July 29, 1952 A. H. ZIPH 2,604,887

DRAFT CONTROL FOR HEATING APPARATUS

Filed March 27, 1950 3 Sheets-Sheet 1

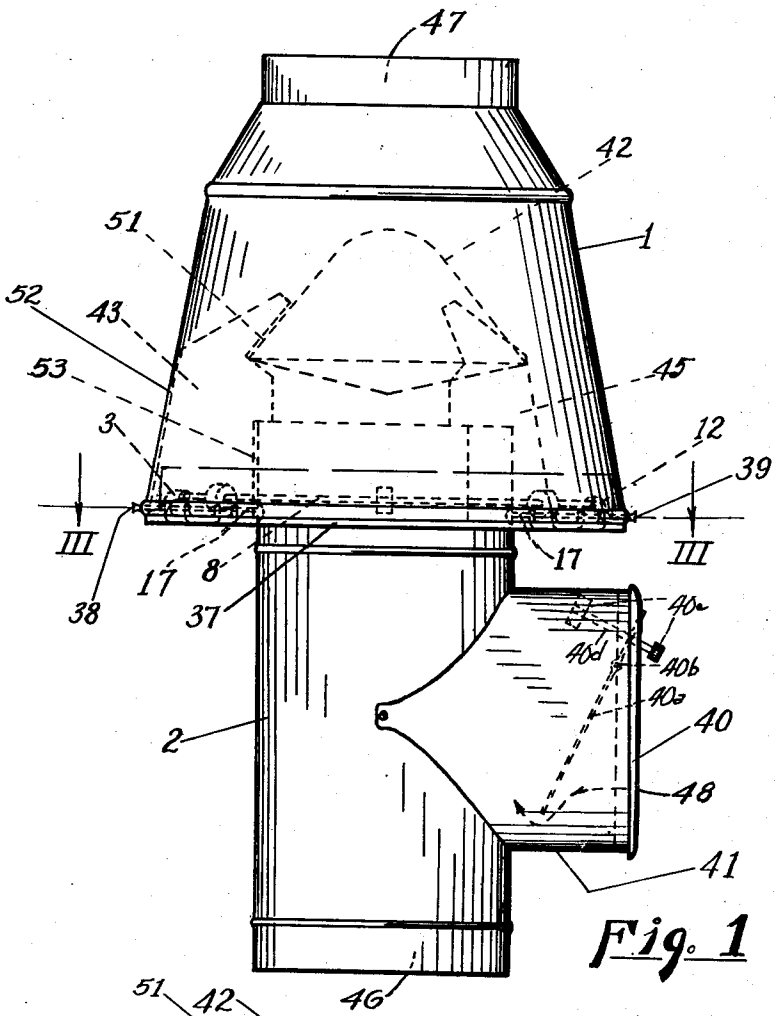



Fig. 1

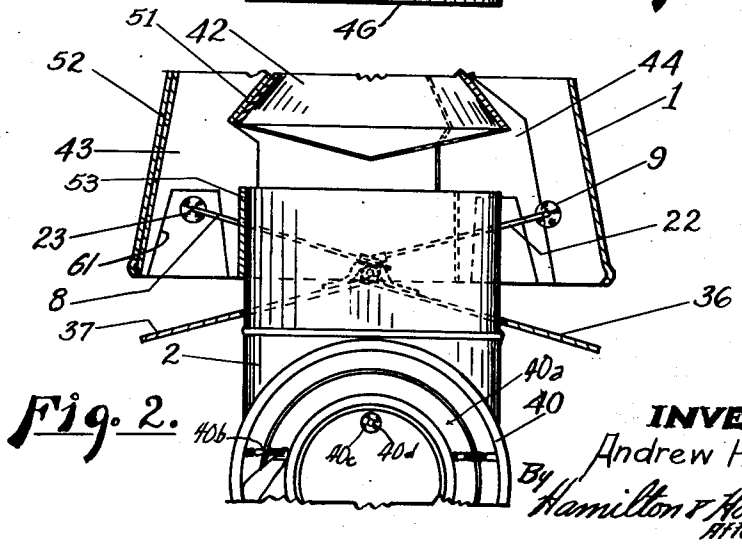



Fig. 2.

