No. 836,955. PATENTED NOV. 27, 1906.

C. R. WORTHINGTON.

AUTOMATIC DAMPER.

APPLICATION FILED SEPT. 29, 1905.

Fig. 1.

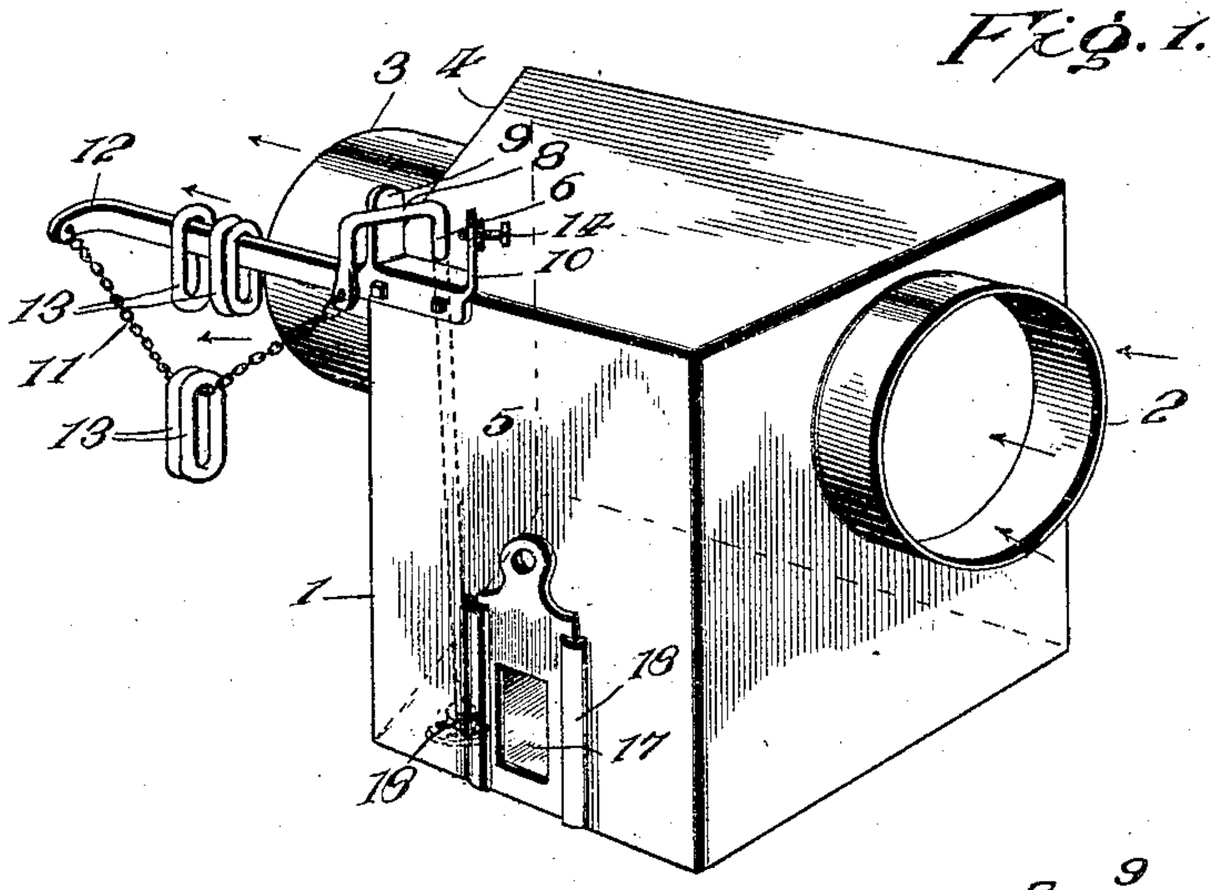


Fig. 2.

