June 11, 1940. C. B. COOK 2,204,012

AIR CONDITIONING APPARATUS

Filed Jan. 20, 1939 3 Sheets-Sheet 1

Fig. 1

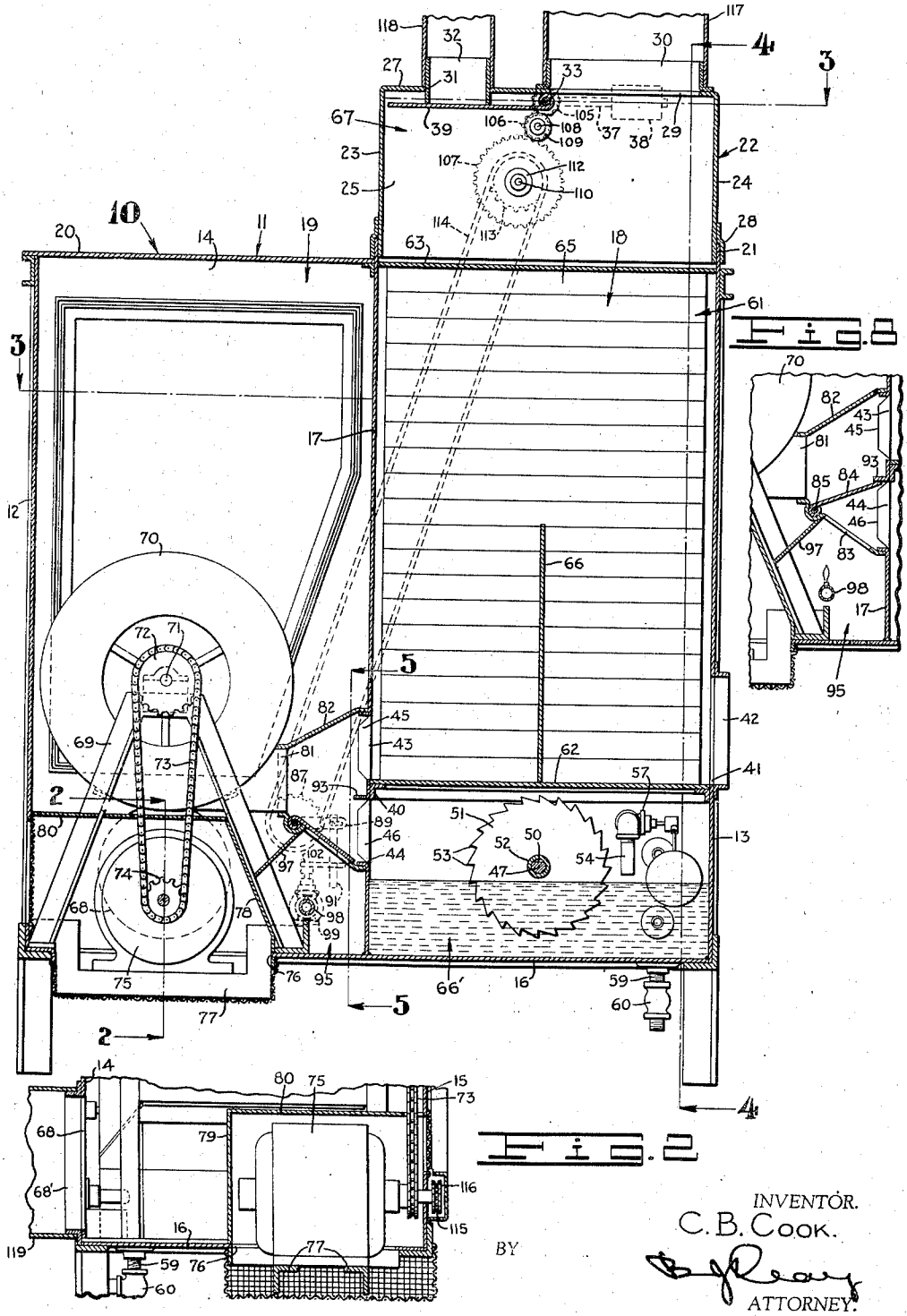


Fig. 8

Fig. 2

INVENTOR.
C. B. COOK.
BY
ATTORNEY.