INVENTOR,
Andrew H. Ziph.
By Hamilton & Hamilton,
Attorneys.

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Filed March 27, 1950 3 Sheets-Sheet 2

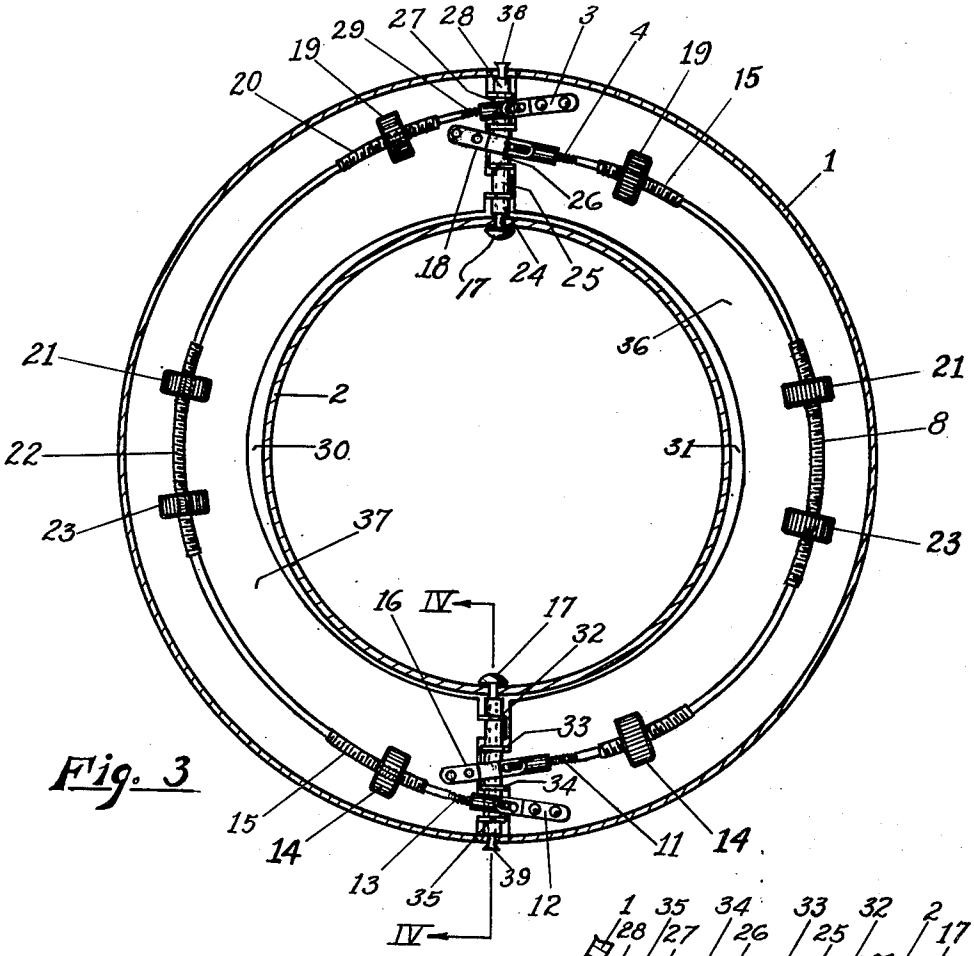



Fig. 3

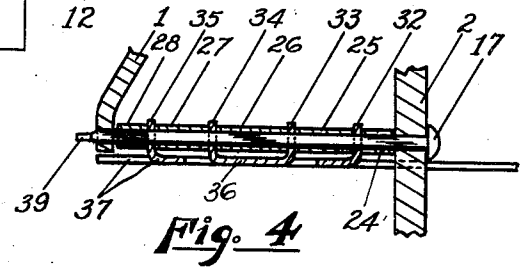



Fig. 4

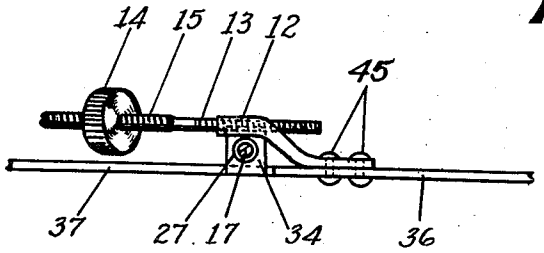



Fig. 5

INVENTOR,
Andrew H. Ziph.
By Hamilton & Hamilton,
Attorneys.

