

Jan. 8, 1935.

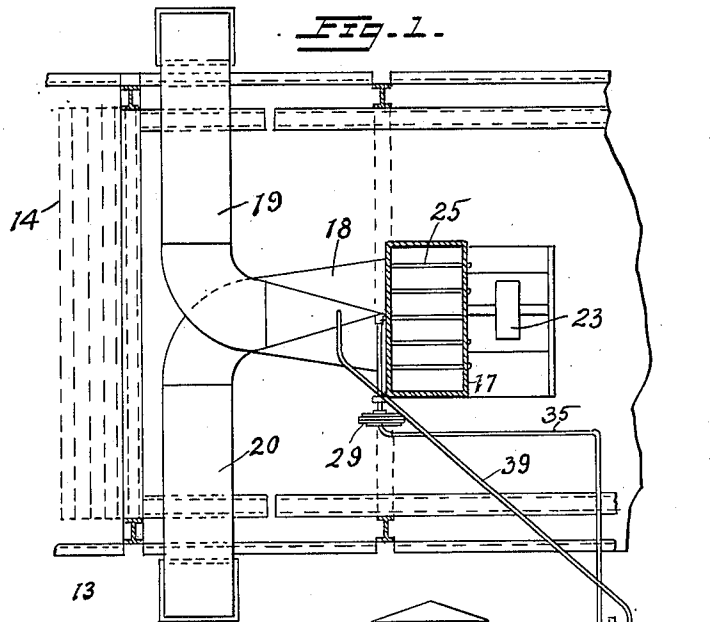
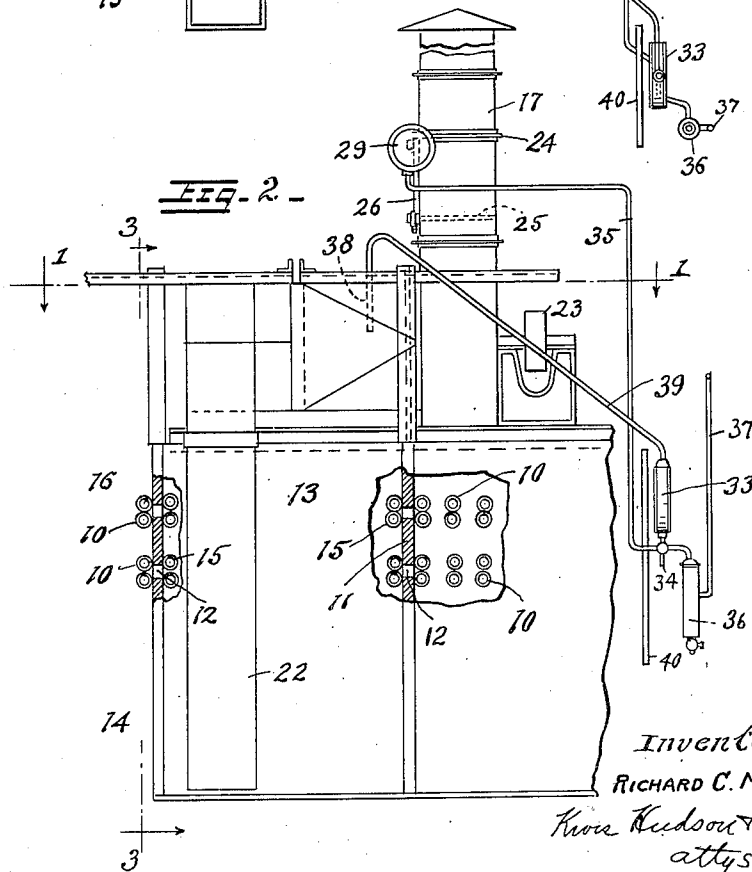
R. C. MOORE

1,987,410

AIR SEAL FOR DRIERS

Filed Nov. 27, 1931

2 Sheets-Sheet 1



Inventor:
RICHARD C. MOORE

Norm Hudson & Kent
attys.

Jan. 8, 1935.

R. C. MOORE

1,987,410

AIR SEAL FOR DRIERS

Filed Nov. 27, 1931

2 Sheets-Sheet 2

Fig. 3.

