June 4, 1946. M. W. CREW 2,401,553

CONTROL MEANS FOR DRAFT REGULATORS

Filed June 30, 1943 2 Sheets-Sheet 1

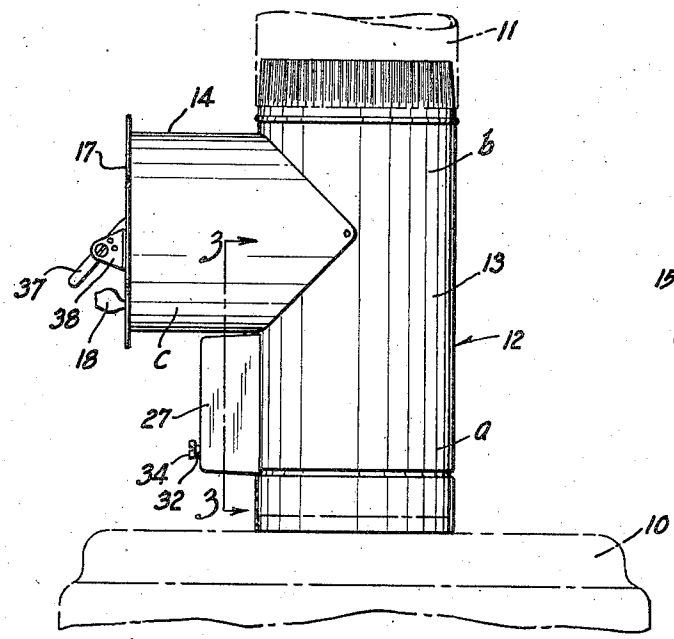


Fig.-1

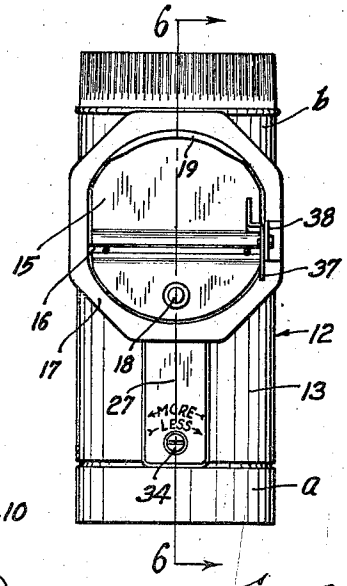


Fig.-2

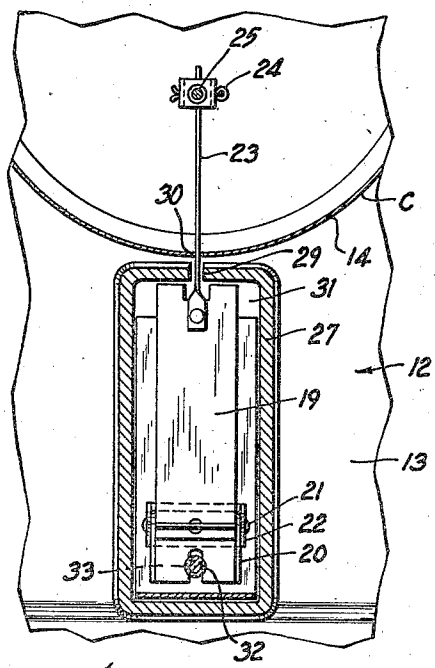


Fig.-3

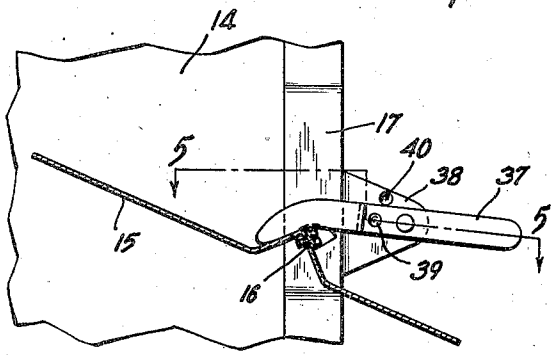


Fig.-4

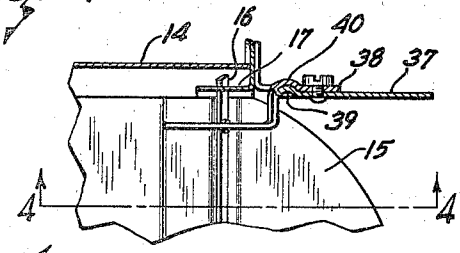


Fig.-5

INVENTOR.
MORRIS W. CREW

BY Hyde and Meyer.