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DRAFT CONTROL FOR HEATING APPARATUS

Filed March 27, 1950 3 Sheets-Sheet 3

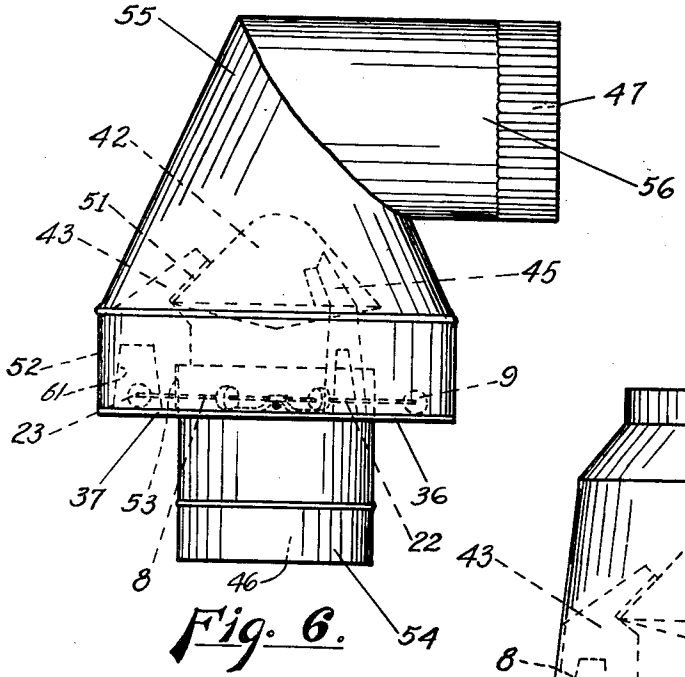



Fig. 6.

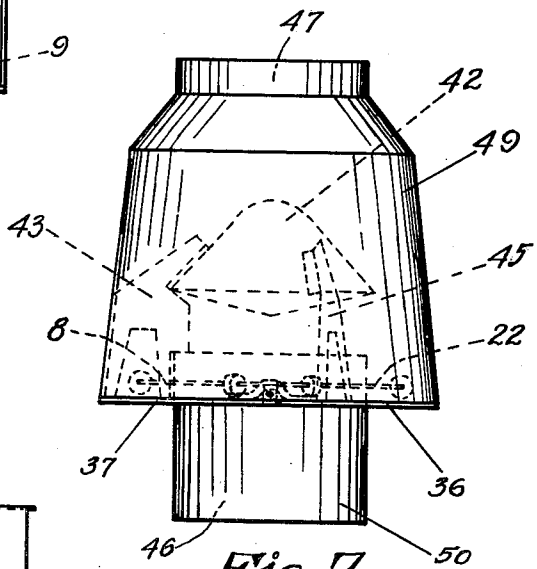



Fig. 7.