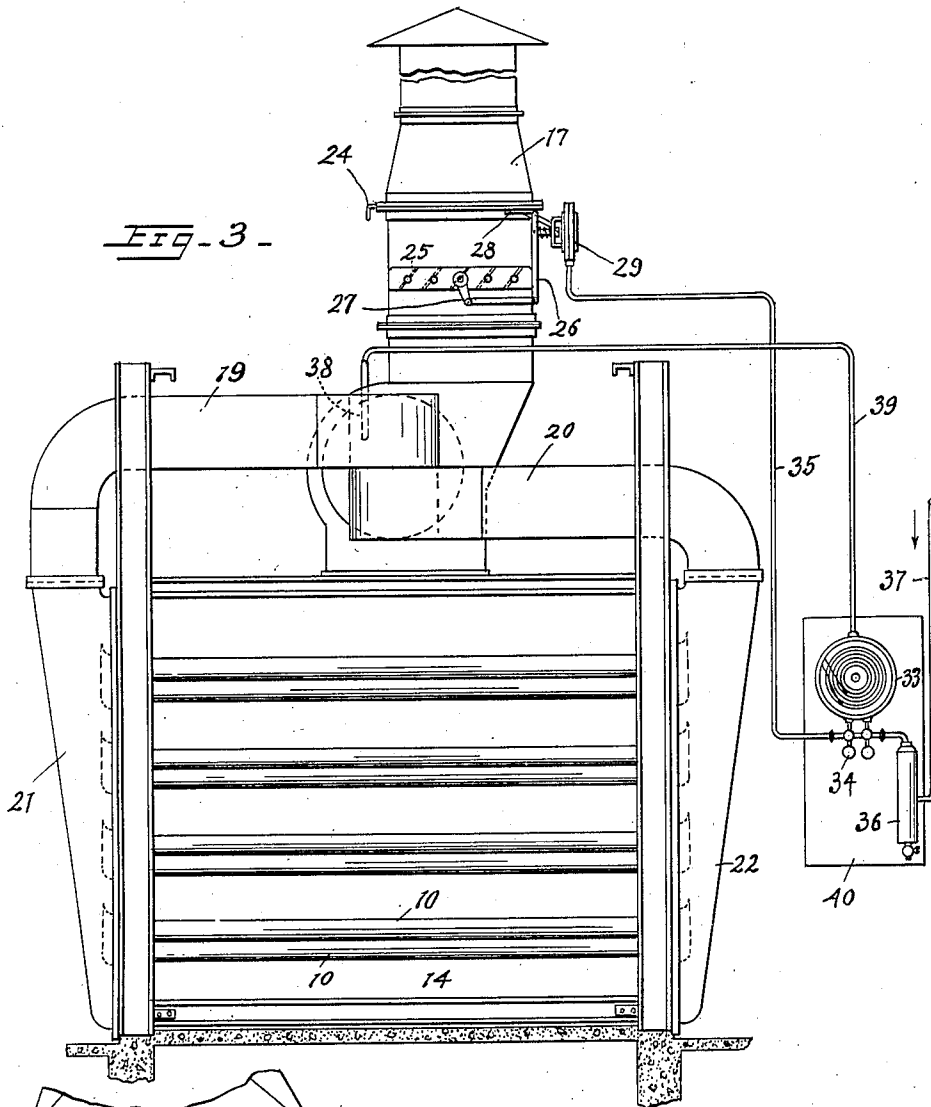
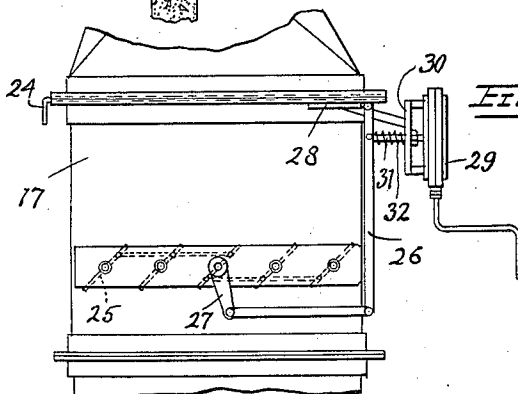


Fig. 4.



Inventor:
RICHARD C. MOORE
Kiva Hudson & Kent
attys.

UNITED STATES PATENT OFFICE

1,987,410

AIR SEAL FOR DRIERS

Richard C. Moore, Painesville, Ohio, assignor to
The Coe Manufacturing Company, Painesville,
Ohio, a corporation of Ohio

Application November 27, 1931, Serial No. 577,539

9 Claims. (Cl. 34—31)

This invention relates to a means particularly adapted to be used in combination with a chamber within which a fluid medium is circulated in predetermined paths causing the static pressure at various points within the chamber to be positive or negative with respect to atmospheric pressure, and constitutes a continuation in part of my copending application Serial No. 340,522 filed February 16, 1929.

