

Feb. 7, 1939.

F. J. HORVATH

2,146,071

AIR CONDITIONING APPARATUS

Filed Dec. 18, 1936

2 Sheets-Sheet 1

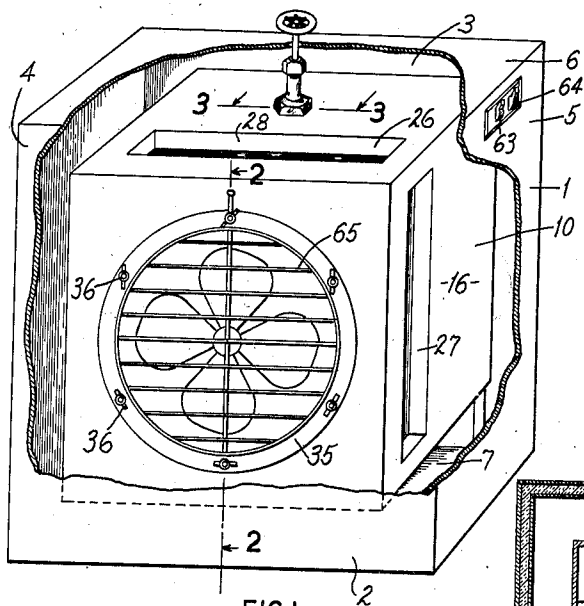


FIG. 1.

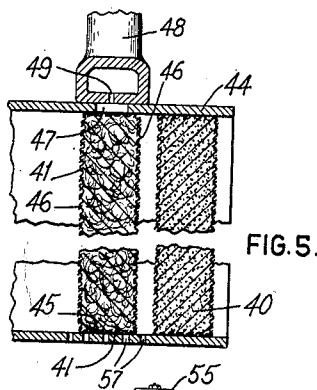


FIG. 5.

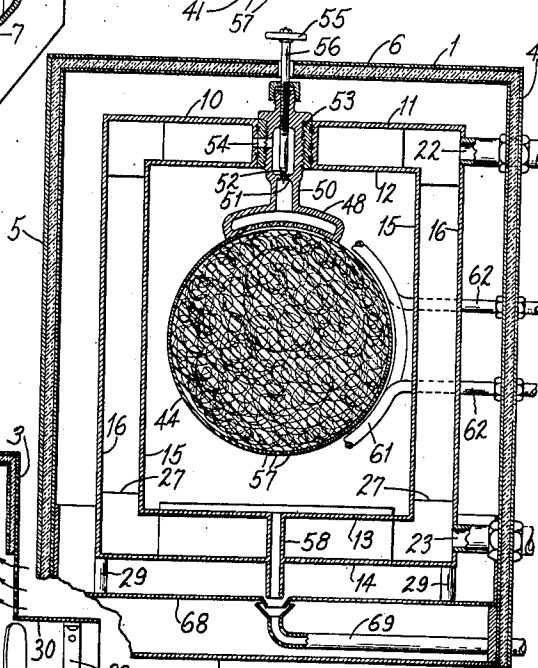


FIG. 3.

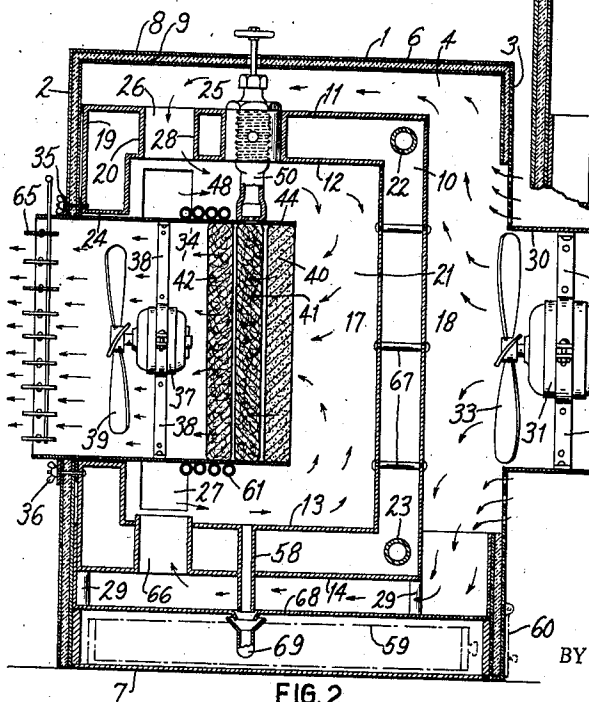


FIG. 2.