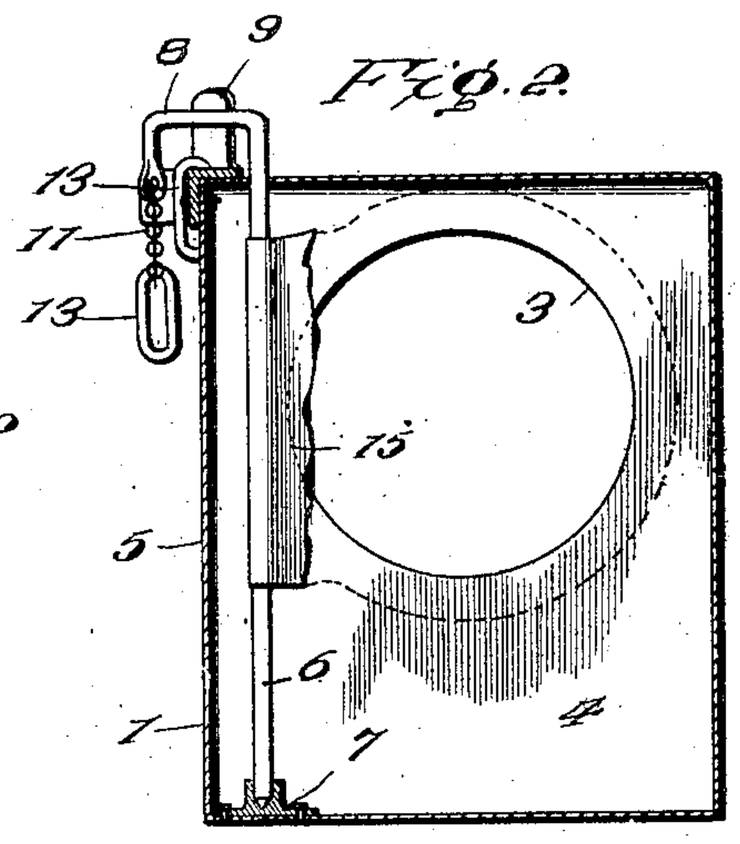


Fig. 3.

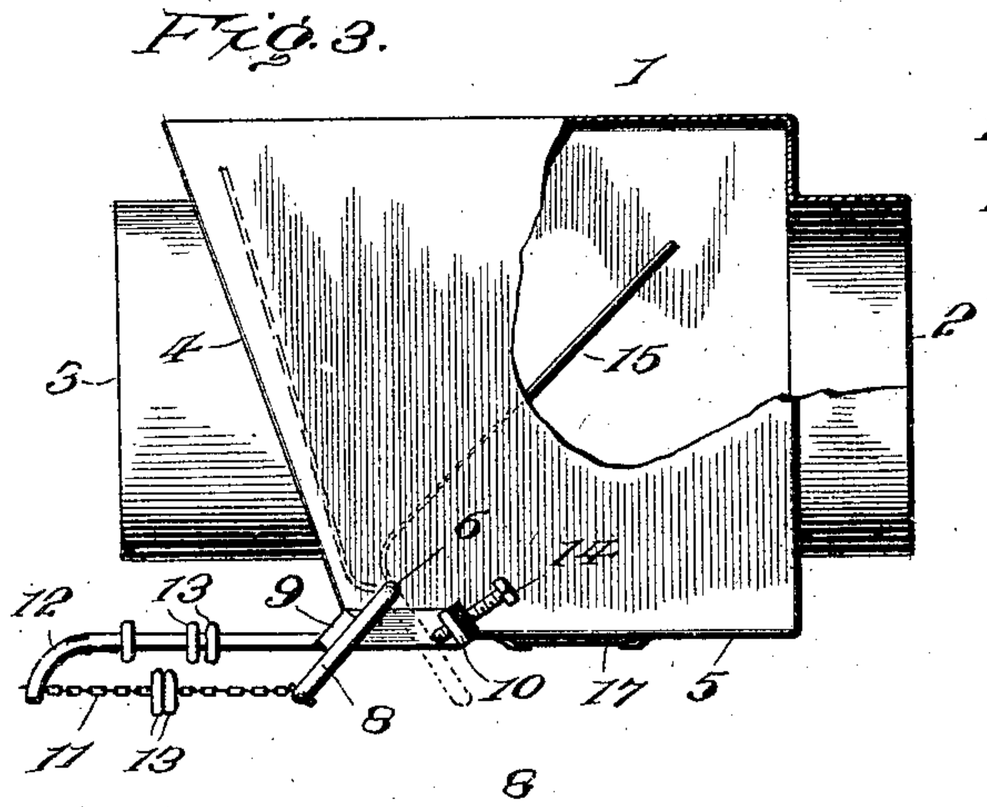


Fig. 4.

