April 14, 1942. C. G. ANDERSON 2,279,610

FURNACE DAMPER WITH MINIMUM DRAFT CONTROL

Filed July 2, 1940 2 Sheets-Sheet 1

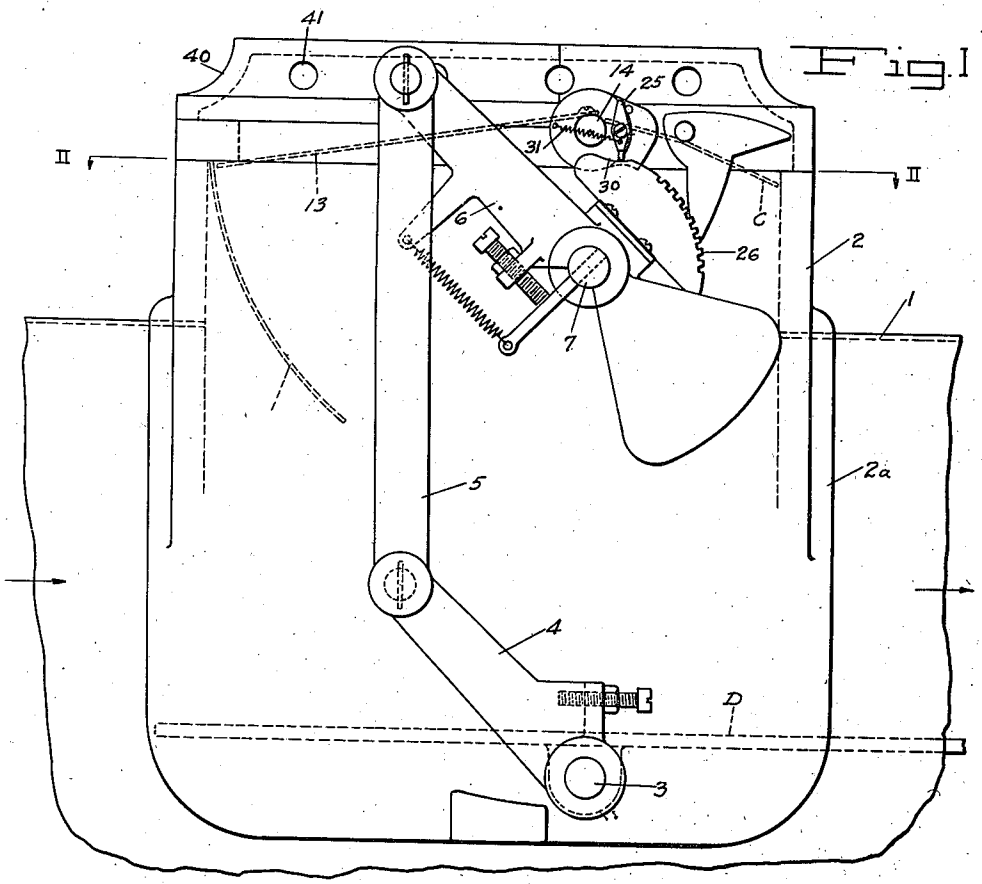


Fig. I