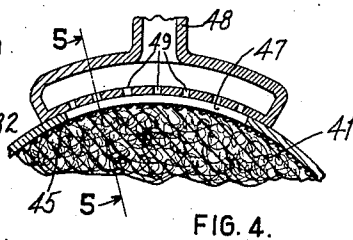


FIG. 4.

INVENTOR.
FRANK J. HORVATH
Glough and Canfield
ATTORNEY.

Feb. 7, 1939.

F. J. HORVATH
AIR CONDITIONING APPARATUS

2,146,071

Filed Dec. 18, 1936

2 Sheets-Sheet 2

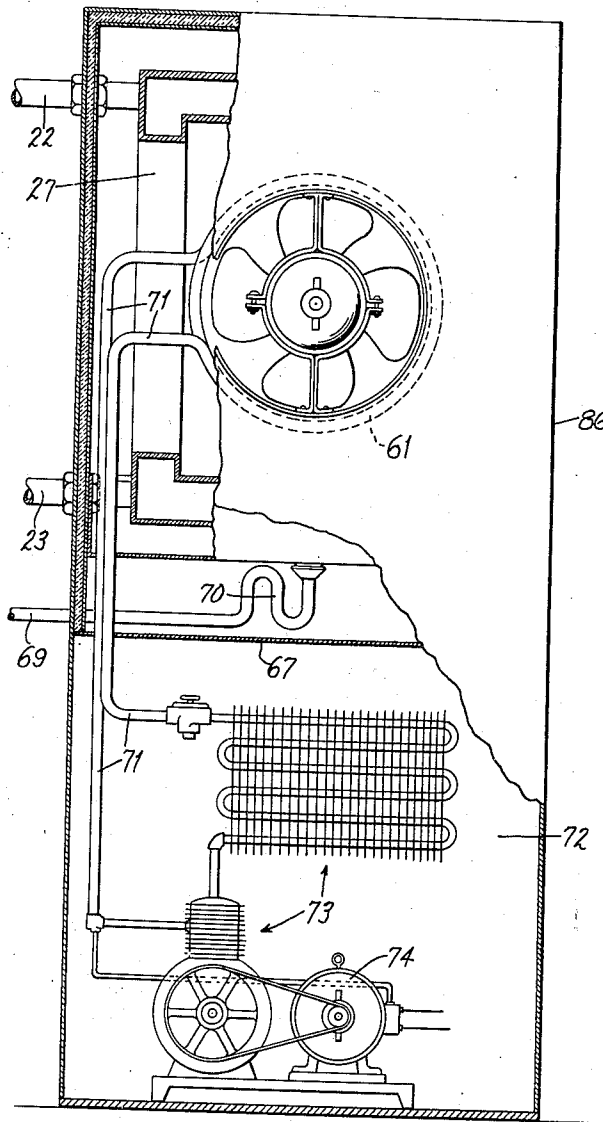


FIG. 6.

INVENTOR.
FRANK J. HORVATH
BY *Slough and Canfield*
ATTORNEY.

UNITED STATES PATENT OFFICE

2,146,071

AIR CONDITIONING APPARATUS

Frank J. Horvath, Cleveland, Ohio

Application December 18, 1936, Serial No. 116,579

19 Claims. (Cl. 261—9)

This invention relates to apparatus for conditioning the air in buildings to render it more suitable for breathing by the occupants thereof.

While my invention may be applied to the centralized distributing type of air conditioning apparatus, it has particular advantages when applied to apparatus of the unit type or room type and will be described herein as applied to that use.

An object of the invention is to provide generally an improved air conditioning apparatus.

Other objects of the invention are to provide: Improved means for changing the temperature of air passed therethrough;

An improved heat exchange apparatus; Improved means for changing the humidity of air passed therethrough;

Improved means for cleaning and purifying air passed therethrough;

Another object of the invention is to provide an improved construction of air conditioning apparatus comprising means entirely enclosed in a cabinet for forcing air to flow therethrough and for changing the temperature and the humidity of the air and for cleaning and purifying it during its passage therethrough.

Other objects will be apparent to those skilled in the art to which my invention appertains.

