April 11, 1944. M. W. CREW 2,346,559

DRAFT REGULATOR

Filed April 27, 1942 2 Sheets-Sheet 1

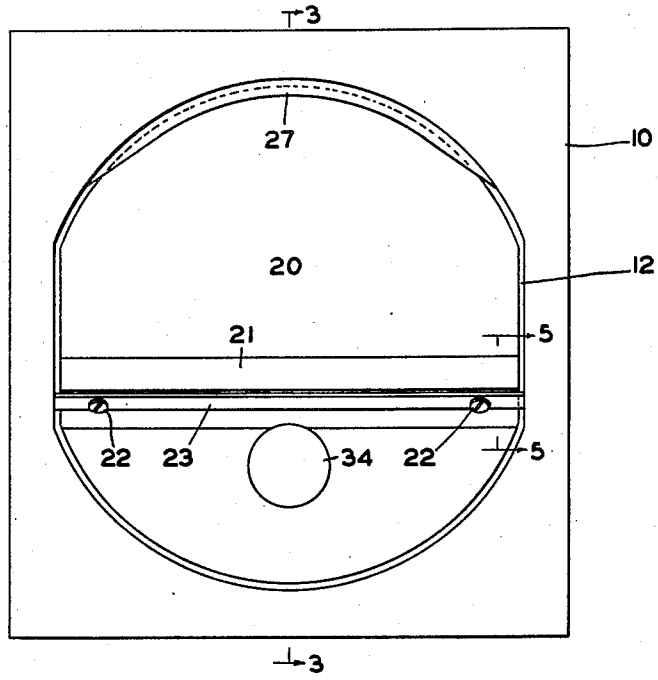


FIG.-1

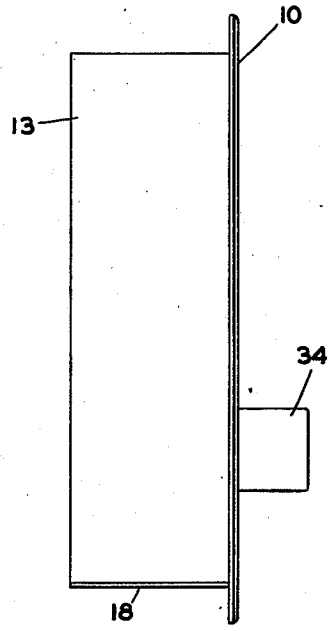


FIG.-2

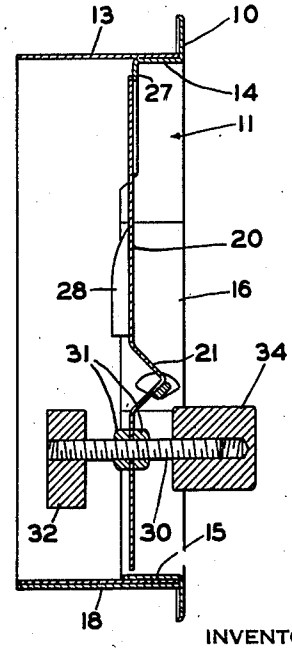


FIG.-3

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DRAFT REGULATOR

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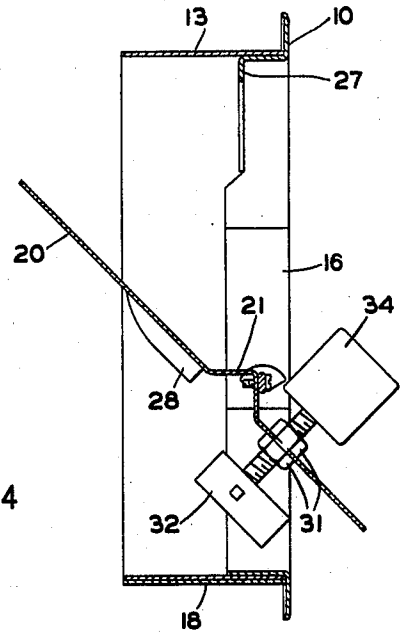