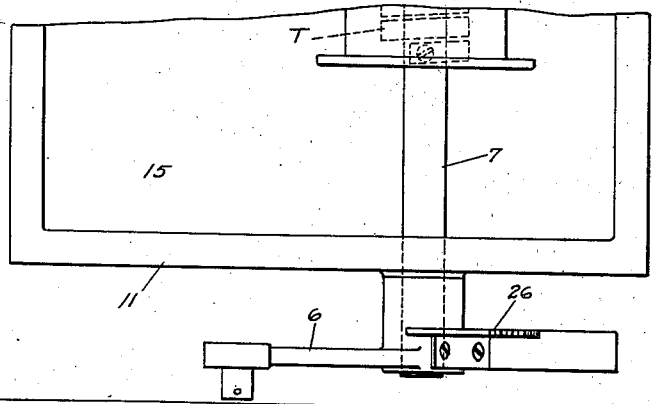


Fig. II

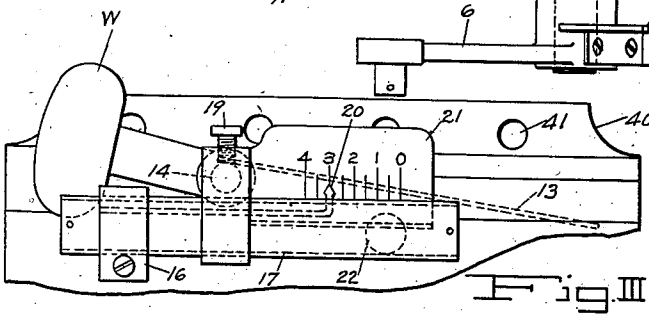


Fig. III

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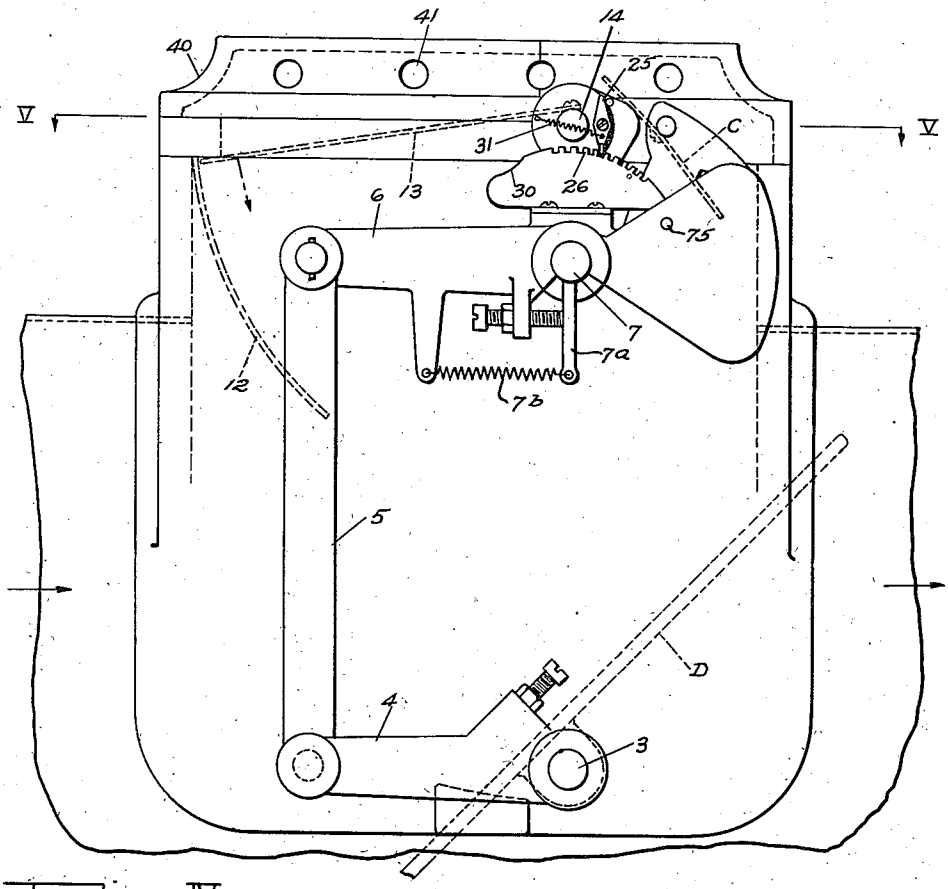


