Our invention relates to air conditioning apparatus especially designed and constructed to accomplish the treatment of air or gas to remove therefrom dust, bacteria, foreign matter, etc.; and to establish the air or gas at desired predetermined humidity and temperature. The invention provides an apparatus capable of use in industrial, residential, public or private institutions or buildings regardless of size.

One of the principal general objects of the invention is to provide apparatus for the above purposes in the nature of a compact unitary machine which can be installed completely in the basement or other part of a building remote from the area or rooms to which the air is to be delivered, thus facilitating economy of construction and operation as well as conserving valuable space in many instances.

Another object of the invention is to provide apparatus or a machine of the above type, especially but not exclusively designed for low pressure (frictional) operation, and capable of treating a large volume of air in a relatively small space. One of the important features accomplishing this object being the downward substantially vertical flow of air through a spray chamber against an upward and angularly disposed spray of water, the spray being so directed and the spray chamber so formed that the impingement of the spray and resultant back-lash increases the turbulence and atomization of the spray in the spray chamber.

Another object of the invention is to provide for spraying either hot or chilled water or water of selected intermediate temperatures within the chamber, and means for automatically controlling the temperature of the spray responsive to the temperature and humidity of the conditioned air.

Other objects and advantages of the invention include the provision of a machine or apparatus of the character mentioned capable of either humidifying or dehumidifying the air; means for automatically maintaining the condition of the treated air at predetermined humidification and temperature, and means for maintaining the form of unitary device capable of being grouped to take care of the needs of buildings of various sizes.

While we have thus far mentioned use of the invention chiefly in connection with the treatment of air, we wish it to be understood that the same is capable of use industrially for the treatment of various gases for the purpose of maintaining them at predetermined relative humidity and temperature either by humidifying them, dehumidifying, heating or cooling them. Furthermore, apparatus embodying our invention may be used as a heating plant.

All of the objects and advantages of the invention will become apparent and will be pointed out during the course of the following detailed description of the accompanying drawings, in which

Fig. 1 is a front elevation of the exterior of a machine embodying our invention;
Fig. 2 is a view on the line 2—2 of Fig. 1;
Fig. 3 is a view taken on the line 3—3 of Fig. 2;
Fig. 4 is a view taken on the line 4—4 of Fig. 2;
Fig. 5 is a view taken on the line 5—5 of Fig. 2;
Fig. 6 is a view taken on the line 6—6 of Fig. 2;
Fig. 7 is a view similar to Fig. 1 with a portion of the front of the housing broken away;
Fig. 8 is a view taken on the line 8—8 of Fig. 7;
Fig. 9 is a view taken on the line 9—9 of Fig. 7;
Fig. 10 is a detailed sectional view of a heater or cooler for the spray water;
Fig. 11 is a front perspective view of a machine which may be used as a heating plant and showing the arrangement of parts on the interior of the machine diagrammatically;
Figs. 11a and 11b are perspective views of the fan assemblies removed from the machine;
Fig. 12 is a diagrammatic view of the automatic control means for the heating and cooling elements of the machine showing the electric circuits;
Fig. 13 is a small top plan view showing how the units may be grouped;
Fig. 14 is a side view of a machine with a separate refrigerating unit coupled thereto or positioned in proximity thereto; and
Fig. 15 is a complete diagrammatic view of the heating, cooling, and spraying means.

Referring to the drawings, and particularly at present to Fig. 1, the numeral 1 designates the front panel of the housing for the apparatus, said panel being provided with a plurality of openings closed respectively by doors 2, 3, 4, 5 and 6. The front panel is preferably of metal as also are the sides, back, and top of the apparatus, and the exterior of the housing may be finished in the style of the usual refrigerator finish or may be covered by baked enamel or a plastic heat insulating material. The walls of the housing are also preferably lined with a heat insulating material such as generally used in casings of refrigerators or refrigerating apparatus, such lining not being shown in the drawings. The doors 5, 6 and 6 may be hingedly con-
connected to the housing as indicated by the letter b, while the doors 3 and 4 are preferably gas-
tekted and are tightly held in their openings to
compress the gaskets, not shown, by jam nuts
or wing nuts N fitting on cooperating bolts, to
provide a water tight seal between the doors 3
and 4 and the panel 1.

