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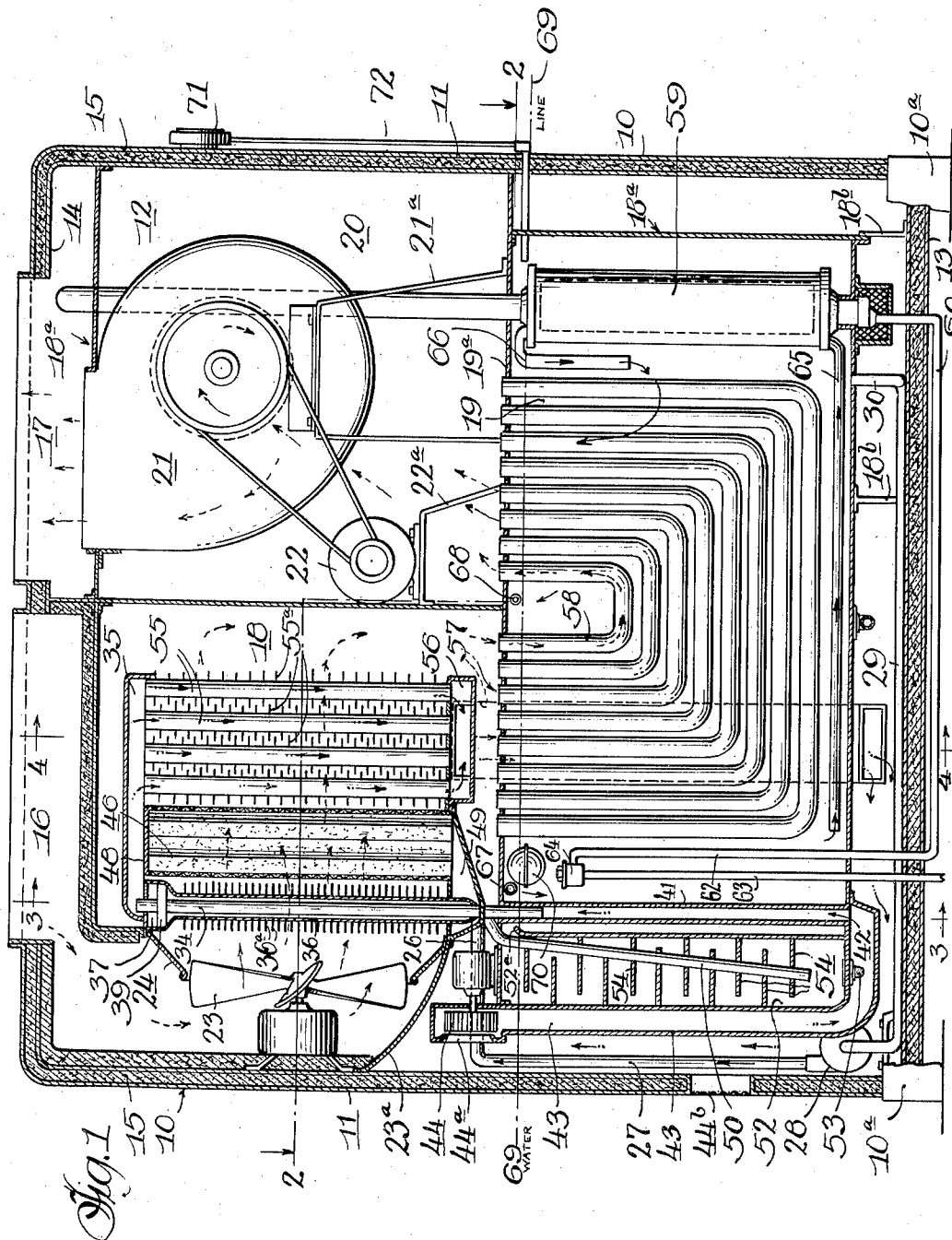
G. A. HELBING, JR

