March 10, 1936. C. B. ROGERS 2,033,398

CHECK DRAFT DAMPER

Filed Jan. 28, 1933

FIG. 1

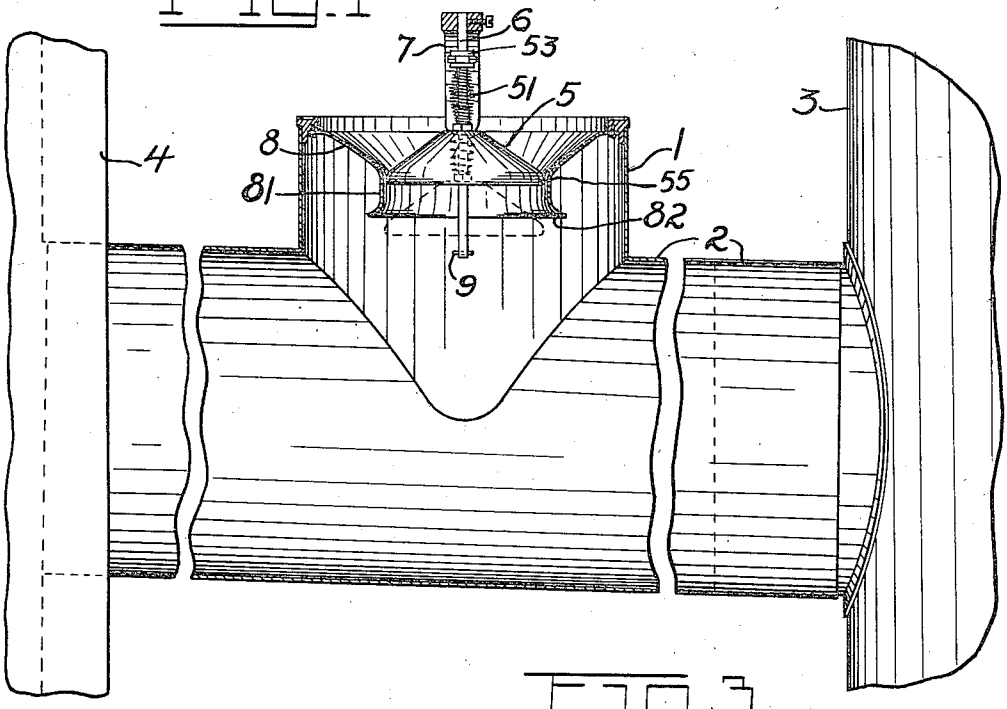


FIG. 2

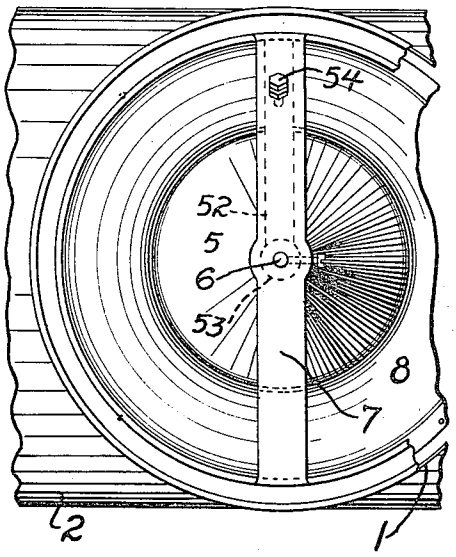
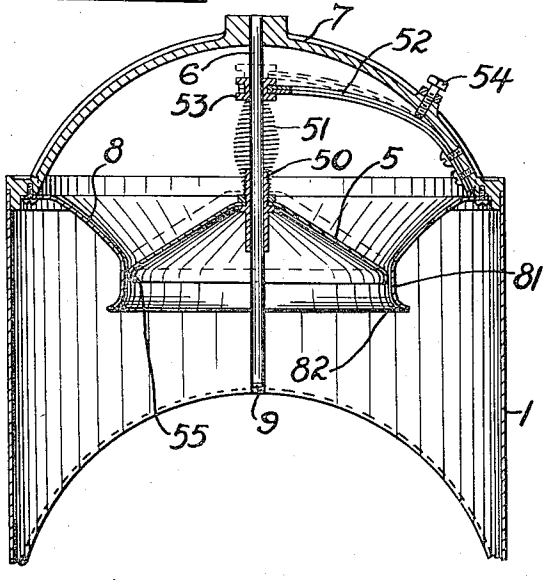


FIG. 3



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Patented Mar. 10, 1936 2,033,398

UNITED STATES PATENT OFFICE

2,033,398

CHECK DRAFT DAMPER

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Application January 28, 1933, Serial No. 653,935

18 Claims. (Cl. 236—45)

My invention relates in general to check draft dampers, and more particularly to such a damper which is automatically opened under the influence of an increased draft in the chimney flue to admit air to such flue, which will reduce the draft to decrease the intensity of the fire in the furnace.