Among the many applications of the invention to specific devices with which it has particular utility is its use in connection with a drier of the type known as a progressive drier, wherein sheet material such as wall board, veneer, or the like, is fed in at one end of the drier in a green or undried state, conveyed through the drying chamber and delivered out of the opposite end of the drier in a dried or treated condition.

Especially may the invention be advantageously used in connection with this type of drier having a circulating system for the drying medium such as is set forth in the copending application of Arthur J. Vance, Serial No. 290,985, filed July 7, 1928; wherein the circulation of the drying medium flows from the feed end of the drier toward the discharge end thereof and is so directed and controlled that a positive static pressure with respect to atmospheric pressure will occur at the discharge end while a negative static pressure will occur at the feed end.

It should be understood however that the adaptation of the invention for use with a drier of the type set forth above is simply one example of the many uses to which the invention may be applied, and that broadly, the principal object of the invention is to provide in combination with a chamber within which a fluid medium is circulated in directed paths causing the interior static pressure at various portions thereof to vary with respect to atmospheric pressure, an air seal which may be associated with any of such portions of the chamber and prevent the suction of air into or the escape of medium from such portions to the exterior of the chamber.

A more specific object is to provide in combination with a drier of the type above set forth, means for preventing the introduction or suction of cold air into the heated medium within the drier at certain points thereof or the escape at other points thereof of the heated medium within the drier into the room in which the drier is located.

A further object of the invention resides in the provision of automatic means for maintaining the pressure within the air seal substantially equal

to the static pressure within the drier adjacent the point of attachment.

Additional objects and advantages will become apparent as the detailed description of the invention proceeds.

An embodiment of the invention is illustrated in the accompanying drawings wherein:

Figure 1 is a top plan view of the discharge end of a progressive drier with the invention applied thereto;

Fig. 2 is a side elevational view, portions of the side walls thereof being broken away to show in detail certain parts;

Fig. 3 is an end view taken approximately on line 3—3 of Fig. 2 and looking in the direction of the arrows; and

Fig. 4 is a fragmentary enlarged view of the lower control means.

In the drawings only a small part of the drier has been shown since it is not necessary to show in detail the construction thereof as such construction is clearly set forth in the copending applications of Arthur J. Vance, one of which has been noted above, and the other of which bears Serial No. 291,093, and is an application for the reissue of Patent No. 1,656,802.

It should suffice to say that the drier comprises an elongated housing or closure forming a drying chamber within which are arranged a plurality of transversely extending conveyor rolls adapted to convey the material through the chamber in the process of treatment. There may be any desired number of decks of conveyor rolls, depending upon the desired output capacity of the drier, each deck being adapted to convey the plaster board, wall board, veneer, or other material as the case may be through the drier. Ordinarily the conveyors move the material through the chamber in one direction although there are instances where part of the material will be conveyed in one direction while part will be conveyed in the opposite direction.

The conveyor rolls are supported at their opposite ends by cages associated with the frame of the drier in such manner that a driving means for the conveyor rolls may be accommodated. In the usual construction the lower conveyor rolls are mounted to rotate about fixed axes while the upper conveyor rolls are mounted to rotate about axes which are vertically shiftable. This arrangement adapts the conveyor rolls for the reception of boards and like material of various thicknesses without in any way interfering with the positive driving of the lower rolls. Of course, the conveying means of

the drier may comprise the single roll type which does not have the top rolls on each deck but has the bottom rolls only which convey the material.

Adjacent the receiving or feed and the discharging ends of the drier chamber there is a receiving portion and a cooling section respectively, each provided with a plurality of decks of conveyor rolls upon which the untreated or finished material is received or discharged as the case may be. The rolls of the receiving portion and the cooling section are operatively associated with the driving means for the rolls 10 so that the movement of the material placed thereon or received thereby will be properly synchronized with the movement of the material on the rolls 10. The end walls of the drier chamber are provided with suitable openings through which the material passes from the receiving portion or to the cooling section.