ATTORNEYS.

June 4, 1946. M. W. CREW 2,401,553

CONTROL MEANS FOR DRAFT REGULATORS

Filed June 30, 1943 2 Sheets-Sheet 2

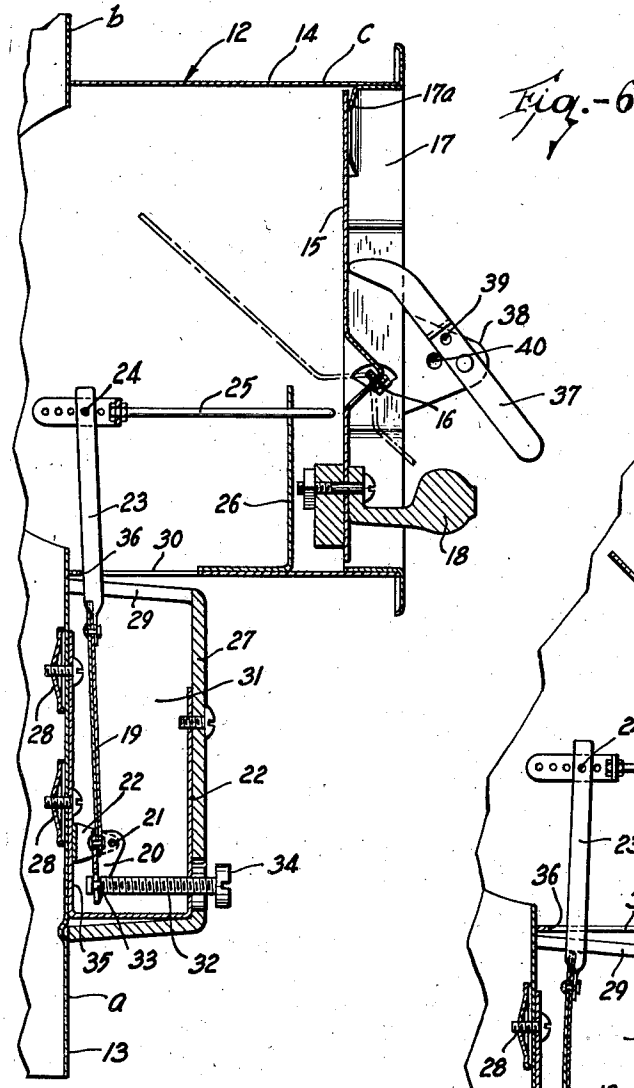


Fig.-6

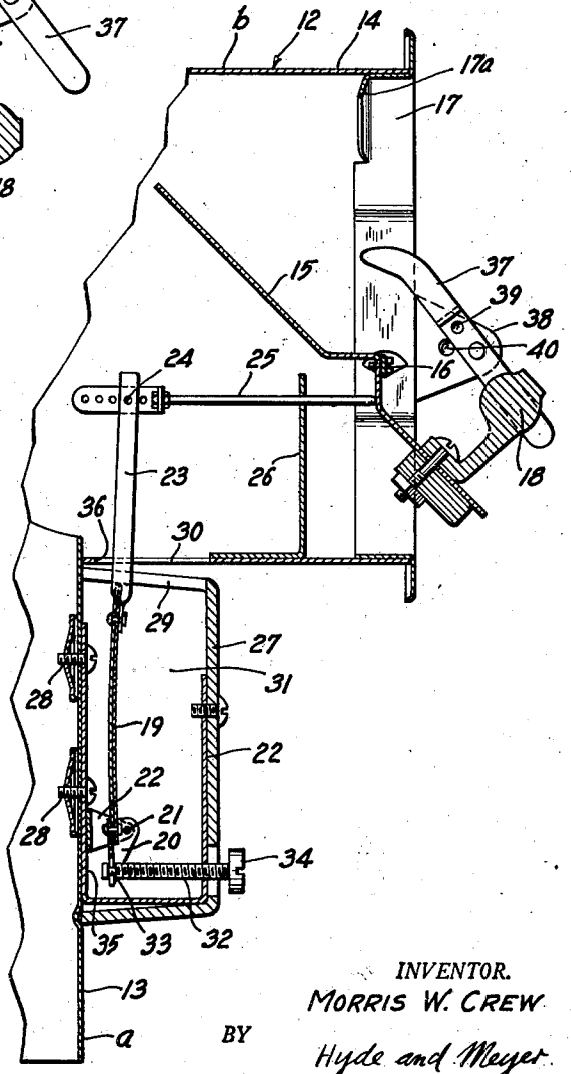


Fig.-7

INVENTOR.
MORRIS W. CREW
BY
Hyde and Meyer
ATTORNEYS

Patented June 4, 1946

2,401,553

UNITED STATES PATENT OFFICE

2,401,553

CONTROL MEANS FOR DRAFT REGULATORS

Morris W. Crew, Cleveland, Ohio, assignor to The Hotstream Heater Company, Cleveland, Ohio, a corporation of Ohio

Application June 30, 1943, Serial No. 492,840

3 Claims. (Cl. 236—45)

1

This invention relates to the control of the draft in the operation of magazine feed stoves or other forms af solid fuel fired furnaces, boilers or space heating equipment.

One object of the invention is to provide an improved draft controller or regulator which is thermostatically controlled in such manner as to automatically limit the rate of combustion and the stack temperature and thus prevent overheating or unnecessary fuel loss.

Another object is to provide an improved thermostatically controlled draft regulator capable of adjustment to meet any desired temperature conditions, within reasonable limits.

Still another object is to provide a combined draft regulator and controller in which all parts, including the control parts, may be assembled and sold as a complete unit ready for insertion in or attachment to the usual stove pipe connection to the stack.

A further object is to provile a draft control unit of the character described provided with means for eliminating automatic control during standby periods, such as when the stove is banked for night use.

Further objects of the invention are in part obvious and in part will appear more in detail hereinafter.

In the drawings, which represent one typical embodiment of the invention,

Fig. 1 is a front elevation, showing only a portiton of the stove to which the regulating unit is connected;

Fig. 2 is a side elevation, from the left in Fig. 1;

Fig. 3 is a sectional elevation on the line 3—3, Fig. 1;

Fig. 4 is a detail sectional elevation on the line 4—4, Fig. 5;

Fig. 5 is a detail sectional plan view on the line 5—5, Fig. 4;