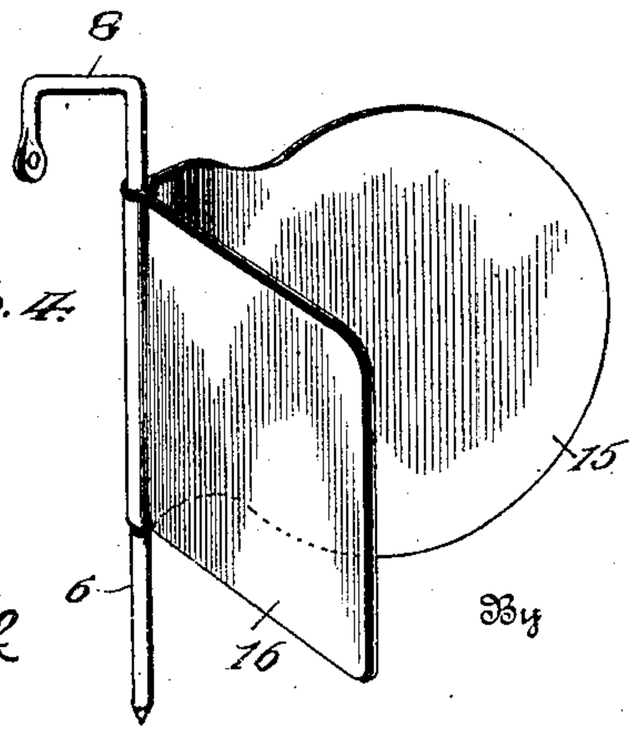
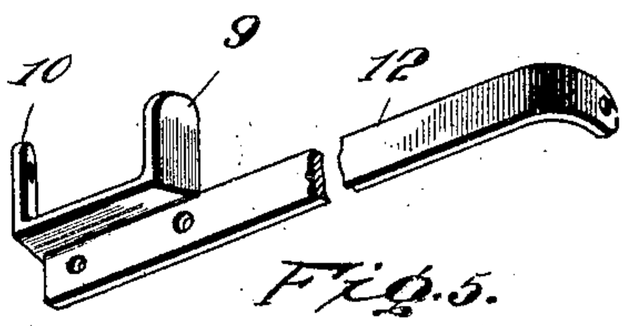


Fig. 5.



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AUTOMATIC DAMPER.

No. 836,955. Specification of Letters Patent. Patented Nov. 27, 1906.

Application filed September 29, 1905. Serial No. 280,649.

To all whom it may concern:

Be it known that I, CHARLES REEDER WORTHINGTON, a citizen of the United States, residing at Baltimore city, State of Maryland, have invented certain new and useful Improvements in Automatic Dampers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to certain improvements in automatic dampers for cold-air or other pipes or ducts.

An object of the invention is to provide an improved automatic damper particularly adapted for use in the fresh-air ducts supplying cold air to the heating portions of hot-air heating-furnaces for the purpose of regulating or equalizing the quantity and speed of the cold air passing through the duct in an efficient manner by simple and durable means.

A further object of the invention is to provide certain improvements in details of construction and arrangements of parts whereby an efficient and easily-adjusted automatic damper and dust-trap will be provided for air-ducts to furnaces.

The invention consists in certain novel features in construction or in combinations and arrangements of parts, as fully explained in detail hereinafter.

Referring to the accompanying drawings, Figure 1 is a perspective view of the damper-box detached from the air-flue, the damper-shaft being indicated by dotted lines as inclined from the vertical. Fig. 2 is a vertical sectional view, a part of the damper being broken away. Fig. 3 is a top plan view, the top wall of the casing being partially broken away. Fig. 4 is a detail perspective of a two-wing damper. Fig. 5 is a detail perspective of the bracket forming the stop-arms and the rigid weight-supporting arm.

The damper-box 1 is coupled into or included in a horizontal portion of the cold-air duct that conveys the fresh or cold air to the air-heating portion of the furnace. The box is of considerably greater cross-sectional area than the cross-sectional area of the cold-air duct, which is coupled or attached to the box by means of the collars 2 3, rigid with and projecting from the upper portions of the opposite side walls of the box. The collars are of any suitable shape, and the collar 2 surrounds the intake-opening into the upper portion of the box, while the collar 3 surrounds the outtake-opening from the opposite upper portion of the box. The collars 2 3 are of approximately the same capacity and are located directly opposite each other and in the same axial line. The box depends a considerable distance below the axial line of said collars and the cold-air duct, and the horizontal width of the box is also greater than the diameter of the collars. The side wall 4 at the outlet side of the box is preferably arranged at an angle about as shown—that is, inclining outwardly and rearwardly from the front wall 5 of the box to the rear wall thereof, so as to form an obtuse angle with the front wall and an acute angle with the rear wall.