FIG.-4

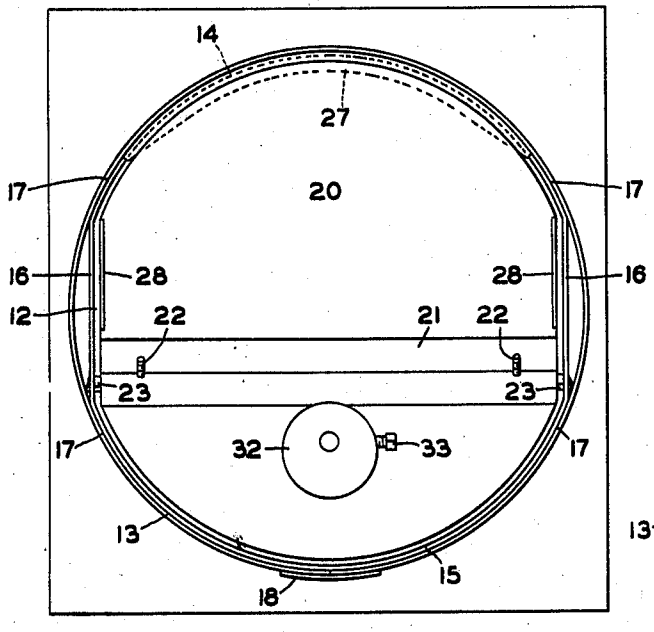


FIG.-7

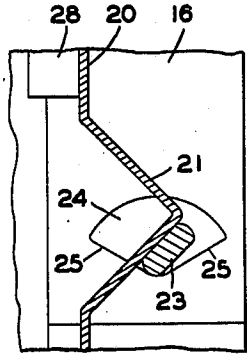


FIG.-5

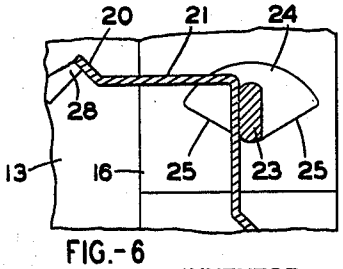


FIG.-6

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UNITED STATES PATENT OFFICE

2,346,559

DRAFT REGULATOR

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Application April 27, 1942, Serial No. 440,626

8 Claims. (Cl. 236—45)

This invention relates to improvements in draft regulators for heating equipment, including heating and power boilers, domestic heating plants, and heating appliances in general, such as domestic water heaters.

More particularly, the present invention relates to draft regulators which in use are mounted in suitable openings in the flue risers, smoke breeching or the bases of the stacks of such heating equipment for the purpose of automatically regulating or controlling the draft in the combustion chambers of such equipment to thereby effect more complete combustion of the fuel and a greater absorption of heat from the combustion gases.

As is well known, the variations in stack or chimney drafts, caused by variable weather conditions, high winds, barometric pressure, humidity and temperature differences between the inside and outside of the stack or chimney, occur so rapidly and so frequently that it is impossible to maintain by hand manipulation the proper amount of draft in the combustion chambers of heating equipment. Under excess draft conditions (excess draft being the greatest cause of fuel losses), too much air is drawn into the combustion chamber, and as a result, fuel consumption is far too rapid and the combustion gases are removed so quickly that much of their heat is lost. With the draft regulators here involved, however, excess draft is automatically prevented from reaching the combustion chambers of the heating equipment with which such regulators are used, as the dampers or flutters of said regulators automatically open under the forces of excess draft. As a result, proper and predetermined amounts of air are drawn into said combustion chambers at all times, regardless of varying draft conditions, for more complete combustion of fuel and for sufficient retardation in the flow of the combustion gases to enable a greater amount of heat to be absorbed therefrom.