Fig. 6 is a sectional elevation on the line 6—6, Fig. 2, showing the flutter closed; and

Fig. 7 is a similar view, showing the flutter open.

In the drawings 10 represents conventionally the top portion of any suitable furnace, boiler or stove, preferably fired by coal or other solid fuel, with which the draft regulating or control unit of the present invention may be used. For example, it may be a magazine feed stove of the general form shown in Patent No. 2,255,527, granted September 9, 1941, to Sam P. Locke, although other forms of stove may be employed. In the arrangement shown the products of combustion or flue gases leave the stove by way of an opening in its upper portion to which is connected the pipe or conduit 11 for conducting such gases to the chimney or stack (not shown) or to the outer atmosphere. The regulating or control unit of the present invention is attached to or forms a part of the said conduit.

2

Said unit, in the arrangement shown, includes a stove pipe T 12 having a running section 13 and a lateral section 14 providing three open ended arms *a*, *b*, *c*, designed for connection of two of them to the stove and stack respectively, with the third open to atmosphere to provide check draft where desirable or necessary.

In the third arm referred to, here marked *c*, is located a draft regulator of suitable form consisting of a disc or plate for flutter 15, mounted to pivot or swing at 16 in a thimblelike frame 17 and provided with a counterweight 18. The flutter of course oscillates back and forth between the dotted line position and the full line position against stop 17*a*, Fig. 6, to balance out fluctuations and varying draft pull from the chimney or stack. The pipe and the particular draft regulator used with any stove will be chosen or selected of the proper size and the counterweight 18 will be of the proper calibrated weight to produce the requisite draft for the desired maximum rating and efficiency, which in the case of a stove of the type shown may be assumed to require a draft of, say, .04 inch. The counterweight is thus carefully calibrated at the factory to produce that draft, and in operation at maximum output the stove will produce an attendant stack temperature of 850° to 900° F.

