Dec. 2, 1930. E. A. FIELD ET AL 1,783,418

DRAFT STABILIZER

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Fig. 2

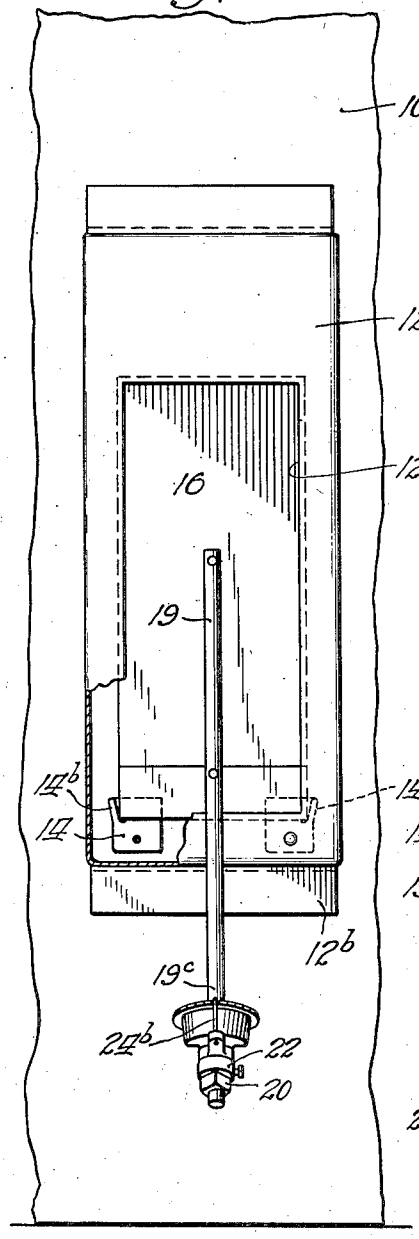
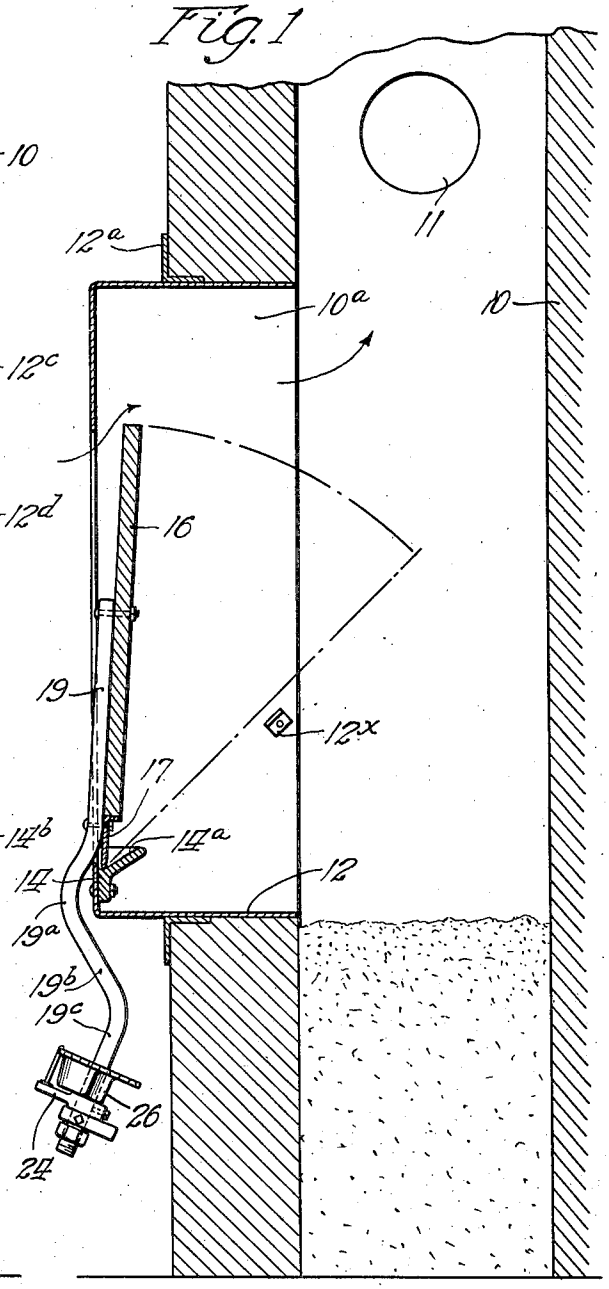