Fig. IV

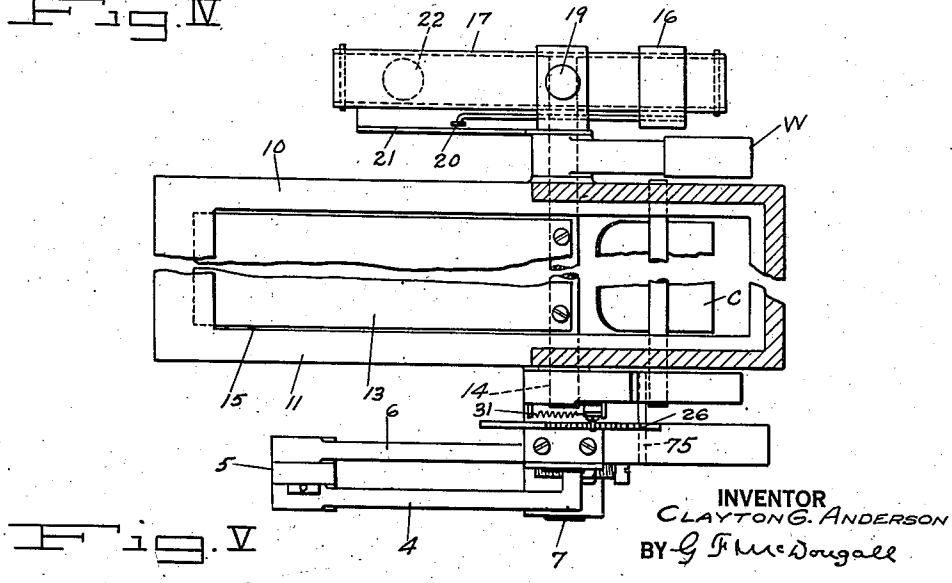


Fig. V

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UNITED STATES PATENT OFFICE

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FURNACE DAMPER WITH MINIMUM DRAFT CONTROL

Clayton G. Anderson, Portland, Oreg.

Application July 2, 1940, Serial No. 343,621

6 Claims. (Cl. 236—45)

This invention relates to apparatus for selectively fixing a minimum draft on a furnace pipe arranged with a thermostatic damper.

The invention finds its chief application in oil fired domestic heating apparatus of the intermittent electrically operated type of which there is such a large number. Economy of operation of intermittently fired oil burner apparatus requires a draft control to prevent waste of heat up the chimney when the furnace is hot, yet a free draft when the furnace is cool, as in the morning after the thermostat controlling the oil burner is set for day temperature.

The most satisfactory apparatus for such furnaces is a pipe with a semi-rotative damper, usually arranged to open a check to admit air above it, that is on the chimney side, when the damper is nearly closed, satisfying the natural draft afforded by the chimney. The trouble with this is that from .01 to .04 inches of draft, usually .03 is necessarily maintained if the basement where the furnace is located is to be kept free from carbon monoxide.

During cold weather, when a furnace sometimes works to nearly its maximum capacity, it will frequently shut off, with the damper practically closed. Then a draft admitted to the heated space by holding a door or window open will cause a start, often quite a cloud of oil smoke due to the spray hitting hot brickwork before the igniter catches, thus contaminating the air of the furnace room from where a disagreeable odor permeates the rooms above, especially with hot-air systems which predominate.

There is no fuel economy worth the cost in holding draft lower than say 2'' water, and it is an object of the present invention to provide auxiliary apparatus of a simple and inexpensive sort that may be pre-set to lock a thermostatically operated damper and prevent further reduction of draft, when a predetermined minimum is reached.

I accomplish the stated object and others that will be apparent, from the following description and the claims thereto attached. I have selected the best embodiment of the invention I have been able to develop so far, to illustrate and describe by way of disclosure.

