Jan. 7, 1947. A. P. CLARK 2,414,020

AIR CONDITIONER

Filed June 1, 1944 3 Sheets-Sheet 1

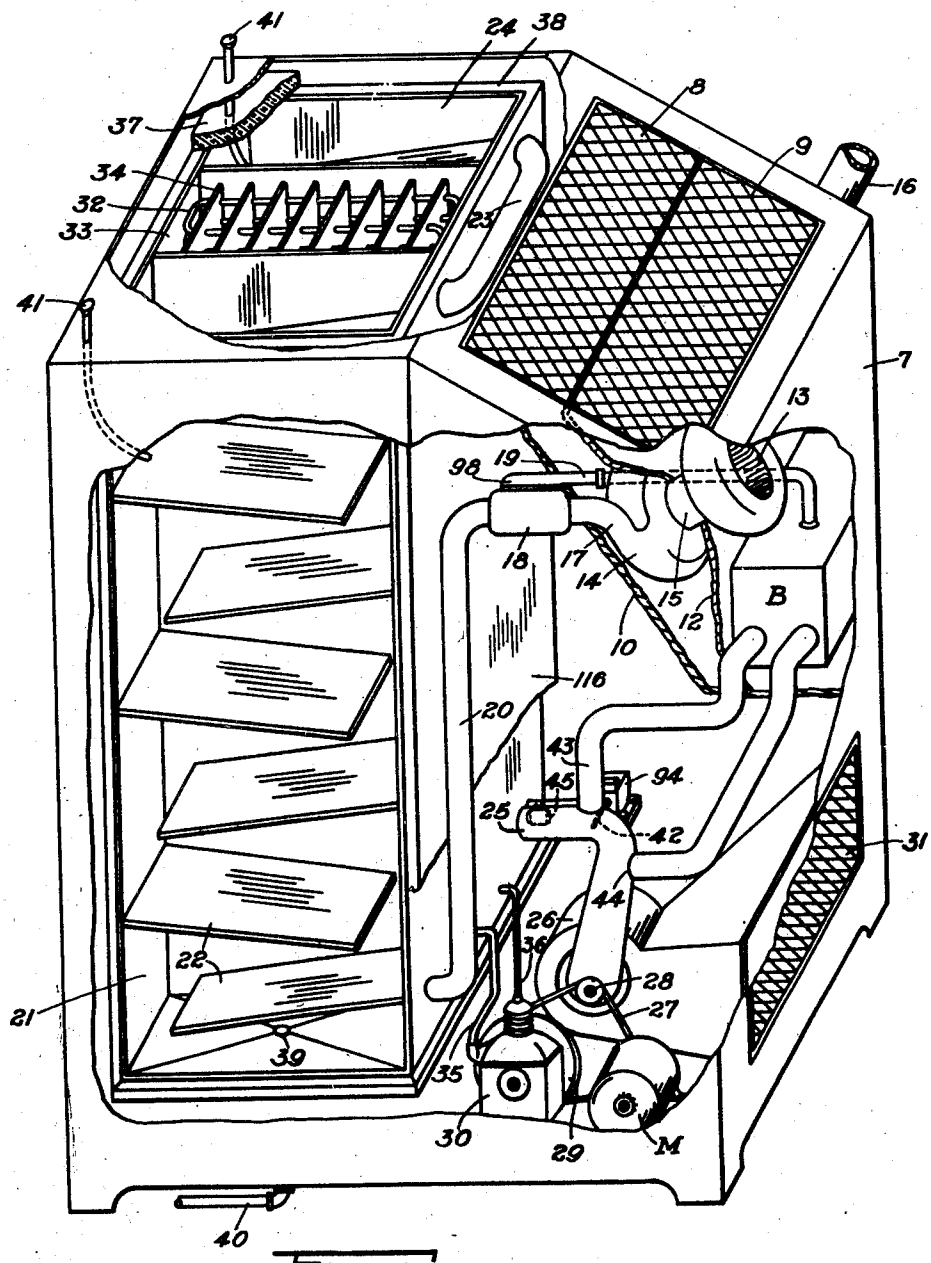



Fig. 1.