The present invention has for its general object the provision of an improved draft regulator of the aforesaid type, said regulator being of simple and inexpensive construction, which enables it to be manufactured and sold at low cost; of exceedingly high sensitivity and operating efficiency, which insures economic operation of the heating equipment with which it is used; of compact form, so that little space is required for its installation and for its shipment and storage; and of sturdy and rugged character, which gives it a long service life without requiring any attention.

More specific objects of the present invention, and many of its practical advantages, will be referred to in or will be evident from the following description of one embodiment of said invention, reference being had to the accompanying drawings, in which

Fig. 1 is a front elevational view of one form of draft regulator embodying the present invention; Fig. 2 is a side elevational view thereof; Fig. 3 is a central vertical sectional view on the line 3—3, Fig. 1, the damper or flutter of the regulator being in closed position; Fig. 4 is a view similar to Fig. 3 and showing the damper or flutter in an open position, the adustable counterbalancing means of said damper or flutter being shown in elevation; Fig. 5 is a detail sectional view on the line 5—5, Fig. 1, the view being on an enlarged scale; Fig. 6 is a view similar to Fig. 3, with the damper or flutter in the open position of Fig. 4; and Fig. 7 is a rear elevational view of the draft regulator.

Before the draft regulator here illustrated is specifically described, it is to be understood that the present invention is not limited to the details of construction or the specific arrangement of parts herein illustrated or described, as the invention obviously may take other forms. It also is to be understood that the terminology or phraseology herein employed is for the purpose of description and not of limitation, the scope of the present invention being denoted by the appended claims.

As will hereinafter more fully appear, the draft regulator here illustrated, for the disclosure of the present invention, comprises in general three parts, namely, (a) a casing or frame having an opening therethrough for communication with the flue riser, smoke breeching or the base of the stack of the heating equipment with which the regulator is used; (b) a damper or flutter pivotally mounted in said casing or frame for controlling air flow through said opening to thereby effect draft regulator or control; and (c) an adjustable counter-balancing means for the damper or flutter to thereby regulate its resistance to draft.

From the accompanying drawings, it will be evident that the casing or frame of the present draft regulator comprises two simple and inexpensive telescopically related sheet metal members, one of said members having a face portion 10 and a rearwardly extending continuous flange 11 surrounding a centrally disposed opening 12

with which such face portion is provided. The other member of the frame or casing is an annular band 13 which surrounds, and which is here rigidly secured to, the flange 11, the front edge of said band being in contact with the rear surface of the face portion 10 and the width of said band being considerably greater than that of said flange. As here shown (see Figs. 1 and 7), the face portion 10 is generally square, and although its centrally disposed opening 12 may have any desired shape, said opening is here shown as having straight and generally parallel side edges and arcuate top and bottom edges. As best shown in Fig. 7, the rearwardly extending flange 11 which surrounds said opening is of corresponding shape, the top and bottom portions 14 and 15, respectively, of said flange being thus of arcuate form and the two side portions 16 of said flange being thus of straight and generally parallel form. Any suitable means may be utilized, of course, for the rigid securement of the annular sheet metal band 13 to the flange 11 which it surrounds, the securement being here effected by welding or the like at the circumferentially spaced contact areas designated by the reference numeral 17 in Fig. 7. As will be readily understood, the band 13 may be given its annular form by its securement to the flange 11 or, as here shown, said band may be given its annular form prior to such securement, the end portions of said band being here lapped by and connected by welding or the like to a sheet metal strip 18 having a length corresponding to the width of said band.