A main object of my invention is to provide such an automatic damper mounted for bodily vertical movement, and having its weight balanced by spring means, so that the damper may be responsive to even small pressure decreases within the chimney flue.

A further object is to provide means whereby the position of the damper may be adjusted so that it will open under the influence of a selected decrease in pressure within the chimney flue, which may be smaller or greater than a given decrease in pressure which will open the damper when it is in the normal position.

Another object of my invention is to form the damper member and its cooperating opening in such a manner that a Venturi-shaped aperture is produced when the damper is opened by a decrease in flue pressure. This Venturi-shaped aperture causes the incoming air to enter the chimney flue at a high velocity. The opening formed may increase in area slightly at its inner end, so that while the high velocity is maintained to a large extent, the air flow will be smoothed out and any appreciable turbulence in the flow of the incoming air will be eliminated.

It is also an object of my invention to associate with such dampers a thermostatic element governed by the temperature of the room in which the check draft damper is located, which thermostatic element operates to move the damper either side of a normal position, so that the damper will open under the influence of either a greater or a smaller decrease in flue pressure than a given decrease, which given decrease will open the damper when the parts are in the normal position. This thermostatic element may be supplemental to the manual adjustment previously mentioned.

Other objects of my invention, resulting more particularly from the shape and disposition of the parts, will appear in the following description and claims, with reference to the accompanying drawing.

Figure 1 is an elevation view of my device as installed in a flue pipe joining a furnace and a stack, parts of which are shown in section.

Figure 2 is a plan view of my device installed in a pipe,

Figure 3 is a sectional view of my device before it is installed.

In the preferred form of my invention an inlet conduit **1** is mounted on the upper side of a pipe **2** which may be the flue pipe joining the furnace **3** and the stack **4**, or may be a separate pipe entering the chimney flue from an adjoining room. The damper **5** is a hollow bell-shaped member. As shown in Figure 3, a sleeve **50** closes the upper end of the damper, and is slidable on the rod **6**. This rod is secured in a bridged support **7**, which may be secured in the upper end of the inlet conduit **1**. The damper is suspended upon a spring **51** connected to an arm **52**, which may include a thermostatic element. This arm engages in a slotted collar **53** to which the spring **51** is directly attached. An adjusting screw **54** may be provided to move the damper up or down on the rod **6** by deflecting the arm **52**.

Cooperating with the damper is an outer member shown as an annular Venturi tube **8**, which closes the outer end of the inlet pipe **1**. The opening in this Venturi tube decreases in area to a minimum section **81**, which is cylindrical in shape over an appreciable length. The opening again diverges to the inner end of the tube, at **82**. When the damper is opposite the portion **81**, it may be considered as being in closed position.

The central damper member **5** fits snugly within the cylindrical portion **81** of the Venturi tube, and its section of maximum diameter is normally adjacent the middle of the cylindrical section of the Venturi tube. In this position of the parts a given decrease in flue pressure will draw the damper down below the end **82** of the Venturi tube against the action of the spring **51** and allow air to flow into the chimney flue. The inner end of the damper **5** may decrease slightly in diameter, as shown at **55**, so that when the parts are in the dotted line position shown in Figure 1, an annular Venturi opening will be formed by the cooperating damper and Venturi tube, which opening first decreases in area to a minimum section, and then gradually increases again to the inner end of the parts.

The adjusting screw **54** may be manipulated to move the parts to the dotted line position shown in Figure 3. The maximum diameter of the damper **5** will now be adjacent the upper end of the cylindrical portion **81** of the Venturi tube. With the parts in this position a decrease in flue pressure greater than the given decrease required to open the damper when it is midway of the cylindrical section **81** will be necessary to increase the air inlet opening, since the damper **5** will now

have to move a greater distance against the resisting action of the spring **51**. On the other hand, if the adjusting screw **54** is manipulated to lower the damper until its maximum diameter lies adjacent the lower end of the cylindrical section **81**, only a smal decrease in flue pressure will be necessary to move the damper to the open position.