In the drawings, particularly in Fig. 2 thereof, the end wall 11 at the discharge end of the drier chamber is shown as provided with a plurality of openings 12 corresponding in number to the number of decks of conveyor rolls 10 and in operative alignment therewith. The lower rolls of each deck adjacent the end wall 11 are so positioned that their peripheries will engage the inner side of such wall adjacent the lower part of the openings 12 and will extend upwardly across the entrance to such openings, while the cooperating upper rolls are similarly positioned with respect to the wall 11, their peripheries also contacting with the peripheries of the lower rolls. This arrangement prevents the passage of a large amount of air between the rolls and through the openings, and since the upper rolls are vertically shiftable it is apparent that such relationship will be maintained even when the material has separated the rolls, the material itself then constituting a portion of the closure for the openings. This construction is clearly and specifically set forth in copending application Serial No. 291,093, above mentioned, and is the same at both the discharge and receiving ends of the drier chamber. In the case of the single roll type of conveyor double rolls would be used adjacent the openings for the purpose set forth above.

As already stated the drying medium, which may consist of any suitable fluid, such as air, is circulated longitudinally of the drier by means of manifolds, nozzles or other suitable devices in such manner that there is a positive static pressure with respect to atmospheric pressure within the drier at the discharge end thereof and a negative static pressure at the receiving end. Despite the arrangement of the rolls 10 adjacent to the openings 12, it is apparent that a leakage of air through these openings, as well as the openings provided at the ends for the passage of chains and other operative parts, will take place and that because of the negative static pressure cold air will be sucked into the receiving end of the drier diluting and lowering the temperature of the circulating drying medium therein, while the heated moist air because of the positive static pressure will escape outwardly of the drier chamber at the discharge end. In the first event it would be necessary to exhaust an amount of heated air equal to that of the cold air drawn into the drier chamber to prevent outward leakage at other points, while in the second case there would occur an undesirable heat loss and a condensation of moisture or fog in the drying room which would hinder the operation of the drier.

The application of the present invention to a drier such as has been set forth contemplates the provision of means at either the receiving or discharging ends of the drier chamber, or both, whereby the exterior static pressure at such points may be made to equalize with the interior static pressures at the corresponding points.

The mechanical construction of the means which is to be employed at opposite ends being the same, the following description will describe such means as arranged at the discharge end of the drier chamber. It is proposed to add a closure section, indicated generally at 13, to the discharge end of the drier chamber which section may be located if desired intermediate such end of the chamber and the cooling section 14. The section 13 will be provided with a plurality of decks of rolls 15 of identical construction with the rolls 10 in the drier and the cooling section and corresponding in number of decks and arrangement therewith. The end rolls 15 of each deck will be arranged adjacent the end 11 of the drier chamber and the wall 16 between the section 13 and the cooling section in the same manner as the end rolls of the drier are arranged with respect to the wall 11, thereby providing a partial check of the escape of the drying medium through the openings 12 upon both sides of the end wall. The rolls 15 may be suitably connected with the operating mechanism or the rolls in the drier or in the cooling section or may be independently but synchronously operated. The construction of the frame and walls of the drier or closure section 13 need not be specifically described since it is the same as the construction of the corresponding parts of the drier which are fully described in the applications referred to.

An air duct 17, arranged upon the top of the drier and extending upwardly therefrom, connects at its lower end through a suitable connecting portion 18 with a pair of ducts 19 and 20 which extend oppositely from each other across the top of the section 13 and connect with manifolds 21 and 22, respectively, arranged vertically on the opposite walls of the section 13 and in communication with the interior thereof. A fan driven from the pulley 23 is arranged at the base of the duct 17 upon the top of the drier and is adapted to draw air at room temperature from the room through the duct 17 and ducts 19 and 20 and discharge the same from the manifolds 21 and 22 into the section 13. A damper 24 may be arranged in the duct 17 for regulating the amount of air drawn through the same irrespective of the regulation of the fan. Sufficient air at room temperature is discharged into the section 13 to cause the static pressure therein to balance the static pressure within the drier adjacent the end wall 11 thereof. Any appreciable outflow of heated drying medium from the discharge end of the drier will thus be prevented since the static pressures on both sides of the wall 11 balance, while such leakage as occurs at the discharge or cooling section end of the section 13 will simply be of air at room temperature. The room in which the drier is located will not be filled with condensed steam or moisture and there will be no appreciable loss of heat from the drier. In addition, it should be noted that the drying medium often contains chemicals, the escape of which into the room would make it impossible or extremely disagreeable, for workmen to work therein.

When the invention is applied to the inlet end of the drier where the static pressure therein is

negative with respect to atmospheric pressure, the construction is identical, except that the fan is reversed in the system and air is exhausted from the added section and discharged into the room, so that the static pressure within the added section is negative with respect to atmospheric pressure and is balanced with the static pressure within the drier adjacent such end. This eliminates the possibility of cold air being sucked into the circulated drying medium within the drier so as to dilute and lower its temperature.