The damper or flutter 20, for controlling air flow through the opening 12 is a simple sheet metal member having a size and shape corresponding to those of said opening. Extending across said damper or flutter, between its straight and generally parallel side edges, is a forwardly extending integral rib 21 of V-shaped cross-section, said rib being located slightly below and being generally parallel with the transverse center line of said damper or flutter, as will be evident from Figs. 1, 3, 4 and 7. Suitably secured, such as by the screws 22, to the inclined lower face of said rib, in contact with the outer surface thereof, is a transversely disposed relatively flat metal strip 23 which constitutes the pivot for the damper or flutter, the end portions of said pivot strip projecting laterally beyond the straight and generally parallel side edges of the damper or flutter, as best shown in Fig. 7. For the reception of the projecting end portions of said pivot strip, and the consequent pivotal mounting of the damper or flutter in the casing or frame of the regulator, the straight and generally parallel side portions 16 of the flange 11 are provided with suitable openings 24.

As best shown in Figs. 3 to 6, inclusive, the openings 24, through which extend the projecting end portions of the pivot strip 23, have generally V-shaped seats for the rounded lower edges of said strip end portions, the sloping edges 25 of each such seat having an angularity of substantially 120° which provides sufficient space for the pivot strip to rock back and forth in the slightly rounded vertexes of the angles of their seats as the damper or flutter 20 swings back and forth between its closed and fully open positions. As will be evident from the accompanying drawings and as will be readily understood, the provision of pivot means of knife-edge form for the damper or flutter 20 enables said damper or flutter to swing with the utmost freedom and as a result, said damper or flutter is extremely sensitive to variations in draft effective upon it. When the damper or flutter is in the open position of Figs. 4 and 6, the plane of the pivot strip 23 is substantially vertical, Figs. 3 and 5 showing the position of the pivot strip in the openings 24 when the damper or flutter is in its closed position.

As best shown in Fig. 7, the ends of the pivot strip 23 extend into close proximity with the annular band 13 which surrounds the flange 11, and as a result, said band constitutes end thrust bearings for said pivot strip, as will be readily understood. As here shown, the ends of said pivot strip are cut away at an angle, the pointed ends of said strip, upon lateral movement of the damper or flutter, thus having substantially frictionless contact with the band 13 for end thrust bearing purposes.

In order to limit clockwise movement of the damper or flutter 20, as viewed in Figs. 3 and 4, and to thus define the closed position of the damper or flutter with respect to the opening 12, the arcuately shaped top portion 14 of the flange 11 is provided at its rear edge with a depending lip 27 of corresponding arcuate form, said lip being engaged by the arcuately shaped top portion of the damper or flutter when the latter is in its closed position.

As will be readily understood, the transverse V-shaped rib 21 with which the sheet metal damper or flutter 20 is integrally provided not only constitutes an angularly disposed support for the pivot strip 23 but also, serves to stiffen and strengthen said damper or flutter. To further rigidify said damper or flutter, the upper portion of the side edges thereof may be provided, if desired, with rearwardly extending wings or the like, such as those here shown and designated by the reference numeral 28.

In order that the resistance of the damper or flutter 20 to draft may be regulated as desired, suitable counter-balancing means of adjustable character is provided for said damper or flutter. The counter-balancing means here shown comprises a headless bolt 30 extending through the damper or flutter below the pivot strip 23 thereof and located on the vertical center line of the damper or flutter. To rigidly secure said bolt to said damper or flutter, with the end portions of said bolt projecting from opposite faces thereof, two clamping nuts 31 are here utilized, said nuts being threaded on said bolt and tightly engaging the damper or flutter from opposite sides thereof. Rigidly mounted on the rear end of said bolt is a suitable weight, the weight 32 here shown being of disk form and being eccentrically mounted on said bolt by a set screw 33. By merely loosening said set screw, the center of gravity of the eccentrically mounted weight 32 may be varied as desired, the center of gravity of said weight being here shown as below the bolt 30 and in the plane thereof, as will be evident from Figs. 3 and 7.

Threaded on the front end portion of the bolt 30, for movement therealong, is a weight 34 which is here shown as of cylindrical form, and by adjusting said weight toward and from the damper or flutter, by rotary movement of said weight, the resistance of said damper or flutter to draft may be easily and conveniently regulated. If desired, the front face of the adjustable weight 34 may bear an arrow or the like to indicate the direction in which the weight is to be turned to increase or decrease the resistance of the damper

or flutter to draft, all as will be readily understood.

