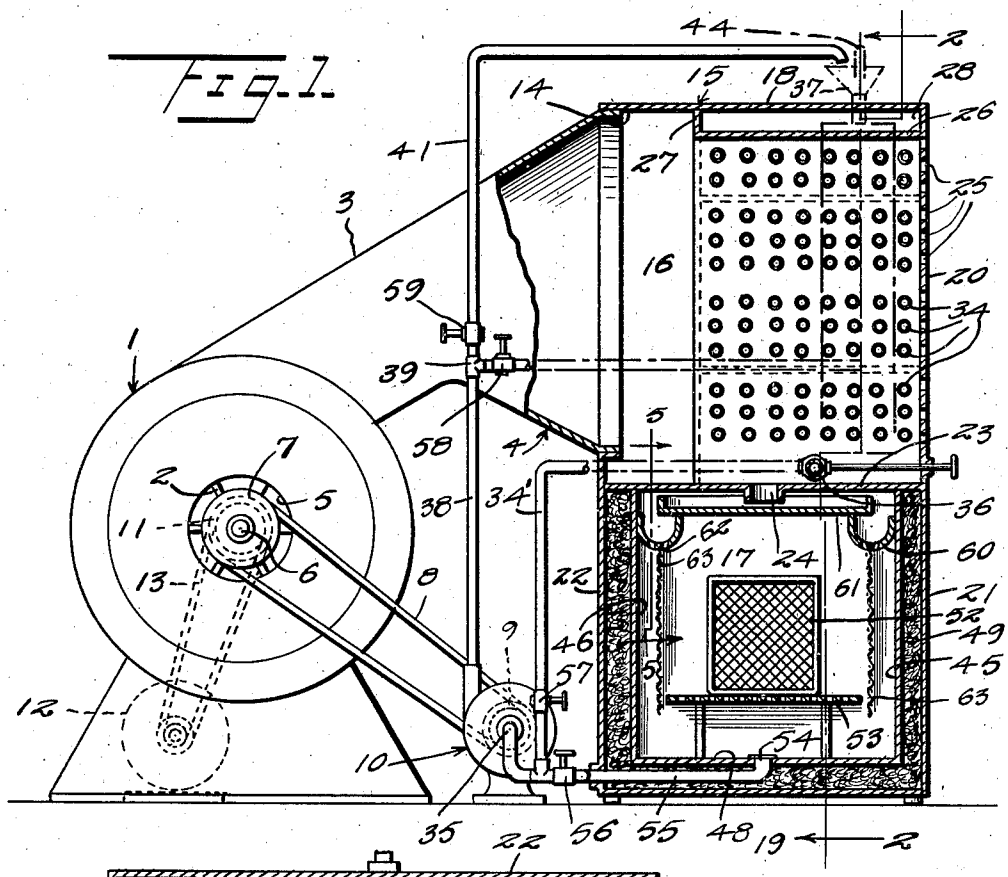
March 28, 1939. E. C. WARWICK 2,152,294

AIR CONDITIONING MECHANISM

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Fig. 1.



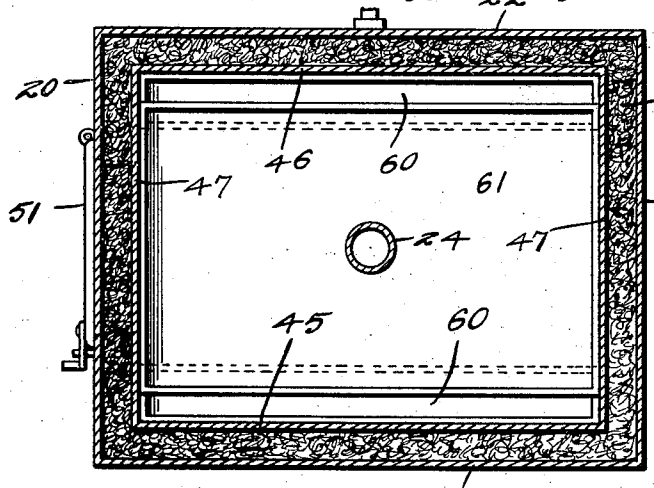
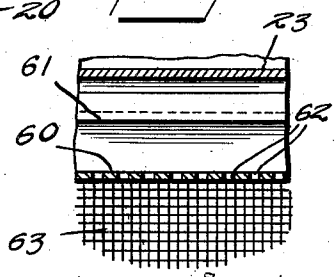


Fig. 4.