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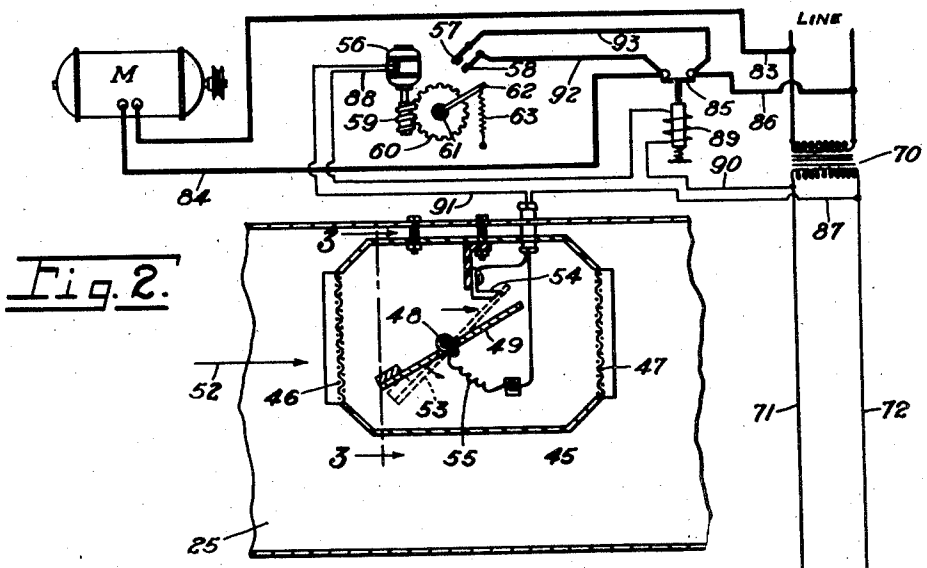



Fig. 2.

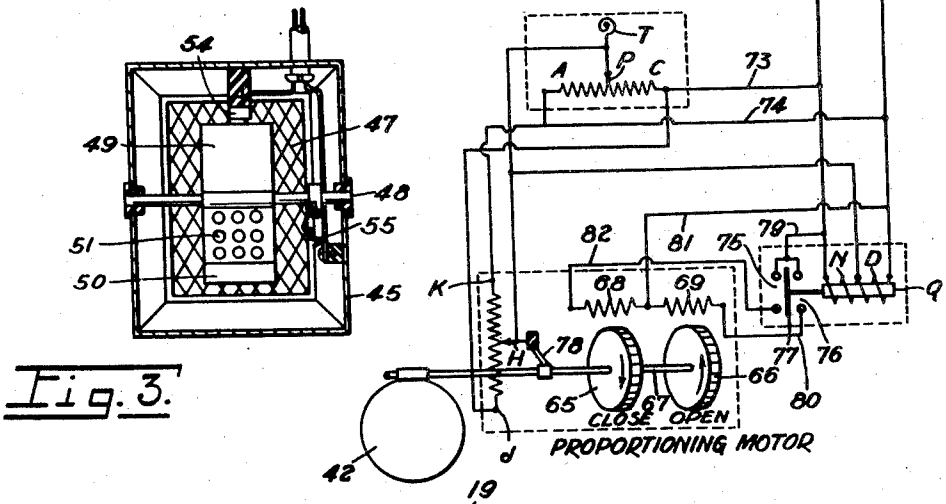



Fig. 3.

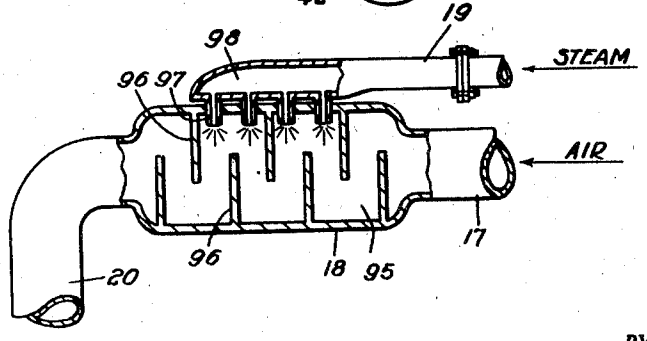



Fig. 4.

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Filed June 1, 1944 3 Sheets-Sheet 3

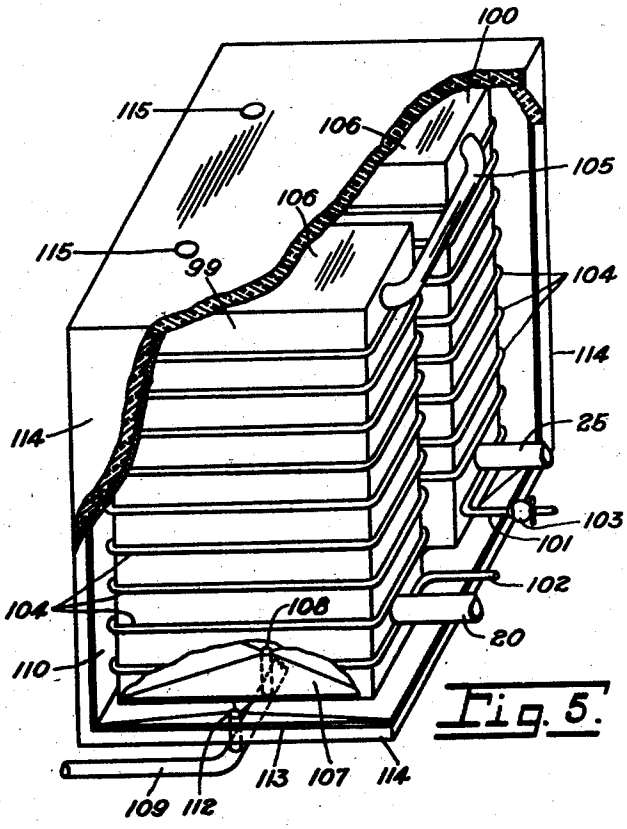



Fig. 5.

