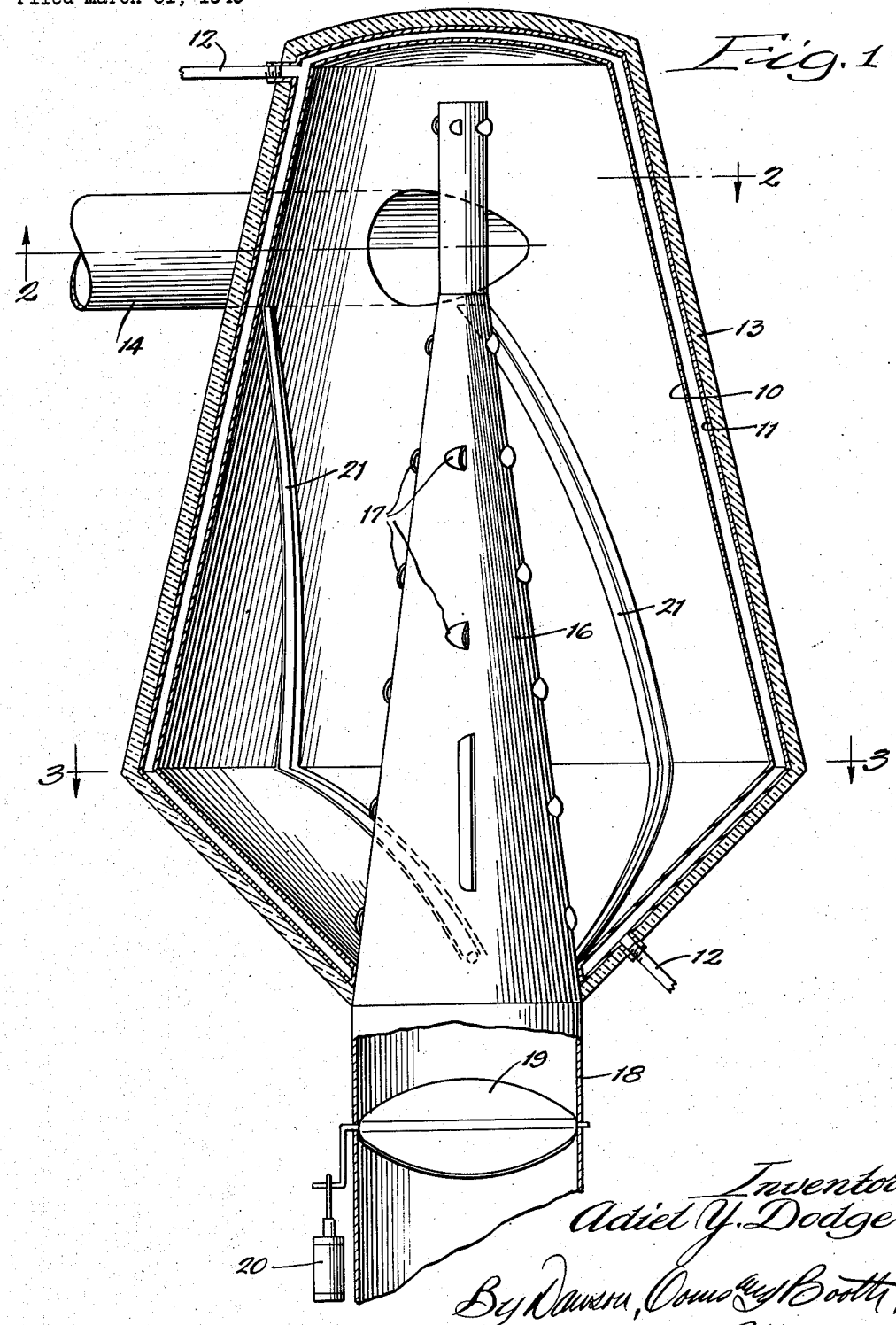
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AIR TREATING APPARATUS