Fig. 5.



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AIR CONDITIONING MECHANISM

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Fig. 2.

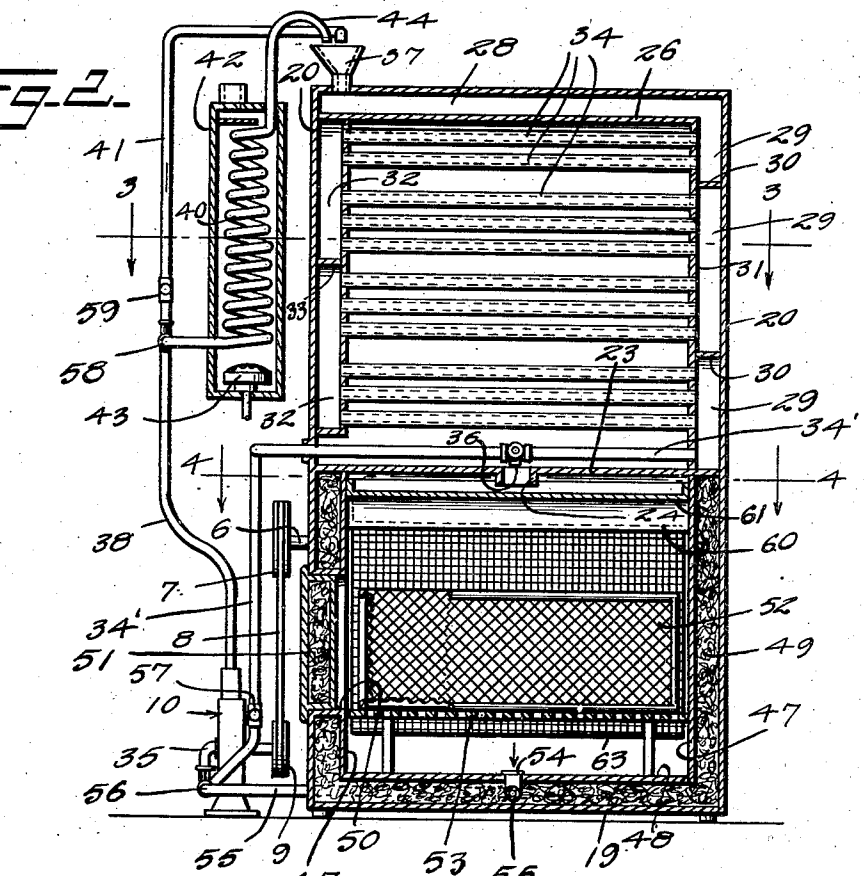
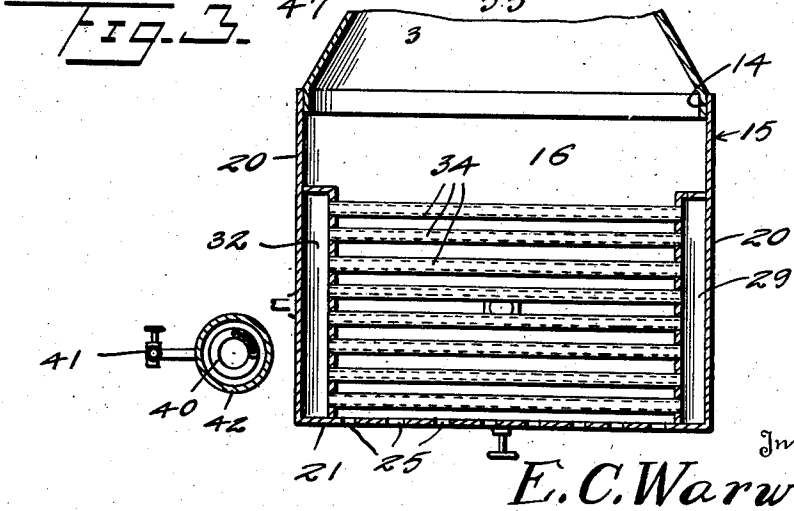


Fig. 3.