Drawings accompany and form a part hereof, in which—

Fig. I is a side view of a portion of furnace pipe embodying a built-in thermostatic damper, with my invention incorporated. In this view the right hand end of the figure is the chimney end, and the left hand end the furnace end as indicated by the arrow;

Fig. II is a partial view on the line II—II, Fig. I, not a section as the cover is separable at this line;

Fig. III is a broken away part of a portion of the side opposite that shown in Fig. I, which will be explained;

Fig. IV is the same structure shown in Fig. I but in half-closed position with respect to the damper, the damper D in Fig. I being full open; and

Fig. V is a view on the line V—V, Fig. IV, foreshortened by removing some of the center that is the same as remains shown, to accommodate the view to the sheet. The purpose of the figure is to co-ordinate the other views.

In the drawings, 1 is a furnace pipe, assumed to be positioned between a furnace at the left, placing the combustion chamber of the furnace in communication with a chimney, also presumed to be present.

2 is a shell, suitable for carrying apparatus to be described, provided with a saddle portion 2*a*, covering a similar but smaller opening in the pipe 1. This portion is diagrammatic.

A damper D is positioned on an axle 3, axially of the pipe 1. A lever 4 forms a part of an operative connection between the damper D and a thermostat T (Fig. II); the other members being a link 5, a lever arm 6 and a shaft 7. The lever 6 is revolubly mounted on the shaft 7 and receives turning moment of the thermostat through the eye-bolt 7*a* and the spring 7*b*. When the damper D reaches a nearly closed position, the pin 75 will cause an abrupt opening of the check C; this being a form of the invention claimed by me in my Patent No. 2,102,873.

The representation of the thermostat T is of the casing within which it is contained, but it will be bimetallic in coil form, tending to rotate the shaft 7. A small section of the coil T is shown dotted. A check C shown dotted, is opened abruptly by contact of the pin 75 on the lever arm 6, when the damper D is nearly closed. All of the structure heretofore numbered and described is old and well known, being described merely because it is used for a setting for the invention herein, now to be described.

The upper part of the shell 2 contains a chamber 15, formed by side-walls 10 and 11, Fig. V, and an arcuate end wall 12. A semi-rotative blade 13 is made rigid with the cross-shaft 14 in such manner that the chamber 15 is substantially cut off by the blade 13; and it will be at once seen that the blade 13 is sensitive to draft in the furnace end of the pipe 1 when the damper D tends to obstruct the pipe 1 as shown in Fig. IV, and tends to pull it down as shown in this figure. In Fig. I it is shown in its uppermost position, there being no draft presumed to be acting.

The shaft 14 is equipped with a fixed weight W that counterbalances the weight of the blade and an adjustable weight 16, slidable along the tube 17 which is made adjustable with respect to the cross-shaft 14 by the set-screw 19 so that

the apparatus as a whole may be applied to a horizontal pipe as shown, or to an angular or vertical pipe without affecting its operativeness.

The sliding weight 16 biases the blade towards its upper position as shown in Fig. I in an amount depending on its adjusted position and is equipped with a pointer 20 to indicate the amount of predetermined draft on the scale 21, which is made rigid with the tube 17.

The tube 17 will tip with the blade 13, as it is adjustably attached to the cross-shaft 14 and contains a ball 22, free to roll from one end to the other, inside the tube 17, acting as the necessary snap-over mechanism, when the blade rises under the influence of the combined weights of the weight W and the adjustable weight 16, as draft decreases at the furnace end of the pipe 1 due to damper action.

It will be plain that when the draft reaches the set minimum bringing the tube 17 so that the ball tends to roll from the right to the left hand end of the tube 17 (see Fig. III), the weight effect will be abruptly increased and the blade will swing up, the shaft 14 will swing with it and the paw 25 will engage with the ratchet 26, which being rigid with the arm 6 will lock the arm 6 and damper D in the attained position, thus preventing further decrease of draft at the furnace end of the pipe 1, whatever the temperature, as the thermostat T can move the damper no further.