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Fig. 1



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Fig. 2

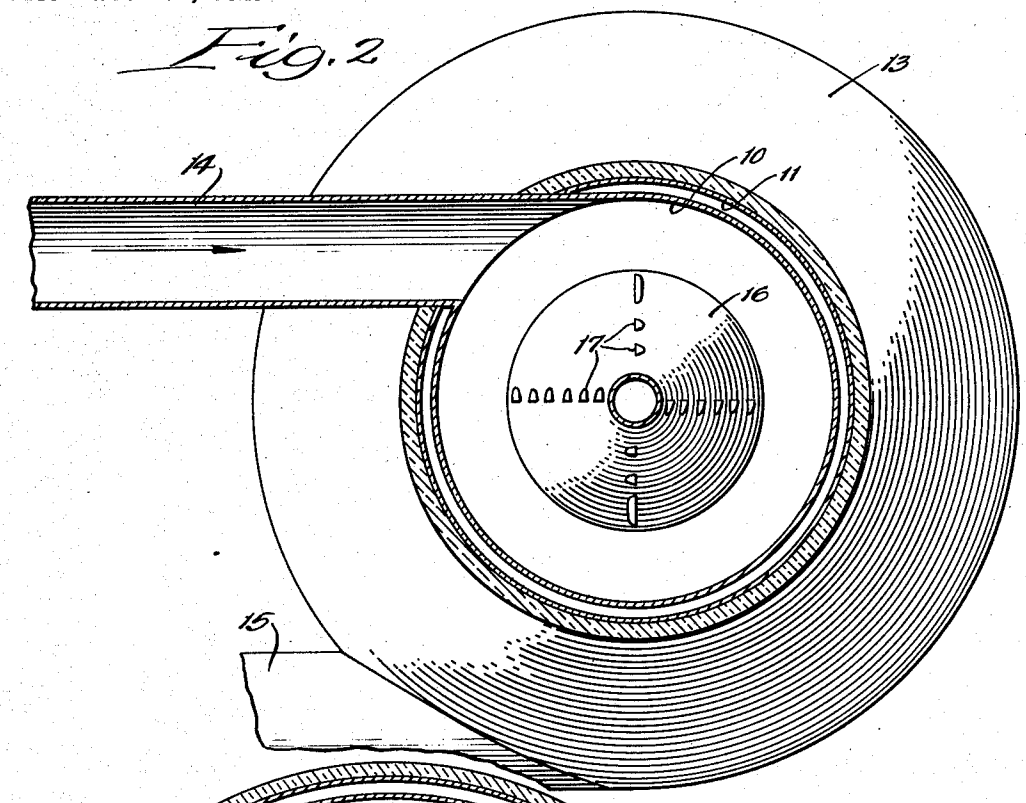
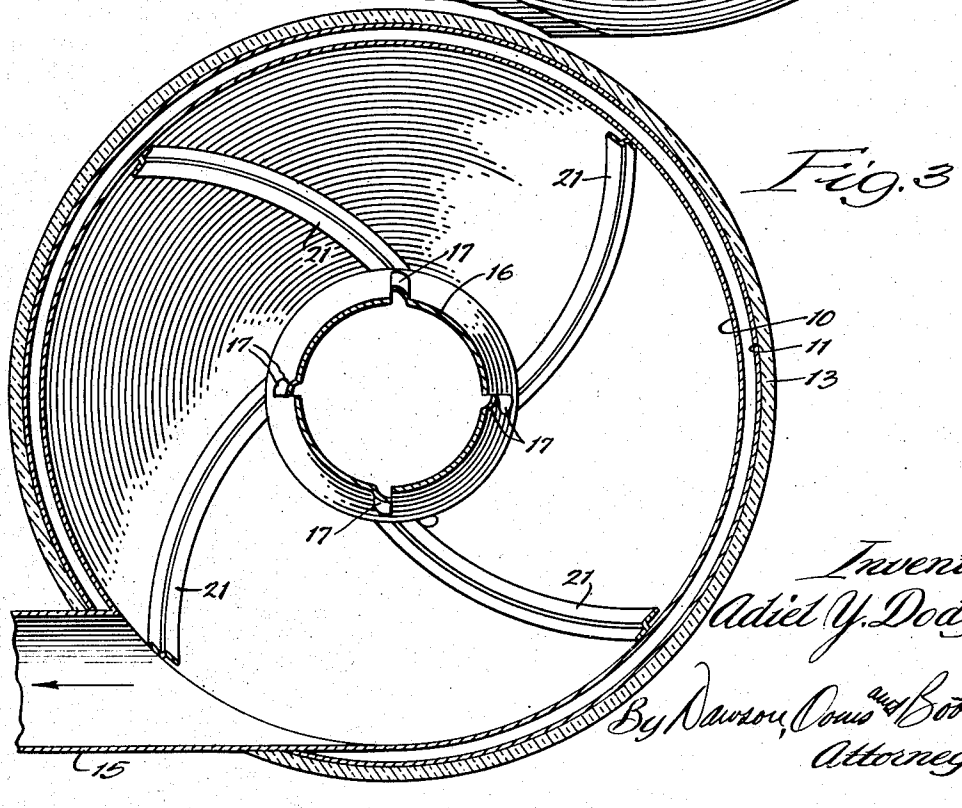


Fig. 3



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AIR TREATING APPARATUS

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Application March 31, 1945, Serial No. 585,866

4 Claims. (Cl. 183—32)

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This invention relates to air treating apparatus and more particularly to apparatus for dehumidifying air or like gases.

One of the objects of the invention is to provide air treating apparatus which will remove both wet or condensed vapors and dry vapors from the air.

Another object is to provide air treating apparatus in which the air is cooled and is dehumidified by removal of condensate and dry vapor thereform.

Still another object is to provide air treating apparatus which is capable of continuous operation without attention and without employing any movable parts other than adjustable control valves.

The above and other objects and advantages of the invention will be more readily apparent from the following description when read in connection with the accompanying drawings, in which—

Figure 1 is an axial section with parts in elevation of an apparatus embodying the invention;

Figure 2 is a section on the line 2—2 of Figure 1; and

Figure 3 is a section on the line 3—3 of Figure 1.

