is preferably at such a height that the entire surfaces of the foraminous walls 26 may be moistened as said walls 26 move through the pan 33. The preferable direction of rotation of the annular rings 24 and 25 supporting the moistened walls 26, is in the direction shown by the arrows in Fig. 3. Rotation in this direction permits a somewhat more thorough cleansing action of the moistened walls by the water and causes a more uniform distribution of water over the moistened walls 26, and less energy is required to rotate the moistened walls in this direction and less strain is thereby placed on the screens. Obviously, motor 31 may be eliminated and well known driving and reduction means may be used to connect a common motor to rotate the fan and the rotor which carries walls 26. The level of the liquid in the pan 33 may be automatically

maintained by the use of a float operated valve connected to a source of supply of liquid. This means of maintaining is well known in the art and generally used about boilers and similar devices.

In the operation of my device the air is preferably drawn first between the moistened surfaces of walls 26 at the upper portion of the rotor cylinder and due to the particular shape of these surfaces, a whirling action of the air takes place as it passes from the outside of the cylinder to the inside of the cylinder. As the air whirls in this manner as shown by the direction of the arrows in Figs. 3 and 4, the heavier particles of solid matter are forced radially and are deposited upon the moistened surfaces of walls 26. Thereafter the direction of the air is suddenly changed at substantially right angles and is discharged from this cylinder out of the open end portions thereof. Any foreign particles which may have escaped the cleaning action of the moistened surfaces, will be lost from the air, because of the change of direction, as it is discharged thru the open ends. The air in passing out of the open ends of this rotor cylinder is drawn downwardly and then into the open ends of the fan 13. The direction of the air before it enters the open end of the fan is again changed and a further action tending to eliminate foreign particles of solid matter is again obtained. The air after entering the open ends of the fan is discharged through the periphery of the fan in two streams adjacent the center portion of the fan, the air being divided by the disc 15 which disc acts as a baffle plate.

In actual operation, the speed of rotation of the rotor cylinder on which the moistened walls 26 are mounted may be varied from one fourth of one revolution per minute to six revolutions per minute, depending upon the humidifying effect desired.

As examples of the effect on air, which may be produced by this device and by variations in the speed of rotation of the rotor which carries the moistened walls 26 I have found by taking the average of a number of carefully made tests and observations that:

At one revolution per minute of this rotor, with the air at the intake having a dry bulb temperature of seventy four degrees Fahrenheit and a relative humidity of fifty four percent, the temperature of the discharging air will be seventy two degrees Fahrenheit and the relative humidity of the same will be sixty five percent.

At six revolutions per minute of the rotor with the same intake air the discharging air will have a temperature of seventy degrees and a relative humidity of sixty nine percent.

This shows a humidity increase of eleven percent at one revolution per minute of the rotor and a humidity increase of fifteen percent at six revolutions per minute of the rotor.

From the foregoing statistics it is obvious that the humidity of the air discharged from my device may be varied over a large range and that the humidity of the air discharged is proportional to the speed of the rotating cylinder on which the moistened surfaces 26 are mounted, providing that a constant volume of air is discharged. With this proportion definitely known, a humidostat or other device responsive to the amount of moisture in the air, is operatively connected in the circuit of the motor 31 and is adjusted so that the desired change of speed of rotation of the cylinder is obtained according to the humidity of

the room. For manual control of the motor 31 rheostat 35 is similarly operatively connected in the circuit of the motor 31.

In the calibration of the automatic means for controlling the humidity, it may be desirable to calibrate the same so that the humidostat 34 will operate the rotor cylinder at a series of varying speeds. However, practical operation of my device has been obtained with the use of two speeds of the rotating cylinder, the humidostat operating the device at low speed when the humidity has increased beyond the desired amount and at other times operating the same at high speed when the humidity has decreased below the desired amount.

In connection with the control of the moisture it is to be especially noted that the cleaning action of the gas is not varied with the lessening of the moisture content of the gas.

Obviously, changes may be made in the form, dimension and arrangement of the parts of my invention, without departing from the principle thereof, the above setting forth only preferred forms of embodiment.

I claim:

1. In a device of the class described, a substantially cylindrical rotor having an open centrally positioned chamber embodying a plurality of peripherally positioned spaced apart, overlapping, foraminous walls forming passage ways therebetween inclined relative to the radii of the rotor, said passageways being in communication with said centrally positioned chamber; a liquid container having liquid disposed to contact said walls; and means for passing gas in said passageways, whereby the gas is caused to change direction in passing through said passageways into said centrally positioned chamber.