The present invention provides means by which the draft automatically may be reduced when desirable, such as during mild weather or when for any reason the stove might continue to operate at maximum output when that is undesirable. As shown, the control unit includes a thermostatic element, such as a bimetallic strip or member 19, one end of which is fastened to a member 20 pivoted at 21 on a bracket 22, and the other end of which carries an arm 23 pinned at 24 to a rod 25 sliding through and guided in an opening in a fixed plate 26, the end of said rod lying near to a portion of the flutter 15 below its pivotal axis. Bracket 22 is housed within and carried by a casing 27 adapted for attachment, as by bolts 28, to one arm of the pipe T 12. The arm 23, of course, passes through slots 29, 30 in said casing and in the T arm *a*, respectively.

The parts so far described operate as follows: Let us assume all parts cold with the tempera-

ture below normal in the space to be heated, such as the room containing the stove. The parts then occupy the positions shown in Fig. 6, with the bimetallic strip holding the rod 25 away from the closed flutter 15. When the fire is started in the stove combustion and draft increase until the stove is operating at maximum output with the desired draft of .04 inch. Heat transfer from the stove to the space to be heated is rapid. The temperature of the flue gases and stack reaches 850° to 900° F. and the temperature in the thermostat chamber 31*a* slightly lesser value, it being understood, however, that at all times there is a definite relation between the temperatures of the flue gases and in chamber 31. However, at first and until the room temperature comes up to normal, say 72° F., the temperature in chamber 31 does not rise sufficiently to move the end of rod 25 into the zone of movement of flutter 15.

During the initial period, while the room temperature is rising, the flutter moves back and forth, either quickly, to counteract the effects of gusts, due to back draft, or slowly to balance out gradual fluctuations in draft pull, thus tending to maintain the desirable maximum stack draft of .04 inch.

When, finally, the room temperature reaches normal, say 72° F., the rate of absorption of heat by the space to be heated from the exposed heated parts, including the stove jacket, the T 12 and thermostat casing 27, etc., has been so reduced that the temperature of both the flue gases and in chamber 31 rises, with the result of flexing the bimetallic strip 19 until it reaches the position of Fig. 7, with the end of rod 25 within the zone of movement of the flutter. If, at the time, the flutter is closed, rod 25 will engage it and move it to and hold it in the position of Fig. 7, whereas if it is already open, rod 25 will merely hold it there. In either case the check draft opening is open, air flow through the fuel bed is reduced and held to a low value, the combustion rate is reduced and sooner or later the stove and stack temperatures are reduced below that attendant upon operation at maxmum rating, to-wit, 850° to 900° F. Thus, after the stove has been operated at maximum output for a period sufficient to bring the space temperature up to the desired normal value, it is thereafter operated with thermostatic control to maintain normal space temperature, without overheating and avoiding unnecessary waste of fuel.

Means may be provided for adjusting the parts to secure and maintain any desired normal space temperature. In the arrangement shown, this means takes the form of a screw 32 threaded into the bracket 22 and having swiveled connection at 33 to the member 20 to which the lower end of the strip 19 is attached. The head 34 of the screw is exposed on the outside of the casing 27 for manual adjustment. Stops 35, 36 limit the amount of adjustment in both directions. As the screw is adjusted to the right, Fig. 6, the normal space temperature will be increased, as will be readily understood.

Means is also provided for manually and releasably locking the flutter in its full open position. This comprises a hand lever 37 pivoted in a bracket 38 on the thimble 17, and having two positions, shown in Figs. 6 and 4 respectively. Fig. 6 is the normal position, when the lever is ineffective and flutter 15 is permitted to have full and unrestricted operation, as before described. Fig. 4 illustrates the locking position

of the lever in which its inner arm has engaged the shutter and holds it open. The check draft opening is now wide open and ultimately the stack draft may be reduced to as low as .005 inch. This lever is used when the stove is banked at night and low draft is desirable. It does away with any necessity of adjusting the air intake at the bottom of the stove.