2,216,175

AIR CONDITIONING DEVICE

Filed Nov. 25, 1938

3 Sheets-Sheet 1



Witness:  
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3 Sheets-Sheet 2

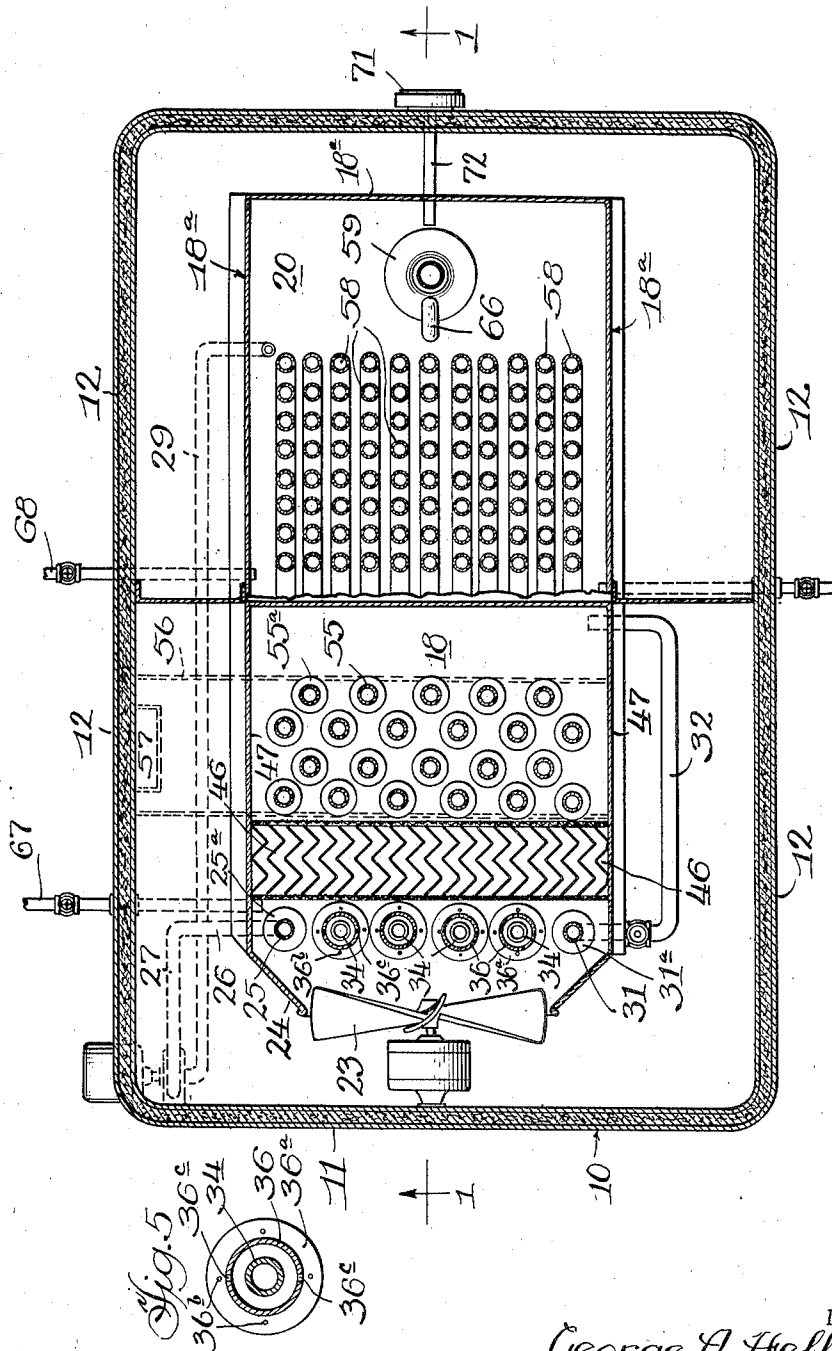


Fig. 2

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3 Sheets-Sheet 3

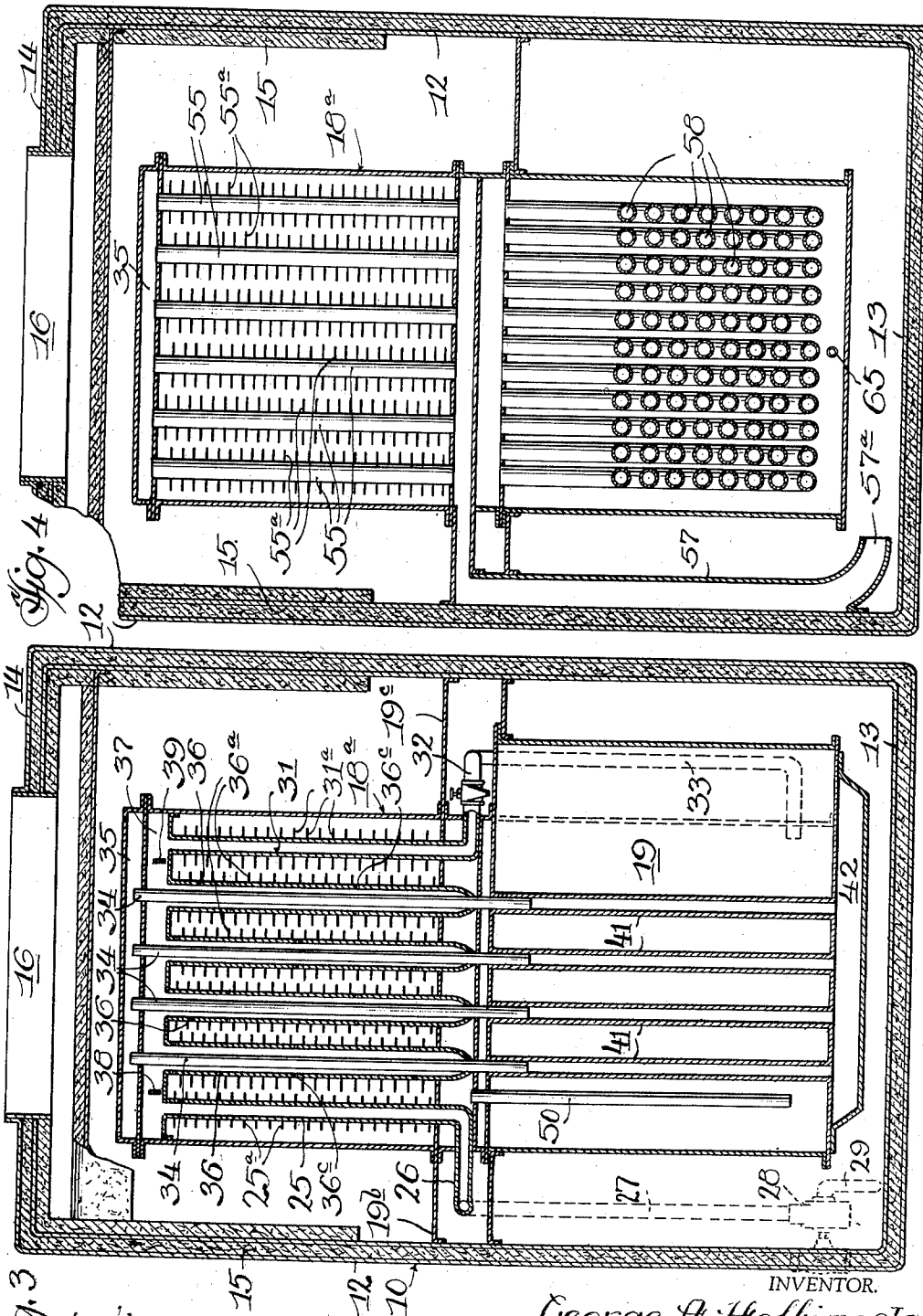


Fig. 3

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## UNITED STATES PATENT OFFICE

2,216,175

## AIR CONDITIONING DEVICE

George A. Helbing, Jr., Chicago, Ill., assignor, by mesne assignments, of two per cent to Proctor McCormack, Chicago, Ill., one-fourth to Edward H. Lindow, Rensselaer, Ind., and seventy-three per cent to Emery Rice, Hanna, Ind.