The vertically-disposed valve or damper-shaft 6 is located within the box closely adjacent to the corner or apex of the obtuse angle formed by the vertical edges of the walls 4 5. The lower end of the shaft is mounted to freely oscillate in the step-bearing 7, secured in the lower corner of the box at the junction of walls 4 5. The upper end of the shaft is confined to turn in a suitable bearing in the box-top, and the shaft projects through and to a point above the box-top and is formed with the forwardly and downwardly bent upper end 8. The horizontal portion of the end 8 extends forwardly a distance above the box-top and between the two spaced vertical stop-arms or lugs 9 10. A loosely-hanging flexible connection 11 is secured at one end to the front depending extremity of the shaft end 8 and at its opposite end to the outer extremity of a rigid arm 12, projecting laterally from the front wall of the box. The arm 12 is so formed that one or more of the several separate loop-weights 13, normally hung on and depending from connection 11, can be separately slipped longitudinally along the connection and onto the arm 12 or can be slipped from the arm and onto the connection for the purpose hereinafter set forth.

The stop-arm 9 by engagement with the horizontal portion of end 8 of the damper-shaft limits the oscillation of said shaft and of the damper carried thereby toward the intake-opening—that is, toward the open or normal position of the damper. The oppo-

site stop-arm 10 is provided with a horizontal set or thumb screw 14, adjustable therethrough to form an adjustable stop for engagement with said horizontal portion of shaft end 8, and whereby the limit of oscillation of the shaft and the damper carried thereby toward the inclined side wall 4 can be varied.

The stop-arms 9 10 can be formed by the upturned ends of a U-shaped piece of metal secured on the box-top and forming a bracket rigid with and carrying the rigid lateral arm 12.

In Fig. 3 I show the damper-shaft provided with a single plate valve or damper 15, rigid therewith and extending rearwardly therefrom and at right angles thereto. This damper is so located on said shaft as to be approximately in the same vertical plane as the shaft end 8 and so as to normally extend in an inclined position toward the rear and intake-opening wall of the box—that is, so as to form an acute angle of about forty-five degrees with the front wall of the box. The width and height of the damper are considerably less than the corresponding dimensions of the box, so that the bottom, top, and rear walls of the box are spaced from the corresponding edges of the damper. The damper is arranged directly between and opposite the box intake and outtake openings, and the weights 13 hold the shaft end 8 to the stop-arm 9 and the damper yieldingly in its normal open position directly opposite the intake-opening and at an acute angle to the axial line thereof, so as to receive the full force of the air discharging therethrough into the box. The space within the box around the edges of the damper when in its normal position exceeds the capacity of the air intakes and outtakes, and under normal air flow and pressure or speed the damper remains in its normal position, although the pressure under which the damper is held in its normal position can be varied to suit conditions by increasing or decreasing the number of weights 13 on the connection 11 in the manner hereinbefore described. For instance, in very cold weather or during high winds it is usually desirable to have the damper more sensitive, so as to respond more quickly than during warmer or more quiet weather, and hence I provide the easily and quickly operative adjustable weight arrangement at the front of the box, so that one or more weights can be easily slipped to or from the rigid supporting-arm 12 and from or to operative position acting on the damper.

Advantages are attained by locating the damper, as described, in its normal open position, so as to receive the full force and pressure of the air entering the intake, whereby the damper quickly responds in case the air-pressure is excessive and gradually reduces the volume of air passing through the box by swinging toward the outtake and toward the position at right angles to the front and rear walls of the box. If the entering air is under sufficient pressure, the damper will swing to the inclined wall 4 and close the outtake until the air-pressure is reduced sufficiently. Advantages are also attained in arranging wall 4 at an angle about radially of the damper-shaft. By means of set-screw 14, hereinbefore described, the closing movement of the damper can be limited so that the damper can be permitted to completely close the outtake under excessive pressure, or the set-screw can be so adjusted as to prevent the damper from completely closing said outtake, for under certain conditions it is desirable to prevent the damper from completely closing the outtake.