June 11, 1940. C. B. COOK 2,204,012

AIR CONDITIONING APPARATUS

Filed Jan. 20, 1939 3 Sheets-Sheet 2

FIG. 3

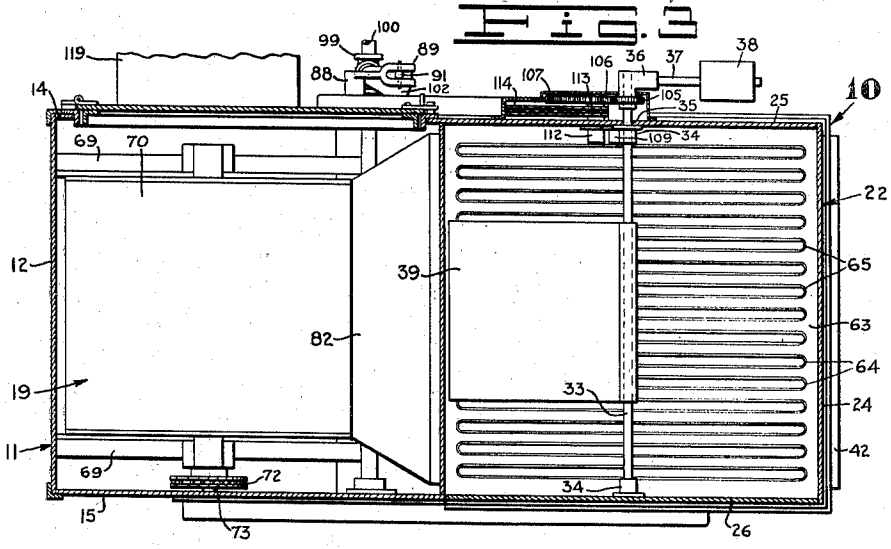


FIG. 4

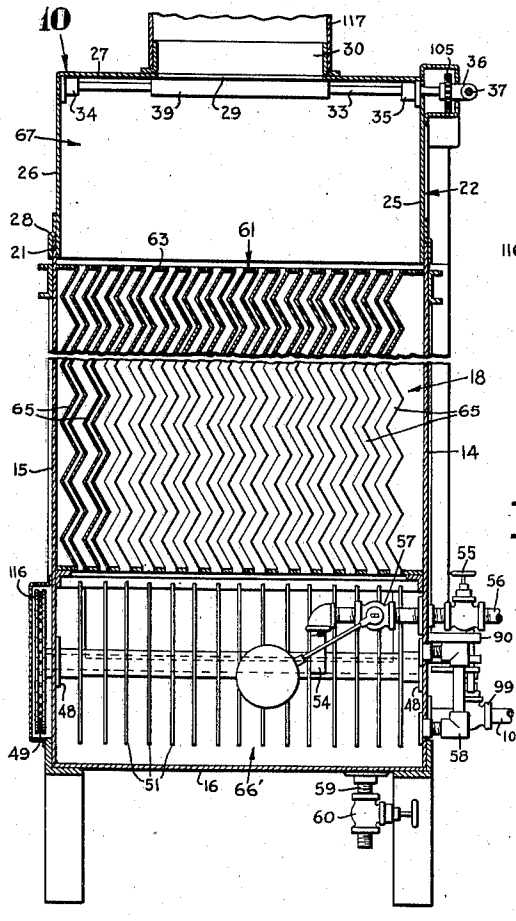


FIG. 5

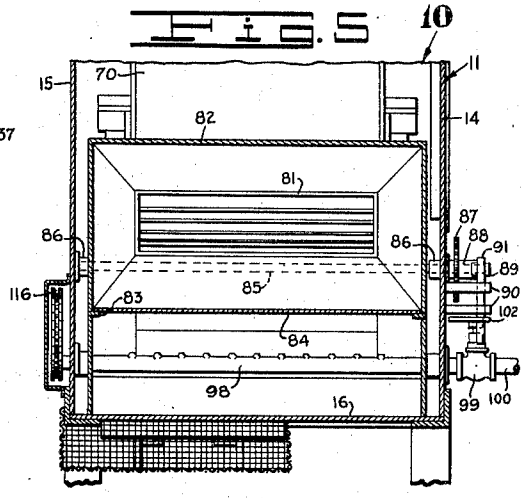


FIG. 6

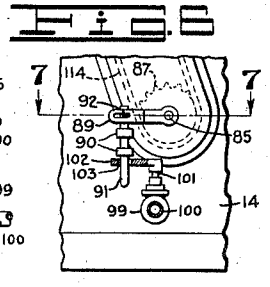
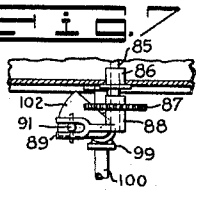


FIG. 7



INVENTOR.
C. B. COOK.
BY
ATTORNEY.