Projecting outwardly from the top of the
housing is the end of a stack 7 adapted to be
connected to a conduit for delivering air to the
machine for conditioning. Also, on the top of
the machine at opposite sides thereof there may
be collars 8, two at each side of the machine, and
similar collars 8' on each side panel of the
machine for delivering the conditioned air to
conduits for conveying it to the proper rooms or
parts of the building.

Referring to Figs. 2-6, it will be noted that
plates 9 are mounted between the front and back
of the machine and which, in connection with
the sides 10 of the stack, divide the top part of
the machine into spaces or compartments 11 and
12, at opposite sides of the stack. At each side
of the housing are flues 13, 13' and 14, 14', (Fig.
6) formed by partitions 15 between the walls 9
and the sides 1 of the housing. Each of these com-
municates with openings surrounded by collars
8 and 8'. At this point, we would mention that
such of the collars 8, 8', as are not connected
to conduits leading to rooms to receive the treat-
ed air may be closed by suitable caps or plates
of metal. There are preferably eight collars,
four on top and four collars on the sides, and
it would be preferable to use either the four top
collars and close the side ones or use the side
collars and close the top ones. This assumes
that the capacity of the machine is sufficient to
deliver a required amount of air to four rooms,
but it will be understood that this is purely illus-
trative and that the capacity of the machine
may be such as to care for more or less rooms.

However, we consider it highly desirable to
provide the machines of a unitary character capable
of supplying air say to four rooms, and rather
than build a larger machine to take care of more
rooms, to simply arrange the units side by side
so that two units would furnish air to eight
rooms, three units to twelve rooms, etc. This
assumes rooms of usual standard size such, for instance, as school rooms,
and large residences, and, of course, a machine
capable of supplying conditioned air to such
rooms in requisite number of cubic feet per min-
ute could supply six, eight or more rooms of
smaller capacity.

The lower ends of the plates 10 forming
the sides of the stack 7 (Figs. 2 and 3) are flanged
diagonally outward as at 16, and have their
lower ends rigidly connected to the plates 9 by
any suitable means. It is possible, of course,
instead of flanging or bending the plates 10 to
provide flanges 16, to connect separate plates
between the ends of the plates 10 and 9, to form
bottoms of the compartments 11 and 12, which
as hereinafter described, may be utilized for the
housing of cooling, heating or other elements.

The front of the stack 7 is formed by plate 17
mounted parallel to the front 1 of the casing
and connected between the plates 10. The lower
end of the plate 17 is flanged similarly to the
plates 10 and connected to the front of the hous-
ing. Thus, a space 18 is provided between the
front of the stack 7 and front 1 of the housing,
said space communicating with the chambers 11
and 12 and also being adapted to receive part
of the heating or cooling means. It will be
noted that the stack consists of an inverted sub-
stantially funnel-shaped member secured be-
 tween the plates 9 and 10 and front wall 1, and
having its top end projecting through and above
the top plate 20 of the casing.

Within the stack 7 and adjacent its lower
ends are heater tubes or coils 21 (primary heat-
ers) which may be connected, as hereinafter ex-
plained, to a suitable source of steam supply.

Also, within the stack and above the heaters 21
are the coils 22, which are hereinafter referred
to as the primary cooler, and which are con-
nected to a suitable source of chilled water
at low temperature, or which may be used as
direct expansion refrigerator coils using any suit-
able commercial refrigerant.

Below the flanges 16, 18, of the stack, that is,
below the flaring end of the stack and across
the chamber 8, which is defined by the front and
back of the housing and the lower ends of the
plates 9, there is mounted a baffle 23 having ir-
regular passages 23' through which the air passes
upon entering the chamber 8 from the stack.
The purpose of such baffle is to assist in freeing
the air of any dust or other foreign matter not
possible. Referring again to Fig. 1, the door 3
is mounted across the casing 1 in front of the
baffle 23, so that upon opening or removing the
doors 1, one may have access to the baffle 23 for
closing the passages whenever necessary.

