Jan. 27, 1948. W. B. STEPHENSON 2,435,166

DRAFT CONTROL

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Fig. 1.

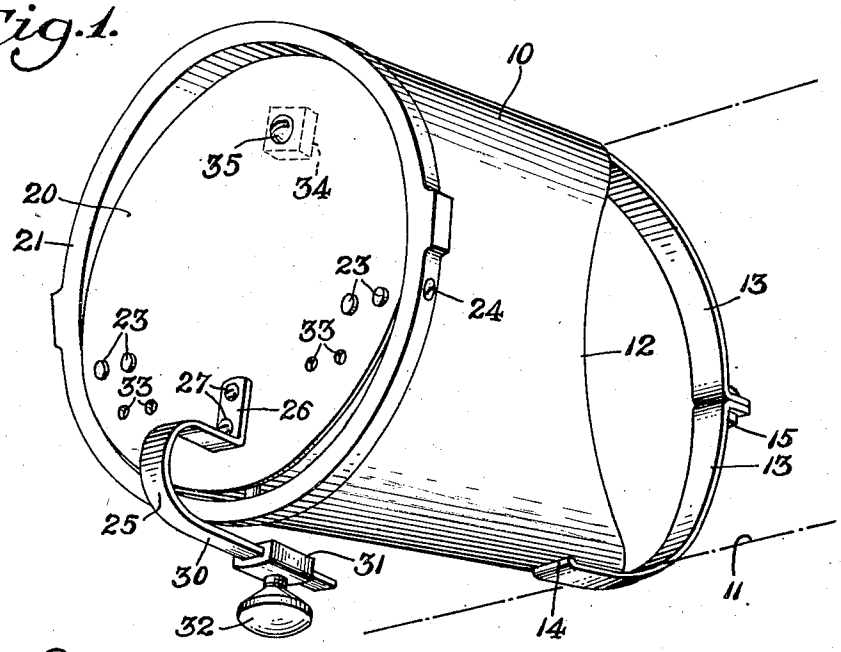


Fig. 2.

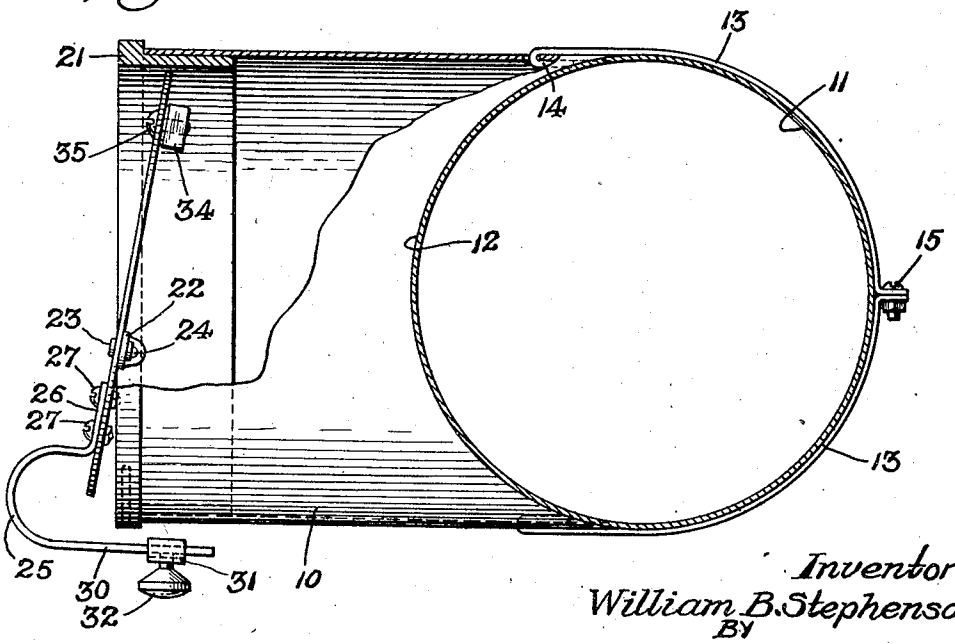


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Fig. 3.