According to the present invention, air or like gases may be dehumidified by mechanical treatment to remove both condensate or other liquid particles and dry vapors therefrom. In treating air according to the invention, a current of air is caused to whirl in a substantially helical spiral path and may be cooled during the whirling operation. Condensate or other liquid particles carried by the air being considerably heavier than the air will be thrown outwardly and may be collected and conducted away separately from the air. Dry water vapor, having only about one-half of the density of dry air, will travel to the center portion of the spiral and may be withdrawn separately from the air, the air being removed adjacent the outer part of the spiral path. Under comparable atmospheric conditions at a temperature of about 100° C. and a pressure of 76 centimeters of mercury the density of dry air is about .00102 and of water vapor is about .000596 so that a relatively sharp separation can be obtained without requiring extremely high centrifugal velocities or long retention times.

The apparatus shown comprises a vertically elongated casing 10 of relatively small diameter at its top diverging to a portion of maximum diameter and then converging rapidly to its lower end. The casing is preferably covered by a

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jacket 11 through which cooling medium may be circulated by means of pipes 12 and is provided with an outer insulating covering 13. Air enters the casing through a tangential inlet pipe 14 at the top thereof and the dry air is discharged through the casing through a tangential outlet pipe 15 connected to the casing adjacent its maximum diameter portion.

Extending vertically into the bottom of the casing is a vapor outlet conduit 16 which tapers upwardly and is preferably open at its upper end. The conduit 16 is formed with a series of louvers 17 opening in the direction of air travel to scoop vapors into the conduit. The conduit connects with a pipe 18 controlled by a valve 19 which may be operated in any desired manner as by a solenoid 20 to regulate the amount of vapors withdrawn from the casing.

Condensate or liquid particles thrown out against the casing inner wall by centrifugal force will be collected in troughs 21 extending spirally downward along the casing wall and opening into the conduit 16 to deliver the condensate thereto.

In operation of the apparatus, air entering through the tangential inlet pipe 14 will be caused to whirl in the casing traveling toward the outlet in a substantially spiral path. The air will be cooled by contact with the casing walls to condense at least a part of the water vapor carried thereby and the condensate will be collected in the troughs 21 and will flow down through the troughs to discharge into the conduit 16. The lighter dry vapors which are not condensed by cooling of the air will travel to the center of the casing and will be scooped up by the louvers 17 to be discharged with the collected condensate through the conduit 16 and the discharge pipe 18. Therefore, the air flowing through the outlet pipe 15 will be substantially free of moisture either in the form of wet or dry vapor.

For normal operation the velocity of the incoming air should be at least 100 feet per second and may be as high as 500 feet per second. The actual rotational speed of the air in the casing may exceed the inlet velocity by a substantial amount inasmuch as the air is moving in a confined and forced vortex and the velocities developed will depend upon the difference between energy put in and energy taken out and energy absorbed in friction. In this way a substantial separation of the air and the lighter dry vapors can be effected at inlet velocities as low as 100 feet per second.

Thus, by the use of the present apparatus, air may be quickly and effectively dehumidified with-

out requiring that it be cooled to an extremely low temperature to condense the moisture carried thereby. While the invention has been specifically described in connection with dehumidification of air, it will be understood that it could be used equally well for the removal of water vapor or other liquid vapors from gases other than air and that the invention is not intended to be limited to the exact structure and operation defined nor otherwise than by the terms of the appended claims.

What is claimed is:

1. Air treating apparatus comprising a hollow casing of substantially circular section unobstructed in its interior adjacent its periphery, a tangential air inlet for the casing to cause air to whirl in a vortex therein, a tangential air outlet for the casing spaced from the air inlet, means to cool the casing to condense a portion of the moisture carried by the air, means adjacent the periphery of the casing to collect condensate thrown from the air by centrifugal force, and an outlet conduit for dry vapors extending axially through the casing substantially from end to end thereof and being perforated throughout its length.

2. Air treating apparatus comprising a vertically elongated casing of substantially circular horizontal section, a tangential air inlet adjacent the top of the casing, a tangential air outlet for the casing below the inlet, means to cool the casing to condense a portion of the moisture in the air, condensate collecting troughs on the inside of the casing, and a conduit extending vertically through the bottom of the casing to remove dry vapor, the condensate collecting troughs discharging into the conduit.

3. Air treating apparatus comprising a hollow casing of circular section tapering in diameter from one end toward the other, a tangential air inlet opening into the casing adjacent its smaller end, a tangential air outlet opening into the casing adjacent its larger end, condensate collecting troughs extending spirally along the inner wall of the casing to collect condensate thrown out by the air, and an outlet conduit for dry vapor extending axially into the casing and being perforated throughout its length, the condensate collecting troughs discharging into said outlet conduit.

4. The method of dehumidifying air containing water vapor which comprises causing the air to whirl in a confined space, separately drawing off condensate and a portion of the air substantially free from water vapor from the periphery of the space, and separately drawing off the remainder of the air and substantially all of the water vapor from the center of the space.

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