My invention is fully disclosed in the following description taken in connection with the accompanying drawings in which:

Fig. 1 is a perspective view with parts broken away for clearness illustrating an embodiment of my invention;

Fig. 2 is a longitudinal vertical sectional view taken approximately from the plane 2—2 of Fig. 1;

Fig. 3 is a transverse sectional view taken approximately from the plane 3—3 of Fig. 1;

Fig. 4 is a fragmentary view to a magnified scale of a part of Fig. 3;

Fig. 5 is a sectional view taken from the plane 5—5 of Fig. 4;

Fig. 6 is a view illustrating in elevation a modified form of my invention.

Referring to the drawings, I have shown generally at 1 an enclosing housing within which the other parts of the embodiment of my invention are enclosed. The housing preferably comprises front and rear walls 2 and 3, side walls 4 and 5, a top wall 6 and a bottom wall 7.

The walls just referred to with the exception of the wall 7, are heat insulated and preferably comprise an outer covering 8 of sheet metal lined with heat insulating material 9.

A heat exchange vessel 10 is supported within

the housing 1 preferably spaced therefrom at all points except at the front whereat it engages the front wall 2. The vessel 10 is of generally hollow rectangular box-form. It has double spaced upper walls 11 and 12, bottom walls 13 and 14, opposite pairs of side walls 15 and 16, rear walls 17 and 18 and front walls 19 and 20. A chamber is thus provided enclosing a space 21 therewithin. Conduit connections 22 and 23 are provided projected through one of the outer walls such for example, as the wall 4, (although they may be similarly projected through other walls) and communicating with the interior of the said chamber whereby water, steam or the like may be circulated through the chamber for purposes to be described.

The front walls 19 and 20 of the vessel 10 have a large opening 24 therethrough preferably circular in form; the top walls 11 and 12 have a circular opening 25 therethrough; the top walls 11 and 12, forwardly of the opening 25 have also an elongated slot-form walled passageway 26 therethrough; and the bottom walls 13 and 14, and the opposite pairs of side walls 15 and 16, have like passageways 27—27 and 28 respectively therethrough. Slot-form passages may likewise be provided through the front wall although this has not been illustrated as being deemed an obvious modification.

The two spaced walls, in each case, where the passageways go therethrough, are sealed off by side walls of the passageways such as that shown at 29 for the passageway 26 in Fig. 2 whereby, although such passageways extend entirely through the double wall of the chamber, the chamber is rendered liquid-tight and is preferably pressure-tight. The vessel walls may be reinforced by stay bolts 31—31.

In the lower part of the casing is a transverse wall or false bottom 32 spaced from the under side of the vessel 10 and from the casing bottom wall 7.

Legs 33—33 support the vessel 10 resting on the wall 32. Preferably the forward outer wall 20 of the vessel 10 is substantially sealed air-tight upon the inner surface of the outer casing wall 2 for a purpose that will become clear.

The rear wall 3 of the outer housing has a large opening 34 centrally thereof and a fan motor 35 is supported in the opening upon brackets 36—36 extending from the motor frame to the casing wall and a fan 37 supported and driven by the motor draws air through the opening 34 and discharges it into the housing 1.

A generally tubular walled chamber 38 prefer-

ably of cylindrical cross-section is projected inwardly into the space 21 enclosed by the vessel 10 filling the perforation 24 in the front wall of the casing and is supported within the space 21 spaced at all points from the inner walls of the vessel 10. Preferably the supporting means comprises a flange 35 on an outer end portion of the chamber wall detachably secured to the outer surface of the front casing wall 2 by a plurality of wing nuts 36—36 threaded on studs that are secured to the front wall 2 and project outwardly through perforations in the flange 35.

Within the chamber 34, a motor 37 is supported, preferably co-axially thereof, by brackets 38—38 extending therefrom and secured to the wall of the chamber 34 and the motor drives a fan 39.

At or near the rear or inner end of the chamber 34, is a plurality such for example as three, air treating devices 40, 41 and 42, telescoped into the rearward end of the wall 44 of the chamber 34.

The devices 40 to 42 may be variously constructed. Preferably they are in the form of hollow discs of woven wire fabric. A fragment of the disc 41 is illustrated in Figs. 4 and 5 and as shown there comprises a peripheral portion of wire fabric 45 and longitudinally spaced circular walls 46—46. When the disc is constructed in this manner, the hollow space therewithin is filled with suitable material to perform the functions hereinafter referred to.