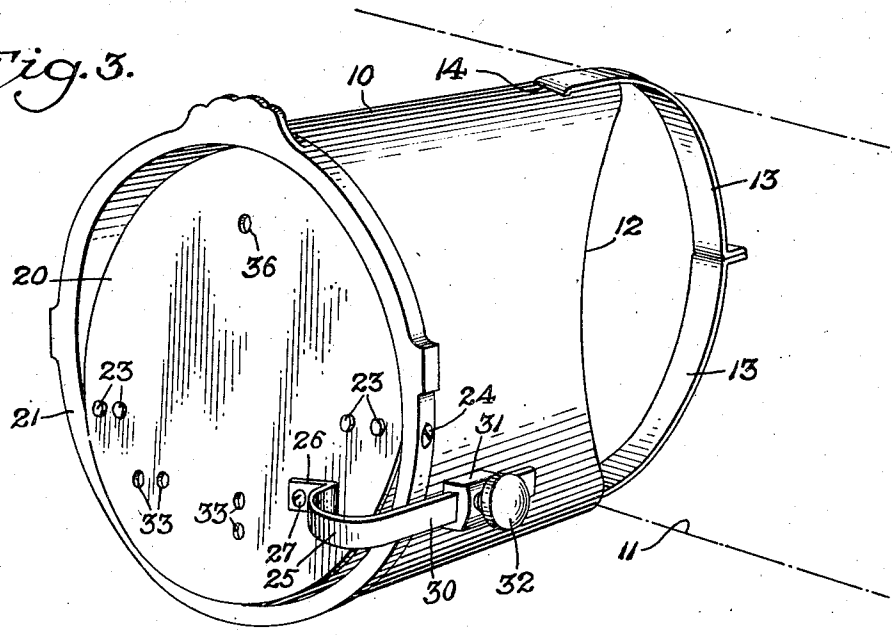
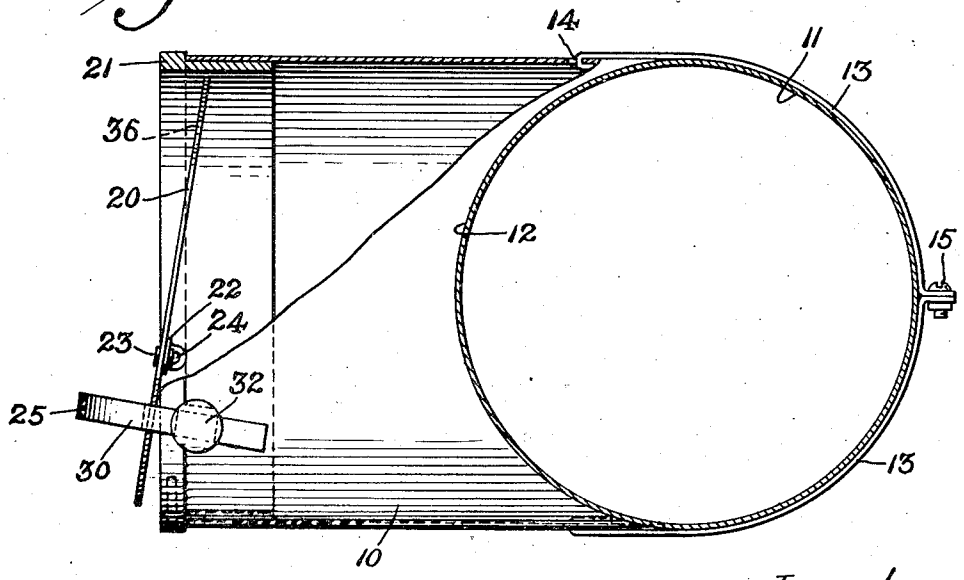



Fig. 4.

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# UNITED STATES PATENT OFFICE

2,435,166

## DRAFT CONTROL

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Application March 16, 1944, Serial No. 526,808

3 Claims. (Cl. 236—45)

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The invention relates generally to improvements in draft controls, and more particularly to controls for automatically admitting air to a furnace stack to regulate the draft.

The general object of the invention is to provide a novel draft control which is of simple and inexpensive construction, and highly efficient in holding a constant draft in the furnace combustion chamber.