If the arm **52** is a thermostatic element, it will operate to the same end as the manual adjustment **54**. A furnace room is often inclined to become overheated, and since it is sometimes desirable to store apples or other fruit in such a room I provide means whereby its temperature may be controlled to prevent spoiling of the stored fruit. Upon an increase in room temperature the arm **52** will bend to lower its free end, thus to move the damper **5** downward, which will then open under the influence of a smaller decrease in pressure within the chimney flue. A decrease in room temperature will conversely cause the thermostatic element to move the damper to a higher position, and a greater decrease in flue pressure will be required to open it. Thus, when the room becomes over-heated, the maximum diameter of the damper will lie adjacent the lower end of the cylindrical section **81**, and upon being opened by a small decrease in flue pressure, warm air will flow from the room through such opening, and cool air from the outside may replace the warm air removed through the check draft damper to again cool the room temperature. Such operation will serve both to control the temperature of the room, and to simultaneously lessen the intensity of the fire in the furnace. A stop pin **9** is provided to prevent the damper from moving past the end of the rod **6** under the influence of a warm room effecting a downward movement of the damper and a large decrease in flue pressure, which further draws the damper downward.

It will also be noted that an increase in flue pressure would move the hollow bell-shaped damper **5** in an outward direction. When an oil burner is lighted, a miniature explosion sometimes occurs in the furnace, which tends to blow soot out through the chimney flue and through the furnace doors. With this installation any such sudden pressure increase will tend to force the damper **5** outward, and both the force and concussion of the burst will be absorbed in an oscillating and damping movement of the damper in the Venturi tube.

It will be seen that the delicate balance of my damper renders it sensitive to even a small increase in draft, when desired, and the intensity of a furnace fire and in addition room temperature may be very accurately controlled by its use without constant personal attention.

It may be found desirable, in some installations, to ventilate or to regulate the temperature of spaces or rooms other than that in which the furnace is located or in which the smoke pipe **2** is found. In such instances the inlet pipe **1** may be extended from its connection with the smoke pipe into a distant room or even to a point out of doors, or its discharge end may be connected direct with the chimney flue instead of to the smoke pipe. In such instances the space or room to be ventilated will be the point where the air is admitted to the inlet pipe **1**, at which point will be found the damper **5** and the thermostatic element **52**, if the latter is to be used, as it ordinarily would be.

What I claim as my invention is:

1. A check draft damper comprising an inlet conduit connected to the chimney flue and a member movable from a normal closed position, under the influence of a given decrease in pressure within the flue, to admit air through said conduit from the surrounding room, and means responsive to increase in temperature of such room, operatively connected to effect movement of said movable member to a position wherein it is responsive to a lesser decrease in pressure.

2. A check draft damper comprising an inlet conduit connected to the chimney flue, a damper supported relative to the inlet opening for movement inward from a closed position, under the influence of a decrease in pressure within the conduit, and thermostatic means controlled by the temperature of the room in which the check draft damper is located, to displace the point of support of said damper relative to the damper's closed position.

3. A check draft damper comprising an inlet conduit connected to the chimney flue, an annular member in said conduit having an opening decreasing in diameter from its outer end to a section of minimum diameter and again increasing in diameter from such section to its inner end, and a cooperating central member increasing in diameter from its outer end to a section of maximum diameter, and again decreasing in diameter from such section to its inner end, the maximum diameter section of said central member lying adjacent the section of minimum diameter of said annular member in the closed position of the parts, said central member being movable relative to said annular member to an open position under the influence of a given decrease in pressure within the flue.

4. The combination of claim 3, and adjusting means associated with one of said members adapted for adjustment to effect movement of the central member to open position under the influence of a decrease in pressure within the flue smaller than such given decrease and conversely adapted for adjustment to effect movement of the central member to open position only under the influence of a decrease in pressure within the flue greater than such given decrease.

5. The combination of claim 3, the section of minimum diameter of the annular member being of appreciable length, and adjusting means operable to position the maximum diameter section of the central member adjacent any desired portion of the minimum diameter section of the annular member, whereby the decrease in pressure necessary to move the central member to open position may be selected at will at a smaller or greater value than the given pressure decrease.

6. A check draft damper comprising an inlet conduit connected to the chimney flue, a member received in said conduit having an opening therein converging from its outer end to a cylindrical section and again diverging to its inner end, a cupped member received in the opening of said first member, its concave surface facing inward, and its convex surface diverging from its outer end to a maximum section normally disposed adjacent the cylindrical section of said first member, said second member being movable outward from such normal position relative to said first member under the influence of an increase in pressure within the flue, and movable inward from such normal position relative to said first member under the influence of a decrease in pressure within the flue.