The shaft 14 is semi-rotatively mounted in the shell 2 as shown. The blade 13 is made rigid with the central portion of shaft 14, being counterbalanced by the assembly shown in Fig. III, hereinbefore described, adjustably attached to shaft 14 by the setscrew 19. On the opposite end of shaft 14 a pawl 25 is mounted in such manner that it is engageable with the ratchet 26, only when the blade 13 has yielded to substantially the position shown in Fig. IV, due to minimum draft conditions having been reached within the furnace end of the flue due to movement of the damper D by the thermostat T. The ratchet 26 moves in synchronism with the damper as will be seen from Figs. I and IV and it will be at once apparent that when minimum draft conditions have been reached, the pawl 25 will engage the ratchet 26, preventing further closure of the damper D, as the ratchet is made rigid with the lever arm 6. The thermostat may still move by virtue of the yielding connection as explained, though reverse movement of the ratchet 26 is easily made by yielding of the spring 31 or by the lifting of the pawl 25 out of engagement with the ratchet 26 when the atmosphere pressure pushes 13 down in the normal course of operation.

It is thus seen that when minimum draft is reached, further movement of the damper D is stopped, thus maintaining minimum draft conditions in the furnace side of the flue in accordance with the stated object of the invention.

The spring 31 serves to allow the damper to turn without material interference from the pawl 25. Holes 41 through the cap 40, of which there are sufficient number, allow free access of atmosphere pressure to the top side of the blade 13, also serving as air inlet means for the check C.

It will be seen that whatever the heat conditions, the draft on the furnace end of the pipe 1 cannot fall below a predetermined minimum and that otherwise the action of the thermostatically controlled damper is as free as without the control. Also, the additional minimum draft control adds little to cost and is not likely to get out of order.

Having fully disclosed my invention and shown an adequate yet simple way of applying it, what I claim as new and desire to secure by Letters Patent, is:

1. In a flue draft control, a damper, thermostatic control apparatus for said damper and means limiting the action of said damper to maintain a minimum amount of draft on the furnace side of the damper, comprising a movable plate exposed to furnace draft on one side and atmosphere on the other side, means biasing movement of said plate toward the atmosphere upon overcoming the influence of draft, a locking means for said damper and means movable by said biasing means effective to lock the damper against further closure upon movement of said movable plate due to minimum draft having been reached.

2. The combination as claimed in claim 1 and including a snap-over device effective to give the lock operating means a positive movement to engage the lock with the damper upon movement thereof to partial lock operating position.

3. A draft control apparatus of the character described, a pipe, a thermostatically operable damper in said pipe, a locking means for said damper effective upon operation to prevent complete closure of the damper across the pipe and means sensitive to draft conditions on the inlet side of the damper effective to operate said locking means to prevent further closure of the damper when draft conditions on the inlet side of the damper reach a predetermined minimum.

4. In draft control apparatus for a furnace pipe, a damper, thermostatic means for control of said damper and locking means for stopping closing movement of the damper to maintain minimum draft on the inlet side thereof, comprising a plate member mounted for movement under influence of draft, a weight mounted to reverse such movement upon decrease of draft to minimum, and transmissions between said plate member and said locking means effective to lock the damper against further closing movement when the weight reverses the direction of movement of the plate.

5. In draft control apparatus of the character described, including a pipe, a thermostatically operable damper in said pipe, a locking means for said damper, a draft sensitive plate member and transmissions for operating said lock and a snap-over device for said transmissions comprising a tube member mounted for oscillation as the sensitive plate responds to draft and a rolling weight in said tube that abruptly changes ends in said tube as the tube oscillates.

6. In draft control apparatus, means limiting the action of such apparatus to maintain minimum draft, comprising a movable draft responsive plate sensitive to atmosphere pressure on one side and draft pressure on the other side, a damper, a locking means for said damper, control apparatus and transmissions between said movable member and said locking means effective to operate said locking means when the plate moves in response to draft having reached a predetermined minimum value by reason of partial closure of the damper.

CLAYTON G. ANDERSON.