Application November 25, 1938, Serial No. 242,179

3 Claims. (Cl. 257—52)

This invention relates to an air conditioning device and consists of the matters hereinafter described and more particularly pointed out in the appended claims.

5 The object of the invention is to provide an air conditioning apparatus of simple and economical construction, whereby the air to be conditioned is primarily washed and filtered immediately after it is introduced, and at the same time is primarily cooled or otherwise treated as to temperature of air taken from within the apparatus and having the predetermined temperature which the air being conditioned is designed to attain.

15 Another object of the invention is to provide in connection with the washing, filtering and air and water temperature treating means as described above, supplemental air pipes which act as condensers to remove any surplus water still retained in the air being conditioned after passing through the filter.

These and other objects of the invention will appear more fully as I proceed with my specification.

25 In the drawings:

Figure 1 is a view showing a vertical section through the improved device in a plane indicated by the line 1—1 of Figure 2.

30 Figure 2 is a view representing a horizontal section through the device in the plane indicated by the line 2—2 of Figure 1.

Figure 3 is a vertical section through the device in a plane indicated by the line 3—3 of Figure 1.

35 Figure 4 is a vertical section through the device in a plane indicated by the line 4—4 of Figure 1.

40 Figure 5 is a cross-sectional view on an enlarged scale of one of the water jacketed air pipes 34.

Referring now to that embodiment of the invention illustrated in the drawings: The air conditioning device is enclosed in a cabinet 10 having upright end walls 11, 11; side walls 12, 12; a bottom wall 13, and a top wall 14. Said cabinet may be of any suitable structure and is preferably made of inner and outer metal shells spaced apart to receive between them an insulation lining 15. In the top wall 14 of the cabinet is provided an inlet opening 16 and a discharge or outlet opening 17. Corner legs 18<sup>a</sup>, 18<sup>a</sup> fixed to the cabinet are adapted to support it with its bottom wall 13 raised somewhat above the floor upon which the cabinet rests.

55 The air conditioning device itself is enclosed

within a casing indicated generally by the numeral 18<sup>a</sup> made up of suitable vertical and horizontal plates fixed together and supported as a whole by bracket plates 18<sup>b</sup> rising from the bottom wall 13 of the cabinet (see Figures 1 and 2). The casing is formed to provide in the upper part of the cabinet a pre-treatment chamber 18 at one end below the inlet opening 16; a discharge chamber 20 at the other end associated with the discharge opening 17; and a final treatment chamber 19 located below said first named chambers and connecting the pre-treatment chamber with the discharge chamber.

21 indicates an exhaust fan driven by a motor 22 located in the discharge chamber 20 and mounted on brackets 21<sup>a</sup> and 22<sup>a</sup> suitably supported by the walls of the casing. Said fan is adapted to draw the air entering through the inlet opening 16 in the cabinet successively through the pre-treatment chamber 18, the final treatment chamber 19, into the exhaust chamber 20, from which it is discharged through the discharge opening 17 of the cabinet.

A motor driven fan 23 is mounted on the end wall 11 adjacent to the pre-treatment chamber 18 which is provided with an inlet funnel 24 through which the fan drives the air supplied from the cabinet inlet opening 16 into and through said pre-treatment chamber, thereby supplementing or boosting the exhaust or suction action of the fan 21. The space in which the fan 23 is located is separated from the space below in the cabinet by a diaphragm wall 23<sup>a</sup>; and the spaces at the sides and back of the chambers 18 and 20 are separated from the space in the cabinet occupied by the chamber 19 by horizontal plates 19<sup>b</sup>, 19<sup>b</sup>, 19<sup>c</sup> which are continuations of the horizontal wall 19<sup>a</sup> enclosing the top of the chamber 19 and secured to the side and end walls of the cabinet, as shown respectively in Figures 1 and 3. Thus neither the fan 21 nor the fan 23 has any effect whatever upon the air contained in the space between the chamber 19 and the side walls, end walls and bottom wall of the cabinet.