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# UNITED STATES PATENT OFFICE

2,414,020

## AIR CONDITIONER

Andrew P. Clark, Louisville, Ky.

Application June 1, 1944, Serial No. 538,252

7 Claims. (Cl. 257—3)

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This invention relates to an air conditioner, and embodies as one of its principal features the use of stem jets and refrigerated surfaces properly related, to effect a thorough separation of impurities and foreign particles from air passing therethrough. The device of the invention may be constructed in different sizes and capacities, to adapt it to any of the numerous existing circumstances under which the purifying of air may be considered necessary or desirable. The device may also temper the air and establish a desired humidity, as will be explained, and its operation may be rendered fully automatic by the use of controls such as are disclosed herein. It is capable of rendering wholesome and fit for human consumption, air which is foul and laden with dust, dirt, smoke, odors and such other impurities and particles as are commonly found in unclean air.

The advantages and accomplishments above stated are among the objects of the invention, others of which are: to provide an automatic device of the character stated, which will operate noiselessly, efficiently, and without care in service; to provide a device capable of purifying air to a degree not attainable with the use of air filters or screens; to incorporate in the apparatus an automatic means for periodically disposing of entrapped particles and substances accumulated as impurities during the operating periods of the device.

The foregoing and other objects are attained by the means described herein and disclosed in the accompanying drawings, in which:

Fig. 1 is a perspective view of the device of the invention, parts being broken away for clarity of illustration.

Fig. 2 is a view showing the elements of an electrical automatic control means for the device, including the wiring diagram.

Fig. 3 is a cross-sectional view taken on line 3—3 of Fig. 2, showing an automatic defrosting switch.

Fig. 4 is an enlarged cross-sectional view of an air-steam mixer, shown on a smaller scale and in elevation upon Fig. 1.

Fig. 5 is a perspective view, parts broken away, showing a modified condensing unit for the device, which is substitutable for the corresponding unit of Fig. 1.

The apparatus of this invention depends upon the use of a steam treatment, followed immediately by a low temperature condensing and separating action of a refrigerating means, for removing foreign particles, smoke, odors and other

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impurities from air, and restoring to the treated air the wholesomeness, cleanliness, humidity and temperature characteristics desired in air fit for human consumption or for other uses.

To treat the unclean air, it is first drawn into the apparatus by means of a fan, and subjected to a thorough intermixing with steam from a suitable boiler, which elevates the temperature of the air, destroys odors and certain bacteria, and moistens air-borne particles of foreign matter preparatory to separation from the air. The steam treatment is believed to not only increase the weight of the particles, but also to expand the volume thereof, so that in the relatively heavy and expanded condition, the unwanted particles will be unable to escape the condensing and separating action imposed thereon by a dehumidifying refrigerating means disposed in the path of air movement.

The dehumidifying character of the refrigerating or chilling means for the air undergoing treatment, is to be especially noted and distinguished from chilling means of the character which adds moisture to the air undergoing treatment. Water sprays and the like fall into the category of the latter type of chilling means, and are wholly unsuited for use in an apparatus of the kind herein disclosed. In other words, the air undergoing treatment is not to be subjected to direct contact with the cooling medium, but should be chilled by passing it along refrigerated surfaces upon which the steam-treated particles and impurities may condense as a slime, while at the same time the air undergoes substantial dehumidification.

After the treatment above described, the air in the thoroughly cleaned condition may be tempered automatically to room temperature, or to any other desired temperature, if necessary or desirable, before being exhausted from the apparatus.

The operation of the device may be rendered fully automatic by means of certain controls to be herein disclosed, and provision is made for automatic periodic disposal of accumulated particles and impurities from the condensing chambers thereof. Proper conditioning of the air for temperature may be attained by associating with the apparatus a suitable thermostatic control, and preferably one including a proportioning thermostat arrangement, although it is feasible to provide a manual control for this purpose as will be explained.

Referring to Fig. 1 of the drawings, the device comprises in general a casing 7 including an up-

per aperture preferably furnished with a grill through which may enter the foul air to be cleansed and conditioned. The foul air inlet may be divided into two sections, indicated at 8 and 9, and the space beneath said grill sections may be divided into a pair of compartments established by walls 10 and 12 which extend across the full width of the casing. Each compartment includes a suction fan for drawing air into the device through the grills 8 and 9, said fans being indicated by the characters 13 and 14. The fans are disposed at the opposite sides of partition wall 12, and if desired they may be mounted upon a common shaft with an interposed electric motor 15 in driving relationship thereto.