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2,152,294

AIR CONDITIONING MECHANISM

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Application June 2, 1938, Serial No. 211,459

5 Claims. (Cl. 257—9)

This invention relates to improvements in air conditioning mechanism.

The primary object of the present invention is to provide an air conditioning mechanism in the form of a unit which may be conveniently moved within a home or other establishment where it is to be used and which is so designed that it may function as an air heater or an air cooler, as may be desired.

Another object of the invention is to provide an air conditioning unit employing water as a heating or cooling medium for effecting or bringing about an increase or decrease in the temperature of the air of a room in which the unit is installed, convenient means being made use of for shunting the circulation of the water through a temperature raising or temperature reducing unit which forms a part of the mechanism.

The invention has for a more specific object the provision of a mechanism for regulating the temperature of the air in a room by the process of circulating heated water through heat transfer tubes between which air is blown, when an increased temperature in a room is desired or circulating refrigerated water through said heat transfer tubes when a decreased temperature in a room is desired.

The invention broadly comprises a mechanism consisting of two distinct parts, one of which comprises a series of water tubes between which air may be forced and the other consisting of a refrigerating chamber through which water may be passed to be circulated through said tubes, whereby the water after being passed through the refrigerating chamber and reduced in temperature will operate to reduce the temperature of the surrounding atmosphere as it flows through said tubes and absorbs heat from the air driven between the tubes.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming part of this specification, with the understanding, however, that the invention is not to be confined to any strict conformity with the showing of the drawings but may be changed or modified so long as such changes or modifications mark no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings:

Figure 1 is a view partly in side elevation and partly in vertical section of the air conditioning mechanism embodying the present invention.

Figure 2 is a sectional view taken substantially upon the line 2—2 of Figure 1.

Figure 3 is a sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a sectional view taken on the line 4—4 of Figure 2.

Figure 5 is a sectional view on an enlarged scale on the line 5—5 of Figure 1.

Referring now more particularly to the drawings, the numeral 1 generally designates a housing for a blower by means of which air is circulated through the hereinafter described structure so that the necessary circulation of air in a room or building may be obtained. This housing encloses fan blades 2 of a suitable construction and has the upwardly directed outlet conduit 3 terminating in the bell 4 which forms an outlet for the blower, the air being taken in through the opening 5 in the side of the casing, in the usual manner. The fan 2 is mounted upon the shaft 6 which, at one side of the housing 1, carries a pulley wheel 7, which is connected by a belt 8 with the pulley wheel 9 of a water pump 10. At the opposite side of the blower housing the shaft 6 carries a suitable pulley 11 for connecting a driving motor 12 with the fan shaft through the medium of a belt 13.

The bell 4 of the blower is connected in the opening 14 in one side of the upper part of a casing, which is indicated as a whole by the numeral 15. This casing is divided into an upper heat transfer chamber 16 and a lower refrigerating chamber 17. For convenience in describing the general construction of the mechanism and without intending to limit the form of the same in any manner, the casing may be set forth as having the top and bottom walls 18 and 19, the vertical side walls 20 and the front and rear walls 21 and 22, respectively. Thus, it will be apparent from reference to Figure 1 that the opening 14 is in the upper half of the back wall of the casing. Just below the opening 14, the casing is horizontally divided by the wall 23 which has a central opening surrounded by the downturned flange 24 for the purpose hereinafter described. The front wall 21 opposite the opening 14 is provided with a plurality of apertures 25 or this wall may be opened or covered by screen, if desired, so long as air discharged into the chamber 16 from the conduit 3 may have free passage through the chamber into the room from which it was drawn into the fan housing 1.