June 11, 1940. C. B. COOK 2,204,012

AIR CONDITIONING APPARATUS

Filed Jan. 20, 1939 3 Sheets-Sheet 3

FIG. 9

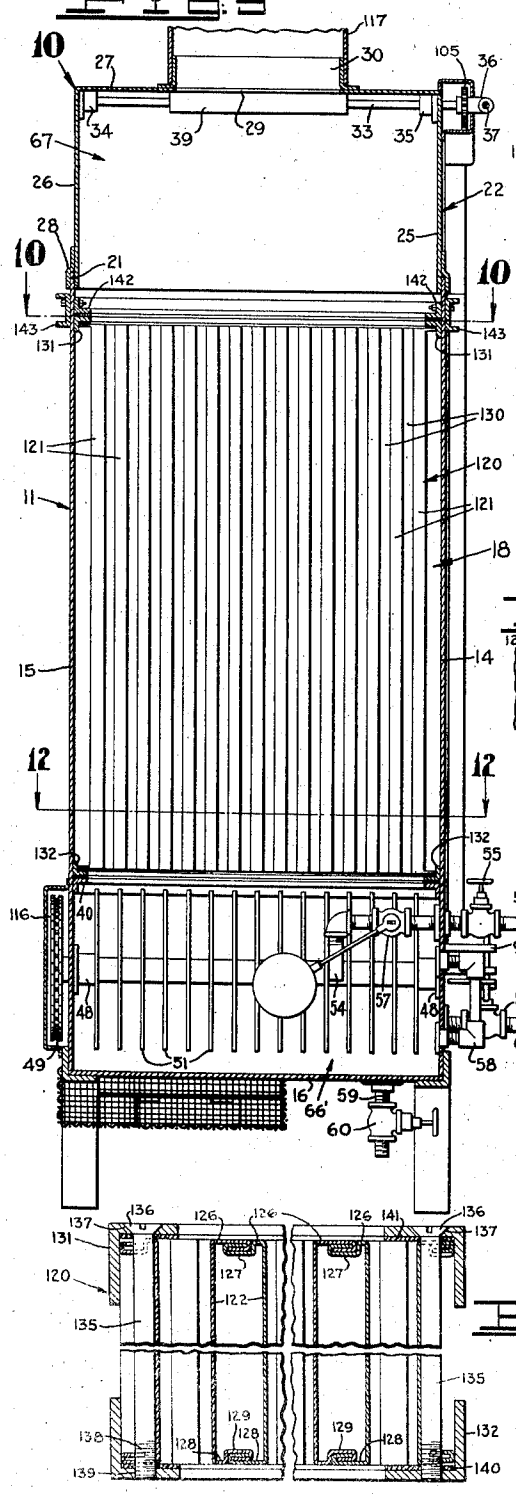


FIG. 10

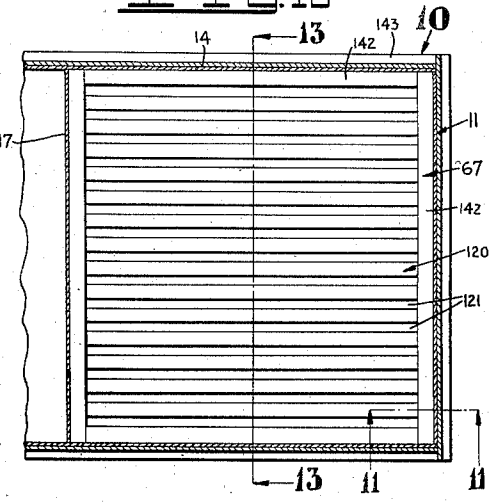


FIG. 11

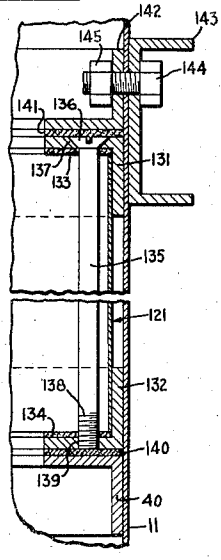


FIG. 12

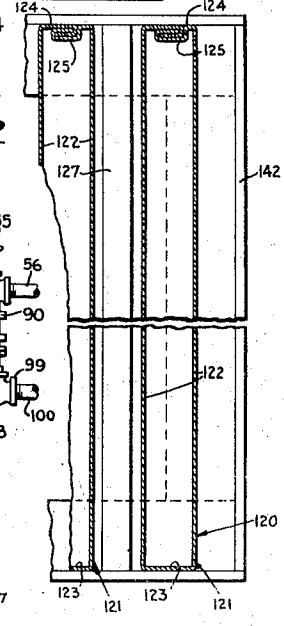


FIG. 13

INVENTOR.
C. B. COOK.
BY
ATTORNEY.

Patented June 11, 1940

2,204,012

UNITED STATES PATENT OFFICE

2,204,012

AIR CONDITIONING APPARATUS

Charles B. Cook, Los Angeles, Calif.

Application January 20, 1939, Serial No. 251,965

6 Claims. (Cl. 62—139)

This invention relates to improvements in air conditioning apparatus.

The general object of the invention is to provide an improved device for circulating cooled or heated air.

Another object of the invention is to provide an air conditioning device wherein the conditioned air does not come in direct contact with the conditioning means.

Other objects and the advantages of this invention will be apparent from the following description taken in connection with the accompanying drawings, wherein:

Fig. 1 is a vertical longitudinal section through my improved air conditioning apparatus;

Fig. 2 is a section taken on line 2—2 of Fig. 1;

Fig. 3 is a section taken on line 3—3 of Fig. 1;

Fig. 4 is a fragmentary section taken on line 4—4 of Fig. 1;

Fig. 5 is a section taken on line 5—5 of Fig. 1;

Fig. 6 is a fragmentary elevation of one side of the apparatus;

Fig. 7 is a fragmentary section taken on line 7—7 of Fig. 6 with the chain guard removed;

Fig. 8 is a fragmentary view similar to Fig. 1 showing the intake air damper in the position it occupies when the apparatus operates to heat air;

Fig. 9 is a view similar to Fig. 4 showing a modified form of core member in the device;

Fig. 10 is a fragmentary section of the device taken on line 10—10 of Fig. 9;

Fig. 11 is an enlarged fragmentary section taken on line 11—11 of Fig. 10;

Fig. 12 is a fragmentary enlarged section of the core taken on line 12—12 of Fig. 9; and