Suction fan 13 operates to draw foul air into the compartment that communicates with grill opening 9, and drives the air past a boiler indicated at B for dissipating surrounding heat and discharging the heated air through an exhaust pipe 16, which may lead to the atmosphere exteriorly of the room or space in which the air conditioning device is located. This same compartment may contain the customary heat transfer coil (not shown) of the compressor 30.

Exhaust fan 14 drives foul air through the grill opening 8 and forces the air into a conduit 17 leading to mixer 18, where steam from the boiler is intimately associated with the air. Boiler steam is conveyed to the mixer by means of pipe 19. From the mixer, the air-stream mixture is carried by way of a conduit 20, to the lower end of a refrigerated condensing chamber 21, which includes a number of alternately sloping and overlapping baffles 22 upon which may accumulate the foreign particles and impurities borne by the air-steam mixture. In traveling upwardly through the refrigerated condensing chamber 21, the air is forced to travel over the cold surfaces of all of the baffles, along a circuitous path until it reaches the upper end of chamber 21, where by means of a connecting conduit 23, the air is transferred to the upper end of a second refrigerated condensing chamber 24 constructed similarly to the chamber 21. Air entering the refrigerated chamber 24 passes downwardly along the series of baffles contained therein, and finally leaves chamber 24 through a duct 25. A suction is maintained in duct 25 by means of an exhaust fan 26 driven by belt or otherwise from a main driving motor M. The character 27 indicates the belt or chain passing over the motor pulley, the pulley 28 of the exhaust fan, and the pulley 29 of a compressor for the refrigerating system. The compressor is indicated by the character 30, and may be of conventional design.

With the aid of exhaust fan 26, air is withdrawn from the refrigerated condensing chamber 24 by way of conduit 25, and projected from the machine through the grill opening 31.

Near the upper end of Fig. 1 is illustrated a system of cooling or refrigerating coils 32 contained within a coil compartment 33 and passing through a multiplicity of cold conducting fins 34 which, along their vertical side edges, are held in intimate contact with the adjacent side walls of both condensing chambers. The coils and fins preferably fill the coil chamber from top to bottom, and are capable of lowering the temperature of the condensing chambers considerably below the freezing point of water. The coils have terminal portions 35 and 36 associated in the conventional manner with compressor 30 and such accompanying apparatus as may be necessary in the refrigerating system. The refrigerating system preferably is of the direct expansion type.

As will be understood, the upper ends of chambers 21, 33 and 24, are closed by means of a suitable cap bearing insulating material 37. In fact, the entire refrigerating unit comprising the compartments 21, 33, 24 is preferably encased within an insulating shell, indicated at 38, for enhancing the efficiency of the device as a whole.

As previously stated herein, the refrigerating coils and the chambers 21, 33 and 24 are adapted to be periodically defrosted automatically, wherefore, each of said chambers is provided with a drain opening in its bottom wall, as indicated at 39, leading to a common drain pipe 40 that may carry to the sewer such waste products as will be dislodged from the walls and baffles of the several chambers during the defrosting period. The characters 41 indicate sealed flushing tubes through which quantities of water may be introduced for flushing the baffles whenever flushing of the compartments seems to be necessary or desirable.

Upon the basis of the foregoing description, it will be understood that the device when in operation, will draw foul air into the grill opening 8, through blower 14, and said air will pass through the air-stream mixer 18 wherein the temperature of the air is elevated to destroy odors and certain bacteria, while at the same time the air-borne particles of foreign matter are moistened and possibly expanded with a resultant increase of weight or volume. From the mixer 18, the air travels through duct 20 to the lower end of the refrigerated chamber 21, the walls and baffles of which are maintained at a very low temperature. During its travel through chamber 21, the air loses a great deal of its humidity, while at the same time a considerable amount of foreign particles and impurities carried thereby are condensed upon the walls and baffles of the chambers. Passing over to the secondary refrigerated chamber 24, by way of duct 23, further condensation of moisture and removal of particles and impurities takes place, until at the end of its travel, the treated air leaves by way of duct 25 and is discharged into the room through the outlet 31.

It should be appreciated that the air, after having been saturated and thoroughly intermixed with steam and brought to a relatively high temperature in the mixing chamber 18, is immediately subjected to the dry-chilling action of the condensing and dehumidifying baffles and walls of the refrigerated chambers 21 and 24. It is important to note that the chilling is accomplished in a dry atmosphere, so that the air undergoing treatment is materially dehumidified after having been steam-treated, with the result that it is rendered properly humid for human consumption by the time it is discharged through the outlet 31. The humidity of the cleansed air may be further controlled, if desired, by adding steam or moisture thereto after it leaves the secondary condensing chamber, should the humidity be found too low after the air has been treated as explained.

