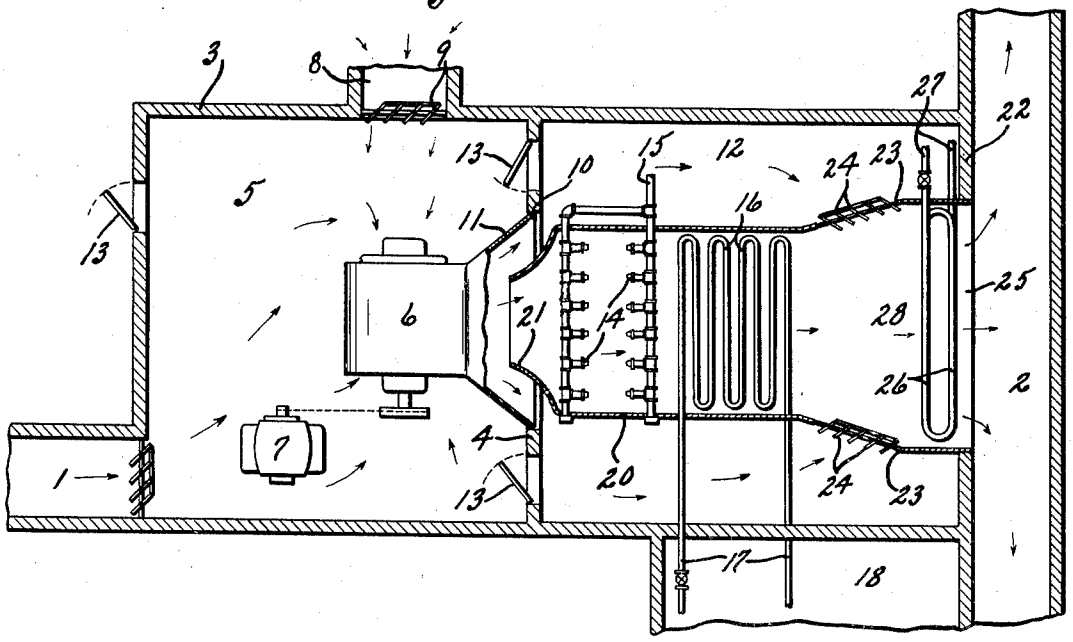
June 13, 1933. T. CHESTER 1,913,659

AIR CONDITIONING

Filed Feb. 21, 1931

Fig. 1



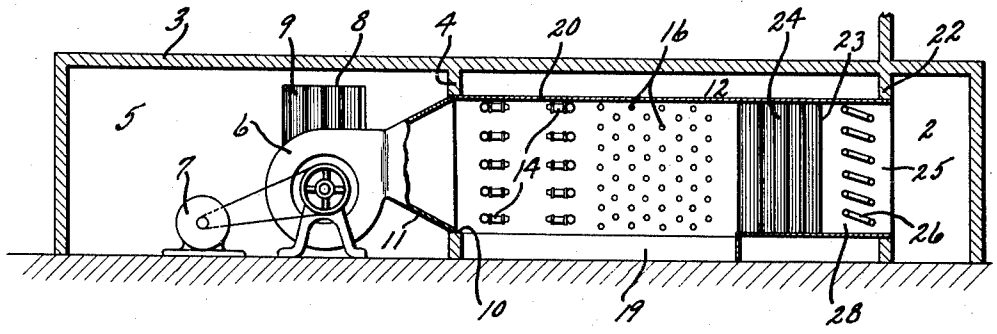


Fig. 2

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UNITED STATES PATENT OFFICE

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AIR CONDITIONING

Application filed February 21, 1931. Serial No. 517,475.

This invention relates to air conditioning and ventilating as for auditoriums or other enclosures wherein a standard of conditions of humidity, temperature, and quality is to be maintained.

The system usually provided for such a purpose embraces recirculating the air of the enclosure, and treating the air thus withdrawn from the enclosure before it is returned thereto. Treatment typically includes a modification of the dewpoint of the air, and thereafter adjustment of the temperature. Also, to maintain the standard of quality fresh air may be added to the recirculating air.

An object of the present invention is to provide an apparatus for treating such recirculated air whereby the desired changes therein will require only the simplest and most inexpensive apparatus.

The exact nature of the invention together with further objects and advantages thereof will be apparent from the following description taken in connection with the accompanying drawing in which Figs. 1 and 2 are sectional views in plan and elevation respectively illustrative of pertinent parts of the apparatus, and in which arrows indicate the direction of flow of air.

With reference now to the drawing, 1 is a conduit by which air is led into the conditioning apparatus from the enclosure to be ventilated and 2 is the return conduit to the enclosure. The conditioning apparatus is located in a housing 3 separated into the two compartments shown by the partition 4.

The first compartment, 5, is a fan room containing the fan or blower 6 and motor 7 for driving the same. An opening 8 for fresh air, leads into the compartment 5, and dampers 9 may be arranged for adjustment of the effective opening. Thus both recirculated and fresh air will have input to the fan 6. A large opening 10 is provided in the partition 4 and a mouth 11 connects the output end of the fan with the other compartment 12 so that the fan will deliver into the latter. Doors 13, normally kept closed allow access to the parts within the compartments of the housing.