Fig. 13 is a fragmentary enlarged section taken on line 13—13 of Fig. 10.

Referring to the drawings by reference characters I have indicated my improved air conditioning apparatus generally at 10. As shown the apparatus 10 includes a housing 11 having end walls 12 and 13, side walls 14 and 15 and a bottom wall 16. Intermediate the ends 12 and 13 the housing 11 has a transverse vertical partition 17 therein forming chambers 18 and 19 within the housing. The top of the chamber 19 is closed by a top member 20. The end, side and partition wall of the chamber 18 extend above the top member 20 to form a flanged portion 21.

Mounted on the flanged portion 21 I provide a head member 22 which includes end walls 23 and 24, side walls 25 and 26 and a top wall 27. A head member 28 surrounding the head member 22 together with the side and end walls of the head member forms a groove in which the housing flange 21 is positioned. The top wall 27 has an outlet aperture 29 therein surrounded by an upwardly projecting flange 30 and an outlet aperture 31 of less area than the aperture 29. Positioned in the aperture 31 I provide a short length of conduit 32 which extends a predetermined distance below and above the top wall 27.

Adjacent the aperture 29 I provide a transversely extending shaft 33 which is supported in bearing members 34 on the side walls 25 and 26. The side wall 25 is apertured as at 35 and the shaft 33 extends outwardly through the aperture 35 (see Fig. 3). Mounted on the shaft exterior of the header member I provide a hub member 36 which has a rod 37 extending therefrom at right angles to the shaft 33 and has a weighted member 38 thereon.

Mounted on the shaft 33 within the head member I provide a flap member 39. The flap member 39 when in one position is adapted to restrict passage through the conduit 32 as shown in Fig. 1 and in another position to restrict passage through the aperture 29. The weighted member 38 retains the flap 39 in either of its two extreme positions.

