

April 11, 1939.

H. S. WHELLER
CIRCULATION CONTROL MEANS

2,153,604

Filed May 4, 1937

Fig. 4.

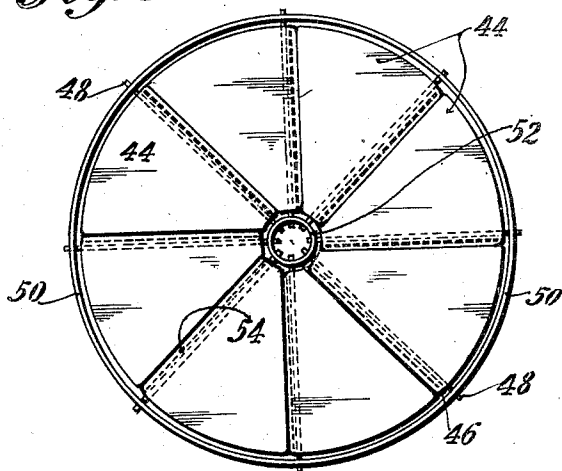


Fig. 2.

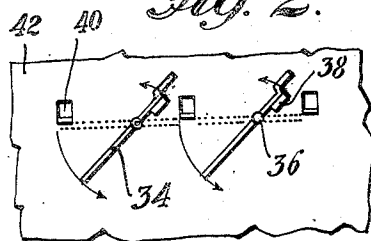


Fig. 1.

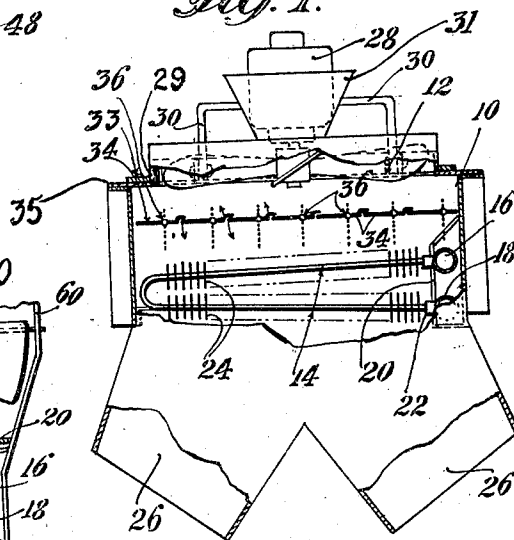


Fig. 5.

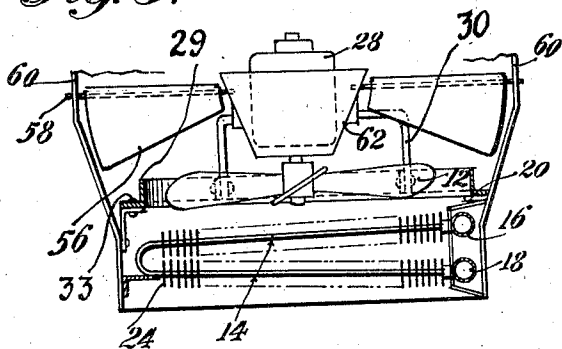
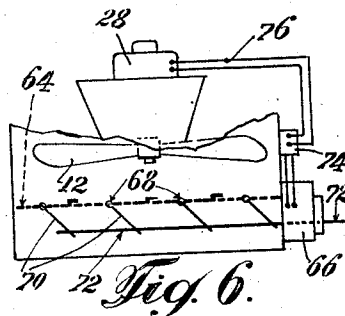
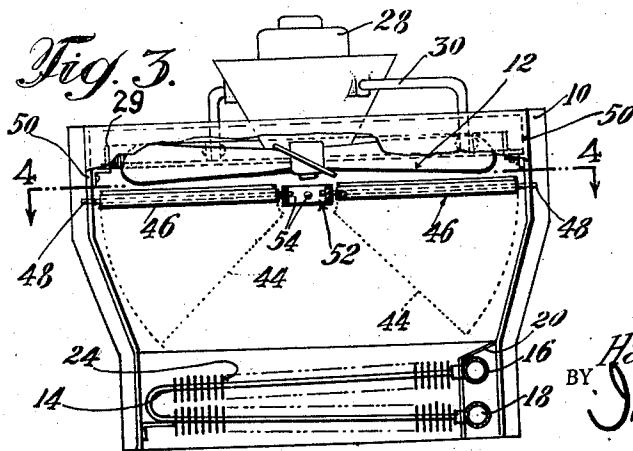


Fig. 3.