Extending across the upper part of the chamber 16 between the side walls 20 and in relatively closely spaced relation with the top wall 18, is a

plate 26 which forms with the top wall, the adjacent front wall 21 and the upturned flange portion 27, which contacts the top wall 18, a water receiving area 28. As shown in Figure 2, this plate 26 terminates short of one of the side walls 20 and communicates with the upper one of the vertically disposed water header chambers 29, which are divided by the horizontal partitions 30 and which are defined on their inner sides by the header walls 31. As shown in Figure 2, there are three of these chambers 29 and at the opposite side of the main chamber 12 are two header chambers 32 which are separated one from the other by the division wall 33. Thus, there are formed at one side of the structure the three chambers 29 which have their division walls disposed in planes passing centrally through the opposite chambers 32 and connecting these header chambers are the spaced water tubes 34 which carry water discharged into the top area 28 from the first or top header chamber 29 across to the opposite chamber 32 from which it is carried back into the central header chamber 29 and it is then passed back into the lower chamber 32 to be returned by the lowermost tubes 34 into the lowermost header chamber 29 and from this header chamber the water is carried across above the partition wall 23 by the pipe 34' which leads to the intake 35 of the water circulating pump 10. This pipe 34' has a valve controlled outlet 36 therein, which is designed to permit the water entering the pipe from the lower header chamber 29 to pass from the pipe onto the partition 23 to flow through the flanged opening 24 for the purpose hereinafter stated.

Secured to the top wall 18 of the casing is a water receiver 37 by means of which water may be introduced into the system and which also operates to receive water forced to the top of the structure by the pump 10 through the pipe line 38 which is divided at 39 for connection with the lower end of a gas heated coil 40 and for connection with the direct pipe 41, the upper end of which leads to and terminates above the receiver 37. This coil 40 is of the type commonly employed for heating water and is enclosed in the casing 42 which has a gas burner unit 43 in the lower part thereof and the upper end of the coil terminates in the gooseneck 44 which discharges downwardly into the receiver 37, as shown.

Below the horizontal partition 23, the front, back, side and bottom walls of the casing have inner walls 45, 46, 47 and 48, respectively, in spaced relation therewith, the walls 45 to 47 inclusive being vertical and extending to the underside of the partition wall 23, while the wall 48 is above and in spaced relation with the bottom wall 19 and the spaces between these inner walls and the outer walls of the casing are filled with a suitable insulation material 49 so that the lower chamber 17, in which a refrigerant is placed, as hereinafter described, is thoroughly insulated. At one side of the casing structure a door opening 50 is formed through the two walls and is closed by the door structure 51. Through the medium of this opening, a receptacle, such as is shown in Figure 2 and generally indicated by the numeral 52, may be introduced into the refrigerating chamber 17 and this receptacle is provided to carry a suitable refrigerant such as ice or solidified carbon dioxide, otherwise known as "dry ice". A suitable platform 53 or other supporting structure is arranged within the chamber 17 to support the refrigerant carrying receptacle 52.

While a removable receptacle has here been shown for carrying ice or another suitable form of refrigerant, it is to be understood that a suitable mechanical refrigerating unit may be installed in the chamber 17, if desired.

The floor of the refrigerating chamber, which is formed by the inner wall 48, is provided with a drain 54, which communicates with the pipe 55, which is connected with the pump intake 35, this pipe having a control valve 56 therein, as shown in Figure 1. As is also shown in this figure, the return pipe for hot water, when the mechanism is used with this medium for heating air, is connected between the valve 56 and the intake side of the pump, this last mentioned pipe, which is generally designated by the numeral 34' as previously stated, which has the three-way or shunt valve therein for shunting the flow of water through the outlet 36, has an additional control valve 57 therein adjacent its point of connection with the intake of the pump, whereby it may be closed when the valve 56 is opened to prevent any passage of water thereinto.