In the bottom of the chamber 8 is a trough 24
and above the trough is a spray nozzle 25 con-

ected to pipes hereinafter described for con-
ducting water of predetermined temperature to 35
the nozzle, so that the water will issue from the
nozzle in the form of a spray directed upwardly
and outwardly towards the top of the chamber
8, as shown in Figs. 2 and 3. The position of the
nozzle is preferably centrally of the chamber 8,
so that the spray will contact the upper por-
tion of the walls of the chamber, and the lower
surface of the baffle 23 creating a back-lash and
resulting in further breaking up of the spray
into a mist at the top of the chamber immediately
beneath the baffle 23. The impingement of the
spray against the walls and baffle and further
breaking up of the spray creates additional turbul-
ence in the spray chamber immediately at
the point where the air enters through the baffle.

One of the advantages of the construction and
arrangement of the parts defining the spray chamber and the manner of projecting the spray
affords a relatively short length of travel of the
air through the spray chamber, whereby a rela-
tively great volume of air can be treated in a rela-
tively small and compact spray chamber.

Through each of the walls 9 adjacent the bot-
tom of the spray chamber, are openings 26 lead-
ing to compartments containing fans F which
60 draw the air down through the stack 7, baffle 23,
and spray chamber and project it upwardly through flues 13, 13' 14 and 14' and across the
secondary cooling coils 27 and 28, and secondary
heaters 28, 28, 29 and 29', for delivery to four
rooms or desired parts of a building through con-
duits connected to collars 8 or 8'. There is pref-
erably a fan to supply each flue.

We have previously explained that the door 3
may be opened to give access to the baffle 23 for
70 cleaning the passages therein. The operating
mechanism therefor and mechanism for circulat-
ing the water are mounted behind the
doors 5 and 6, and by opening the doors access
may be had for such parts for the purposes of 75
repair at any time. Also, the door 4 may be removed to give access to the spray chamber 8 and the parts therein, and the doors 2 may be opened for access to the parts housed in the compartment 18.

Referring particularly to Figs. 2, 3, 7, 10, it will be seen that within the space 19 between the stack and the front of the housing is a pipe 28, leading from any suitable source of steam supply, and to which is connected a header 29 having branches a, a', b, b', c, c', d, d', e, e', and f. The branches a and a' are connected by pipes 30 and 31 respectively to the primary heaters 21. The branches b, b', (see Figs. 7 and 15) are connected by pipes 31, 31' respectively to the front secondary heaters 28, 28'; the branches c, c', are connected by pipes 32, 32' to the back secondary heaters 28, 28'; the branches d, d', are connected by pipes 33, 33' to the front upper secondary heaters 25, 25'; and the branches e, e', are connected by pipes 34, 34' to the rear upper secondary heaters 25, 25'. Each of the heaters is provided with an opening 39 to receive a return pipe. The branch 37 is connected by means of the pipe 38 leading from the water heater 35 shown in detail in Fig. 10, as comprising a jacket having a coupling 37 to receive the spray water inlet pipe and the coupling or nipple 38 receive an outlet pipe. The water passing to the spray nozzle 67 may be diverted through the heater whereon the water is required in accordance with and automatic means hereinafter described. Fig. 10 shows the steam pipe within the heater and around which the water circulates. We wish it to be understood that we may employ electric water heaters of known and available other heating medium for the water instead of the steam coil shown and described.

There is provided in connection with each of the extensions a, a', b, b', c, c', d, d', e, e', a valve, each operated by an electro-magnet E.M. so that all of the primary and secondary heaters may be collectively and individually placed in communication with or closed from communication with the source of steam supply through the pipe 38. Each of the electro-magnets E.M. is connected in circuit with and operated by the operation of the valves to control the flow of steam to the primary and secondary heaters and location of the thermostats will be explained in detail in connection with the explanation of the operation of the apparatus.