In the chamber 18 are provided devices through which the air taken in from the inlet opening 16 is washed with water; a filter by passing through which the air is freed of water and of dirt and dust; and a device by which the air at the bottom of the cabinet is caused to impart preliminarily to the incoming air the temperature of the air in the bottom of the cabinet. This preliminary treatment of the air is brought about by the following means:

In the chamber 18 at one side is provided adjacent to the funnel 24 an upright water-supply pipe 25 (see Figures 2 and 3) which is connected by a horizontal branch 26 with a pipe 27 connected to the discharge side of a pump 28 mounted in the bottom of the cabinet. The inlet side of the pump 28 is connected by a horizontal pipe 29 to the far end of the final treatment chamber 19, which is filled with water. At the other side of the chamber 18 similarly located back of the funnel 24, is an upright return flow pipe 31 which is connected at its bottom end by a hand valve controlled horizontal branch 32 with a pipe 33 which depends into the water-filled chamber 19, as shown in Figure 3.

Intermediate and in the vertical plane of the said pipes 26 and 31 there are located a plurality of upright air pipes 34 which open at their upper ends into an air manifold 35 common to said pipes. Each of said pipes 34 is provided with a water jacket formed of larger pipes 36 surrounding them. Said jacket pipes terminate at their upper ends in a common plane with the upper ends of the inlet and return pipes 25 and 31, where they each open into a common water manifold 37. Dams or weirs 38, 39 determine the level of the water in said manifold.

Each of the water jacket pipes 36 is provided with a plurality of vertically spaced circular vanes 36<sup>a</sup>. The riser or inlet pipe 25 and the return pipe 31 are provided with similar vanes indicated respectively by the numerals 25<sup>a</sup> and 31<sup>a</sup>. The several vanes 36<sup>a</sup> of the water jacket pipes 36 are provided with apertures 36<sup>b</sup> as indicated in Figures 2 and 5, and the jacket pipes 36 themselves are provided with vertically spaced apertures 36<sup>c</sup>. By this construction the water in the jacket pipes will run out through the apertures 36<sup>c</sup> and drip upon the vanes 36<sup>a</sup> and cascade from the several vanes 36<sup>a</sup> and through the openings 36<sup>b</sup> therein to provide a film of water on the outside of the jacket pipes and on the vanes adapted to wash the air driven between said pipes. They also act to increase the temperature change imparted to the air flowing between them by the water circulated through said jacket pipes and the supply and return pipes, as will be presently described.

The water jacket pipes 36 are closed at their bottom ends against their respective air pipes 34 which depend below said jacket pipes into and have air-tight connection with associated pipes 41 (in the lower part of the cabinet) which open at their bottom ends into a manifold 42. Said manifold is connected to an upright pipe 43 (see Figure 1) located near the end wall 11, leading into the casing of an auxiliary fan 44 below the diaphragm 23<sup>a</sup>. Said fan 44 has an inlet opening 44<sup>a</sup> adjacent the aforesaid end wall 11 of the cabinet and acts to withdraw the air in the lower part of the cabinet and force it through the pipe 43, the manifold 42 and the pipes 41 up into the air manifold 35. With said air also may be mixed air drawn in from the outside of the cabinet through a screen opening 44<sup>b</sup> in the said cabinet end wall located below the fan 44.