The explanation which follows is devoted particularly to the automatic controls for the apparatus. At the location 42 is indicated a swinging damper disposed within the conduit 25, and adapted to shunt air from the secondary condensing chamber 24 to a conduit 43 that enters boiler B and returns from the boiler to connect with conduit 25 at the location 44. The purpose of conduit 43 is to subject the treated air to the tempering action of the boiler, in the event that

the treated air is too cold to discharge into the room occupied by the air conditioning apparatus. During the summer season the damper **42** may completely close the conduit **43** so that all of the treated air may pass freely to the blower **26** and be exhausted at **31**. However, during the winter season, it may be desirable to shunt all or a portion of the treated air to the boiler for tempering it prior to discharge. Automatic means are provided, including preferably a proportioning thermostat control means, for establishing various positions of damper **42** whereby varying amounts of treated air passing through duct **25** may be shunted to the boiler and thereafter mixed with the cold air at the port **44**. The mechanism about to be explained, and which is illustrated by Figs. 2 and 3, serves to automatically regulate the position of the damper and to thereby regulate the temperature of air discharged through the ports.

It may be here pointed out, that conduit **43** enters the boiler B below the water level therein, and continues through the boiler without interruption, so that none of the water or steam of the boiler is placed in contact with the air in said conduit as the air is subjected to the tempering action of the boiler water heat.

The element indicated at **45** of Figs. 1 and 2, represents an electrical control means for initiating a defrosting period, which occurs whenever the products of condensation within chambers **21** and **24** become so voluminous as to interfere with the movement of air therethrough. The device at **45** may comprise a housing having open ends **46** and **47**, which may be screened as shown, and through which may pass a portion of the air flowing through the discharge duct **25**. The housing of the element **45** may carry a transversely arranged shaft **48** upon which is rockably mounted a metallic leaf or vane **49** responsive in movement to the velocity of air entering the opening **46** and leaving through the opening **47**. By providing the leaf or vane with a weighted end **50** furnished with a series of openings **51**, the leaf or vane may be so balanced as to assume a near-horizontal position when acted upon by air of sufficient velocity traveling in the direction of the arrow **52** of Fig. 2. Upon a substantial decrease in air velocity, the leaf or vane will rock to the broken line position indicated at **53**, to make contact with an electrical switch point or contactor **54**. By means of an electric conductor **55** applied to the metallic shaft of vane or leaf **49**, the latter may be placed in an electrical circuit, to be completed at the contact **54**, for initiating a timed or predetermined defrosting period for the apparatus.

As will be understood, the leaf or vane **49** will be out of contact with the switch element **54** whenever the device is operating with a free and relatively unrestricted flow of air through the refrigerated condensing chambers.

With further reference to Fig. 2, **56** indicates the prime mover, which in this instance is an electric motor, constituting part of a timing switch whose electrical contacts are indicated at **57** and **58**. The showing of this timing switch is conventional only, and it is intended that any commercial form of timing switch may be substituted therefor. As shown, the timer includes a worm **59** on the shaft of motor **56** engaging the teeth of a worm wheel **60** rotatably mounted upon shaft **61** that carries a radial arm **62** adapted to be swung upwardly for moving the electric contact **58** into a position of abutment with contact **57**. Such advancing movement of arm **62** is to be performed very slowly, through the gearing associated with motor **56**. At any time during which the motor is deenergized, a spring **63** serves to retract arm **62** from the electrical contact **58**, for allowing contacts **57—58** to open. The time required for arm **62** to advance to effect a closing of the switch **57—58**, should approximate the time required for defrosting of the condensing chambers **21** and **24**. For this purpose, the timing switch may include a suitable adjustment which is common to such switches, but not believed necessary to illustrate herein.



At the lower end of Fig. 2 is illustrated a proportioning motor, the purpose of which is to swing the damper **42** to various positions between the fully open and fully closed positions with respect to the open adjacent end of conduit **43**, (Fig. 1), in response to the changing demands of a room thermostat T. Motors of this type are available as Minneapolis-Honeywell, Series 90 proportioning controls, and such motors comprise usually a pair of rotors **65** and **66** fixed on a common shaft **67** to be rocked in opposite directions of rotation by the rotors, depending upon electrical energization of one or the other of the field coils **68** or **69**. By energizing coil **68**, for example, a partial rotation of rotor **65** is effected in the direction of the arrow applied thereto, whereas coil **69** upon being energized causes rotor **66** to partially rotate in the opposite direction, to thereby change the position of the damper **42**, affixed to shaft **67**. The partial or limited rotational movements of shaft **67** and damper **42**, are determined by the changing demands of the thermostat T, and the amount of such rotational movements is proportional to the change of conditions noticed by the thermostat. Thus, the damper may be automatically adjusted at all times, to shunt varying amounts of air to boiler B for tempering the air finally discharged at grill **31**.