In the compartment 12, centrally thereof and opposite the mouth of the fan, are banks of spray nozzles 14 having water supply connection as at 15. Back of the spray nozzles is a bank of cold coils 16 in which refrigerant may be expanded, connection therefor being by way of the piping 17 from the refrigerating room 18. A tank 19 is arranged beneath the nozzles 14 and cold coil 16 for drainage of the spray from the former.

Arranged about the nozzles 14 and the cold coils 16 is a wall 20 having an inlet opening as at 21 turned toward the fan 6. The wall extends rearwardly from the fan to the back wall 22 of the housing 3. Back of the cold coils, however, the wall 20 has one or more openings as at 23 in which dampers 24 are set for the purpose of controlling the same.

It will be apparent that the described apparatus within the walls 20 comprises a dehumidifier by which the air passing therethrough may be brought approximately to the saturation or dew point at the mist chamber temperature; the cold coils being available for use in the summer months as will be appreciated.

Just at the delivery end 25 of the dehumidifier into the conduit 2, and beyond the openings 23, I provide means for creating turbulence. Such means may preferably be in the form of sectional heaters or coils which cause the air to follow tortuous paths over pipes or surfaces which produce mixing due to turbulence. The heating coils 26 have connections as at 27 by which steam or hot water may be provided in winter to add any required amount of heat to the air. It is not necessary to supply steam to such a heater in warm weather, as in summer its sole function is to act as a device for intermingling the two different air streams. If desired the apparatus can be designed so that in winter the entire volume of air handled by the fan can be made to pass through the air washer for the purpose of removing dust and dirt from the air which is returned to the apparatus from the auditorium or enclosure.

It will be observed that the walls 20 provide an alternate passage for air delivered by the fan 6 and into the chamber 28; one passage being by way of the dehumidifier and the other passage being outside of the walls 20 and by way of the openings 23.

In operation the air leaves the fan outlet with a certain total pressure above atmospheric pressure. This total pressure is the sum of the velocity pressure and the static pressure. The static pressure is the sum of all the various resistances encountered by the moving air until it finally reaches atmospheric pressure. These resistances include those of the dehumidifier with cooling coils, the heater, ducts, outlet registers, and also any slightly maintained pressure above atmosphere or plenum within the auditorium or structure to be ventilated. The force available to cause air to flow from the chambers on each side of the dehumidifier, through the openings 23, and thence through the reheater, is the differential pressure between the air entering and that leaving the dehumidifier. In other words there is a drop in static pressure of the air ahead of and after the dehumidifier, due to the resistance of the latter; and this differential head is available in the air discharged from the fan outside the dehumidifier, to cause it to enter the openings 23 and rejoin the central stream. The outside course is the easier path and the air would naturally take this path, so that the side dampers 24 can nicely provide suitable humidity control by regulating the volumes of the two parallel portions of the air stream, namely, unmodified and refrigerated or dehumidified air.

The space within the compartment 12 and outside the dehumidifier walls 20 thus constitutes a plenum chamber. This chamber may extend above and on either side of the dehumidifier as shown in the drawing, or, of course, it may be only on any one side. At any rate the plenum chamber is in parallel relation with the dehumidifier chamber, in the system.

In operation, the relative velocities in these two parallel paths are of course controlled by adjustment of the dampers 24. The control of the dampers may be made automatic, dependent upon air conditions in another part of the system as by hygrostat or thermostat, all as is well known in the art.

Thus, the immediate control of the relative velocities is by varying the resistance to flow through the plenum chamber. Obviously decrease in velocity through the plenum chamber will increase that through the dehumidifier, so that a greater volume of the total will be dehumidified.

The dehumidified and undehumidified portions of the stream, will be reunited in the chamber 28 and intermixed by flow of the stream past the heating coils 26, the coils creating ample turbulence for the purpose. This effect of turbulence is had regardless of whether or not there be actual circulation, as of a heating medium such as steam through the heating coils. Thus, when air heating is unnecessary as in the summer season, the chilled and unmodified air in the stream delivered through the duct 2 will still be thoroughly intermixed, so that the stream has substantially uniform humidity throughout its section.

What I claim is:

1. In a ventilating system, an enclosure having an air supply connection, a second, adjacent enclosure having a conditioned air outlet, means providing air flow from said first chamber into said second chamber, partition means in the second chamber, providing a conduit leading from said outlet with a plenum chamber adjacent the conduit, air conditioning means within said conduit, heating means at the delivery end of said conduit, said partition having a controlled bypass opening providing communication from said plenum chamber to said conduit, between said air conditioning means and said heating means.

2. In a ventilating system, an enclosure having controlled fresh air and recirculated air supply connections, a second, adjacent enclosure having a conditioned air outlet, fan means in the first chamber arranged to deliver into the second chamber, partition means in the second chamber, leading from said outlet toward said fan to provide a conduit with a plenum chamber thereadjacent, air conditioning means within said conduit, heating means at the delivery end of said conduit, said partition having a controlled bypass opening providing communication from said plenum chamber to said conduit, between said air conditioning means and said heating means.

In testimony whereof I hereby affix my signature.

THOMAS CHESTER.