Within the chamber 18 and a predetermined distance above the bottom 16 I provide angle iron support members 40 on the side walls 14 and 15, the end wall 13 and the partition 17.

Just above the support 40 the end wall 13 has an elongated outlet aperture 41 therein which is surrounded by a flange 42. Just above the support 40 the partition wall 17 has an elongated inlet aperture 43 therein and below the support 40 an elongated inlet aperture 44. Flanges 45 are formed at the sides and top of the aperture 43 by turning the metal of the partition wall outwardly towards the chamber 19 and similar flanges 46 are provided at the sides and bottom of the aperture 44.

Intermediate the end wall 13 and the partition wall 17 and intermediate the bottom 16 and the supports 40 I provide a transversely extending shaft 47 which is rotatably supported in bearings 48 on the side walls 14 and 15 (see Fig. 4). The bearing 48 on the side wall 15 extends out of the chamber 18 through a suitable aperture in the side wall 15 and the shaft 47 extends beyond the outer end of the bearing where it has a sprocket 49 mounted thereon. Between the bearings 48 the shaft includes a flattened portion 50. Mounted on the shaft 47 I provide a plurality of spaced discs 51 which are apertured to conform to the shape of the shaft. The discs 51 are retained in a predetermined spaced relationship by

a plurality of sleeve members 52. The periphery of each of the discs 51 is preferably formed saw toothed as indicated at 53.

Extending into the chamber 18 below the supports 40 through the side wall 14 I provide a water supply conduit 54. Exterior to the housing the conduit 54 communicates through a shut off valve 55 with a water supply pipe 56. Interposed in the conduit 54 within the chamber 18 I provide float actuated control valve 57.

When the valve 55 is opened water flows into the chamber 18 until the level thereof is slightly below the shaft 47 whereupon the float valve 57 closes. Thereafter the water level is automatically maintained by the float valve 57.

Communicating with the interior of the chamber 18 through the side wall 14 I preferably provide a water level gauge device 58.

Communicating with the interior of the chamber 18 through the bottom wall 16 I provide a drain conduit 59 having a shut off valve 60 interposed therein.

Positioned in the chamber 18 below the head member 22 I provide a core member 61. The core member 61 includes a lower plate 62 which rests on the supports 40 and an upper plate 63. The plates 62 and 63 each has a plurality of spaced elongated apertures 64 therein which extend parallel to the side walls 14 and 15 (see Fig. 3). Positioned in the apertures 64 of the plates 62 and 63 I provide vertical conduit members 65.

Between the plates 62 and 63 each of the conduits is crenulated to form a tortuous passage therethrough. Between each of the conduits 65 I provide a vertical partition member 66 which extends upwardly from the lower plate 62 a predetermined distance.

When the core 61 is in a position in the chamber 18 a lower chamber 66' is provided in the chamber 18 and an upper chamber 67 is formed in the head member 22. The core conduits 65 form a plurality of tortuous vertical passageways from the lower chamber 66 to the upper chamber 67 and a plurality of horizontal passageways from the inlet aperture 43 to the outlet aperture 41. The side wall 14 has an inlet aperture 68 surrounded by a flange 68' opening into the chamber 19 (see Fig. 2).

Mounted on a suitable support 69 within the chamber 19 I provide a centrifugal blower 70. The blower 70 includes a drive shaft 71 having a sprocket 72 thereon which is adapted to be driven through the medium of a sprocket chain 73 from a sprocket 74 on the armature shaft of an electric motor 75. The motor 75 is arranged in an aperture 76 in the bottom 16 and is supported by suitable brackets 77. The motor is encased by an end wall 78, a side wall 79 and a top wall 80 to isolate it from the chamber 18.

The blower 70 includes an outlet portion 81 which communicates with the inlet end of a distributor conduit member 82. The opposite or outlet end of the distributor conduit 82 engages the flanges 45 and 46 and encompasses the apertures 43 and 44.

The bottom of the conduit 82 has an aperture 83 therein which is adapted to be closed by a flap 84. The flap 84 is mounted on a shaft 85 which is supported in bearing members 86 on the side walls 14 and 15. The bearing 86 on the wall 14 extends through a suitable aperture in the wall and the shaft 85 extends outwardly beyond the end of the bearing where it has a sprocket 87 thereon (see Figs. 5 and 7). Beyond the sprocket 87 the shaft 85 has a hub member 88 thereon which has an arm 89 extending therefrom at right angles to the shaft 85.