7. A check draft damper comprising an air in-

let pipe communicating with the chimney flue, a member extending inward from the end of said pipe having a circular aperture progressively decreasing in area inward from the pipe end, a cooperating circular member disposed within such aperture progressively increasing in area inward from the pipe end, the section of maximum area of said second member being normally disposed opposite the section of minimum opening in said first member, and the common axis of the two members being vertical, and spring means connected to the second member to balance the weight of such member, thus to maintain it in a position of minimum opening under normal conditions, but adapted to be moved bodily to a position of increased opening under the influence of a decrease in pressure within the chimney flue.

8. A check draft damper comprising an air inlet pipe communicating with the chimney flue, a support mounted thereon, a rod secured in said support coaxial with said inlet pipe and extending within the outer end thereof, a Venturi tube encircling said rod and closing the end of said pipe with the exception of the Venturi opening, the throat of said Venturi tube including a cylindrical section, a bell-shaped member slidable on said rod and adapted to fit snugly within the cylindrical section of the Venturi tube throat, the concave side of said member facing the chimney end of the pipe, a thermostatic element mounted on said support, its free end being adapted to move inward of said pipe upon an increase in temperature of the room, a spring interconnecting said thermostatic element and said bell-shaped member to maintain the periphery thereof adjacent to the cylindrical section of the Venturi tube throat under normal conditions, but adapted to permit movement of said member inward of the inlet pipe upon a decrease in pressure within the chimney flue or outward upon an increase of pressure in the flue, and manual adjusting means to adjust the normal position of said bell-shaped member relative to said Venturi tube.

9. A check draft damper for use in an inlet conduit connected to a chimney flue, comprising a damper plate disposed within said inlet conduit, the latter including a restricted portion within which the damper plate is normally disposed, means supporting the damper plate for bodily rectilinear movement through such restricted portion, and means to impose an increasing resistance to such movement either side of such normal position.

10. A check draft damper for use in an inlet conduit connected to a chimney flue, comprising a damper element normally disposed within the inlet opening of such conduit, and means supporting the damper element for movement axially of the conduit to either side of such normal position, the damper element and the inlet opening being relatively disposed and shaped to increase the effective size of the aperture as movement progresses away from such normal position.

11. A damper for controlling an air inlet conduit, comprising a support, a rod supported thereby axially of the conduit, a damper plate slidably mounted on said rod, plate supporting means, and a spring interconnecting said plate and said means.

12. The combination of claim 11, and a thermostat responsive to room temperature associated with the plate supporting means to vary the position thereof.

13. The combination of claim 11, and manually operable means to adjust the plate supporting means.

14. A damper for controlling an air inlet conduit having a restricted portion intermediate its ends, and flaring oppositely therefrom, a damper plate of a size to pass through such restricted portion, a support, and a spring interconnecting said damper plate and said support, and supporting the damper plate normally in registry with the restricted portion, for movement under the influence of changes of pressure to either side thereof.

15. A damper for controlling an air inlet conduit having a restricted portion intermediate its ends, and flaring oppositely therefrom, a damper plate of a size to pass through such restricted portion, a thermostatic element, a spring forming the sole support for said damper plate connected to said thermostatic element, and supporting the damper plate normally in registry with the restricted portion, for movement to either side thereof under the influence of changes in pressure, and changes in temperature affecting said thermostatic element.

16. A check draft damper, comprising an inlet conduit having a restricted portion, connected to a chimney flue, a damper member received in said conduit and of a size to pass readily through the restricted portion of said conduit, and means guiding the damper member for bodily rectilinear movement to one side of such restricted portion under the influence of a decrease in chimney flue pressure from atmospheric pressure, to increase the area of inlet opening, and for bodily rectilinear movement to the other side of such restricted portion under the influence of an increase in chimney flue pressure, to damp movement of air emerging from such inlet opening.

17. A check draft damper for controlling an air inlet into a chimney flue, comprising a damper member movable in an opening in such flue under the influence of draft fluctuations in the flue, and located within a room, and thermoresponsive means progressively responsive to changes in the temperature of air in such room, and operatively connected to control, progressively, said damper member in accordance with such temperature variations.

18. A check draft damper for controlling an air inlet into a chimney flue, comprising a damper member movable in an opening in such flue under the influence of draft fluctuations in the flue, and located within a room, and thermoresponsive means directly connected to said damper member to move it compensably in response to variations of the temperature of the air in such room.

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