The electrical circuit of the proportioning control comprises a wound resistance A—C over which moves a contact slide P. This resistance may be energized by low voltage current from a transformer **70**, whose primary winding is across the main line conductors. The resistance is connected across the conductors **71** and **72** by means of the leads **73** and **74**. Connected across said conductors also is the proportioning relay consisting of a pair of coils N—D, operative to shift an armature Q in opposite directions, to open or close the switches **75** and **76** by means of the movable switch blade **77** mechanically connected with the armature.

A balancing potentiometer, associated with the motor shaft **67**, is represented by the characters J—K which identify a wound resistance element over which the contact slide H is moved. The travel of this slide is controlled by operation of the proportioning motor so that as the shaft **67** moves its maximum amount in both directions of rotation, the slide is moved across the balancing potentiometer winding J—K. The sliding contact H may be carried by an arm **78** fixed to shaft **67**.

To describe the operation, it may be assumed that the slide contacts P and H are in the center position as shown by the diagram. Under these circumstances, the resistances A—P, P—C, J—H and H—K are all equal, and current flowing in coil N is equal to that flowing in coil D, of the switch actuator. The armature Q will then be acted on by equal magnetic forces from coils N and D, and switch blade **77** will be held in a neutral position between the contacts of witches

75 and 76. The rotors 65 and 66 will be at rest with the damper 42 at what may be considered a half-open position.

A reduction in temperature at the thermostat T will cause the contactor P to move toward A. This will immediately unbalance the electrical system as the resistance A—P will then be less than P—C. The net result will be that more current will flow in the circuit of coil D, than in the circuit of coil N. Armature Q therefore will move, due to the increased magnetic effect of coil D, to carry switch blade 77 to the right, for closing the switch 76. With this switch closed, current will flow through the circuit 71, 79, switch 76 and conductors 80, 69, 81 and 72. Thus, the rotor 66 will be energized to partially rotate the shaft 67 and move the damper 42 toward open position.

As the rotor moves, the balancing potentiometer slide H is mechanically moved toward the end of its resistance marked J. When the increase in the resistance H—K has overcome (balanced) the lowered resistance A—P in the thermostat, such that the effect of A—P and H—K is equal to the effect of P—C and J—H, then the coils N and D will again exert equal influence on armature Q. This will cause the armature to center itself again, and to open the switch 76, stopping the rotor 66. Having taken up this new position, which is exactly in proportion to the increased heat demand at the thermostat, the proportioning motor remains at rest until a new demand at the thermostat again unbalances the circuit.

In like manner an increase of heat at the thermostat will result in moving the contactor P toward C, making P—C of less resistance than A—P, and increasing the current flow through coil N. The corresponding increased magnetic effect of coil N will move armature Q to the left, thereby closing the blade 77 upon the contacts of switch 75 and completing the circuit through the field coil 68 of rotor 65. The rotor 65 will thereby be energized to rotate shaft 67 and damper 42 in the opposite direction, or toward the closed damper position, until slide H of the balancing potentiometer reaches a point on the resistance where a balance is effected. Then armature Q will again neutralize the switch blade 77 to the Fig. 2 position, to stop the proportioning motor.

It will be noted that the automatic action above described maintains always a balance between the demands of the thermostat and the position of the damper, resulting in true modulation of heat delivery through grill 31.

Concurrently with the foregoing operation, the main drive motor M is continuously energized by current flowing from the line wires over conductors 83, 84, switch 85, and conductor 86, the switch 85 being normally spring-closed as shown, while the defrosting control switch 54—49 is open-circuted. Eventually, however, the condensing chambers of the apparatus will become laden with foreign matter that will restrict the flow of air therethrough, with the result that the air flow through housing 45 will be reduced to the extent of allowing the weighted end 53 of the leaf or vane 49 to drop, and thereby close the switch contact at 54, as indicated by the broken lines on Fig. 2. Closing of this switch at 54 establishes a flow of current through the circuit comprising the conductor 87, switch 49—54, conductor 91, motor 56, conductor 88, the solenoid coil 89 of switch 85, and conductor 90. The



solenoid thereupon immediately moves to open the switch 85 to stop the main drive motor M. With the resultant absence of air flow through duct 25 and housing 45, the switch 49—54 remains closed and keeps in operation the timer motor 56. The timer motor operates for a period of time, perhaps an hour or less, until it advances the arm 62 to position for closing the switch contacts 57—58, whereupon current will be induced to flow to the main drive motor M by way of conductors 83, 84, 92, 58, 57, 93 and 86. By this time, the condensing chambers have defrosted sufficiently to permit a free flow of air therethrough, and the velocity thereof will be sufficient to again open the defroster switch contacts at 54—49. As this switch opens, the coil 89 of magnetic switch 85 will be deenergized, and switch 85 will close by spring action to maintain a closed circuit through the main drive motor M, while the timer arm 62 returns to a retracted position under the influence of its spring 63, permitting contacts 57—58 to spring apart to normality. The motor M then continues to operate the air conditioner until defrosting again becomes necessary and is initiated by the closing of defrosting switch 54—49 automatically as previously explained.