The lower end of the coil 40 where it joins the pipe 38 is also provided with a valve 58 which, when closed, will cause water to be directed upwardly into the line 41 through the valve 59 therein.

Within the refrigerating chamber 17 and extending from one side to the other thereof along the front and rear walls, are troughs 60 and disposed above the inner or adjacent ends of these troughs, is a pan 61 which has a side edge extended over a trough 60, as shown in Figure 1, and which has the upturned sides thereof extended to a plane lying above the lower edge of the flange 24 surrounding the opening in the partition plate 23. These troughs 60 are provided throughout their lengths with the bottom drain apertures 62 and extending downwardly from the undersides of the troughs and extending lengthwise of the troughs, are the screens 63 which lie upon opposite sides of the receptacle support 53, as shown in Figure 1, and terminate short of the bottom of the refrigerant chamber.

In the operation of the present air conditioning apparatus, a suitable quantity of water is first introduced into the device through the receiver 37 and, if the device is to be employed for heating air, then the control valve for the outlet 36 will be closed and also the valve 59, and the valves 57 and 58 will be opened. The burner unit 43 will then be lighted so that as the water is drawn by the pump 10 from the lower one of the headers 29 and forced upwardly through the coil 40, it will have its temperature raised and it will be discharged from the upper end of the coil into the receiver 37 to flow into the water area 28 and be passed back and forth between the headers 29 and 32 through the pipes 34 which are preferably of copper or some other suitable material which will transmit heat rapidly so that it may be absorbed therefrom by air blown between the pipes by the blower mechanism which is connected with one side of the chamber 16. Thus, it will be seen that the water in the system may be used continuously for raising the temperature of air in the room or building in which the mechanism is installed.

Where the mechanism is to be employed for lowering the temperature of a room or building, the water of the system is circulated by the pump either through the coil 40 or through the pipe 41,

as desired, and the control valve for the outlet 36 will be closed as regards the part of the pipe 34 lying between it and the intake 35 of the pump and will be opened as regards the outlet 36 so that the water passing through the tubes 34 will flow from the lower header 29 through the opening in the partition 23 and fill the pan 61 from which it will then flow over the sides into the troughs 60 and run down the screens 63 to the bottom of the refrigerating chamber. It will be noted that due to the novel arrangement of the water circulating means in the refrigerant chamber, the water is carried downwardly through the chamber and in relatively close proximity to the refrigerant medium, which is exposed in the chamber so that there will be a free circulation of air around it, but the water is not brought into contact with this medium. Thus the water passing through the refrigerant chamber circulates in the air in which the refrigerant medium is placed but does not flow over or come into contact with the medium. The water will then be drawn by the pump 10 from the lower part of the refrigerating chamber and passed up again to the receiver 37 to repeat the circuit. The receptacle 52 will, of course, contain a refrigerant medium or some other means will be employed for refrigerating the chamber 17 so that the water, as it passes through the refrigerating chamber, will be thoroughly chilled or, in other words, will have the absorbed heat removed therefrom and will be recirculated through the tubes 34 to absorb heat from the air blown over the tubes by the blower connected with the chamber 16.

From the foregoing, it will be readily seen that there has here been disclosed novel compact mechanism which will operate efficiently for the purpose of heating or cooling air in a room or building and which will operate with a minimum of expense as the water used in the system is made use of over and over again, thus reducing the cost of operation over those systems which are connected with a house water supply and which have fresh water passing through continuously.

I claim:

1. An air conditioning mechanism of the character described, comprising a casing divided to form an upper air chamber and a lower refrigerating chamber, means for insulating said lower chamber, means for effecting a forced circulation of air through said upper chamber, means forming a vertical series of water receivers in said upper chamber on the opposite sides thereof, water inlet means for the upper one of one of said series of receivers, a water outlet means for the lower one of one of said series of receivers, a plurality of water tubes connecting said water receivers and extending across said upper chamber in the path of flow of air therethrough, a water outlet for the lower part of said refrigerating chamber, means for supporting a refrigerant in the refrigerating chamber for the free circulation thereabout of the air of the chamber, means for discharging water from the outlet of the lower one of the said water receivers into said refrigerant chamber, means facilitating the passage of water through the air of the refrigerant chamber in proximity to said refrigerant but out of contact therewith to effect the chilling of the water, and a water circulating pump having its intake side connected with the water outlet of the refrigerant chamber and having a discharge side connected with said inlet for the said upper one of the water receivers.