More specifically, it is an object to provide a novel draft control utilizing a round damper plate pivoted for movement under the influence of the draft, and having its pivotal axis so located that the damper plate opens inwardly at the top to allow an inflow of air to the top of the current of gases flowing through the stack.

A further object is to provide a novel draft control having a pivoted damper plate movable inwardly at the top under the influence of the draft, and provided with counterbalancing means adapted to be mounted on the damper plate below the pivoted axis in various selective positions to suit different conditions of installation.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawings, in which:

Figure 1 is a perspective view of a draft control embodying the features of the invention.

Fig. 2 is a side elevational view, partially in section, of the draft control as shown in Fig. 1.

Fig. 3 is a perspective view similar to Fig. 1, but showing the counterbalancing means mounted in a different position from that shown in Fig. 1.

Fig. 4 is a side elevational view, partially in section, of the draft control as shown in Fig. 3.

In both domestic and commercial or industrial boiler plants, it is desirable to utilize a draft control to hold the draft through the fire constant under varying weather conditions. Such a draft control is usually mounted in the stack or flue extending from the boiler to the chimney. In different installations various conditions are encountered, and the stack may be horizontal, vertical or inclined. Consequently, a draft control constructed to meet such conditions is preferably adjustable so that the damper plate may have the same position in each installation regardless of the position of the stack. Furthermore, the space between the boiler and the chimney may be so restricted or congested with other ducts that proper operation of the draft control may make adjustment or relocation of the operating parts desirable.

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The present invention provides a draft control which is adjustable so that it may operate properly on a stack that extends either horizontally, vertically or at an angle. Moreover, a draft control such as contemplated herein is so constructed that the air permitted to enter the stack through the control passes into the top of the stack where it produces less turbulence in the passage of the gases and products of combustion. As a result, the draft through the fire may be more accurately controlled under varying atmospheric conditions. The preferred embodiment of the invention includes a damper plate operable under the influence of the draft in the stack to vary the flow of air entering the stack through the control, and such damper plate is provided with a counterbalance which is adjustable as to its counterbalancing effect to suit the conditions encountered in any particular installation. To make the draft control still more adaptable for varying conditions, the counterbalancing means may be connected to the damper plate in different positions so that in any given installation it may be disposed in the most convenient and efficient location. Thus, the counterbalancing means may be placed at the bottom of the control or at either side thereof, the counterbalancing means being readily attached in any one of these three positions.

As shown in the drawings, the draft control constituting the preferred form of the invention comprises a duct 10 adapted to be attached to and extend laterally of a stack or flue leading from a furnace (not shown) to a chimney (not shown). In the drawings, the stack is indicated at 11 by the dash and dot lines in Figs. 1 and 3, and in transverse section in Figs. 2 and 4. The duct 10 is adapted to be placed endwise over a hole (not shown) in one side of the stack, the rear end of the duct being cut on the curvature of the stack, as shown at 12, so that it will fit closely against the stack. To clamp the duct rigidly in place, means such as a pair of straps or bands 13 is provided. Each band has one end secured to the duct by extending through a slot therein and being reversely bent, as at 14. The two bands embrace the stack 11, and their free ends are connected by being bent to extend laterally from the stack in face-to-face relation with each other for connection, as by a nut and bolt 15.

A damper plate 20 is located in the outer end of the duct 10, and is pivotally supported so that it may swing to permit air to enter the stack through the duct. Since the air entering the stack, if permitted to enter the top thereof,

creates less turbulence within the stack, and consequently provides for more accurate control of the air through the fire, the damper plate 20 is pivoted on a horizontal axis in such a manner that in the opening movement the top of the plate will move inwardly of the duct. The position of the stack may differ in different installations, that is, the stack may be located horizontally or vertically, or at an angle. It is, therefore, desirable to provide a pivotal support for the damper plate 20 which may be adjusted to bring the pivotal axis in a horizontal position for any position of the stack. To this end, the damper plate 20 is supported by an annular mounting frame 21 telescoping within the outer end of the duct 10, and rotatably adjustable therein. Any simple pivoting means may be provided for the plate 20, the particular one herein shown comprising a pair of lug members 22 riveted to the plate 20, as at 23, and supported on screws 24 extending through the annular frame 21.