In the use of the present draft regulator with a water heater or other heating equipment, the rearwardly extending flange 11 and its surrounding band 13 are mounted in an air-tight manner in a suitable opening in a flue riser, smoke breeching or the base of the stack of such heating equipment, the pivot strip 23 of the damper or flutter 20 being horizontally disposed. Because of the flat top of the face portion 10, a true horizontal positioning of said damper or flutter pivot can be readily effected, a spirit level being capable of convenient use with such flat top for such purpose, if necessary or desirable. The counterbalancing means of the damper or flutter is adjusted to provide in the combustion chamber of the heating equipment the proper amount of draft normally necessary for economical and efficient operation of said heating equipment and any variations in draft conditions are automatically taken care of by appropriate movement of the damper or flutter, in a manner which will be readily understood.

From the foregoing description thereof, it will be evident that the draft regulator here illustrated is of simple, efficient and inexpensive form. Not only does the V-shaped rib serve as a mechanical reinforcement to strengthen the sheet metal flutter, but also the angularity of the lower face of the damper or flutter rib 21, to which the pivot strip 23 is secured, is such that said rib face, and hence such pivot strip, are substantially vertical when the damper or flutter is in the position (the open position of Figs. 4 and 6) which it normally occupies in use of the device. As a result, normal fluctuations of the damper or flutter take place with the utmost freedom of movement, there being the least possible journal bearing friction as the damper or flutter swings in its normal arc. Furthermore, offsetting of the pivotal axis, as described, enables the V-shaped recesses or openings 24 to be located midway between the front and rear edges of the flanges 16, giving to such flanges greater strength than if the openings extended clear to the edges thereof.

If desired, the position of the rear weight 32 on the bolt 30 can be fixed at the factory, and the position of the adjustable front weight 34 so set that the damper or flutter 20 will operate on a predetermined amount of draft, say .01 of an inch. If greater draft is desired when the device is put into operation, the front weight 34 is merely turned in a counter-clockwise direction, Fig. 1, to locate it further from the plane of the damper or flutter, as will be readily understood.

A further feature of the present invention resides in the fact that the damper or flutter 20 is of substantially maximum size with respect to the opening in the flue riser, smoke breeching or the like in which the device is mounted in use thereof. The device here illustrated is what is termed in the trade a six-inch draft regulator, the opening in which it is mounted having a diameter of six inches. That is substantially the length of the vertical dimension of the damper or flutter 20, so that maximum effectiveness of the damper or flutter in regulating or controlling draft is insured.

To those skilled in the art to which the present invention relates, further features and advantages of draft regulators embodying the present invention will be evident from the foregoing description of one embodiment of such invention.

What I claim is:

1. A draft regulator, comprising a casing having a face portion provided with an opening, said casing also having a pair of opposed flange portions at the sides of said opening and extending rearwardly from said face portion, each thereof being provided intermediate its front and rear edges with a V-shaped opening, a flutter for controlling air flow through said opening and provided with a forwardly extending transversely disposed rib, and generally flat pivot means carried by the rib of said flutter and projecting laterally from said flutter into the apertures of said flange portions and supported edgewise upon the vertexes thereof for the pivotal connection of said flutter to said casing, the longitudinal axis of said pivot means being laterally offset relative to the general plane of said flutter.

2. A draft regulator, comprising a casing having a face portion provided with an opening, said casing also having a pair of opposed flange portions at the sides of said opening and extending rearwardly from said face portion, each thereof being provided intermediate its front and rear edges with a V-shaped opening, a flutter for controlling air flow through said opening and provided with a forwardly extending transversely disposed rib of generally V-shaped cross-section, and pivot means carried by the lower inclined face of said flutter and projecting laterally from said flutter into the apertures of said flange portions and supported edgewise upon the vertexes thereof for the pivotal connection of said flutter to said casing, the longitudinal axis of said pivot means being laterally offset relative to the general plane of said flutter and being generally parallel with the inclined face of the flutter rib by which the pivot means is carried.