It is desirable to provide a suitable means for automatically maintaining the static pressures within the air seal chamber and the adjacent end of the drier with which it is in communication and while there are various ways in which this may be accomplished, the pressure control will hereinafter be explained in detail.

Such a control means can be effectively provided by taking advantage of the temperature changes of the air being discharged by the fan system through the duct 17.

Louvre dampers 25 are supported for pivotal movement upon the inside of the duct 17 and are adapted to be moved to open position or to closed position by a flexible link connection 26 having one end connected to an arm 27 secured to the louvre damper 25 and the other end pivotally connected to a support 28 attached to the outside of the duct 17.

A diaphragm motor 29 of the air type is also attached to the support 28 and has a U-shaped strap 30 attached to the rear side of the motor housing. A rod 31 has one end pivotally connected to the link connection 26, while the other end passes through an opening in the strap 30 and is secured to the diaphragm of the motor 29. A coil spring 32 encircles the rod 31 and has its opposite ends abutting the link connection 26 and the strap 30 respectively. This spring 32 normally urges the louvre damper 25 toward its closed position.

A temperature recording controller 33 is supported in any suitable manner upon a panel 40 which may be located adjacent the drier wherever desired. The controller 33 is connected through suitable valves 34 with an air line 35 intermediate the motor 29 and an air filter 36 to which the opposite ends of the air line 35 are attached respectively. One end of the air line 35 should be attached to the motor 29 so that the air will be introduced into the motor 29 upon the side of the diaphragm which will tend to move the rod 31 against the tension of the spring 32 so as to move the louvre damper 25 to its open position. The air filter 36 is also connected to one end of an air line 37 which has its other end connected with any suitable air supply, not shown.

A control bulb 38 is disposed in the inlet side of the fan connection to the air seal manifold and is supported from the duct 18. This bulb 38 is connected in the usual manner with the recording controller 33 by a pipe line 39 in a closed system and contains any suitable heat responsive medium, the changes in the temperature thereof being visually recorded upon the recording controller 33 and in operative cooperation with the valves 34.

In actual practice when these air seal chambers are used, the ordinary temperature controller operating upon the louvre damper 25 in the exhaust from the air seal chamber is relied upon to give the proper control of pressure within the air seal chamber. In other words, if the air seal chamber is located upon the suction end of the

drier, the temperature of the air exhausted by the air seal fan will remain at substantially room temperature until the amount of suction created within the seal chamber is sufficient to draw hot air out of the drier, in which case the temperature of the air exhausted by the air seal fan will increase above room temperature.

The method of control, therefore, is to provide a temperature controller 33 of the conventional type with the control bulb 38 disposed in the exhaust from the air seal fan setting the controller to function at about fifteen degrees above room temperature. The thermometer actuating element controls the louvre damper 25 in the exhaust from the air seal fan. As long as the temperature of the air exhausted is below the setting of the controller 33, the louvre damper 25 will remain wide open. For successful operation of the air seal fan, the fan must have an excess of capacity over what is actually required. If the louvre damper 25 remains open, the suction created in the air seal chamber will draw hot air from the drier into the air seal chamber and cause the temperature of the exhausted air to increase. When this temperature has reached the setting of the controller 33, the louvre damper 25 tends to close. In a short time equilibrium is reached where the amount of air exhausted is just enough to produce a slight outward leakage on the suction end of the drier.

If the air seal chamber is located in a somewhat similar manner, but at the discharge end of the drier, the operation is much the same except that in this case the fan discharges air into the air seal chamber whence it escapes through cracks around the rolls, doors, etc. In this case the control bulb 38 is disposed within the air seal chamber, it being obvious that if insufficient air is provided by the fan the temperature within the air seal chamber will increase materially above the room temperature. The point of control is, therefore, a few degrees higher than room temperature showing that there is a slight leakage outward from the pressure end of the drier of whatever amount is necessary to produce the control differential.

While I have described the preferred embodiment of my invention, it is to be understood that I am not to be limited thereto, inasmuch as changes and modifications may be resorted to without departing from the spirit of the invention as described in the appended claims.

Having thus described my invention, I claim:

1. In combination with a drier for drying and seasoning veneers, wall board and other materials, and of the type having a drying chamber which is adapted to contain a circulated drying medium and is provided with an opening in an end thereof for the passage of the material there-through, of means independent of said circulated medium for creating an air pressure adjacent said opening in said chamber substantially equal to the static pressure of said medium within the chamber adjacent such end, and control means operable in conjunction with the last mentioned means for automatically maintaining said pressures in substantial equilibrium.