Fig. 1



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Fig. 4

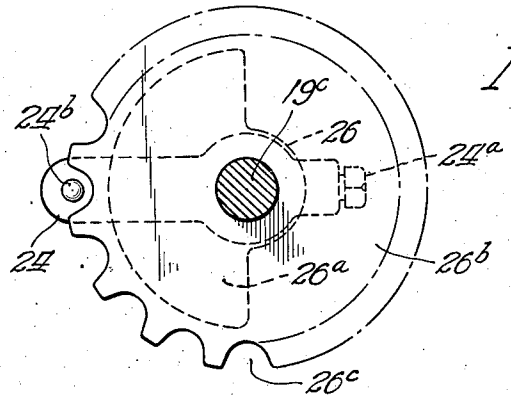


Fig. 3

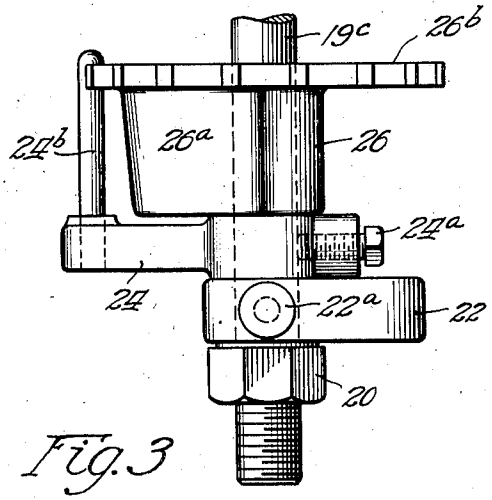
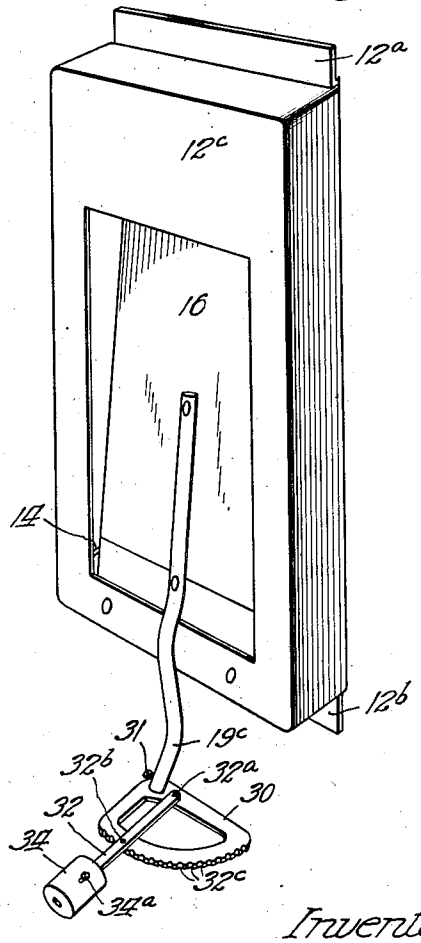