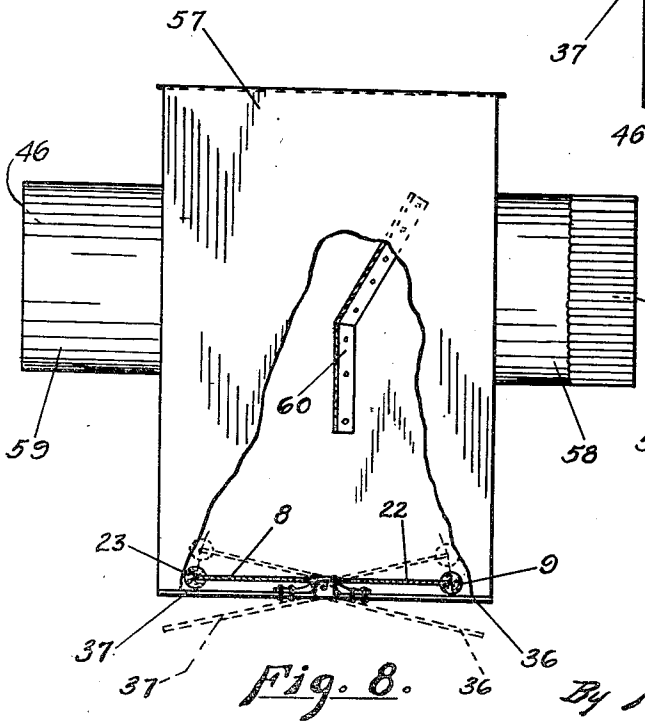



Fig. 8.

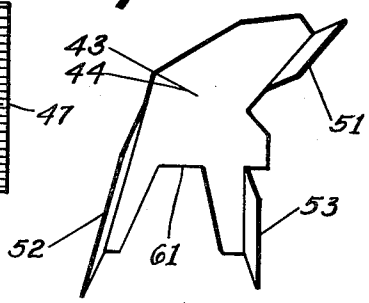



Fig. 9.

INVENTOR.
Andrew H. Ziph
By Hamilton & Hamilton,
Attorneys.

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# UNITED STATES PATENT OFFICE

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## DRAFT CONTROL FOR HEATING APPARATUS

Andrew H. Ziph, St. Joseph, Mo.

Application March 27, 1950, Serial No. 152,089

11 Claims. (Cl. 126—307)

1

This invention relates to improvements in draft control for heating apparatus, and has particular reference to the control and regulation of the up and down drafts especially in domestic heating installations.

The principal object of this invention is the provision of a back draft diverter that automatically diffuses and makes ineffective excessive back or down drafts that are often severe enough to snuff out the pilot or low-fire flame, especially in oil or gas-fired installations.

An inherent weakness of the back draft diverter now on the market is that the annular open space at the bottom of the hood, called the "relief opening," communicates directly with the inside of the pipe. The reason that this constitutes a weakness lies in the fact that draft conditions vary with atmospheric pressure, temperature, wind velocity, height and location of the chimney, intermittent operation of the appliance, and many other changing conditions. Therefore, since in a back draft diverter the pipe has direct communication with the variable conditions existent at the outside of the pipe, all these variations will be communicated undiminished to the inside of the pipe with the consequent lowered combustion efficiency that results from an extreme range of draft conditions.

To correct and minimize these effects, it is common practice to make use of draft regulators (also called barometric draft controls) which check excessive up drafts (as opposed to down drafts mentioned with respect to down draft hoods), and equalizes chimney draft so that it is possible to assure a comparatively constant draft wherever an installation is subjected to more than normal draft pressure.

An inherent weakness of a draft control such as described above is the fact that it cannot function whenever draft conditions are less than the value for which the regulator is adjusted.

Therefore it is impossible, and has never been a recommended practice, to use a draft regulator in conjunction with a back draft diverter (although a highly desirable combination) because the one in accomplishing its useful function directly opposes the other and vice versa.

Some attempts have been made to overcome these difficulties by internal damper arrangements, but have not been very successful because of the corrosive effects of the products of combustion on the damper and pivot pins when in direct contact therewith, and for other inherent difficulties in design.

The principal object of the present invention is, therefore, to provide a combination of a back draft diverter and draft regulator that will perform both functions without interference therebetween, thus allowing the single unit to accomplish both back draft and up draft control effectively.

2

Another object is to provide a back draft diverter only with means to control back drafts and at the same time to overcome its inherent weaknesses by closing the relief opening that directly connects the outside and inside of the device, with provision to open it only as necessity arises due to back or down drafts occuring in the chimney and smoke pipe.

A further object is to provide a back draft diverter with two semi-circular annular plates or flaps that pivot on a line through the major diameter of the plates so that said plates can swing angularly from their normally closed position to an open position thus allowing the diffusion of back drafts with no ill effects on the operation of the heating appliance.