In the preferred practice, the disc 40 is filled with activated carbon in crystal or granular form and the discs 41 and 42 are filled with glass wool, that of the disc 41 being preferably more crystalline and rougher in texture than that of the disc 42. As will be apparent therefore all of the discs are porous and will permit air to flow there-through.

Means is provided to supply water to the upper edge of some of the discs, for example to the disc 41, when desired for a purpose to be described. To this end, the wall 44 has an arcuate perforation 47 therein on the upper side thereof and a hollow head 48 is fitted thereover and thereupon being provided with a plurality of spray orifices 49—49. The hollow head 48 is connected to a shank 50 having a needle valve seat 51 therein controlled by a needle valve 52. The shank 50 above the valve seat is threaded into a bushing 53 sealed in perforations in the upper walls 11 and 12 of the said vessel 10. Aligned perforations at 54 in the shank 50 and bushing 53 effect communication with the interior of the head 48 and the interior of the vessel controlled by the needle valve 52 which may be turned by a handle 55 exteriorly of the housing 1, the stem 56 connecting the handle to the valve passing through a perforation in the upper wall 6 of the outer housing 1.

By this means a controlled amount of water may flow from the vessel 10 to the spray orifices 49 and the water will be supplied to the upper edge portion of the disc 41 and will flow downwardly therethrough by gravity wetting the same; and as will be understood this water supply may be cut off entirely by turning the handle 55 if desired.

In the general operation of the apparatus above described, air is forcibly blown into the casing 1 by the fan 33 and first impinges upon the vessel wall 13 and then flows thereover and over the walls 16, 11 and 14, flowing toward the front of the housing 1; and thence it flows inwardly through the slots 26 and 27—27 and 66, and then flows rearwardly over the inner surface of

the vessel over the walls 12, 13 and 15—15 to the inner end wall 17 of the vessel and over it and into the chamber 34; and thence flows through the discs 40 to 42 inclusive and out at the forward open end of the chamber 34, the flow being aided and increased by the fan 39. The fan 33 may be considered as forcing air into the system under pressure and the fan 39 as drawing it out of the system and expelling it out of the chamber 34, so that a free flow of air passes through the apparatus despite the resistance of the tortuous path which it takes. The chamber 34 thus functions as an air conduit or passageway.

In this connection it will be observed, of course, that either fan alone will cause a flow of air through the apparatus and that if a fan sufficiently large and powerful were utilized, one fan would be sufficient but I have found that by employing two fans, the same rate of air flow may be produced with a much smaller and more compact apparatus than if a single fan were used.

When the apparatus is to be used in hot weather to cool and de-humidify the air, cold water such as that in the usual water service system of the building will be supplied to the vessel 10 through the conduit connection 22 and will circulate through the vessel 10; and the air flowing thereover will be chilled and will be discharged out of the chamber 34 into the room to be cooled. If the water supply is cut off at the valve 52, the particles of moisture in the air flowing through the discs 41 and 42 will be caught therein and, accumulating in these discs, will drain out downwardly through the discs and will collect in the lower part of the chamber 34 and to discharge it therefrom as it accumulates, I prefer to provide a plurality of perforations 57—57 in the lower part of the wall 44 of the chamber 34 through which the water will flow into the lower part of the vessel 10, and at this point I preferably provide a drain pipe 58 extending through the walls 13 and 14 and discharging into the funneled end of a waste pipe 69 by which the dehydrating water may be carried off.

If preferred, instead of draining off the water through the pipe 69, the pipe 69 may be omitted and the water allowed to drain directly into a pan shown at 59 in dotted lines in Fig. 3 which may, from time to time, be removed through a door 60 shown in dotted lines and emptied.

It will be observed that the vessel 10 is generally of bowl form and functions as a heat transfer means, heat flowing out of the air in through the walls thereof and into the water therein; and that for a given total value of the heat transfer means, the area exposed to the air flowing thereover is enormous.