Fig. 5



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Fig. 6

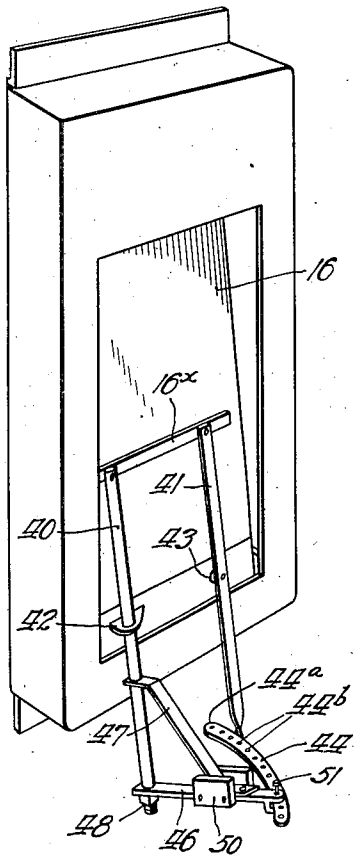


Fig. 7

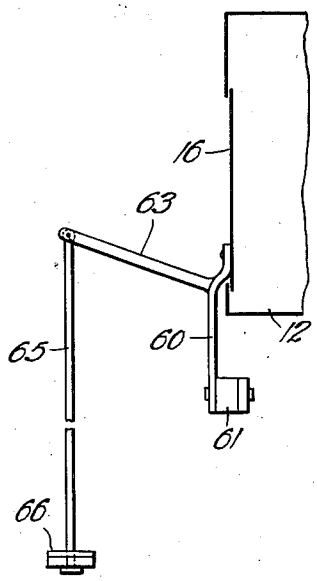


Fig. 8

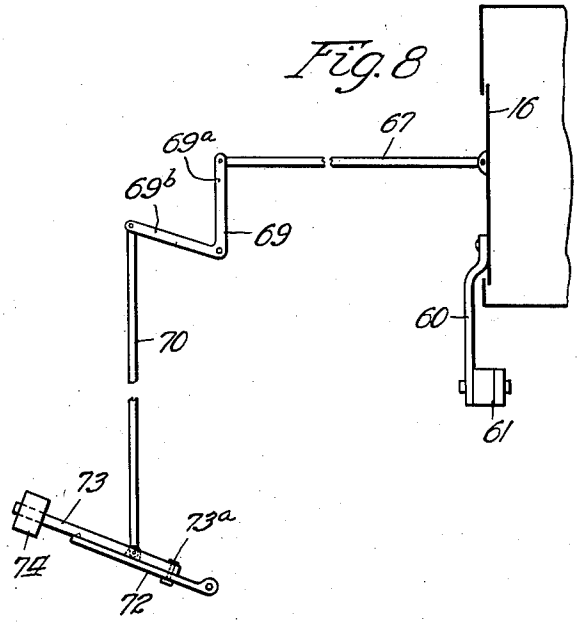
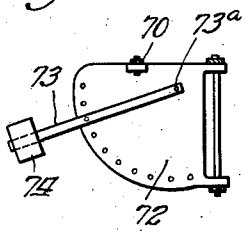


Fig. 9



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Patented Dec. 2, 1930 1,783,418

UNITED STATES PATENT OFFICE

EDWARD A. FIELD AND EDWARD A. FIELD, JR., OF CHICAGO, ILLINOIS

DRAFT STABILIZER

Application filed May 16, 1928. Serial No. 278,253.

Our invention relates to draft stabilizers and has among its objects to provide a device which will maintain the draft obtaining in the fire-box of a combustion furnace substantially uniform under varying internal and external conditions; to provide such a stabilizer which will not obstruct the smoke-pipe or chimney duct through which the gases and smoke pass from the furnace; to provide such a device which may be utilized in conjunction with a chimney opening in which it may be readily inserted and removed for use as a clean-out opening and closure; to provide such a device which in coaction with a port or opening will open such port in degree varying in substantial accord with variations in the draft effect obtaining in the chimney to vary the opening as required to maintain a substantially constant draft in the fire-box; and in general to provide a simple, relatively inexpensive and practical device of the character described. These and other objects will be made more fully apparent and set forth in the following specification and shown in the accompanying drawings, in which:

Figure 1 is a vertical section through a chimney showing one embodiment of our invention applied thereto;

Fig. 2 is a front elevation of the same, a portion of the casing being broken away;

Fig. 3 is a side elevation on an enlarged scale illustrating the adjustable counterweights;

Fig. 4 is a plan view of the structure illustrated in Fig. 3;

Fig. 5 is a perspective of another embodiment of our invention in its broad aspect;

Fig. 6 is a perspective of another form of stabilizer embodying our invention in its broad aspect;

Fig. 7 is a diagrammatic side elevation of another modification;

Fig. 8 is a view similar to Fig. 7 of still another modification; and

Fig. 9 is a plan view of the adjustable weight and support of Fig. 8.

Like numerals refer to like elements throughout the drawings.