3. A draft regulator, comprising a casing having a face portion provided with an opening, said casing also having a pair of opposed apertured flange portions at the sides of said opening and extending rearwardly from said face portion, a flutter for controlling air flow through said opening and provided below its center with a transversely disposed forwardly extending rib of generally V-shaped cross-section, and generally flat pivot means carried by the lower inclined face of said flutter and projecting laterally from said flutter into the apertures of said flange portions for the pivotal connection of said flutter to said casing, the plane of said pivot means being generally parallel with the plane of said lower rib face and therefore angularly disposed with respect to the general plane of the flutter.

4. A draft regulator, comprising a casing having a face portion provided with an opening, said casing also having a pair of opposed apertured flange portions at the sides of said opening and extending rearwardly from said face portion, a sheet metal flutter for controlling air flow through said opening and provided with a transversely disposed forwardly extending integral rib of generally V-shaped cross-section, and pivot means lying alongside and secured to the front surface of one of the inclined faces of said flutter and projecting laterally therefrom into the apertures of said flange portions for the pivotal connection of said flutter to said casing, the longitudinal axis of said pivot means being forwardly offset relative to the general plane of said flutter, said casing also having means outwardly overlying the apertures of said flange portions and constituting end thrust bearings for the pivot means of said flutter.

5. A draft regulator, comprising a casing having a face portion provided with an opening, said casing also having a pair of opposed apertured flange portions at the sides of said opening and extending rearwardly from said face portion, a flutter for controlling air flow through said opening, and a substantially flat pivot strip transversely carried by said flutter and projecting laterally therefrom into the apertures of said flange portions for the pivotal mounting of said flutter in said casing, the general plane of said pivot strip being angularly disposed relative to the general plane of the flutter, the apertures of said flange portions being provided with generally V-shaped seats for the projecting end portions of said pivot strip, the pivotal mounting of said flutter being thus of knife-edge character.

6. A draft regulator, comprising a casing having a face portion provided with an opening having generally parallel side edges, said casing also having a continuous flange surrounding said opening and extending rearwardly from said face portion, the portions of said flange at the sides of said opening being apertured and in generally parallel relationship, a flutter for controlling air flow through said opening, and pivot means carried by said flutter and projecting laterally therefrom into the apertures of said side flange portions for the pivotal connection of said flutter to said casing, said casing also having means secured to the continuous flange thereof and outwardly overlying the apertures therein and constituting end thrust bearings for the pivot means of said flutter.

7. A draft regulator, comprising a casing having a face portion provided with an opening having generally parallel side edges and generally arcuate top and bottom edges, said casing also having a continuous flange surrounding and generally conforming to the shape of said opening and extending rearwardly from said face portion, the portions of said flange at the sides of said opening being apertured, a flutter for controlling air flow through said opening, and pivot means carried by said flutter and projecting laterally therefrom into the apertures of said side flange portions for the pivotal connection of said flutter to said casing, the arcuate top portion of said flange having a depending arcuately shaped projection engageable by the top portion of said flutter to thereby determine the closed position of said flutter.

8. A draft regulator, comprising a casing having a face portion provided with an opening having substantially straight and generally parallel side edges and generally arcuate top and bottom edges, said casing also having a pair of apertured substantially straight flange portions at the sides of said opening and extending rearwardly from said face portion in generally parallel relation, a flutter for controlling air flow through said opening and shaped to correspond to said opening, and pivot means carried by said flutter and projecting laterally therefrom into the apertures of said flange portions for the pivotal connection of said flutter to said casing, said casing also having arcuately shaped means outwardly overlying said flange portions and spaced from the apertures thereof and constituting end thrust bearings for the pivot means of said flutter.

MORRIS W. CREW.