Within the space or chamber 11 are pipes 40 and 41, the former leading to the secondary cooling coils 27 in the flues on the left side of the machine and the latter leading from said coils. These pipes may conduct the chilled water, brine, or other refrigerant from any suitable type of refrigerating apparatus. Pipes 42 and 43 are located in the space or chamber 11 and are connected preferentially to the same apparatus as the pipes 40 and 41 to conduct the refrigerant to and from the primary coils 22 in the stack 7. Pipes 44 and 45 also lead to and from the refrigerating apparatus to conduct the refrigerant to and from the secondary cooling coils 47 in the flues at the right side of the machine. The respective groups of pipes 40, 41, 42, 43, 44, 45, may be provided with automatically operated valves similar to the steam valves, or expansion valves actuated in response to thermostatic elements located in the air terminal spaces, so that the refrigerant may be conducted simultaneously through all of the coils both primary and secondary or through the primary alone or through the secondary coils alone.

From the description thus far given, it will be seen that the air entering through the stack 7 may be either heated by the primary heaters 21 or chilled by the primary coils 22 and then drawn by the fans through the base and spray and openings 26 and sent on to the conduits leading to the air terminal spaces, and the air leaving the fans may further be chilled by the secondary coils 27, or heated by either or both of the secondary heaters in the respective flues according to the conditions existing in the air terminal spaces or rooms directly affecting the thermostatic controls. It will be apparent that the temperature of the air or gas treated with our apparatus may be controlled over a very wide range.

As has been pointed out, it is an important object of the invention to regulate or control the relative humidity of the air or gas. This is accomplished largely by controlling the temperature of the spray. To this end, the trough 46 is supplied with water through a pipe 47 mounted adjacent the front wall of the housing and extending up into the space 19 for connection with a pipe leading from a source of supply. The flow of water through the pipe 47 to the trough is preferably controlled by a float valve 48, and an overflow pipe 49 leads through the trough and housing to a drain, to which is also connected a drain outside 50.

A pipe 50 leads from the trough 47 and is connected to branch pipes 51, 51', in which are mounted strainers 52. Branch pipes 53, 53' connect pipes 51 and 51' to pump 52 and 52' extending across the bottom of the casing. Pipes 50 is also connected by a pipe 55 around strainers 52 to pipe 56. Valves H.V. are mounted in pipes 51, 51', 53, 53' and 55, so that the water may be diverted through one strainer or the other, through 51, 53, or 51', 53', or through 55, according to which of the valves H.V. are open. Pipe 58 is also connected to a drain branch 58 leading to a sediment pocket 57. A thermostatic element 60 is installed in the pipe line and may be installed in the pipe 56 leading to the pump 52. A pump discharge pipe leading from the discharge of the pump 52, 61 is connected with the two branches 58, 58, the former leading to water cooling means which may be the refrigerating apparatus previously referred to, and the latter leading to the water heater 38 in the chamber 18 and shown in detail in Fig. 10.

An electro-magnetic valve 64 is mounted in the branch 58 of the pump discharge line, and a similar valve 65 is mounted in the branch 38 of the pump discharge line to the water heater. The operation of these valves and the means actuating them will be hereinafter explained in detail, and for the present we would state generally that the electro-magnetic valves 64, 65 are alternately operated in response to humidistats in the air terminal spaces or elsewhere, or by other elements as presently explained, so that water will be drawn from the tank 24 through the strainers by the pump and discharged either to the water cooler and thence to the spray nozzle 26, or to the water heater and thence to the spray nozzle. The result is that the water sprayed from the nozzle 26 is of predetermined temperature according to the requirements for the humidity of the air, which is determined by the setting of humidistat or other control elements as hereinafter pointed out.

The thermostatic element 60 in the pump suction line operates the magnetic valve 65 to open 75.
and close communication between the extension f on the header 29, and the hot water heater 36. The same element 60 also operates a valve 81 in the water cooler. The function of controlling the valves in the water cooler is to further assure maintenance of proper predetermined humidification of the treated air as will become more apparent hereinafter.

A relief line RL is connected between pipes 54 and 61. Check valves CV are mounted in the pipes 54 and 62, leading from the water heater and cooler to the spray nozzle.