INVENTOR.

Harry Stewart Wheller
BY Irving F. Goodfriend
ATTORNEY.

UNITED STATES PATENT OFFICE

2,153,604

CIRCULATION CONTROL MEANS

Harry Stewart Wheller, Elizabeth, N. J.

Application May 4, 1937, Serial No. 140,643

3 Claims. (Cl. 230-114)

This invention relates to circulation control means and particularly to that type in which air is forced by a fan through a heater and in which the air thus heated is then discharged through outlets into a room or enclosure. Heating devices of this general character have been disclosed in Letters Patent No. 2,000,112 issued to me on May 7, 1935, and in my copending application filed concurrently herewith. Such devices have arranged therein heating means conventionally in the form of steam coils over which the air is circulated and thereby heated prior to its discharge from the heater.

In the operation of such heaters, the fan is often stopped, either manually or automatically, at such times as the room or enclosure in which the device is arranged is brought to the desired temperature. It will be recognized that a such time the steam or other heating medium will continue to circulate through the heater which remain therefore comparatively hot after the fan is stopped. This results in the induction of air by convection through the heater, occasioned by the heating means in these devices coming in contact with the air. The unobstructed passage through the heater therefore brings about a chimney or stack effect which causes currents of hot air to circulate through the heater past the motor with attendant possible damage thereto due to heating. In addition, circulation of air through the heater results in the wasteful condensation of steam occasioned by the useless heating by convection of the air which merely collects as a blanket or layer of hot air adjacent the ceiling of the room or enclosure in which the heater is arranged, thereby causing overheating of the room.

My invention contemplates the provision of means for eliminating this chimney or stack effect upon the cessation of operation of the fan. My invention contemplates the provision of dampers arranged in the heater between the heating coils and the motor, which dampers are arranged to spontaneously close the air passages in the heater when the fan stops, and which are opened by the air forced through the heater by the fan.

The various objects of my invention will be clear from the description which follows and from the drawing in which

Figure 1 is a front elevation and partial section of my heater showing the air convection eliminating dampers arranged in the casing.

Figure 2 is a fragmentary enlarged view of some of the said dampers.

Figure 3 is a front elevation and partial section of a modified form of my heater.

Figure 4 is a sectional view along the line 4-4 of Figure 3.

Figure 5 is a front elevation and partial section of a further modified form of my heater.

Figure 6 is a partial front elevation of a still further modified form of my heater.

In that practical embodiment of my invention which I have illustrated by way of example in Figures 1 and 2, the heater casing 10 is preferably suspended overhead as to the ceiling of a room in any desired position and in a manner well known in the art and which, therefore, need not be described in detail. It will be understood, however, that my invention may be applied to any type of heater, as for example a floor or wall type, and that I do not intend to limit myself to the specific structure illustrated.

To heat the air forced through the casing by the fan 12, the heating tubes 14 are secured to the steam and return headers 16 and 18, which are fastened in the casing as by means of the key plates 20, preferably welded to each end of the headers. The headers may be drilled and machined for the reception of the heating tubes 14 which are secured thereto by any suitable means, as for example by compression unions 22.