I can provide a double damper, as shown in Fig. 4, by adding a wing 16, rigid with the damper-shaft and arranged at an acute angle to the outtake-closing-damper wing heretofore described. The additional wing rests closely adjacent the inner surface of the front wall of the box when the damper is in its normal position, so that when the damper 15 swings toward the outtake said wing 16 will move in front of the intake in a position to be acted on by the inrushing air and forced toward the outtake, thereby rendering the damper quickly responsive under comparatively light air-pressure.

The damper-box depends below the air-duct and the damper and has a closed bottom and forms a dust-trap. The inrushing air strikes the damper and its direction of movement is somewhat changed, causing the circulation of the air in the box, which acts approximately as an equalizing or pressure-reducing chamber, causing precipitation of dust and foreign matter carried by the inrushing air. To permit cleaning of the box by removal of the dust deposit from the floor of the box and to permit inspection of the damper, I provide an opening in the lower portion of the front wall 5 of the box, and this opening is normally closed by suitable means, such as removable plate 17, usually of glass or other suitable transparent material, and slidable vertically behind the flanges 18, forming ways retaining the movable plate in position and permitting removal thereof through the open upper ends of said ways.

The damper and its shaft are so mounted in the box as to tend to swing by gravity to closed position when free of the weights. This result is preferably attained by inclining shaft 6 slightly from the perpendicular, the shaft, nevertheless, being vertically disposed. In other words, when the weights are removed from connection 11 the damper swings to its limit of movement toward the outlet-opening and tends to remain in such closed position when not under the influence of the weights. Hence when the furnace is

not in use during warm weather the weights are all placed on arm 12, and the screw 14 is adjusted back to permit the damper to completely close the outlet-opening, thereby closing the outlet against entrance of dust into the house-pipes. When the damper is removed from the damper-box, the capacity of the box for the passage of air is more than twice the capacity of either the box intake or outlet. When the damper is in its normal open position in the box, the capacity of the box for passage of air is not less than the full capacity of either the box intake or outlet.

The automatic damper described can be used as a draft-regulator or for other like purposes, and it is exceedingly simple and durable in construction and effective in action for the purposes intended, and as various modifications in the construction and arrangement can be resorted to I do not wish to limit myself to the exact constructions shown.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In combination, a damper-box having oppositely-arranged inlet and outlet openings through its side walls, the box depending below said openings, an upright damper-shaft mounted in the box and having a damper of a reduced area with respect to the box and interposed between said openings, the upper end of said shaft being continued above said box and provided with a lateral extension, stops between which said extension oscillates, and means applied to said extension for yieldingly holding the shaft and damper in their normal positions.

2. In combination, a damper-box having inlet and outlet openings, a damper in and of reduced area with respect to the box and provided with a shaft having a lateral extension, a rigid arm, a flexible connection between said arm and said extension, and loop-weights adapted to hang on said connection to yieldingly hold the damper in normal position, said weights being movable to and from said connection and from and onto said arm.

3. In combination, a damper-box having inlet and outlet openings, a damper in and of reduced area with respect to said box and provided with a shaft having a lateral extension at the exterior of the box, means applied to said extension to yieldingly hold the shaft and damper in normal position, a pair of stop-arms at the exterior of the box between which said extension oscillates, and an adjustable stop carried by one of said arms to vary the limit of closing movement of the damper.

4. In combination, a damper-box having opposite inlet and outlet openings of reduced size with respect to the dimensions of the box, said box depending below said openings to form a dust-trap and equalizing-chamber and provided with an opening in the front wall, movable means normally closing said opening, a damper in and of reduced area with respect to the box and directly interposed between said inlet and outlet openings, and means yieldingly holding said damper in its normal position toward the intake-opening.

5. In combination, a damper-box having an inlet-opening and an outlet-opening opposite the inlet-opening, a swinging-damper having a vertically-disposed shaft, said damper of a reduced size with respect to said box and arranged between said openings, means yieldingly holding said damper at its limit of movement toward the inlet-opening, said damper-shaft being inclined from the vertical, whereby said damper when acting independently of said means, normally tends to assume a position closing said outlet-opening.