Referring to Figs. 2-4, it will be noted that behind the rooms 5 and 6 between the sides of the housing and the walls 9 there are plates 70 to one of the electro-magnets EM, there being one fan in alignment with each of the openings 26 in the walls 9, as shown in Fig. 4, and below each delivery flue. The fans may be rotated by electric motors M arranged in housings 71 between the fans and having a shaft projecting from each end and connected to the fans. Also, within the fan chamber is the transformer 72. Above the fans are plates 73 closing the top of the fan chamber and provided with openings 73’ through which the partly treated air is discharged by the fans. We have, in the arrangement of fans, motor, and transformer is purely illustrative and that other means for rotating the fans may be employed and that such means may be located either within the housing or on the exterior. The arrangement of the electric motors, transformer, and fans within the chamber just described, affords very compact arrangement, and by slidably mounting the plates 70 on angle irons 70’, the entire assembly of fans and motors may be removed.

Bearing in mind our previous explanations, that apparatus shown in this application is purely illustrative, and that for the purpose of convenience and understanding of the invention, we have mentioned that there may be four outlets connected to conduits leading to different rooms, and now referring to Fig. 12, the numeral C1 designates a thermostat located in one of the rooms, and C2, C3 and C4 designate thermostats located respectively in the other rooms, and each of the thermostats C1, C3, C4, being automatically operative in response to temperature changes to establish or close an electric circuit to operate valves in two of the secondary heaters.

Referring again to the thermostat C1, it will be noted that electric wires 75, are also connected to another of the electromagnets EM. The valves in the header 29 operated by the said electro-magnets may be the ones Fig. 7 mounted in the extensions b and d.

Assuming that thermostat C1 is set to control or maintain the temperature of the air in rooms or terminal spaces served at 68º, and if the air in the said room should drop to a temperature below 68º, then the thermostat C1 will close circuits through the wires 15 and 16 to the electro-magnets EM to open valves in the extensions b and d and admit steam to the upper and lower secondary heaters with which the extensions b and d are connected. Thus, the temperature of the air passing these secondary heaters through the communicating particular room will be increased, and as the temperature in the room reaches 68º, one of the secondary heaters will be cut out, that is, either the circuits 75 and 76 will be opened, and when the temperature goes above 68º then both of the circuits will be open and the valves in the extensions b and d will be closed. Any subsequent drop in temperature will cause one of the circuits to be closed to operate one of the valves 35 in either of the extensions b and d. Through the extension on the header 29 connected to the secondary heaters will be controlled automatically by the thermostats in the respective rooms.

As previously mentioned, the invention also provides for maintaining the conditioned air at a predetermined amount of humidity, which is obtained by controlling the temperature of the spray water and which may be accomplished in several ways. First, a dew-point control element 77 located either in the air-terminal spaces or the discharge duct of the machine for contact by the air which has passed the primary heaters and coolers through the spray chamber and secondary heaters and coolers, as shown in Fig. 12, is connected by wires 78 to the circuit 79 for effecting simultaneous operation of the valves 64 and 65 in the pump discharge. The dew-point control element is also connected by wires 80 to the circuit 81 for effecting simultaneous operation of the valve 66 controlling the heating medium of the water heater, and for controlling the supply of the refrigerant or cooling medium to the water cooler. Assuming that the air contacting the dew-point control element 77 is of greater humidity than desired, the valve 64 will be opened and the valve 65 closed, so that the water will be pumped through the cooler to the spray nozzle. At the same time that the valves 64, 65, are respectively opened and closed, the valve 66 is also closed and the valve 81 opened, thus supplying refrigerant to the water cooler. If the condition of the air is such as to call for an increase in humidity, the valves 64, 65, will be operated reversely to the above, that is, the valve 64 will be closed and the valve 65 opened. When the valve 64 is closed and the valve 65 opened, the valve 66 is also opened and the valve 81 closed, so that the heating medium is supplied to the water heater through which the water is pumped to increase its temperature and the humidity content of the air. We would mention at this time that the valves 64, 65, the pump discharge line are preferably by-passed.

Still referring to Fig. 12, it will be noted that a humidistat 82 may be provided in any of the rooms or air terminal spaces. This element may be set by the owner of the premises or person in charge of control at will the humidity content of the air. This element 82 is shown connected by wires 83 to circuits 78 for control of the valves 64, 65, and by wires 84 in the circuit 80 for control of the valves 66 and 81. The operation of the valves in response to the element 82 would be exactly the same as described in connection with 60 the dew-point control 77. Preferably either the dew-point control element is provided or the humidistat elements 82 are provided, it not being necessary, nor, we believe, entirely desirable, to provide both.