In the form shown in Figs. 1 to 4, 10 indicates a chimney in one wall of which is provided a large port or opening 10^a; 11 indicates the end of the smoke-pipe or the like from a furnace. The opening 10^a is preferably located in the bottom of the chimney 10 beneath the smoke-pipe 11 and a casing 12 is set therein, the same being provided with top and bottom flanges 12^a, 12^b, respectively, bearing against the outer surface of the chimney wall. This casing 12 is provided with a face plate 12^c. The face plate 12^c is provided with a port or opening 12^d therein. Secured by rivets or the like to the inner side of the face plate 12^c at the bottom of the opening 12^d are provided spaced bearing members 14 having sockets or recesses 14^a therein as illustrated in Fig. 1. These bearing members with the face plate 12^c form species of V-shaped bearings, the outer ends of which are limited by the flanges 14^b.

A closure plate 16 is also provided having at its lower edge a downwardly extending fin 17 which is stepped in the bearing sockets 14^a, providing a species of knife-edge bearing as will be obvious. Secured to the front of the plate 16 is the bar or rod 19 outwardly curved or convexed at 19^a intermediate its extremities to provide the portion 19^b underlying the front of the casing 10 and the plate 16. Below the portion 19^b the portion 19^c of bar or rod 19 is outwardly and downwardly directed at an angle which we have found it desirable for most installations to make approximately 20° from the vertical.

The lower end of portion 19^c is threaded and a nut 20 threadedly engages the same. Located above the nut and slidable upon the bar portion 19^c is an eccentric counterweight 22 provided with a set-screw 22^a to secure it in an adjusted position on the bar. Located above the eccentric 22 upon the bar is an arm 24 which is secured to the bar by a set-screw 24^a. This bar is provided with the upstanding pin 24^b. Also rotatably mounted upon the bar portion 19^c is the weight 26 having eccentric portion or mass 26^a and a dial plate portion 26^b. The outer periphery of the dial plate 26^b is notched as indicated by numeral 26^c, the purpose of this construction being to permit lift and subsequent rotation of the eccentric weight member 26 to any desired

position after which it may be dropped to permit engagement of the pin 24^b with the corresponding notch, some of the notches being numbered to afford an easy identification of the desired adjustment.

The casing 12 is provided with one or more stop lugs 12^x to limit the opening movement of the plate 16, it being generally sufficient to permit 45° to 50° of such movement. It will also be noted that the plate 16 is of greater area than the port 12^d and therefore substantially closes the same when the plate is in closing position.

In the use and operation of the structure described above, we find it desirable to initially set the weights 22 and 26 in position so that the plate will be balanced on its pivotal axis in a horizontal plane. The plate is then next balanced in a substantially vertical plane preferably by such further rotative adjustment of the weight 26 as may be necessary. With the plate thus balanced in vertical and horizontal position the eccentric weight 26 is rotated to create an overbalance by the counterweights, or in other words, a resistance to the opening or movement of the plate 16 from closing position. This adjustment is best made while a draft reading is being taken in the fire-box of the furnace. The counterweight 26 is adjusted until proper resistance is afforded to the opening movement of the plate 16 to produce the desired draft in the fire-box. In other words, by adjustment of the counterweight 26 variation in the draft in the fire-box will result and when the desired draft is indicated on the meter or other indicating instrument the proper adjustment has been made. Thereafter such draft will be substantially uniform despite varying conditions in or outside of the chimney. If it should be desired to vary this draft setting, it may readily be effected by further adjustment of the weight 26.

Since different conditions of combustion are sought in many instances, provision is made for variation in the amount of air to the fire-box and to the ashpit of such furnaces. These variations in the air admission may be readily made when our stabilizer is used without substantial variation in the draft which will be automatically maintained.