Positioned in and reciprocatable through a pair of apertured brackets 90 I provide a vertical rod 91 which adjacent the upper end is slackly connected to the arm 89 as indicated at 92.

Intermediate the inlet apertures 43 and 44 I provide a flange member 93 extending into the distributor conduit 82. In one position or the down position the flap 84 engages the bottom of the distributor conduit 82 and forms a closure for the aperture 83 as shown in Fig. 1. In another position or the up position the flap 84 engages the flange 93 thereby affording unrestricted passageway through the aperture 83 into the distributor conduit and at the same time forming a partition to restrict passage from the blower outlet 81 to the inlet aperture 44 of the lower chamber 66 (see Fig. 8).

Below the distributor conduit 82 I provide a heat chamber 95 which is formed by the bottom of the distributor conduit 82, a portion of the partition 17, a portion of the motor housing wall 78, a pair of spaced side walls 96 and an inclined top wall 97. Within the chamber 95 I provide a gas burner member 98 which includes a portion extending out through the side wall 14 of the housing which communicates through a control valve 99 with a pipe 100 from a source of gas supply.

The control valve 99 includes an operating stem 101 on which is mounted a segmental actuating plate 102 having an aperture 103 therein. When the control valve 99 is in a closed position as shown in Figs. 6 and 7 the aperture 103 in the plate 102 is in line with the brackets 90 and when the flap 84 is in the down position the rod 91 is positioned in the aperture 103. Thus the control valve 99 cannot be actuated to an open position until the flap 84 is raised to an up position. When the flap 84 is in an up position and the control valve 99 is open the plate 102 prevents the rod 91 from being lowered thereby preventing the flap 84 to be moved to a down position.

The shaft 33 of the head member 22 has a gear 105 thereon which meshes with an idler gear 106 which in turn meshes with an enlarged gear 107. The idler gear 106 is mounted on a stud shaft 108 which is supported in a bearing 109 and the gear 107 is mounted on a shaft 110 which is suitably journaled in a bearing 112. Also mounted on the shaft 110 I provide a sprocket 113 which is connected with the sprocket 87 by a sprocket chain 114.

The connection between the shaft 33 and the shaft 85 is such that when the flap 39 is in a position to restrict passage through the conduit 32 the flap 84 is in a position to restrict passage through the distributor aperture 83 as shown in Fig. 1. When the flap 39 is moved to restrict passage through the aperture 29 the flap 84 is moved to an up position to restrict passage from the blower outlet 81 to the inlet aperture 44 of the lower chamber 66 and afford unrestricted passage from the heat chamber 95 through the aperture 83 to the inlet aperture 44 as shown in Fig. 8.

The armature shaft of the motor 75 extends outwardly through a suitable aperture in the side wall 15 and has a sprocket 115 thereon which is connected by a sprocket chain 116 to the sprocket 49 on the disc shaft 47. Thus when the motor

operates the discs 51 are rotated in a direction towards the inlet aperture 44.

When the device 10 is installed in a house a conduit 117 is provided one end of which communicates with the head aperture 29 and the opposite end of which may open into the attic of the house. One end of a conduit 118 communicates with the head conduit 32 and the opposite end may open into the attic or open to the outside atmosphere. If desired an inlet conduit 119 may be provided having one end communicating with the inlet aperture 68 and the opposite end with the outside atmosphere.

The outlet aperture 41 of the device 10 may be made as shown in the drawings or a conduit or series of conduits (not shown) may communicate therewith to direct air to various desired locations.

When it is desired to condition air by cooling it the head flap 39 is swung to the position shown in Fig. 1 with the flap 84 moved to a down position as previously described. The lower chamber 66 is filled with water to a predetermined level as previously described.

The motor 75 is then started which then drives the blower 70 and rotates the discs 51 through the means previously described. As the discs 51 rotate water adheres to them and is thrown off by centrifugal force into the space above the water level in the chamber 66. As the blower 70 operates air is drawn into the chamber 19 through the inlet aperture 68 and into the blower. From the outlet portion 81 of the blower a column of air under pressure is directed into the distributor conduit 82.

A portion of the air from the blower passes through the inlet aperture 43 into the chamber 18 and a portion passes through the inlet aperture 44 into the lower chamber 66'. The air going into the lower chamber 66' absorbs some of the water thrown off of the discs 51 and is thus cooled. This cooled air then passes upwardly through the tortuous passageways in the core conduits 65 into the upper chamber 67 and thence through the aperture 29 into the conduit 117.