The element 80 in the pump suction line affords another means of controlling the relative humidity of the air. This element can be set to control the temperature of the spray water at a predetermined temperature, depending on 70 the relative humidity of the air. Assuming that the water flowing through the pump suction line is at a temperature below that at which the element 60 is set, the element will contract and energize the circuit 78 through wires 85, closing the 76
valve 64 and opening the valve 65, and at the same time through the wires 88, closing the circuit 89, opening valve 66, and closing valve 81. If the temperature of the water running through the temperature element 66 is set, then the valves 64, 65, and 66 and 81 are operated reversely, so that the water will be conducted through the cooler and hence to the spray nozzle.

Still referring to Fig. 12, it will be noted that the cooling means which operate the valves in the extensions a, a', on the header 29 to control the admission of the heating medium to the primary heaters 21, are connected by wires 87 to cool air thermostat 88 which is preferably located in the air inlet conduit for direct contact with the entering air. This thermostat may be set at any point to operate the electro-magnets and valves 35 controlling the flow of heating medium to the primary heaters in response to the temperature of the entering air. It will thus be seen that the entering air may affect the element 88 to cause opening of the valves 35 controlling the flow of heating medium to the primary heaters, or the temperature of the air may be such that the valves will not be opened. In either event, the air is sucked down across the primary heaters and through the element 88 and through the turbulent spray or mist at the top of the spray chamber, the temperature of which is maintained and controlled by any of the means hereinbefore described to humidify or dehumidify the air or gas. The air then passes on through the openings 26 in the walls 5, through the fans and past the secondary heaters and coolers in the several flues to the terminal space or rooms. If the dew-point control 77 is within the discharge ducts it will function as previously described. The air entering the terminal space or rooms, will, of course, contact the thermostatic elements C1, C2, C3 and C4, which may open and close the valves V controlling the respective secondary heaters.

It is obvious that a machine or apparatus may be made complete in the forms shown in Figs. 1, 2 and 11 with all of the parts assembled in compact form, it only being necessary when the device is installed to admit water to the trough 25 which is done by coupling the pipe 47 to a source of water supply. The thermostatic and/or humidistatic elements are installed in the rooms or area to be served with the air, and electric wiring is completed between the installed electro-magnetic valves and the humidistatic and/or thermostatic devices.

We wish it to be understood that the exact form shown in the drawings is purely illustrative of one preferred embodiment of the invention and that numerous alterations and modifications may be made at will. For instance, the primary and secondary heaters may be in the nature of coils such as shown and described, or heavy straight pipe provided with surface extension fins and connected to suitable headers, the dimensions being such as to fit within the flues. We also wish it to be understood that a machine constructed in accordance with our invention and embodying the features above described may be made in various sizes or shapes to supply requisite amount of conditioned air to any number of rooms or to large auditoriums, factories and the like. We believe that for all commercial purposes it may be best to build the machines in a standard size and capacity to supply a predetermined amount of conditioned air to areas of predetermined size, and if the area to be supplied is greater than the capacity of the machine, to simply accumulate two or more machines which may be arranged side by side as shown in Fig. 13. A single source of supply of heating medium for the primary heaters, secondary heaters, and spray water, will serve any number of machines and the same is true of the refrigerant and water and electric supply.

In the description of the operation of the machine in connection with Fig. 12, we do not deem it necessary to describe the primary and secondary coolers, as these can be operated and controlled in the same manner as the primary and secondary heaters. If the apparatus is to serve as a heating plant the cooling coils in the flues 15 must be omitted, and only the heaters installed, such arrangement being shown in Fig. 11.

The motors for rotating the fans and the pump should preferably be provided with variable speed controls. Furthermore, we deem it advisable to provide both manual and automatic means of starting and stopping the motors. Such automatic means might be a temperature responsive element located for contact by the air, and which, 85 should the air reach an undesired temperature will, through proper electric circuit in which the element and motors are connected, stop operation of the motors.