In the space immediately back of the water jacket pipes 34 and the riser and return pipes 25 and 31 is located a filter 46 (see Figures 1 and 5). This may be of any suitable construction designed to remove the water and moisture from the air driven by the fan 23 through the grille provided by said pipes. Said filter is supported between upright plates 47, 47 which enclose its sides as shown in Figure 5. The space occupied by said

filter is closed at the top by a plate 48, and is open at the bottom, below which there is provided a trap 49 (see Figure 1) adapted to receive any moisture that is collected in the filter and drained downwardly therefrom. Water from said trap is discharged by a pipe 50 (see Figure 1) into the bottom end of a vertically disposed pan 52 provided with a device 53 for draining it.

The upright walls of the pan 52 are provided with a plurality of alternately disposed, vertically spaced horizontal baffle plates 54. When the water is agitated in said tank or pan 52 by the delivery of water thereto from the pipe 50, these baffle plates will tend to prevent agitation of the water so that the dust or dirt washed down into said tank will settle out and remain in the bottom of the tank whence it may be removed when the drain 53 is open. One of the upright walls of the tank 52 has an overflow lip indicated at 52<sup>a</sup>, which is substantially on a level with the level of the water in the water chamber 19 (see Figure 1).

Beyond the filter 46 are disposed a plurality of vertically spaced air pipes 55. These pipes are arranged in parallel rows, with the pipes in one row disposed in alternation with pipes in adjacent rows, as shown in Figure 2. Said pipes open at their upper ends into the manifold 35, and open at their lower ends into the manifold 56. The latter is connected by a flat vertical pipe 57, suitably supported upon the adjacent wall of the cabinet, and opening adjacent the bottom of the cabinet, as indicated at 57<sup>a</sup>, into the free space surrounding the water-filling chamber 19.

In the water chamber 19 are located a plurality of U-pipes 58 disposed in a bank of parallel spaced rows, as shown in Figure 4. Said U-pipes open through the plate 19<sup>a</sup> from which they are suitably suspended, with the one upright leg of each U opening into the chamber 18, and the other leg of each U opening into the discharge chamber 20.

In the end of the water chamber 19 remote from the plane of the booster fan 23 is mounted an upright water heater 59 with a gas burner supplied from the outside of the cabinet by a gas main 60 below the bottom of the cabinet (see Figure 1). Said main has an upright branch including pipes 62, 63 which is disposed in the water chamber 19 near its end remote from the heater 59. Said branch includes a thermostat 64 for controlling the supply of gas to the burner.

65 indicates a pipe positioned in the bottom of the water chamber 19 open at its end near the gas main branch pipes 62, 63, and connected at its other end to the bottom of the water heater. Water is returned from said heater into the water chamber by a pipe 66 at the top of the heater.

Water is introduced into the water chamber 19 from an outside water main at inlet 67, and may be discharged through an outlet 68. The normal level of the water in the water chamber is indicated by the line 69—69 in Figure 1, said level being maintained by a ball operated valve 70 in a familiar manner.

As will be readily understood, the water heater 59 will be cut off in hot weather, its use being designed only when the outside temperature is such that the air to be conditioned must be raised to a temperature above that at which it is supplied to the inlet opening 16. In warm weather the water will be changed as and when necessary to cool the air, the temperature of the water being noted by a thermometer 71 disposed on the out-

side of the cabinet and having a branch 72 extending through the wall of the cabinet and into the water casing, as shown at the right in Figure 1.

The operation of the air conditioning device is as follows: The air drawn in through the inlet opening 16 of the cabinet will be drawn by the exhaust fan 21 supplemented by the blowing operation of the fan 23 from the inlet opening 16, and forced through the grille presented by the water cooled (or heated, as may be) pipes 25, 36. As it passes through said grille the air will be washed by the water dripping from the vanes or fins 36<sup>a</sup> of the pipes 36, and the vanes or fins 25<sup>a</sup>, 31<sup>a</sup> of the pipes 25 and 31. Said vanes will enhance the effect on the air of the water in said pipes. The air then passes through the filter 46 which takes up the water which then drains down into the trap 49. Beyond the filter 46 the air is driven through the battery of pipes 55 with their vanes or fins 55<sup>a</sup>.