Suitable means may be provided for releasably locking the hand lever in either of the two positions to which it may be adjusted, such as a small teat 39 punched out of the metal of the lever and adapted to engage either of two depressions 40 in the supporting bracket for said lever.

Since all parts of the mechanism, including the flutter and its thimble and the thermostatic device and its housing, are relatively permanently attached to the pipe T 12, the controlling or regulating device here involved may be assembled as a complete unit on the bench at the factory and so sold and shipped for use. As before stated, the pipe and flutter sizes are predetermined and the weight and location of the counterweight are calibrated for the particular size and style of stove or heating device with which the control unit is to be used, so as to produce the desired stack draft, say .04 inch more or less, required for maximum efficiency and output.

When the unit is installed in the original setting up of the stove, the bimetallic element is adjusted to a permanent setting by the user, by a series of trials, until the stove produces and maintains the desired normal room or space temperature. This is accomplished by moving the adjusting screw 32 inwardly or outwardly to set the angle or position of the bimetallic strip and thus determine the amount of movement of arm 23 and rod 25 required before rod 25 exerts a controlling effect upon the flutter 15. While any desirable bimetallic element may be employed, I have used one which begins to travel at 200° F. and which reaches its maximum travel at possibly 800° or 900° of temperature within the T 11. When the parts are so adjusted, if the stove is serving a comparatively small space that may be satisfactorily heated by utilizing only a portion of the maximum output of the stove, satisfactory heating may be accomplished by adjusting the screw 37 all the way in, which carries the rod 25 closer to the flutter and permits it to be opened when the stove temperature reaches 400° to 500° of temperature. When a larger space is being heated the screw is adjusted all the way out, permitting the stove to operate at maximum output until the normal temperature of 72° is reached, after which the thermostat takes over control and prevents the possibility of the stove continuing to operate at maximum output and either overheating the room space or unnecessarily wasting fuel.

What I claim is:

1. As an article of manufacture, a self-contained draft controller adapted for insertion into a stove stack pipe, comprising a pipe T having three arms, two for connection to the stove and stack respectively, a flutter mounted for swinging motion in the third arm, a housing mounted on said T closely adjacent to said third arm, a thermostatic element enclosed within said housing and sensitive to variations in the temperature of the flue gases conducted through the T, an operating device operated by said element and extending through the walls of said housing and third arm and movable into and out of the path

of movement of the flutter, and a manually operatable releasable locking lever for said flutter movably mounted on the third T arm and having two positions in one of which the flutter is free for full motion and in the other of which said lever engages the flutter and holds it in fully open position, and means for maintaining said lever in either of its two positions.

2. As an article of manufacture, a self-contained draft controller, comprising a pipe T having upper and lower end arms and a middle arm, the lower end arm being connectable to a stove or the like and the upper end arm being connectable to the stack pipe for said stove or the like, a flutter mounted for swinging movement in said middle arm, a chambered housing mounted on the lower end arm exteriorly thereof and in planar contact therewith, the chamber of said housing having no direct communication with such lower end arm, thermostatic means mounted within the chamber of said housing and sensitive to variations in the temperature of the flue gases passing through the pipe T, and means mounted within said middle arm for movement into and

out of the path of movement of the flutter, said last named means being operatively connected with said thermostatic means for operation thereby.

3. As an article of manufacture, a self-contained draft controller, comprising a pipe T having two end arms and a middle arm, one end arm being connectable to a stove or the like and the other end arm being connectable to the stack pipe for said stove or the like, a flutter mounted for swinging movement in said middle arm, a housing carried by one of said arms exteriorly thereof, thermostatic means pivotally mounted in said housing and extending into said third arm, a push rod in said third arm adjustably connected to said thermostatic means for movement into and out of the path of movement of the flutter, and means connected to said thermostatic means and extending to the outside of the housing for adjusting said thermostatic means about its pivot to vary the range of temperature to which said thermostatic means is effectively responsive.

MORRIS W. CREW.