To permit the damper plate 20 to swing inwardly of the duct at the top, the pivotal axis of the plate is located below the vertical center thereof so that the area above the axis is greater than the area below the axis. If the diameter of the damper plate 20 were such as to fit snugly within the frame 21, the damper plate when so mounted would bind or stick against the sides of the duct upon swinging out of closed position through an angle less than required. To prevent such binding and thereby permit the plate to swing freely through the required range of movement, a clearance is provided between the periphery of the plate and the interior of the frame. Such clearance may be relatively small, with the pivotal axis positioned as shown in the drawings, and consequently the extra amount of air passing through such clearance does not materially interfere with the proper functioning of the control.

The damper plate 20 is preferably made of sheet metal and, since the pivotal axis thereof is below its horizontal center line, counterbalancing means is attached to the lower part of the plate to prevent the weight of the plate from causing it to swing inwardly excessively, and to regulate the inward swinging movement in accordance with the draft. Preferably, the counterbalancing means extends outside of the duct and frame so that it is readily accessible, and is adjustable to suit the draft conditions in any installation.

In the preferred form, the counterbalancing means comprises a U-shaped bracket 25 having its arms extending substantially perpendicular to the plane of the damper plate. To attach the bracket 25 to the plate, one of its arms is bent laterally, as at 26, so that it may lie flatwise against the outer face of the damper plate and be secured thereto, as by screws 27. The other arm of the bracket, indicated at 30, extends generally parallel to and alongside the exterior of the duct 10, and carries an adjustable weight comprising a member 31 slidable on the arm 30 and a weighted clamping screw 32. As is clearly shown in the drawings, the member 31 may be adjusted along the arm 30 and clamped in any desired position to suit the draft conditions in a particular installation. Thus, since the arm extends from a point beyond the outer end of the duct 10, toward the stack and alongside the duct, the weight may be shifted from a position to the right of the plane of the damper plate, as shown in the various figures of the drawings, or may be adjusted to a position to the left of such plate should a high draft be desired.

Since it is desirable to have the counterbalancing means readily accessible so that it may be conveniently adjusted, and since in many installations there may be other ducts in the space next to the stack that would interfere with the counterbalancing means if it were positioned the same in all installations, the damper plate is provided with a plurality of sets of holes 33 to receive the screws 27 by which the counterbalancing means is secured to the plate. Thus the counterbalancing means may be secured to the damper plate at the bottom thereof so that the arm 30 and its adjustable weight 31, 32 extend under the duct 20, as shown in Figs. 1 and 2, or at the right side as shown in Figs. 3 and 4. Holes 33 are also provided in the plate 20, as clearly shown in Figs. 1 and 3, so that the counterbalancing means may be positioned at the left side. Thus the counterbalancing means may be mounted in the most convenient position for any particular installation.

It is obvious that the counterbalancing means has a greater effective moment arm from the pivotal center of the damper plate, as when said means is attached to the bottom of the plate, than it has when attached at either side of the plate. In fact, the weight of the plate alone above the axis is not adequate properly to balance the weight below the axis including the adjustable counterweight so as to obtain or hold the desired constant draft. Hence, an additional weight is mounted on the upper part of the damper plate 20 to supplement the weight of the upper part of the plate. Such additional weight preferably comprises a nut 34 secured to the upper portion of the inner face of the plate by a screw 35 (see Figs. 1 and 2) extending through a hole 36 (see Figs. 3 and 4). The nut 34 and screw 35 are not utilized when the counterbalancing means is positioned at the right or left side of the plate.

In installing the draft control shown herein, a hole is cut in the side of the stack 11, which is slightly smaller than the diameter of the duct 10. The duct is then placed in position over the hole with the duct extending horizontally, and the straps 13 are connected to secure the duct in place. The frame 21 is then rotated if necessary within the outer end of the duct so that the pivotal axis of the plate 20 is positioned horizontally. The counterbalancing means is attached to the damper plate by the screws 27 through one of the sets of holes 33 in the position where most readily accessible, the additional weight provided by the screw 35 and nut 34 being added to the damper plate if the counterbalancing means is placed at the bottom position.