From the foregoing, it will be appreciated that operation of the device may be rendered completely automatic by use of the means herein disclosed, and that cleansed air will be delivered in a tempered condition according to the intensity of demand of the thermostat. In less expensive models of the apparatus, however, the damper 42 may be manually adjusted by providing suitable actuating means accessible exteriorly of the cabinet, as will readily be understood. The proportioning controls then may be eliminated, with retention of the automatic defrosting feature, if desired. Upon Fig. 1, the character 94 indicates a suitably supported housing or casing for the timing switch, the proportioning motor, and their cooperative electrical adjuncts.

Fig. 4 illustrates a representative form of air-steam mixer, such as is indicated at 18 of Fig. 1. The mixer may comprise the enlarged chamber 95 including a series of baffles 96 to furnish a circuitous or tortuous path for the air as steam from jets 97 is directed into the flow of air. The steam jets 97 are furnished in sufficient numbers to effect a sterilizing and thorough saturating of the air within the mixer, and said jets may be fed by a manifold or jet head indicated at 98. Other types of mixers, of course, may be substituted for the mixer herein shown, if desired. The steam generator or boiler B may be operated electrically or by means of liquid or gaseous fuel, and will preferably include the customary safety devices or controls to prevent explosion and to regulate the amount of steam generated.

In Fig. 5 is illustrated a condensing unit of modified design, which may be substituted bodily for the condensing unit disclosed in Fig. 1. In the modified unit, 99 and 100 indicate condensing chambers which are similar to the chambers 21 and 24 of Fig. 1, in that each contains a series of baffles as previously explained, for the purpose of directing steam-treated air along a circuitous route for condensing therefrom the excess moisture laden with foreign particles and impurities. The air-steam mixture enters one condensing chamber through the conduit 20, and after treatment the air leaves the other con-

densing chamber by way of conduit or duct 25. Treatment of the air prior to entering the condensing chamber 99 is the same as was explained in connection with Fig. 1, that is, the air is initially subjected to a steam-treatment as explained. Upon leaving the condensing chamber 100, the cleansed air emitted through conduit 25, may be heated and discharged by means of the same mechanism set forth in the description of Fig. 1.

With further reference to Fig. 5, it will be noted that the cooling coil for the condensing chambers is spirally wound exteriorly of the condensing chamber walls, the coil beginning at 101 and ending at 102. The portion 102 will be carried to the compressor as Fig. 1 illustrates, and coil 101 will include an expansion valve 103 such as is generally employed in connection with direct expansion refrigerating apparatus. In order to establish the best possible conductivity for effectively cooling the condensing chambers, the coil should be made to contact the walls of the chambers along the extent of its length. Intimacy of contact may be enhanced by thermally uniting the coil with the walls of the condensing chambers, as by soldering, brazing, or the like. The reference character 104 indicates the convolutions of the direct expansion coil disposed about the exterior surfaces of the condensing chambers.

The flow of air through the condensing chambers, and the reaction obtained thereby, are precisely as was explained in connection with Fig. 1. Thus, a connecting duct 105 is shown spanning the condensing chambers. The length of duct 105 will depend upon the space between condensing chambers, which space may be much less than is illustrated by Fig. 5 when compactness is required in manufacture of the apparatus. Each condensing chamber is closed by means of a top wall 106, and the bottom wall 107 of each is provided with a drain opening 108 leading to a drain pipe 109 for disposing of condensation products when the condensing chambers are defrosted periodically, in accordance with previous explanation.

It may be noted that the condensing chambers are completely encased within a shell 110 spaced therefrom, in order that water of condensation may gravitate down the outside surfaces of the condensing chambers during defrosting, and enter a drain opening 112 provided in the bottom wall 113 of the shell. From the foregoing, it will be evident that the condensing chambers of Fig. 5 require drainage both interiorly and exteriorly thereof during the defrosting period, but that the interiors of the chambers will contain the foreign particles and impurities directed thereto through the duct 20.

In order to conserve energy and enhance the efficiency of the unit, all outer surfaces of the shell 110 may be furnished with insulating material as indicated at 114. The condensing chambers may be equipped with normally sealed flushing tubes such as are indicated at 41 of Fig. 1, said tubes being represented at 115 in the Fig. 5 modification. As stated, the condensing unit of Fig. 5 may be bodily substituted for the corresponding structure disclosed in Fig. 1, wherefore, it is deemed unnecessary to include in Fig. 5 the duplicate showing of the boiler, mixer, fans and control units of Figs. 2 to 4 inclusive. The understanding is that all of the mechanism of Fig. 1 shown at the right of the insulating panel 116, is associated with the unit illustrated by Fig. 5.