In order to increase the heating capacity of the tubes, a series of closely spaced flat fins 24 arranged preferably with their greatest dimensions in the direction of air flow are forced onto the tubes. One or more discharge outlets 26 may be provided, through which the heated air is discharged in a generally downward direction. Said outlet or outlets 26 communicate with the interior of the casing 10 which serves as a passage for the circulation of air through the heater, and are mounted thereon in any suitable manner. The motor 28, which is secured as by means of the arms 30 to the annular shroud 29 arranged adjacent the outer tip of the fan, drives the fan 12. The motor is insulated by the crown sheet 31 from the heat which may be radiated from the heated tubes and is thereby protected against possibility of damage which might result from open exposure to the heating tubes.

The annular shroud is supported on the casing by the sheet metal panels 35 to which it is secured as by means of the rivets 33 and which panels are preferably welded to the sides of the casing.

It will be apparent that the outlet 26 and the interior of the casing together provide in the

heater a continuously open passage or stack through which air may circulate.

When the fan ceases to operate, either by manual or automatic means, the steam or other heating medium continues to circulate through the steam headers and the tubes remain at a high temperature. The air adjacent the steam coils is heated thereby, rising by convection to the top of the casing and affecting thereby circulation of air upwardly through the interior of the heater.

The air thus heated by the steam coils and caused to circulate there past by convection condenses the steam or cools any other heating medium found therein. Such condensation of steam or cooling of the heating medium is wasteful since the heated air rises to the ceiling of the room or enclosure forming there a blanket or layer of warm air which serves no useful heating purpose but which may give rise to attendant discomfort.

In addition, the heated air circulates past the motor with attendant possibility of damage there-to due to heating.

In order, therefore, to eliminate this stack or chimney effect and the attendant wasteful condensation of steam, I arrange in the casing a plurality of dampers 34 which are hingedly supported to the casing walls by means of the pivot rods 36.

These dampers are arranged when they are in the closed position indicated in Figure 1, to completely cover the entire inner cross section of the casing. The dampers may be provided with counter weights 38 at one side thereof so that they are thereby made slightly out of balance.

This provides a turning moment about the pivot rod, causing the dampers to normally gravitate into closed position.

When the fan is operated, the air blast therefrom will cause the dampers to rotate about the pivot rods in a counterclockwise direction into the open position, indicated by the arrows in Figures 1 and 2, to thereby provide an unrestricted passage for the circulation of heated air downwardly through the interior of the heater.

When the motor is stopped, the dampers, since the gravitational moment of the dampers about the pivot rods is restrained by the air blast, will be urged by gravity about their pivots into fully closed position, the lugs 40 extending from an end wall of the casing 42 arresting rotation of the dampers and maintaining them stationary in closed position.

The dampers are arranged in the casing in positions parallel to each other so that upon the dampers moving into closed position the edges thereof will meet and entirely close the interior cross section of the casing so that the draft occasioned by the chimney or stack effect of the heating tubes, outlets and casing is completely eliminated.

Referring now to Figures 3 and 4, I have therein illustrated another embodiment of my invention in which the dampers are radially arranged in the casing to provide a circular passage for the air through the casing. The dampers 44 are hingedly secured closely adjacent one edge 46 thereof by means of the pivot rods 48, which extend at one end thereof into the circular wall 50 of the casing and at the other end thereof into the inner ring 52. The edge 46 of these dampers is made slightly heavier than the other ends of the dampers so that they normally gravitate into closed position about the rods, in which posi-

tion the edges of the dampers are arranged to meet to thereby completely close the interior passage of the heater to circulation of air there-through.

When the fan is operated, the air pressure against the greater surface of the damper exposed thereto forces the dampers to rotate about their pivot rods into the substantially vertical position indicated by the dotted lines in Figure 3, thereby completely opening the interior of the heater to circulation of the air therethrough.

When the fan is stopped, these dampers will likewise gravitate into closed position, the edges 54 of the dampers engaging an adjacent damper to thereby arrest rotation of the dampers about the pivot rod and maintain them in closed position.