As indicated above, the air is first projected against the back wall 18 and flows radially outwardly thereover into the space between the chamber and the casing walls and is caused to turn at a right angle and to flow with great convection over the walls 11, 14 and 16—16; and then is forced to turn through 180 to flow through the slots 26 and 27—27 and 66 and thence between the wall 44 and the inner walls 12, 13 and 15—15 and in close contact therewith and with high convection and finally is forced to flow over the rear inner wall 17, being again turned at a right angle when it reaches this wall. Thus, the temperature of the incoming air is reduced with a high degree of efficiency of thermal transfer in a relatively small space and with relatively simple parts and with a high degree of convection.

As the air passes through the disc 40, impuri-

ties of a gaseous nature are removed by the well known absorption process. Particles of dirt, dust, etc., are also removed by the discs 40 to 42 inclusive, the discs 41 and 42 inclusive performing the additional above mentioned function of de-hydrating the air.

To hydrate the air, it is only necessary to open the valve 52—51 to supply moisture to the disc 41.

If the apparatus is to be used in cold weather, then steam or hot water would be supplied through the conduit 22 to the vessel 10 and the air flowing thereover as above described would be heated, and the air may be de-hydrated as above described by flowing through the discs 41 and 42 or it may be hydrated by opening the valve 51—52 to allow water to flow into the head 48 or to allow steam to flow into the head 48 and condense therein, and flow through the orifices 49—49 as liquid into the disc 41. In this connection, the air flowing over the exposed portion of the head 48 and shank 50 in a constantly renewed stream will be sufficient to condense the steam into water for this purpose.

From time to time, it may be necessary or desirable to renew the discs 40 to 42 and for this purpose, the inner chamber 34 may be entirely removed, being withdrawn outwardly through the front of the apparatus after removing the wing nuts 36—36 and the discs may then be withdrawn from the end of the wall 44 and renewed. To this end, the discs may be easily made to fit in the enclosing wall 44 being slightly compressible by the structure thereof above described and maintaining their position within the wall by the friction caused by their tendency to expand.

To supplement the cooling action of the cold water flowing through the vessel 10, or in substitution therefor, a refrigerating pipe 61 may be coiled into a helix co-axial with the chamber wall 44 and therefore surrounding the same and may be supplied with refrigerant through communicating conduits 62—62.

Moisture which condenses out of the air flowing through the tortuous path above described upon contact thereof with the cold walls of the vessel 10 may flow downwardly thereover and be discharged through the pipe 58 as above described.

To insure that water, collecting in the lower part of the vessel 10 on the wall 13, will flow out at the drain 58 and not through the passageway 66, the inner end of the passageway walls may project above the wall 13.

The electric motors may be supplied with current from the usual house wiring system and may be therefore individually controlled by switches 63 and 64, Fig. 1, disposed on the outside of the outer housing 1, and connected to the motors by any suitable wiring system.

The air passages from the fan 33 and around the vessel 10 and through the passages 27, etc., into the space 21 are preferably provided so that the pressure in the space 21 will be at least atmospheric pressure to prevent back flow from the fan 39 and to insure a free flow of air through the apparatus.

The open end of the chamber 34 out of which the air discharges may be provided with shutters 65 of any suitable or known construction, or it may be covered with a coarse wire mesh, the shutters when employed being preferably adjustable to direct the blast of air as desired, these parts not being essential to the present invention.

In the above described embodiment of my invention, the conduits 62—62 leading to the coil 61 will pass outwardly through the vessel 11 through one of the side slot-form passages 27 and thence exteriorly of the cabinet or housing 1 and it is contemplated that they will be supplied with refrigerant from a central refrigerating plant corresponding to the central plant which supplies fluid to the conduits 22 and 23.

In some instances it may be desired to supply the refrigerant from a local plant associated with the cabinet and in such cases, the form illustrated in Fig. 6 may be employed. In this form, a housing or cabinet 86 is provided having therein a transverse floor 67 which corresponds to the floor or bottom wall 7 of the above described form. The parts above the floor 67 may be the same as those in the form just described but as showing a possible alternative arrangement, the conduits 22 and 23 and the drain pipe 69 lead outwardly through the left wall instead of through the right wall as described above; and the drain pipe 69 may have a trap 70 therein.

The refrigerating coil 61 is supplied with refrigerant through a pair of conduits 71—71 which lead outwardly laterally through one of the side slot-form passages 27 and thence downwardly through the wall 67 into a lower compartment 72. Here the conduits are connected to a refrigerating unit shown generally at 73 in a somewhat diagrammatic showing driven by an electric motor 74.