It is to be understood that in commercial practice, various modifications and changes in the structural details of the device may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What is claimed is:

1. An air conditioning apparatus comprising in combination, a steam generator having a steam discharge jet, means for moving foul air past the jet to effect an intimate intermixing of the air with steam, a chamber including refrigerated surfaces in the path of air-steam movement, acting upon the mixture to dehumidify same and to extract and accumulate condensation products therefrom, means dependent upon a reduced velocity of air through the chamber resulting from accumulation of the condensation products, for defrosting the refrigerated surfaces of said chamber, and thermostatically controlled means for shunting to the steam generator a portion of the cleansed and dehumidified air discharged from said chamber to reheat the same.

2. An air conditioning apparatus comprising in combination, a steam generator having a steam discharge jet, means for moving foul air past the jet to effect an intimate intermixing of the air with steam, a chamber including refrigerated surfaces in the path of air-steam movement, acting upon the mixture to dehumidify same and to extract and accumulate condensation products therefrom, means dependent upon a reduced velocity of air through the chamber resulting from accumulation of the condensation products, for defrosting the refrigerated surfaces of said chamber, and means for shunting to the steam generator a portion of the cleansed and dehumidified air discharged from said chamber to reheat the same.

3. An air conditioning apparatus comprising in combination, a steam generator having a steam discharge jet, means for moving foul air past the jet to effect an intimate intermixing of the air with steam, a chamber including refrigerated surfaces in the path of air-steam movement, acting upon the mixture to dehumidify same and to extract and accumulate condensation products therefrom, means dependent upon a reduced velocity of air through the chamber resulting from accumulation of the condensation products, for defrosting the refrigerated surfaces of said chamber, means for conveying a flushing fluid to the chamber, and a drain for disposal of the flushing fluid and the foreign substance dislodged thereby in passing over the refrigerated surfaces and through the chamber.

4. An air conditioning apparatus comprising in combination, a steam discharge jet, means for moving unclean air past the jet and into intimate association with the steam, to destroy odors and saturate the air with moisture, a dehumidifying condensing chamber including an air entry port and an air discharging port, for the continuous movement of a current of air through the chamber, refrigerating means located exteriorly of said chamber for maintaining the chamber walls below the freezing temperature of wtaer, spaced baffle means within the chamber and associated with the cold walls theerof to transfer to said walls the heat of the air-steam mixture moving through the chamber and across the baffle means therein, and means for draining the chamber of accumulated matter condenser upon the walls and baffles thereof.

5. An air conditioning apparatus comprising in combination, a steam discharge jet, means for

moving unclean air past the jet and into intimate association with the steam, to destroy odors and saturate the air with moisture, a dehumidifying condensing chamber including an air entry port and an air discharging port, for the continuous movement of a current of air through the chamber, refrigerating means located exteriorly of said chamber for maintaining the chamber walls below the freezing temperature of water, spaced baffle means within the chamber and associated with the cold walls thereof to transfer to said walls the heat of the air-steam mixture moving through the chamber and across the baffle means therein, means for draining the chamber of accumulated matter condensed upon the walls and baffles thereof, and means responsive to a reduced velocity of air leaving the discharging port of the condensing chamber, for initiating a temporary suspension of operation of the refrigerating means.

6. An air conditioning apparatus comprising in combination, a steam discharge jet, means for moving unclean air past the jet and into intimate association with the steam, to destroy odors and saturate the air with moisture, a dehumidifying condensing chamber including an air entry port and an air discharging port, for the continuous movement of a current of air through the chamber, refrigerating means located exteriorly of said chamber for maintaining the chamber walls below the freezing temperature of water, spaced baffle means within the chamber and associated with the cold walls thereof to transfer to said walls the heat of the air-steam mixture moving through the chamber and across the baffle means therein, and means for draining the chamber of accumulated matter condensed upon the walls and baffles thereof, a conduit for conveying



cleansed air from the discharging port, a suction fan associated with said conduit, a bypass duct in the conduit between the fan and the port last mentioned, means for heating a portion of said bypass duct, and adjustable damper means for controlling the proportion of air shunted through the bypass duct from said conduit.

7. An air conditioning apparatus comprising in combination, a steam discharge jet, means for moving unclean air past the jet and into intimate association with the steam, to destroy odors and saturate the air with moisture, a dehumidifying condensing chamber including an air entry port and an air discharging port, for the continuous movement of a current of air through the chamber, refrigerating means located exteriorly of said chamber for maintaining the chamber walls below the freezing temperature of water, spaced baffle means within the chamber and associated with the cold walls thereof to transfer to said walls the heat of the air-steam mixture moving through the chamber and across the baffle means therein, and means for draining the chamber of accumulated matter condensed upon the walls and baffles thereof, a conduit for conveying cleansed air from the discharging port, a suction fan associated with said conduit, a bypass duct in the conduit between the fan and the port last mentioned, means for heating a portion of said bypass duct, a damper for controlling the proportion of air shunted through the bypass duct from said conduit, and proportioning control means thermostatically governed to establish various adjusted positions of the damper in correspondency with changes in the surrounding air temperatures.

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