2. An air conditioning mechanism comprising a casing, a horizontal partition wall dividing the casing into an upper chamber and a lower chamber, said partition wall having an opening therethrough, means for conducting water through said upper chamber from the upper part to the lower part thereof and in a plurality of streams, means for effecting a circulation of air through said upper chamber to have the temperature thereof modified by the water streams passing through the chamber, means for conducting the water from said streams through the aperture in said partition into said lower chamber, a water receiver in the upper part of said lower chamber below said aperture, means in the lower chamber for conducting water from the receiver to the lower part of the lower chamber in a sheet, means for refrigerating said lower chamber and means for withdrawing the refrigerated water from the said lower chamber and returning it to the upper part of said upper chamber for recirculation therethrough.

3. An air conditioning mechanism comprising a casing, a horizontal partition wall dividing the casing into an upper chamber and a lower chamber, said partition wall having an opening therethrough, means for conducting water through said upper chamber from the upper part to the lower part thereof and in a plurality of streams, means for effecting a circulation of air through said upper chamber to have the temperature thereof modified by the water streams passing through the chamber, means for conducting the water from said streams through the aperture in said partition into said lower chamber, a water receiver in the upper part of said lower chamber adjacent the aperture through said partition, a trough in said lower chamber arranged to have water flow thereinto from said receiver, said trough having outlet apertures in the bottom thereof, a screen suspended from said trough adjacent the apertures in the bottom thereof, means for refrigerating said lower chamber, and means for withdrawing water from said lower chamber and returning it to the upper part of said upper chamber for recirculation therethough.

4. An air conditioning mechanism of the character described, comprising a cabinet structure having a portion constructed to provide a chamber, a plurality of water tubes extending across said chamber, said chamber having one side open and having air outlet apertures at the other side, a blower unit connected with the open side of the chamber for discharging air thereinto for passage between said tubes to escape at the opposite side of the chamber, water receiving receptacles at the ends of said tubes, one of said receptacles having a portion lying above the tubes and being provided with a water inlet, the other receptacle having a portion extending below the tubes and provided with a water outlet, means whereby water passing through said water outlet will be raised to the top of the mechanism for discharge into said water inlet, said means including a pipe line running directly to the inlet and a pipe coil tapped at one end into said pipe line and having its other end arranged for discharge into said inlet, valve means in the pipe line between the said inlet and the point at which said coil is connected therewith, and means for controlling the temperature of fluid passing through said coil to said inlet.

5. An air conditioning mechanism, comprising a cabinet structure having a chamber therein provided with opposite open walls, means at op-

posite sides of the chamber forming water receiving areas, one of said areas being disposed adjacent the top of the chamber and having a water inlet, the other of said areas being disposed adjacent the bottom of the chamber and having a water outlet, means for carrying water back and forth through said chamber between said water areas, a blower unit discharging through one open side of the chamber for effecting the flow of air through the chamber between the water carrying means to the opposite open side of the chamber, a second chamber disposed beneath the first chamber and separated therefrom by a horizontal wall having a central opening, a pan disposed in the second chamber beneath said wall opening, a pair of troughs extending through the second-mentioned chamber beneath opposite edges of said pan and adapted to receive water flowing over said edges, means in the second chamber for supporting a refrigerant beneath said pan, means connected with each trough for carrying water downwardly on opposite sides of the refrigerant from the troughs for discharge into the bottom of the second chamber, an outlet for the second chamber, and a water circulating means connected with said last outlet for withdrawing water from the second chamber and conducting it to the inlet of the upper one of said water receiving areas.

EARL CLARENCE WARWICK.