By inclining the bar portion 19^e at an angle as shown, the plane of adjustment of the eccentric center of gravity of the counterweight 26 will also be at an angle (perpendicular to the axis of the bar portion 19^e in the form shown). This in effect results in a shift of the combined center of gravity of the pivoted mass along a plane inclined upwardly and outwardly from the plane of the plate 16 and parallel to the plane of shift of the counterweight 26. It is this combined center of gravity acting through the torque arm provided by its distance or offset from the plane of the plate which urges the plate to or toward closing position and which resists its movement therefrom. Since due to various variable factors the flow of air through the opening 12^d does not directly increase as the opening increases, it is necessary in order to permit a flow of air therethrough of the substantially proper amount to partially neutralize the chimney draft as it increases, to decrease the resistant effect of this offset combined center of gravity. Therefore, by shifting or offsetting such center of gravity along an upwardly inclined plane at an angle of 20° to the horizontal, for example, the torque arm through which the combined center of gravity acts is shortened as the plate opens and the rate of shortening therein increases as the opening increases due to the increasing trend of the arc of travel of such center of gravity toward the horizontal. We have found the 20° angle referred to satisfactory in many installations and have found that employment of such an angle of shift results in the maintenance of a substantially uniform draft in the furnace under varying draft conditions in the chimney. It will be obvious to those skilled in the art that the basic principle under which our device operates is that by supplying air in greater or lesser amount to the chimney from outside the furnace, the draft obtaining in the furnace will be less than that which would obtain in the chimney without the auxiliary air supply or by-pass.

By arranging the opening 12^d beneath the juncture of the smoke-pipe with the chimney 10 no obstacle or impediment is placed in the way of the flow of the gases of combustion through the smoke-pipe or chimney; in other words, the cross-sectional area of the duct through which the gases and smoke pass is not varied by our stabilizer when it is placed in this manner.

Furthermore, by locating the stabilizer at or near the bottom of the chimney ready access is afforded thereto for cleaning and for other purposes. For such access it is merely necessary to lift the plate 16 from the bearing sockets 14^a and then tilt and partially rotate the same to remove it through the opening 12^d.

In the form illustrated in Figs. 1 to 4, it will be apparent that we are able to perfectly balance the plate in vertical position and then to provide an unbalanced counterweight action varying from zero to a maximum which enables us to utilize our device where very little flow of air is required through the stabilizer to provide the proper draft in the furnace.

In Fig. 5 we have illustrated another embodiment of our invention in its broad aspect adapted to larger installations. In this form the construction is substantially the

same as that illustrated in Figs. 1 and 2, for example, except for the counterweight construction which comprises a quadrant plate 30 adjustably mounted on the bar portion 19[c] and secured in adjusted position by a set-screw 31. An arm 32 is pivotally attached to the plate 30 by the pin or bolt 32[a]. This arm 32 carries an adjustable counterweight 34 at its outer end the same being secured in adjusted position on the arm 32 by a set-screw 34[a]. A pin 32[b] is provided on the underside of the arm 32 for engagement with any one of the notches 32[c] in the outer periphery of the quadrant 30.

The initial adjustments may be made as described in connection with the embodiment illustrated in Figs. 1 to 4 and thereafter the counterweight 34 and arm 32 are rotated to effect the desired offset in the combined center of gravity of the plate 30, weight 34 and arm 32, the arm being held loosely on the pin 32[a] to permit sufficient vertical movement of the arm 32 to enable the pin 32[b] to clear the notches 32[c] until proper adjustment is reached when the pin 32[b] may be dropped in the adjacent notch. The operation otherwise is identical to that described above.

In Fig. 6 we have illustrated still another embodiment of our invention in its broad aspect particularly adapted for very large installations. In this form the plate 16 is provided with a cross strip 16[x] to which are secured the upper ends of a pair of bars 40, 41, such bars being outwardly and downwardly directed and being spaced from the plate 16 at its lower end by means of bridges 42, 43. Extending between and secured to the bars 40, 41 and adjacent the low ends thereof is the quadrant plate 44 lying in a plane angularly disposed to the horizontal when plate 16 is in a closing position. The same angle of 20° described above is believed to be suitable for the positioning of this quadrant 44. The quadrant is extended at its inner end as indicated in 44[a] to underlie the plate 16, and is provided with holes 44[b] therein at spaced intervals. An arm 46 extends outwardly from the bar 40 near the lower end thereof. A second brace arm 47 is similarly rotatably mounted upon the rod 40 and extends downwardly and is secured at its outer end to the arm 46. The position of the arm 46 and brace 47 on the bar 40 may be adjusted by means of the threaded nut 48 at the lower end of said bar. A weight 50 is carried by the arm 46 and is rotatable therewith about the bar 40 as will be obvious. A slidable pin 51 is provided in the outer end of the bar 40 and serves to engage any of the holes 44[b] to secure the weight 50 in adjusted position relative to the quadrant 44.