As the air passes through the tortuous formation of the conduits 65 the air contacts all surfaces of the conduits to cool the latter. Part of the moisture in the air condenses on the inner walls of the conduits which moisture is later evaporated by air passing through the conduits thereupon further chilling the sides of the conduits 65.

The air passing through the inlet aperture 43 into the chamber 18 passes upwardly between the conduits 65 over the tops of the partitions 66 and thence downwardly and out through the outlet aperture 41. As the air thus passes through the chamber 18 it contacts the chilled conduits 65 and in turn becomes chilled.

When the device 10 is to be used to heat air passing through the chamber 18 the head flap 39 is swung to restrict passage through the aperture 29 and afford unrestricted passage through the conduit 32. As the head flap 39 is thus moved the distributor conduit flap 84 is moved to an up position as previously described and shown in Fig. 8. The valve 99 is then opened and the burner member 98 lighted. Heat from the chamber 95 then passes through the aperture 83 into the distributor conduit 82 and then through the inlet aperture 44 into the lower chamber 66' up through the core conduits 65 into the upper chamber 67 and thence through the conduit 32 into the conduit 118. Air from the blower 70 passing through the chamber 18 contacts the heated core conduits 65 and in turn becomes heated before passing out through the outlet aperture 41.

In Figs. 9 to 13 inclusive, I have indicated a modified form of core member generally at 120 which may be used in the device 10 in place of the core member 61. As shown the core member 120 includes a plurality of spaced rectangularly shaped vertical cell members 121. Each of the cells 121 is formed of a single sheet of metal and includes side walls 122 connected by a continuous front wall 123 and a rear wall 124. The rear wall 124 is formed by bending the ends of the side walls towards each other and connecting thereby a folded joint as indicated at 125.

At the upper end the side walls 122 each includes an outwardly bent flange 126 which is connected to the outwardly bent flange of the adjacent cell by a joint which might be termed a step joint as indicated at 127. Similarly at the lower end the side walls 122 each includes an outwardly bent flange 128 which is connected to the outwardly bent flange of the adjacent cell by a folded joint as indicated at 129. When a plurality of the cells 121 are thus connected together they form passageways 130 therebetween.

Around the upper edge of the plurality of connected cells 121 I provide an angle iron frame 131 and around the lower edge I provide an angle iron frame 132. The horizontal flange of the upper frame 131 overlies the top of the adjacent cells and between the cells and the horizontal flange I provide a layer of mastic material 133.

The horizontal flange of the lower frame 132 underlies the bottom of the adjacent cells and between the cells and the horizontal flange I provide a layer of plastic material 134.

The upper and lower frames are secured in position on the cells by a plurality of bolts 135 the countersunk heads 136 of which are positioned in similarly countersunk apertures 137 in the horizontal flanges of the upper frame 131. Adjacent the lower ends thereof the bolts 135 include threaded portions 138 which are positioned in threaded apertures 139 in the horizontal flanges of the lower frame 132.

When the core member 120 is positioned in the chamber 18 of the device 10 a layer of mastic material 140 is placed on the angle iron frame 40. Thereafter the core member 120 is positioned in the chamber 18 with the horizontal flange of the lower core frame 132 resting on the plastic 140. After the core 120 has been positioned in the chamber 18 a layer of plastic material 141 is placed on the upper surface of horizontal flanges of the upper frame 131. An angle iron clamp frame 142 is positioned on top of the plastic material 141. At the front and sides of the housing 11 the clamp frame 142 is secured to an outer encompassing channel iron frame portion 143 of the housing 11 by a plurality of bolts 144 and nuts 145.

The core member 120 functions in a similar manner to that previously described in connection with the core member 61 except that the core member 120 allows water thrown from the disks 51 to wet the entire wall above each disk so that high efficiency may be secured.

From the foregoing description it will be apparent that I have provided an improved air conditioning apparatus which is simple in construction and highly efficient in use.