Still another object is to provide the flaps with a system of weights and means for adjusting said weights so that equilibrium of the flaps can be adjusted to hold them in perfect balance or to unbalance the flaps either positively or negatively according to the operating requirements of the device.

Another object is to provide a system of sensitive pivot points for the swingable flaps at points outside the path of the gaseous products of combustion so that no undue corrosion or pitting will occur to disturb the sensitive balance of the flaps.

Other objects are simplicity and economy both in the operation and production of the device, the provision of parts that can be speedily produced on automatic machines, and the provision of a device that can be installed in any heating smoke pipe line easily and simply by inserting standard sections of pipe in both inlet and outlet connections in the same manner as is customary in present practice with respect to heating installations.

With these objects in view, as well as other objects which will appear in the course of the specification, reference will be had to the drawing, wherein:

Fig. 1 is a side elevation of a draft control apparatus for controlling the various drafts of combustion equipment, embodying the present invention.

Fig. 2 is an elevational view of the draft control apparatus shown at right angles to that

shown in Fig. 1, with the upper portion thereof shown in section to show the open position of the draft flaps.

Fig. 3 is an enlarged horizontal sectional view taken on line III—III of Fig. 1, showing the flap mechanism in plan.

Fig. 4 is an enlarged fragmentary sectional view taken on line IV—IV of Fig. 3.

Fig. 5 is an enlarged elevational view of the balancing for the draft flaps.

Fig. 6 is an elevational view of a draft control means applied to a modified L-shaped back draft deflector with draft control means shown in dotted lines.

Fig. 7 is an elevational view of a vertical type standard back draft diverter shown provided with the present draft control means.

Fig. 8 shows the application of the improved draft control means as applied to the horizontal type of back draft diverters, a side of which is partly broken away to disclose the draft control means in the closed position in solid lines and in dotted lines in the open position.

Fig. 9 is a perspective view of one of a series of brackets that serve to join separate parts of the back draft diverted together by spot welding.

Like reference characters refer to similar parts throughout the several views, and the numeral **2** designates a stovepipe T-joint in which is installed a draft regulator **40** of common type, said regulator comprising essentially a damper door **40***a* hung on a horizontal pivot **40***b* above its center of gravity and counterbalanced by weights **40***c* adjustable on a screw **40***d* fixed in said door. The body of said T-joint projects upwardly into the draft hood **1** in spaced relation below draft cone **42**. The said T-joint, draft hood and draft cone **42** are joined together by means of three like brackets **43**, **44**, and **45** equally spaced apart about said stovepipe T-joint and jointed to the various parts by welding. At points diametrically opposed on both the outer periphery of the draft hood and the circumference of the stovepipe T-joint, pins **17** have their bearings.

The inner ends of pins **17** are headed and the outer ends are flattened, **38** and **39**, at the time of assembly to secure them in place so they will not move endwise out of their bearing positions.

Pins **17** support tabs **35**, **34**, **33**, and **32**, Fig. 4, which are upturned from semi-circular flaps **36** and **37**, forming pivotal bearings for the flaps which swing on pins **17** at the several bearing points provided by the upturned tabs. Spacer bushings **28**, **27**, **26**, **25**, and **24** position flaps **36** and **37** between the bearing points of pins **17** in the upper end of stovepipe T-joint **2** and the lower end of hood **1**.

The upper end of T-joint **2** is secured to three equally spaced brackets, all of which **43**, **44**, and **45** are shown, by spot welding to outwardly turned tabs **53**, Fig. 9. In turn outwardly turned tabs **52** of said brackets are spot welded to draft hood **1** and tabs **51**, are spot welded to double cone **42**. The assembly of these parts forms the devices shown in Figs. 1, 2, 6, and 7. The draft deflecting cone **42** consists of a single cone cupped upwardly in ordinarily used back draft diverters, but for the purposes of this invention the cone is double, with the long apex at the top to provide a draft deflecting surface which directs the pressure or weight of the down draft against the surface of flaps **36** and **37**, while the short apex of cone **42** directs the upwardly flowing gas around the deflecting cone and thence to the outlet passage **47**.