The flow of the air in a direction opposite to the flow of the spray is especially important in connection with the construction and arrangement of the spray chamber and the projection of the spray accomplishing atomization or impaction expansion of the spray by its impingement 35 against the top of the chamber, whereby the spray is broken into a finer mist than otherwise possible and through which the entering air must pass to collect uniform and thorough cool mixture, or absorption by the air. Since the invention is well adapted to the production of a low pressure apparatus, it is preferable to provide for the downward flow of air directly against the upward flow of spray water and through the mist created by the impingement of the spray 35 against the parts at the top of the chamber, and this arrangement as previously explained, provides for handling a great volume of air in a relatively small space, and operating at low pressure.

We claim:

1. Air conditioning apparatus comprising a unitary housing having an air inlet, a heater in said housing disposed in the path of the entering air, a spray chamber in the bottom of said casing, means to project a spray of water in said chamber in a direction opposite to the direction in which the air enters said chamber and with great turbulence at the portion of said chamber which the air first enters, delivery flues commencing with said spray chamber, means to draw air through said inlet and spray chamber and to deliver it through said flues, heaters in said flues, means to regulate the temperature of the spray water in response to the humidity of the delivered air, means to automatically regulate the temperature of the heaters in said flues in response to the temperature of the delivered air, and means to regulate the temperature of the heater in the housing in response to the temperature of the entering air.

2. Air conditioning apparatus comprising a housing, a spray chamber within said housing, an air inlet leading into said spray chamber, means to create a turbulent spray of water in
said chamber with greatest turbulence at the portion of the chamber which the air first enters, a water heater, a water cooler, means automatically operable in response to the humidity of the air which has passed through said spray chamber to cause the water to be sprayed to flow either through said heater or through said cooler, means to cool the air in advance of entry into the spray chamber, and means responsive to the temperature of the entering air to control said air cooling means.

3. Air conditioning apparatus comprising a housing, a spray chamber within said housing, an air inlet, leading into said spray chamber, means to create a turbulent spray of water in said chamber with greatest turbulence at the portion of the chamber which the air first enters, a water heater, a water cooler, means automatically operable in response to the humidity of the air which has passed through said spray chamber to cause the water to be sprayed to flow either through said heater or through said cooler, means to heat the air in advance of entry into the spray chamber, and means responsive to the temperature of the entering air to control said air heating means.

4. Air conditioning apparatus comprising a unitary housing having an air inlet and a plurality of air outlets for connection respectively with a conduit to conduct the air into the housing and conduits to conduct the air away from said housing, a spray chamber within the housing communicating with said air inlet, flues communicating with each of said outlets and with said spray chamber, means to cause the air to flow through said inlet, spray chamber and flues, means to heat the entering air, means to cool the entering air, an air heater in each of said flues, an air cooler in each of the flues, and means responsive to the temperature of the areas to which the air is delivered from said outlets and flues to control the air heaters and coolers in the respective flues.

5. Air conditioning apparatus comprising a housing having an air inlet and a plurality of air outlets for connection respectively with a conduit to conduct the air into the housing and conduits to conduct the air away from the housing to spaces to be served, a spray chamber within the housing communicating with said air inlet, means to project the spray of water toward the air inlet in a direction opposite to the direction in which the air travels when entering the spray chamber, means to accomplish atomization of the spray in the region of the chamber which the air first enters, flues communicating with each of said outlets and with the spray chamber, means to cause the air to flow through said inlet, spray chamber and flues, an air heater in each of said flues, means responsive to the temperature of the spaces to which the air is delivered to control the air heaters in the respective flues, an air heater disposed in the path of the entering air in advance of the spray chamber, means to control the temperature of said heater, and means responsive to the humidity of the air passing from said outlets to control the temperature of the spray.

6. Air conditioning apparatus comprising a housing having an air inlet and a plurality of air outlets for connection respectively with a conduit to conduct the air into the housing and conduits to conduct the air away from the housing to spaces to be served, a spray chamber within the housing communicating with said air inlet, means to project the spray of water toward the air inlet in a direction opposite to the direction in which the air travels when entering the spray chamber, means to accomplish atomization of the spray in the region of the chamber which the air first enters, flues communicating with each of said outlets and with the spray chamber, means to cause the air to flow through said inlet, spray chamber, and flues, an air heater disposed in the path of the entering air in advance of the spray chamber, and means to control the temperature of said last heater.

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