The usual or any suitable regulating means not shown may be provided to maintain the coil 61 at some predetermined temperature.

My invention is not limited to the exact details of construction illustrated and described. Changes and modifications may be made therein and my invention comprehends all such modifications and changes that come within the scope of the appended claims.

I claim:

1. In an air conditioning apparatus, an outer walled enclosing casing, an open mouth bowl formed vessel having spaced apart double walls supported in the casing with the vessel sides and bottom spaced from the casing walls, a tubular air conduit projected through a perforation in the casing wall and into the vessel mouth, and substantially air sealed with respect to the casing perforation and with its inner end disposed adjacent the vessel bottom, a sealed air passage through the double side walls of the vessel adjacent its mouth, an air flow entrance through the casing wall opposite a bottom portion of the vessel and air blower means to force air through the air conduits and through the casing and around and over the vessel outer walls.

2. The apparatus described in claim 1 and in which the blower means comprises a blower disposed adjacent the casing perforation.

3. The apparatus described in claim 1 and in which the blower comprises a blower disposed in the tubular air conduit.

4. The apparatus described in claim 1 and in which the blower means comprises a blower disposed adjacent the casing perforation and a blower disposed in the tubular air conduit.

5. In an air conditioning apparatus, a casing having an opening in a wall thereof, a tubular passageway telescoped into the casing through the opening and detachably mounted therein by securing means on the tubular passageway wall and engaged with the casing adjacent the periph-

ery of the opening, means for forcing air into and through the casing and into the inner end of the passageway and out of the casing at the other end of the passageway, a hollow disc of perforated material, telescopably press-fitted into the tubular passageway and readily removable therefrom and containing air pervious hygroscopic material, a perforation in an upper wall portion of the tubular casing, conduit means disposed over the perforation adapted to discharge water into the upper edge of the disc and means to supply water to the conduit means, valve means to regulate the rate of supply and to entirely shut it off, a perforation in a lower portion of the tubular housing for drawing off water from the lower side of the disc.

6. In an air conditioning apparatus, a casing, a vessel form element supported in the casing spaced therefrom at the vessel bottom and sides, the vessel having double walls providing a sealed fluid chamber therein, conduit connections to the vessel for circulating fluid through the chamber, a sealed air passageway through the side walls of the vessel, a tubular air chamber projected inwardly through the casing wall and into the vessel mouth and substantially sealed to the casing, and the inner end portion of the air chamber being spaced from the bottom of the vessel, an air entrance opening in the casing wall opposite the vessel bottom, an air blower arranged to cause air to flow in at the entrance, over the vessel bottom and over the vessel outer side wall toward its mouth, through the air passageway into the vessel, over the vessel inner side wall to and over the inner bottom wall of the vessel and thence out through the tubular air chamber, and a plurality of hollow discs aligned with the tubular chamber comprising spaced perforated walls and containing air pervious air conditioning material.

7. In an air conditioning apparatus, an outer walled enclosing casing, an open mouthed bowl-form vessel having spaced apart double walls supported in the casing with the vessel sides and the bottom spaced from the casing walls, a tubular air conduit projected through a perforation in the casing wall and into the vessel mouth and substantially air sealed with respect to the casing perforation and with its inner end disposed adjacent the vessel bottom, a sealed air passage through the double side walls of the vessel adjacent to its mouth, an air flow entrance through the casing wall opposite a bottom portion of the vessel, air blower means to force air through the air conduit and through the casing and around and over the vessel outer walls, conduit means to conduct liquid to the space between the vessel wall and to circulate it therethrough and conduct it therefrom, an air pervious hygroscopic element supported in the said air flow path and conduit means to conduct liquid from the vessel to and upon the said element.

8. In an air conditioning apparatus, a vessel generally of bowl-form comprising outer and inner bottom walls, and outer and inner side walls, the walls being sealedly joined together and providing a chamber therewithin, liquid circulating conduit means communicating with the chamber by which liquid may be continuously discharged into, circulated through and conducted from the chamber, a casing substantially enclosing the chamber and comprising casing walls spaced from the outer vessel walls, the casing having a perforation in a wall thereof and opposite the bowl outer bottom wall, and air conduit peripherally

sealed with the casing wall and projecting into the concavity of the bowl, the parts being arranged to provide an air flow passageway including the air conduit itself and the space between the casing and the bowl outer walls and the space between the bowl inner walls and the air conduit projected thereinto, and including said perforation in the casing wall, and a blower for blowing air through said air flow passageway and in heat transferring contact with the bowl walls.