Flaps **36** and **37** are semi-circular in shape on their outside peripheries but their inner peripheries are given an elliptical curvature in order to provide clearance spaces **30** and **31** about the circumference of the T-joint at their pivot points. This clearance space is provided so that when the flaps rotate to an angular position such as shown in Fig. 2, the inner peripheries of the flaps will not strike the circumference of the T-joint until sufficient opening has been attained to allow back drafts to diffuse and escape to the outside atmosphere.

Rods **8** and **22** are threaded or secured in brackets **3** and **12** at their ends, and brackets **3**, **12**, **16**, and **18** are secured to flaps **36** and **37** to hold them in angular position on the flaps or plates so that the ends of rods **8** and **22** when formed approximately semi-circular in shape will coincide with the threaded openings of the brackets in which they are secured.

Along the axis of the rods **8** and **22** are formed rolled threads represented by **15** and **20** which can be rolled the full length of the rods or in the sections only where the weights **19**, **21**, **23**, and **14** are carried, to provide means for positioning said weights so that the center of gravity of the flaps **36** and **37** can be shifted relative to the pivot points to bring said flaps into perfect equilibrium in a horizontal plane, or to shift the center of gravity to any desired points.

Normally a sensitive balance of the flaps in a horizontal plane is desired so that the slightest weight due to draft pressure thereon will cause them to swing angularly downwardly. When the pressure on the upper surfaces is relieved or dissipated through the resulting opening between draft hood **1** and the end of the T-joint **2** which projects upwardly inside the hood, the equilibrium of the flap will again cause them to assume their horizontal plane position, thus closing the opening communicating between the outside and inside of the draft hood. When the flaps are open due to back draft, draft regulator **40** becomes inoperative and remains in its closed position. After the back draft has been diffused and updraft reestablished, the flaps close the relief opening of the back draft hood automatically and draft regulator **40** again becomes operative to automatically check excessive draft, thereby maintaining a constant pre-set overfire draft in the heating appliance.

Brackets **43**, **44**, and **45** are provided with a cut-out space **61** at their lower ends to provide clearance for the adjustment rods and weights to swing upward as shown in Fig. 2 when flaps **36** and **37** are forced downwardly by back pressure on their upper surfaces.

Openings **46** are provided to connect the inlet ends of the devices described herein to a pipe which is directly connected to the flue of the heating appliance, while opening **47** connects to the remainder of the smoke pipe run which leads to the chimney or stack.

In the modification shown in Fig. 6, the device is shown in elbow or L-form, pipe **54**, hood **55**, and pipe **56** thereof corresponding with pipe **2**, hood **1**, and outlet **47** of Fig. 1, except that pipe **56** is disposed at right angles to the axis of the hood.

Exactly the same pivot suspension arrangement is carried out in the flaps of this device except that one pivot pin **17** extending clear through the rectangular opening is used instead

of two as in the preceding cases and the spacer bushings are made suitable to hold the rectangular flaps in correct alignment and position.

The adjustment rods, weights and fittings are exactly similar in shape to those described for the preceding devices but the size of the weights are varied to suit the individual requirements of any given size of diverter which embodies the flaps.

The above reference to size of parts is also true in all cases described before, that this invention is intended for a complete range of sizes to suit every heating installation by varying the size of parts to conform to the required size of the device.

Thus it is apparent from the preceding description and specification that a combination back draft diverter and draft regulator has been produced which may function both as a back draft diverter and draft regulator in the only manner in which the combination can be successfully made; that is, by means of the flaps which open or close automatically by means of draft pressure changes actuating the component elements of the device.

Similarly it is also apparent that a back draft diverter has been produced that will perform its functions of back draft relief while retaining the elements of safety, efficiency and economy afforded by providing a relief opening that is opened or closed automatically in accordance with variations in draft conditions caused by outside influences beyond control, such as atmospheric pressure, temperature, wind velocity, height and location of chimney, intermittent operation of the appliance, and other variable factors.