As we have seen, air drawn from the space in the bottom of the cabinet surrounding the water chamber is driven through said pipes 55. The air thus taken from within the cabinet will necessarily cool or otherwise affect the air driven through the grille of pipes 55, to condition it as to temperature and moisture content in accordance with the temperature imparted to said air in the cabinet by the water in the chamber 19.

From the chamber 18 the air passes down through the pipes 58 in the chamber 19 and then into the discharge chamber 20, being affected as to temperature conditions by the temperature of the water in said chamber. The air is then discharged from the chamber 20 through the discharge opening 17 into the atmosphere surrounding the cabinet.

From the foregoing it will be obvious that the air which passes through the air conditioning device is washed and then dried by the elimination of the wash water. At the same time it is preliminarily cooled or heated by the water circulated through the water jacket pipes 36; and it is also heated or cooled by the air circulated from the space in the cabinet surrounding the chamber 19 through the pipes 55, as it passes through the bank of said pipes after it has passed beyond the filter 46.

After this treatment in the chamber 18 the air is circulated through the pipes 58 in the water chamber 19 wherein there is imparted to it the final temperature change to bring it to the predetermined temperature condition.

As the air passes through the bank of air pipes 55, the moisture still retained therein after its discharge through the filter 46 is condensed by contact with the air pipes 55 which thus further dry said air before it passes through the U-pipes or ducts 58 in the final treatment chamber 19.

I claim as my invention:

1. In combination, a cabinet having inlet and discharge openings, means defining a preliminary air conditioning chamber, a separate discharge chamber and a water-filled chamber including submerged ducts communicating on one side with said first named chamber and on the other

side with said discharge chamber, said water-filled chamber being otherwise separate from said first named chambers and spaced within said cabinet, a grille of water jacketed air pipes and a bank of air pipes disposed in succession in said first named chamber, means providing a closed circuit for forcing water from said water-filled chamber through the jackets of said first named air pipes and for returning it to said water-filled chamber, means including a closed circuit for circulating air from the space about said water-filled chamber through said water jacketed air pipes and for returning it through said bank of air pipes to said space, means for maintaining a predetermined temperature in the water of said water-filled chamber, and means for taking in air through said inlet opening and driving it through said several chambers for finally discharging it through said discharge opening.

2. In combination, a cabinet having inlet and discharge openings, means defining a preliminary air-conditioning chamber and a water-filled chamber separate from said first named chamber and spaced within said cabinet, a grille of water-jacketed air pipes and a bank of air pipes connected to said first named air pipes and disposed in succession in said first named chamber, means providing a closed circuit for forcing water from said water-filled chamber through the jackets of said first named air pipes and for returning it to said water-filled chamber, means including a closed circuit for circulating air from the space about said water-filled chamber through said water-jacketed pipes and through said bank of air pipes and for returning it to said space, means for maintaining a predetermined temperature for the water in said water-filled chamber, and means for taking in air through said inlet opening and for driving it through said several chambers and finally discharging it through said discharge opening.

3. In combination, a cabinet having inlet and discharge openings, means defining a preliminary air-conditioning chamber and a water-filled chamber separate from said first named chamber and spaced within said cabinet, a grille of water-jacketed air pipes, the jackets having spaced perforations, and a bank of air pipes connected to said first named air pipes and disposed in succession in said first named chamber, means providing a closed circuit for forcing water from said water-filled chamber through the jackets of said first named air pipes and for returning it to said water-filled chamber, means including a closed circuit for circulating air from the space about said water-filled chamber through said water-jacketed pipes and through said bank of air pipes and for returning it to said space, means for maintaining a predetermined temperature for the water in said water-filled chamber, and means for taking in air through said inlet opening and for driving it through said several chambers and finally discharging it through said discharge opening.

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