9. In an air conditioning apparatus, a vessel generally of bowl-form comprising outer and inner bottom walls, outer and inner side walls, the walls being sealedly joined together and providing a chamber therewithin, liquid circulating conduit means communicating with the chamber by which liquid may be continuously discharged into, circulated through and conducted from the chamber, a casing substantially enclosing the chamber and comprising casing walls spaced from the outer vessel walls, the casing having a perforation in a wall thereof and opposite the bowl outer bottom wall, an air conduit peripherally sealed with the casing wall and projecting into the concavity of the bowl, the parts being arranged to provide an air flow passageway including the air conduit itself and the space between the casing and the bowl outer walls and the space between the bowl inner walls and the air conduit projected thereinto, and including said perforation in the casing wall, and a blower for blowing air through said air flow passageway and in heat transferring contact with the bowl walls, and a hygroscopic element supported in the said air flow passageway and conduit means to conduct liquid out of the chamber to and upon the hygroscopic element.

10. In an air conditioning apparatus, a vessel generally of bowl-form comprising outer and inner bottom walls, outer and inner side walls, the walls being sealedly joined together and providing a chamber therewithin, liquid circulating conduit means communicating with the chamber by which liquid may be continuously discharged into, circulated through and conducted from the chamber, a casing substantially enclosing the chamber and comprising casing walls spaced from the outer vessel walls, the casing having a perforation in a wall thereof and opposite the bowl outer bottom wall, an air conduit peripherally sealed with the casing wall and projecting into the concavity of the bowl, the parts being arranged to provide an air flow passageway including the air conduit itself and the space between the casing and the bowl outer walls and the space between the bowl inner walls and the air conduit projected thereinto, and including said perforation in the casing wall, and a blower for blowing air through said air flow passageway and in heat transferring contact with the bowl walls, and a hygroscopic element supported in alignment with the said air conduit and within the bowl concavity, and conduit means to conduct liquid out of the chamber and to and upon the hygroscopic element.

11. In an air conditioning apparatus, a vessel generally of bowl-form comprising outer and inner bottom walls, outer and inner side walls, the walls being sealedly joined together and providing a chamber therewithin, liquid circulating conduit means communicating with the chamber by which liquid may be continuously discharged into, circulated through and conducted from the chamber, a casing substantially enclosing the chamber and comprising casing walls spaced from the

outer vessel walls, the casing having a perforation in a wall thereof and opposite the bowl outer bottom wall, an air conduit peripherally sealed with the casing wall and projecting into the concavity of the bowl, the parts being arranged to provide an air flow passageway including the air conduit itself and the space between the casing and the bowl outer walls and the space between the bowl inner walls and the air conduit projected thereinto, and including said perforation in the casing wall, and a blower for blowing air through said air flow passageway and in heat transferring contact with the bowl walls, conduit means in the said air flow passageway in heat transferring relation to the air flowing therein and adapted to have an air temperature changing medium circulated therethrough.

12. In an air conditioning apparatus, a vessel generally of bowl-form comprising outer and inner bottom walls, outer and inner side walls, the walls being sealedly joined together and providing a chamber therewithin, liquid circulating conduit means communicating with the chamber by which liquid may be continuously discharged into, circulated through and conducted from the chamber, a casing substantially enclosing the chamber and comprising casing walls spaced from the outer vessel walls, the casing having a perforation in a wall thereof and opposite the bowl outer bottom wall, an air conduit peripherally sealed with the casing wall and projecting into the concavity of the bowl, the parts being arranged to provide an air flow passageway including the air conduit itself and the space between the casing and the bowl outer walls and the space between the bowl inner walls and the air conduit projected thereinto, and including said perforation in the casing wall, and a blower for blowing air through said air flow passageway and in heat transferring contact with the bowl walls, and conduit means in heat transferring relation to the wall of the said air conduit adapted to have a temperature changing medium circulated there-through.

13. The apparatus described in claim 8 and in which the said air conduit is projected through a perforation in the casing wall and is detachably secured to the casing wall in substantially sealed relation thereto.

14. The apparatus described in claim 8 and in which the air conduit is projected through a perforation in the casing wall and is substantially air sealed with respect to the perforation and the blower is motor driven and is supported in the said air conduit.