Both with and without the combination of draft regulation, the back draft diverter thus provides a new and improved combination and useful improvement that creates greater safety, better efficiency, and maximum economy in the operation of fuel fired combustion equipment of any type, but especially with respect to oil and gas fired equipment.

What I claim as new and desire to protect by Letters Patent is:

1. A back draft deflector assembly comprising a frusto-conical shaped hood, a combustion gas receiving stove-pipe propecting axially into the lower portion of said hood in spaced relation to the outer periphery of said hood, to present an annular space therebetween, a double cone shaped draft deflecting baffle disposed in axial alignment in said hood in spaced relation above said stove-pipe, spaced apart brackets for securing said hood, stove-pipe, and baffle in relatively fixed relation, means adapted to connect the upper end of said hood with a draft flue, a pair of hingedly mounted flat plates to provide means to automatically close said annular space about said stove-pipe, each of said plates being provided with counter-balancing means whereby said plates will normally close said annular space, and whereby down drafts through said draft flues will exert a pressure on said plates to pivot said plates to open said annular space.

2. A back draft diverter assembly comprising a substantially frusto-conical shaped hood provided at its base with a cylindrical inlet pipe of lesser diameter adapted to connect the inlet of said hood with the discharge flue of a fuel burning appliance, a double cone shaped draft deflecting baffle supported above the cylindrical inlet to provide a substantially annular passage in



conformance with the hood, a pair of substantially semi-circular flat plate segments hinged diametrically to provide a means for automatically closing the annular space formed by the base of said conically shaped hood with said cylindrical inlet pipe, said segments being provided with adjustable counter-balancing means to balance said segments individually.

3. A back draft deflector assembly comprising a frusto-conical shaped hood adapted to be connected at its upper end with a draft flue, a stove pipe provided with a draft regulator and adapted to communicate with a combustion chamber to deliver heated gases into the body of said hood, a substantially cone shaped deflector mounted in said hood in fixed relation thereto and in spaced relation above said stove pipe, whereby a substantially annular space is provided between said hood and stove pipe, and a pair of substantially semi-circular flaps hinged to automatically operate to control the down draft through said annular space whereby the major portion of said down draft will be dissipated to the atmosphere.

4. A back draft deflector assembly comprising a frusto-conical shaped hood, a T-joint stove pipe section having an automatic draft regulator damper therein adapted to communicate at its lower end with a combustion chamber and open at its upper end to conduct gases axially into the lower portion of said hood, a cone shaped draft deflecting baffle disposed in axial alignment above the upper end portion of said stove pipe, means for securing said hood, stove pipe, and baffle in fixed relation to present a fixed annular space between said hood and stove pipe, a pair of substantially semi-circular ring plates independently mounted to normally close said annular space, and having counter-balancing means whereby back drafts delivered to said hood will open said annular space to direct the back drafts therethrough to the atmosphere.

5. A back draft deflector and draft regulator assembly for fuel burning appliances comprising a frusto-conical hood, a stove pipe provided with an updraft regulator damper therein adapted to communicate at its lower end with a combustion chamber and open at its upper end to conduct gases axially into the lower portion of said hood, a cone shaped draft deflecting baffle disposed in axial alignment above the upper end portion of said stove pipe, means for securing said hood, stove pipe, and baffle in fixed relation to present a fixed annular space between said hood and stove pipe, a pair of substantially semi-circular ring plates independently mounted to normally close said annular space, and having counter-balancing means whereby back drafts delivered to said hood will open said annular space to direct the back drafts therethrough to the atmosphere.

6. A back draft regulator adapted to be inserted in a flue leading from a heating chamber to a chimney comprising a frusto-conical shaped hood, a stove pipe adapted to communicate at its lower end with a combustion chamber and open at its upper end to conduct gases axially into the lower portion of said hood, a cone shaped draft deflecting baffle disposed in axial alignment above the upper end portion of said stove pipe, means for securing said hood, stove pipe, and baffle in fixed relation to present a fixed annular space between said hood and stove pipe, a pair of substantially semi-circular ring plates independently mounted to normally close said annular space, and having counter-balancing means whereby back drafts delivered to said hood will

open said annular space to direct the back drafts therethrough to the atmosphere.