6. In combination, in an automatic damper for controlling the volume of air passing through an air-duct, a damper-box having an inlet-opening and an outlet-opening, a swinging damper arranged in and of a reduced size with respect to the box and adapted to swing rearwardly to close the outlet-opening, means yieldingly holding said damper in its normal forwardly-inclined position toward the inlet-opening, whereby rearward movement of said damper reduces the volume of air passing through the box, a stop to limit the forward movement of the damper at said normal position, and an adjustable stop for limiting the rearward movement of the damper toward said outlet-opening.

7. In combination, in an automatic damper for controlling the volume of air passing through an air-duct, a damper-box having an inlet-opening and an outlet-opening, a damper-blade of a reduced size with respect to and arranged in said box between said openings and having a shaft journaled in the box provided with a lateral arm, stops carried by the box and between which said arm oscillates, one of said stops being adjustable, and means yieldingly holding said damper-blade at its limit of forward movement toward the inlet-opening.

8. In combination, in an automatic damper for controlling the volume of air passing through an air-duct, a damper-box having an inlet-opening and an outlet-opening, a damper in and of a reduced size with respect to the box and arranged between said openings to control the volume of air passing through the box, and provided with a damper-shaft mounted in the box, and a weight mechanism controlling said shaft to yieldingly hold the damper in its normal forward position, said weight mechanism comprising an arm carried by the box and a flexible connection attached thereto and acting on said damper and a weight movable from the arm onto the connection or from the connection onto the arm.

9. In combination, in an automatic dam-

per for controlling the volume of air passing through an air-duct, a damper-box having an inlet-opening and an outlet-opening, a swinging damper arranged in and of a reduced size with respect to the box and adapted to swing rearwardly to close the outlet-opening, means yieldingly holding said damper to its limit of forward movement toward the inlet-opening, and an adjustable stop for varying the limit of movement of the damper toward the outlet-opening, whereby said stop can be adjusted to prevent the damper completely closing said opening.

10. An automatic damper for controlling the volume of air passing through an air-duct, comprising a damper-box for inclusion in said air-duct and having an inclined wall disposed other than at right angles to adjacent sides of the box, and having an inlet-opening and an opposite outlet-opening, said outlet-opening being arranged in said wall, a damper-shaft arranged adjacent one corner of the box formed by a side and said inclined wall, a damper within and of a reduced area with respect to said box and carried by said shaft and interposed between said inlet and outlet openings, said damper adapted to swing rearwardly toward said inclined wall to gradually reduce the volume of air passing through said box, and mechanism adapted to yieldingly hold said damper in the normal forward position and spaced from said inlet-opening to permit passage of the maximum volume of air through said box.

11. An automatic damper for controlling the volume of air passing through an air-duct, comprising an enlarged damper-box having an inlet-opening in one end and an opposite outlet-opening in the other end and into said air-duct, a damper-shaft arranged adjacent a side of the box and provided with a damper-blade within and of a reduced area with respect to the box and interposed between said openings and normally arranged in an advanced position inclined forwardly from said side toward and spaced from said inlet-opening, for passage of the maximum volume of air through said box, whereby the vertical plane of said blade forms an acute angle with the vertical plane of said opening and the blade tends to deflect the inrushing air toward said side and from the free end of said blade, said blade adapted to swing rearwardly under excessive pressure to reduce the volume of air passing through the box, said box depending below said openings and said damper to form a dust-trap, and means for yieldingly holding said blade in its said normal forward position inclined toward said inlet-opening.

12. An automatic damper for controlling the volume of air passing through an air-duct, comprising a damper-box adapted to be included in said duct and having an inlet-opening and an opposite outlet-opening approximately alined therewith, a swinging relatively reduced damper interposed in said box directly between said openings and swinging on a vertically-disposed axis arranged nearer the outlet-opening than the inlet-opening, said damper normally arranged in an advanced position inclined forwardly toward and spaced from the inlet-opening and at an acute angle to the vertical plane including the inlet-opening, whereby the inflowing air is deflected from the free end of the damper and toward the axis thereof, said damper adapted to swing rearwardly to and beyond a position at right angles to the longitudinal axial line of said openings and to said outlet-opening, to gradually reduce the volume of air passing through said box, and means to yieldingly hold said damper in its normal forward inclined position, to permit passage of the maximum volume of air through the box.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES REEDER WORTHINGTON.

Witnesses:

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