15. In an air conditioning apparatus, a vessel generally of bowl form comprising outer and inner bottom walls, and outer and inner side walls, the walls being sealedly joined together and providing a chamber therewithin, the chamber being adapted to be substantially filled with liquid, a casing substantially enclosing the chamber and comprising casing walls spaced from the outer vessel walls, the casing having a perforation in a wall thereof, opposite the bowl outer bottom wall, an air conduit projecting into the concavity of the bowl, the parts being arranged to provide an air-flow passageway including the air conduit itself and the space between the casing and the bowl outer wall and the space between the bowl inner wall and the air conduit projected thereinto, and including said perforation in the casing wall, a blower for blowing air through the said air flow passageway in heat transferring contact with the bowl walls and effecting heat transfer between

liquid in the chamber and the air, and means to maintain liquid in the chamber at a temperature different from that of the air entering the casing.

16. In an air conditioning apparatus, a vessel generally of bowl form comprising outer and inner bottom walls, and outer and inner side walls, the walls being sealedly joined together and providing a chamber therewithin, the chamber being adapted to be substantially filled with liquid, a casing substantially enclosing the chamber and comprising casing walls spaced from the outer vessel walls, the casing having a perforation in the wall thereof, opposite the bowl outer bottom wall, an air conduit projecting into the concavity of the bowl, the parts being arranged to provide an airflow passageway including the air conduit itself and the space between the casing and the bowl outer wall and the space between the bowl inner wall and the air conduit projected thereinto, and including said perforation in the casing wall, and a blower for blowing air through the airflow passageway in heat transferring contact with the bowl walls, a hygroscopic element supported in the airflow passageway, and conduit means to supply liquid to the hygroscopic element.

17. In an air conditioning apparatus, a vessel generally of bowl form comprising outer and inner bottom walls, and outer and inner side walls, the walls being sealedly joined together and providing a chamber therewithin, the chamber being adapted to be substantially filled with liquid, a casing substantially enclosing the chamber comprising casing walls spaced from the outer vessel walls, the casing having a perforation in a wall thereof, opposite the bowl outer bottom wall, an air conduit peripherally sealed with the casing wall and projecting into the concavity of the bowl, the parts being arranged to provide an airflow passageway including the air conduit itself and the space between the casing and the bowl outer wall and the space between the bowl inner wall and the air conduit projected thereinto, and including said perforation in the casing wall, a blower for blowing air through said airflow passageway in heat transferring contact with the bowl wall, and effecting heat transfer between liquid in the chamber and the air, means to maintain liquid in the chamber at a different temperature from that of the air entering the casing, conduit means in the said airflow passageway in heat transferring relations to the air flowing therein and adapted to have an air temperature changing medium circulating therethrough.

18. In an air conditioning apparatus, a hollow vessel generally of disc form, comprising spaced walls and sealedly joined together at their peripheries and providing a chamber therewithin, the chamber being adapted to be substantially filled with liquid, a casing substantially enclosing the chamber comprising casing walls spaced from the vessel walls and from the periphery thereof, the casing having openings in walls thereof opposite the central portions of the said vessel walls, the parts being arranged to provide an airflow passageway including the openings and the space between the casing and the vessel walls and the space between the casing and the peripheries of the disc, a blower for blowing air through said airflow passageway in heat transferring contact with the vessel wall and effecting heat transfer between liquid in the chamber and the air, and means to maintain liquid in the chamber at a different temperature from that of the air entering the casing.

19. In an air conditioning apparatus, a hollow

- vessel generally of disc form, comprising spaced walls and sealedly joined together at their peripheries and providing a chamber therewithin, the chamber being adapted to be substantially
- 5 filled with liquid, a casing substantially enclosing the chamber comprising casing walls spaced from the vessel walls and from the periphery thereof, the casing having openings in walls thereof opposite the central portions of the said vessel walls,
- 10 the parts being arranged to provide an airflow passageway including the openings and the space

between the casing and the vessel walls and the space between the casing and the peripheries of the disc, a blower for blowing air through said airflow passageway in heat transferring contact with the vessel wall and effecting heat transfer 5 between liquid in the chamber and the air, and conduit means for supplying liquid to the interior of the vessel to circulate it therethrough and conduct it therefrom.

FRANK J. HORVATH. 10