To effect a proper adjustment of the counterbalancing means, the weighted member 31 is shifted along the arm 30 to a point preferably where the damper plate is slightly inclined inwardly from a vertical position. With such adjustment of the weight as a starting position, the weighted member 31 is then shifted slightly to a point where the fire burns clear, that is, where there is sufficient draft to cause the fire to burn freely without causing smoke or flue gases to enter the room. The weighted screw 32 is then clamped onto the arm 30. Thereafter, with changes in draft in the stack due to varying atmospheric conditions, the draft through the fire will be held constant, since the flow area provided by the damper plate will increase or decrease depending upon increases or decreases in the draft.

By maintaining the draft through the fire at a constant point, heat is conserved instead of being drawn up the chimney.

From the foregoing description, it will be apparent that the draft control herein disclosed is of simple and inexpensive construction. Because of the weight and location of the counterbalancing means and the added weight of the screw **35** and nut **34** when used, the damper plate will readily move in response to changes in draft in the stack, but will not be oversensitive and "flutter" with merely slight changes. The draft control is constructed so that it may be used with a stack having any position, and permits the air to enter the stack at the top thereof so that the air through the fire may be more accurately held constant. The counterbalancing means by being attachable to the damper plate in a plurality of positions, permits placing the counterbalancing means where it is most readily accessible.

In some instances, particularly on relatively large controls, it may be desirable to employ two counterbalancing means mounted on the damper plate respectively at opposite sides. This permits the arm **30** in each instance to be shorter than would otherwise be required and permits the length of the duct **10** to be correspondingly decreased.

I claim as my invention:

1. A draft control comprising, in combination, a cylindrical duct adapted to be connected over an opening in a flue with its axis substantially horizontal, a tubular frame telescopingly fitted into the outer end of said duct, a circular damper plate pivotally supported in said frame to rock about an axis located substantially in the plane of the plate below and parallel to the center line of the plate to control the admission of air to said duct, said frame being rotatable relative to said duct for locating the pivotal axis of said damper plate substantially in a horizontal plane, adjustable counterbalancing means for said damper plate comprising a generally U-shaped bracket having a short arm terminating in an outwardly bent portion adapted for attachment to the outer face of said damper plate and a substantially longer arm adapted to extend rearwardly across the plane of the damper plate, and a weight mounted on said longer arm for adjustment longitudinally thereof, said damper plate being formed to accommodate said outwardly bent portion of the bracket in a plurality of positions so as to locate said longer arm at either side or at the bottom of said duct.

2. A draft control comprising, in combination, a cylindrical duct adapted to be connected over an opening in a flue with its axis substantially horizontal, a tubular frame telescopingly fitted into the outer end of said duct for rotary adjustment, a substantially circular damper plate pivotally supported in said frame to rock about an axis located substantially in the plane of the plate below and parallel to the center line of the plate so as to present a slightly greater area above said axis to the action of the draft in said flue whereby the plate is automatically tilted to admit air into the upper portion of said duct, a counterbalance for said damper plate comprising a generally U-shaped bracket having substantially horizontally spaced parallel legs, one of said legs being bent laterally for attachment to the front face of said damper plate and extending forwardly therefrom and the other leg extending substantially perpendicular to the plane of the damper plate and projecting at both sides thereof at one side of said duct, a weight shiftable along said other leg of the bracket selectively into position at either side of said axis, and means for locking said weight to said other leg in selected positions of adjustment.

3. A draft control comprising, in combination, a cylindrical duct adapted to be connected over an opening in a flue with its axis substantially horizontal, a tubular frame telescopingly fitted into the outer end of said duct, a generally circular damper plate pivotally supported in said frame to rock about an axis located substantially in the plane of the plate below and parallel to the center line of the plate to control the admission of air to said duct, said frame being rotatable relative to said duct for locating the pivotal axis of said damper plate substantially in a horizontal plane, adjustable counterbalancing means for said damper plate comprising a generally U-shaped bracket having a short arm terminating in a laterally bent portion adapted for attachment to the outer face of said damper plate and a substantially longer arm adapted to extend rearwardly across the plane of the damper plate, and a weight mounted on said longer arm for adjustment longitudinally thereof, said damper plate being formed to accommodate said laterally bent portion of the bracket in a plurality of positions so as to locate said longer arm at either side of said duct.



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