2. In combination with a closure within which a fluid medium is circulated thereby causing the static pressures within the closure at various portions thereof to be positive or negative with respect to atmospheric pressures, of a second closure associated with said first mentioned closure and arranged adjacent a portion thereof, said closures being intercommunicating and means independ-

ent of said circulated medium for creating an air pressure within said second closure substantially equal to the static pressure within the first closure at such portion, whereby the escape of fluid medium from or the introduction of air thereinto through said intercommunicating means will be prevented, and control means operable in conjunction with the last mentioned means for automatically maintaining said pressures in said closures adjacent the point of intercommunication in substantial equilibrium.

3. In combination with a closure within which a fluid medium is circulated thereby causing the static pressures within the closure at various portions thereof to vary with respect to atmospheric pressure, of a second closure associated with said first mentioned closure and having a communicating passageway therebetween, means independent of said circulated medium for creating a pressure within said second closure, and control means operable in conjunction with the last mentioned means for maintaining the pressures in said second closure and an adjacent portion of the first mentioned closure in substantial equilibrium.

4. In combination with a closure within which a heated fluid medium is circulated thereby causing the static pressures within the closure at various portions thereof to vary with respect to atmospheric pressure, of a second closure associated with said first mentioned closure and having a communicating passageway therebetween, means independent of said circulated medium for creating a pressure within said second closure, and means for maintaining the pressures in said closures in substantial equilibrium, said means being controlled by changes in the temperature of the fluid in the pressure creating means.

5. In combination with a closure within which a heated fluid medium is circulated thereby causing the static pressures within the closure at various portions thereof to vary with respect to atmospheric pressure, of a second closure associated with said first mentioned closure and having a communicating passageway therebetween, a fan having its inlet side communicating with said second closure for creating a pressure therein, means for varying the amount of air discharged by said fan, and a temperature responsive device disposed upon the inlet side of said fan and affected by a variation of the temperature of the exhausted air for controlling said last mentioned means to maintain the pressures within said closures in substantial equilibrium.

6. In combination with a closure within which a heated fluid medium is circulated thereby causing the static pressures within the closure at various portions thereof to vary with respect to atmospheric pressure, of a second closure associated with said first mentioned closure and having a communicating passageway therebetween, an exhaust fan having its inlet side communicating

with said second closure for creating a pressure therein, a duct connected to the discharge side of said fan, a damper mounted within said duct, means for operating said damper to vary the amount of air discharged by said fan, and a temperature responsive device operated by changes of temperature of the air admitted into the inlet side of said fan for controlling said damper operating means to thereby maintain the pressures within said closures adjacent the point of communication in substantial equilibrium.

7. In combination with a closure within which a heated fluid medium is circulated thereby causing the static pressures within the closure at various portions thereof to vary with respect to atmospheric pressure, of a second closure associated with said first mentioned closure and having a communicating passageway therebetween, an exhaust fan having its inlet side communicating with said second closure for creating a pressure therein, a duct connected to the discharge side of said fan, a damper mounted within said duct, an air motor connected to said damper for varying the amount of air discharged by said fan, an air supply line for said motor, valve control means in said air line, and a temperature responsive device operated by changes in temperature of the air admitted into the inlet side of said fan for controlling said valve control means to thereby maintain the pressures within said closure adjacent the point of communication in substantial equilibrium.

8. In combination with a closure within which a heated fluid medium is circulated thereby causing the static pressures within the closure at various portions thereof to vary with respect to atmospheric pressure, of a second closure associated with said first mentioned closure and having a communicating passageway therebetween, a fan connected to said second closure for creating a pressure therein independent of said circulated medium, and means for varying the amount of air discharged by said fan and controlled by changes in temperature of the air within said second closure.

9. In combination with a closure within which a heated fluid medium is circulated thereby causing the static pressures within the closure at various portions thereof to vary with respect to atmospheric pressure, of a second closure associated with said first mentioned closure and having a communicating passageway therebetween, a fan connected to said second closure for creating a pressure therein independent of said circulated medium, means for varying the amount of air discharged by said fan, and control means responsive to changes in a condition of the air being handled by the fan for controlling said last mentioned means to thereby maintain the pressures within said closures adjacent the point of communication in substantial equilibrium.

RICHARD C. MOORE.