Having thus described my invention I claim:

1. In an air conditioning device, a housing

having a transverse vertical partition therein forming two compartments, one of said compartments including a core chamber and a lower chamber, a core member positioned in said core chamber, said core member comprising a plurality of spaced elongated vertical conduits, said housing having an outlet in the upper portion of said core chamber, said housing having an outlet from said core chamber adjacent the lower end thereof, a partition member between said core conduits and extending upwardly from the bottom of said core chamber, air moistening means in said lower chamber and means in the other compartment to force moistened air from said lower chamber through said core conduits and to force air around said core conduits.

2. In an air conditioning device, a housing having a transverse vertical partition therein forming compartments, one of said compartments including a core chamber and a lower chamber, a core positioned in said core chamber, said core member comprising a plurality of spaced elongated vertical conduits, each of said core conduits having a tortuous passageway therethrough, said housing having an outlet in the upper portion thereof, said housing having an outlet from said core chamber adjacent the lower end thereof, said partition having an aperture therein adjacent the lower end of said core chamber, said partition having an aperture adjacent the top of said lower chamber, a partition member between said core conduits and extending upwardly from the bottom of the core chamber, a blower member in said housing, said blower including an outlet portion, a distributor conduit communicating at one end with said blower outlet and at the opposite end with the partition apertures, and air moistening means in said lower chamber.

3. In an air conditioning device, a housing including a core chamber and a lower chamber, a core member positioned in said core chamber, said core member comprising spaced conduits, each having a tortuous passageway therethrough, said housing having an outlet at the top, said core chamber having an inlet and an outlet adjacent the lower end thereof, said lower chamber having an entrance aperture adjacent the top of said lower chamber, a partition member between each of said core conduits extending upwardly from the bottom of the core chamber and terminating below the top thereof, a blower member in said housing, said blower including an outlet portion, a distributor conduit communicating at one end with said blower outlet and at the opposite end with said core chamber inlet and said lower chamber inlet, a shaft in said lower compartment, means to rotate said shaft and a plurality of discs on said shaft and rotatable therewith.

4. In an air conditioning device, a housing including an intermediate chamber, a lower chamber and an upper chamber, a core member positioned in said intermediate chamber, said core member comprising spaced, vertical conduits, each of said conduits having a passageway therethrough, said housing having an exhaust aperture in the top thereof opening into said upper chamber, a movable closure flap in said upper chamber adapted in one position to restrict passage through said exhaust aperture, said housing having an exit aperture therein in said intermediate chamber adjacent the lower end thereof, said intermediate chamber having an entrance aperture therein adjacent the lower end of said core chamber and said lower chamber having an entrance aperture adjacent the top of said lower chamber, a partition member between each of said core conduits extending upwardly from the bottom of said intermediate chamber and terminating below the top thereof, a blower member in said housing, said blower including an outlet portion, a distributor conduit communicating at one end with said blower outlet and at the opposite end with said core chamber inlet and said lower chamber inlet, a transverse shaft in said lower compartment, means to support said shaft and means to rotate said shaft, a plurality of discs on said shaft and rotatable therewith, said discs being positioned one below each of the core conduits, the periphery of said discs being formed saw toothed and means to supply water to said lower compartment.

5. In an air conditioning device, a housing including a core chamber and a lower chamber, a core member positioned in said core chamber, said core member comprising spaced, vertical conduits each having a passageway therethrough, said housing having an exhaust aperture, said housing having an outlet from said core chamber adjacent the lower end thereof, said core chamber having an inlet therein adjacent the lower end of said core chamber and said lower chamber having an entrance aperture adjacent the top of said lower chamber, a partition member between each of said core conduits extending upwardly from the bottom of said core chamber and terminating below the top thereof, a blower member in said housing, said blower including an outlet portion, a distributor conduit communicating at one end with said blower outlet and at the opposite end with said core chamber inlet and said lower chamber inlet, a transverse shaft in said lower compartment, means to support said shaft and means to rotate said shaft, a plurality of discs on said shaft and rotatable therewith, said discs being positioned one below each of the core conduits, and means to supply water to said lower compartment.

6. In an air conditioning device, a housing including a plurality of compartments, a core member positioned in one of said compartments, said core member comprising a plurality of spaced elongated vertical conduits, said housing having an outlet communicating with the interior of said conduits, said housing having a second outlet communicating with the exterior of said conduits, a blower member including an outlet communicating with the exterior and with the interior of said conduits, a shaft in said housing, means to support said shaft, a plurality of disks rotatable on said shaft, each disk being positioned below a core conduit, and means to supply water to said disks.

CHARLES B. COOK.