2. In a device of the class described, a substantially cylindrical rotor having an open centrally positioned chamber and openings at its ends, said rotor embodying a plurality of spaced apart, foraminous walls positioned remote from the center and forming passageways therebetween inclined relative to the radii of the rotor; a liquid container having liquid disposed to contact said walls; and means for passing gas through said passageways to the said central chamber, whereby the gas will pass out the open ends of the cylinder and change its direction of flow after entering through said passageways.

3. In an air conditioner, a casing having air intake and discharge openings; a substantially cylindrical rotor positioned with its periphery adjacent said air intake opening, said rotor embodying a plurality of spaced apart, foraminous walls forming passageways therebetween inclined relative to the radii of the rotor, said walls being positioned remote from the center of the rotor and leaving openings at the ends of the rotor, whereby air may be passed through said passageways into the central portion of said rotor and thence out the ends of said rotor; liquid receptacle means embracing the lower portion of said rotor; and means for discharging air out the discharge opening, whereby the air entering between said foraminous walls into said rotor passes out at the ends of said rotor and thence out said discharge opening.

4. In an air conditioner, a casing having air intake and discharge openings; a substantially cylindrical rotor positioned with its periphery adjacent said air intake opening, said rotor embodying a plurality of spaced apart, foraminous walls forming passageways therebetween inclined

relative to the radii of the rotor, said walls being positioned remote from the center of the rotor and leaving openings at the ends of the rotor; liquid receptacle means embracing the lower portion of said rotor thereby obstructing the passage of air between the walls at the lower portion of said rotor; and fan means positioned adjacent the discharge opening adapted to exert substantially equal suction at both ends of said rotor.

5. In an air conditioner, a casing having air intake and discharge openings; a substantially cylindrical rotor positioned with its periphery adjacent said air intake openings, said rotor embodying a plurality of spaced apart, foraminous walls forming passageways therebetween inclined relative to the radii of the rotor, said walls being positioned remote from the center of the rotor and leaving openings at the ends of the rotor; liquid receptacle means embracing the lower portion of said rotor; and fan means positioned adjacent the discharge opening, said fan means embodying a substantial shell having means for circulating two streams of air one through each end of the shell respectively and through its adjacent portion of the wall of the shell.

6. In an air conditioner, a casing having air intake and discharge openings; a substantially cylindrical rotor positioned with its periphery adjacent one of said openings, said rotor embodying a plurality of spaced apart, foraminous walls forming passageways therebetween inclined relative to the radii of the rotor, said walls being positioned remote from the center of the rotor and leaving openings at the ends of the rotor; liquid receptacle means embracing the lower portion of said rotor; and air circulation means positioned adjacent the other opening.

7. In an air conditioner, a casing having air intake and discharge openings; a substantially cylindrical rotor positioned with its periphery adjacent one of said openings, said rotor embodying a plurality of spaced apart, foraminous walls forming passageways therebetween inclined relative to the radii of the rotor, said walls being positioned remote from the center of the rotor and leaving openings at the ends of the rotor, said rotor being rotated in a direction whereby the more centrally located edge of each said foraminous wall will be in advance in rotation of the outermost edge of said wall; liquid receptacle means embracing the lower portion of said rotor; and air circulation means positioned adjacent the other opening.

8. In a device of the class described, a substantially cylindrical rotor having an open centrally positioned chamber embodying a plurality of peripherally positioned spaced apart, foraminous walls forming passageways therebetween inclined relative to the radii of the rotor, said passageways being in communication with said centrally positioned chamber; a liquid container having liquid through which said walls are moved, whereby liquid adheres to the said surfaces and substantially closes the openings in the foraminous material; and means for passing gas in said passageways, whereby the gas is substantially confined in said passageways and is caused to change direction in passing through said passageways into said centrally positioned chamber.

9. In a device of the class described, a substantially cylindrical rotor having an open centrally positioned chamber embodying a plurality of peripherally positioned spaced apart, arcuate shaped, foraminous walls forming passageways

therebetween inclined relative to the radii of the rotor, said passageways being in communication with said centrally positioned chamber; a liquid container having liquid disposed to contact said walls; and means for passing gas in said passageways, whereby the gas is caused to change direction in passing through said passageways into said centrally positioned chamber.

10. In a device of the class described, a substantially cylindrical rotor having an open centrally positioned chamber and openings at its ends, said rotor embodying a plurality of periph-

erally positioned spaced apart arcuate shaped, foraminous walls forming passageways therebetween inclined relative to the radii of the rotor, said passageways being in communication with said centrally positioned chamber; a liquid container having liquid disposed to contact said walls; and means for passing a gas in said passageways, whereby the gas is caused to change directions in passing through said passageways into said centrally positioned chamber and out through the ends of said rotor.

CHARLES EDWARD CARRY.

15	90
20	95
25	100
30	105
35	110
40	115
45	120
50	125
55	130
60	135
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70	145
75	150