In the use of this structure the weight 50 may be moved to position underlying the plate 16 and thereafter turned sufficient to overbalance such plate 16 in the manner described in connection with the adjustment of the forms shown in Figs. 1 to 4 until the desired draft obtains in the furnace.

In Fig. 7 we have illustrated still another form of device adapted for installations where the stabilizer opening must be located a considerable distance above the floor. In such form a bar 60 is secured to the plate 16 being outwardly curved intermediate its extremities to clear the casing 12. A counterweight 61 is provided at the bottom of this arm 60 the same being constructed and arranged to balance the plate 16. Projecting upwardly and outwardly from the bar 60 is the inclined arm 63 preferably arranged at an angle of approximately 20° to the horizontal when the plate is in closed position. From this arm 63 depends a rod 65 terminating at any desired point and being provided with weights 66 at the bottom thereof, the number or total weight of which may be varied as desired.

It will be apparent that with this construction the effect of the overbalancing weights 66 is as if such weights were located on the arm 63 at the extremity thereof, the rod 65 being pivotally connected thereto. Therefore as the plate opens the torque arm of the weight 66, which obviously includes the weight of the rod 65, is shortened at a rapidly increasing rate and the resistance to the opening of the plate is decreased as it departs farther from closing position.

In Fig. 8 we have illustrated still another form of device which is particularly adapted for use where adjustment of the weight must be made at a point remote from the stabilizer installation. The construction is substantially similar to that illustrated in Fig. 7 save that a horizontal link 67 extends from the plate 16 to the bell-crank 69 to the upper end of the arm 69[a] to which such link is pivotally connected. The rod 70 is pivotally connected to the outer end of the other arm 69[b] of the bell-crank and carries at its lower end a quadrant plate 72 upon which is rotatably mounted the arm 73 carrying the counterweight 74, the arm 73 being rotatable about the pin 73[a] to shift the position of counterweight 74.

The arm 69[b] is inclined upwardly at the desired angle, as, for example, 20°, and it will be apparent that the unbalanced counterweight will act through a decreasing torque arm to resist the movement of the plate from closing position in the manner described in connection with the other forms.

It will be apparent that our device in its broad aspect is susceptible of modification and variation, and we do not wish to be restricted to the forms illustrated and described herein except as the claims are to be construed as limited to any particular form or forms.

What we claim is:

1. A draft stabilizer comprising in combination a pivotally mounted plate movable to and from closing position, a supporting bar attached to said plate, a counterweight carried by said bar and underlying said plate, said counterweight being adjustable on said bar and about said bar to shift its center of gravity with respect to the plane of said plate along an inclined plane.

2. A draft stabilizer comprising in combination a plate movable to and from closing position, a counterweight operatively attached thereto to underlie the same when said plate is in closing position said counterweight being adjustable as to position to vary the location of the combined center of mass of said plate, weight and associated movable elements, a second counterweight operatively associated with said plate and adjustable with respect thereto to shift its center of gravity with respect to the plane of said plate.

3. A draft stabilizer comprising in combination a plate movable to and from closing position, a counterweight operatively attached thereto to underlie the same when said plate is in closing position said counterweight being adjustable as to position to vary the location of the combined center of mass of said plate, weight and associated movable elements, a second counterweight operatively associated with said plate and adjustable with respect thereto to shift its center of gravity along a plane inclined upwardly and outwardly with respect to the plane of said plate.

4. In combination, a frame having an opening therethrough, a plate pivotally mounted in said frame to open and close said opening, a supporting bar attached to said plate and formed to extend below and beneath said plate, and a counterweight eccentrically carried by said bar beneath said plate when the latter is in closed position, said weight being adjustable on said bar to vary position of its center of gravity with respect to the plane of said plate.

5. A draft stabilizer comprising in combination, a frame having an opening therethrough, a plate pivotally mounted in said opening to open and close the same, a supporting member attached to said plate, a counterweight eccentrically mounted on said supporting member below said plate when in closed position said eccentric member being adjustably mounted with respect to said supporting member to shift its center of gravity with respect to the plane of said plate, said supporting member being provided with an inclined portion coacting with said counterweight to direct the center of gravity thereof when adjusted along a plane inclined with respect to the plane of said plate.