7. A back draft deflector assembly comprising a frusto-conical shaped hood, a T-joint stovepipe section having an automatic draft regulator intermediate its ends adapted to communicate at its lower end with a combustion chamber and open at its upper end to conduct gases axially into the lower portion of said hood, a cone shaped draft deflecting baffle disposed in axial alignment above the upper end portion of said stove pipe, means for securing said hood, stove pipe T-joint, and baffle in fixed relation to present a fixed annular space between said hood and stovepipe, a pair of substantially semi-circular ring plates independently mounted to normally close said annular space, and having counter-balancing means whereby back drafts delivered to said hood will open said annular space to direct the back drafts therethrough to the atmosphere, whereupon said semi-circular ring plates will return to the closed position as the up draft is reestablished, thus enabling the draft regulator to check excessive up drafts and to maintain a constant, uniform draft in the combustion chamber of the heating appliance.

8. A back draft deflector assembly comprising a frusto-conical hood open at its lower end and adapted to communicate at its upper end with a flue, a stove-pipe adapted to communicate at one end with a combustion chamber and having its open opposite end extending axially upwardly into the lower portion of said hood, a cone-shaped draft deflecting baffle disposed axially in said hood in spaced relation above the end of said pipe, means for securing said hood, stove-pipe, and baffle in fixed relation to present an annular space between said hood and stove-pipe, a pair of substantially semi-circular ring plates carried pivotally by said assembly and adapted to close said annular space, said ring plates being adapted to be opened outwardly by back draft pressure within said hood, and counter-balancing weights whereby said ring plates are yieldably urged toward their closed position.

9. A combination draft regulator and back draft deflector comprising a frusto-conical hood open at its lower end and adapted to communicate at its upper end with a flue, a stove-pipe adapted to communicate at one end with a combustion chamber and having its open upper end extending axially upwardly into the lower portion of said hood, said stove-pipe having an opening therein outside of said hood and communicating with the atmosphere, a draft regulating damper controlling said opening, a cone-shaped draft deflecting baffle disposed axially in said hood in spaced relation from the end of said pipe, means for securing said hood, stove-pipe, and baffle in fixed relation to present an annular space between said hood and stove-pipe, a pair of substantially semi-circular ring plates carried pivotally by said assembly and adapted to close said annular space, said ring plates being adapted to be opened outwardly by back draft pressure within said hood, and counter-balancing weights whereby said ring plates are yieldably urged toward their closed position.



10. A back draft deflector assembly comprising a frusto-conical hood open at its lower end and adapted to communicate at its upper end with a flue, a stove-pipe adapted to communicate at one end with a combustion chamber and having its open opposite end extending axially upwardly into the lower portion of said hood, a double cone-shaped draft deflecting baffle disposed axially in said hood in spaced relation above the end of said pipe, means for securing said hood, stove-pipe, and baffle in fixed relation to present an annular space between said hood and stove-pipe, a pair of substantially semi-circular ring plates carried pivotally by said assembly and adapted to close said annular space, said ring plates being adapted to be opened outwardly by back draft pressure within said hood, and counter-balancing weights whereby said ring plates are yieldably urged toward their closed position.

11. A back draft deflector assembly comprising a frusto-conical hood open at its lower end and adapted to communicate at its upper end with a flue, a stove-pipe adapted to communicate at one end with a combustion chamber and having its open opposite end extending axially upwardly into the lower portion of said hood, a cone-shaped draft deflecting baffle disposed axially in said hood in spaced relation above the end of said pipe, means for securing said hood, stove-pipe, and baffle in fixed relation to present an annular space between said hood and stove-pipe, a pair of substantially semi-circular ring plates carried pivotally by said assembly and adapted to close said annular space, said ring plates being adapted to be opened outwardly by back draft pressure within said hood, and counter-balancing weights whereby said ring plates are yieldably urged toward their closed position, said weights being adjustable whereby they vary the back draft pressure required to open said ring plates.

ANDREW H. ZIPH.


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