It will be understood, of course, that these dampers need not of necessity be arranged completely below the fan, and I have accordingly illustrated in Figure 5 a modification in which these gravity actuated dampers are radially arranged in the casing above the fan, but which are so positioned with respect to the motor as to eliminate the chimney or stack effect and prevent access of heated air to the unprotected parts of the motor above the crown sheet.

In that modification, the gravity actuated dampers 56, which are likewise arranged in pivotal overbalance, are radially arranged in the casing on the pivot rods 58 which extend at one end thereof into the circular wall 60 of the heater casing and at the other end thereof into the crown sheet 62. The arrangement and operation of the dampers 56, under the influence of the air stream and gravity, is the same as that of the heretofore described and illustrated modifications of my heater, and need, therefore, not be described again in detail.

Referring now to Figure 6, I have therein illustrated a further modification in which the dampers 64 arranged to completely close the heater interior passage may be automatically operated by any other suitable means, such as the electric motor 66.

The dampers 64 are fixedly arranged on the pivot rods 68 which are rotatably secured to the end walls of the heater casing. All of the pivot rods 68 are operatively connected by means of the links 70 to the actuating arm 72, the reciprocation of which, under the influence of the motor to which it is operatively connected in any well known manner, for example by a rack and gear, will rotate the dampers into fully open or fully closed position.

Operation of the motor in either a clockwise or counterclockwise direction to fully open or close the dampers 64, may be effected by any suitable switch 74 well known in the art and which, therefore, need not be described in detail here.

The switch 74 is connected to the electric circuit operating the fan motor, by conventional wiring 76, so that when the electric circuit operating the fan motor is opened to stop that motor, the damper actuating arm motor is simultaneously caused to operate the dampers to close the heater interior.

When the fan motor circuit is closed to operate the fan, the switch 74 is arranged to simultaneously operate the damper actuating motor to rotate the dampers into fully opened position.

It will, of course, be understood that operation of the damper actuating arm may also, if desired, be effected by means other than an electric motor, for example, by means of a conventional

hydraulic or vapor motor or solenoid and the like.

It will be seen that I have provided a simple, inexpensive means for eliminating the induction of air through the interior of the heater when operation of the fan is stopped, resulting in a more efficient heating device by prevention of wasteful condensation of steam on cooling of the heating medium in the heating coils.

While I have shown and described certain specific examples of my invention, it will be understood that such examples are illustrative and are not given as limitations, since other modifications within the spirit and scope of the invention will be apparent to those skilled in the art. Hence, I do not intend to limit myself thereto, but intend to claim my invention as broadly as may be permitted by the state of the prior art and the terms of the appended claims.

I claim:

1. In a heater, a casing provided with a circular passage for the circulation of air therethrough, means comprising a fan for circulating air through the passage, a plurality of pivot rods radially arranged in the passage and rotatable therein, a damper secured at one edge thereof to each pivot rod whereby air circulated by the said air circulating means will urge the dampers to rotate into a vertical position, said dampers, upon discontinuing circulation of the air through the passage, arranged to gravitate about the pivot

rods into a horizontal position, the adjacent edges of the dampers engaging each other to thereby maintain the dampers in position to close said passage.

2. In a heater, a casing provided with a passage for the circulation of air therethrough, means for circulating air through the passage, a plurality of pivot rods arranged transversely in the passage and rotatable therein, dampers eccentrically secured to each pivot rod whereby air circulated by the said air circulating means will urge the dampers to rotate into a vertical position, said dampers, upon discontinuing circulation of the air through the passage, arranged to gravitate into a horizontal position, the adjacent edges of the dampers engaging each other to thereby maintain the dampers in position to close said passage.

3. In a heater, a casing provided with a passage for circulating air therethrough, means for circulating air through the passage and a plurality of dampers eccentrically pivoted transversely in the said air passage whereby air circulated by the said air circulating means will urge the dampers to rotate into vertical position, said dampers arranged to gravitate into a horizontal position, upon discontinuing circulation of air through the passage, contiguous edges of adjacent dampers engaging to maintain the dampers in passage closing position.

HARRY STEWART WHELLER.