6. A draft stabilizer comprising in combination, a pivotally mounted plate, a bar attached to and extending therebelow, the lower portion of said bar being inclined outwardly and downwardly at an angle to the plane of said plate, a counterweight eccentrically mounted and adjustable at the lower portion of said arm and a second counterweight coacting therewith and also eccentrically mounted for shifting of its center of gravity relative to that of said first counterweight and in a plane inclined with respect to the plane of said plate.

7. A draft stabilizer comprising in combination a pivotally mounted plate, a supporting member attached thereto and extending therebelow, an adjustably positioned weight carried by said supporting member below said plate, a counterweight rotatable with respect to said plate and supporting member to shift its center of gravity with respect to the plane of said plate, said counterweight being movable in a plane inclined upwardly and outwardly with respect to the plane of said plate.

8. The combination with a housing in combination with a draft element and having a vertical front wall with an inlet opening therein, the upper edge of the opening being substantially spaced from the top of the housing, a gate for said opening pivotally mounted at its lower end to swing inwardly in opening and occupying a substantially vertical position when closed, the upper edge of the gate being substantially spaced from the top of the housing permitting free passage of air over the top of the gate when open, a stop limiting the opening movement of the gate, an arm carried by said gate and projecting below its pivot, and a counterweight mounted on said arm for adjustment in a plane forming an angle to the vertical plane of the gate pivot, the angle of such plane of adjustment to the vertical plane of the pivot being such that the center of mass carried by the gate pivot moves toward the vertical plane of the pivot as the gate opens and thereby counteracting the decrease in the air thrust incident to variations in the degree of opening of the gate.

9. A draft stabilizer comprising a gate pivotally mounted at its lower end to swing inwardly in opening and occupying a substantially vertical position when closed, an arm carried by said gate and projecting below its pivot, and a counterweight mounted on said arm for adjustment in a plane forming an angle to the vertical plane of the gate pivot, the angle of such plane of adjustment to the vertical plane of the pivot being such that the center of mass carried by the pivot moves toward the vertical plane of the pivot as the gate opens and counteracts the decrease in the air thrust incident to variations in the degree of opening of the gate.

10. In a draft stabilizer, the combination of a housing having an inlet opening, a gate

pivotally mounted at its lower end to stand in a substantially vertical position when closed, the upper edge of the gate being substantially spaced from the top of the housing permitting free passage of air over the top of the gate when open, an arm carried by said gate and projecting below its pivot, and a counterweight mounted on said arm for adjustment in a plane forming an angle to the vertical plane of the gate pivot and so that the center of mass lies above the horizontal plane of the pivot during substantially the entire opening movement of the gate and so that the length of the torque arm is decreased as the gate opens thereby counteracting the decrease in air thrust incident to the opening of the gate.

11. In a draft stabilizer, the combination of a housing having an inlet opening, a gate pivotally mounted at its lower end to stand in a substantially vertical position when closed, the upper edge of the gate being substantially spaced from the top of the housing permitting free passage of air over the top of the gate when open, an arm carried by said gate and projecting below its pivot, and a counterweight mounted on said gate for adjustment in a plane forming an angle to the vertical plane of the gate pivot and so that the center of mass moves toward the vertical plane of the pivot as the gate opens in substantially the proportion of decrease in air thrust as the gate opens.

12. A draft stabilizer comprising a gate pivotally mounted at its lower end, an arm carried by said gate and projecting below its pivot, and a counterweight mounted on said arm for adjustment in a plane forming an angle to the vertical plane of the gate pivot and so that the center of mass lies above the horizontal plane of the pivot during substantially the entire opening movement of the gate and so that the length of the torque arm is decreased as the gate opens, thereby counteracting the decrease in air thrust incident to the opening of the gate.

13. A draft stabilizer comprising a gate pivotally mounted at its lower end, an arm carried by said gate and projecting below its pivot, and a counterweight mounted on said gate for adjustment in a plane forming an angle to the vertical plane of the gate pivot and so that the center of mass moves toward the vertical plane of the pivot as the gate opens in substantially the proportion of decrease in air thrust as the gate opens.

In testimony whereof, we have signed our names to this specification.

EDWARD A. FIELD.
EDWARD A. FIELD, JR.