Nov. 17, 1942. H. C. EDWARDS 2,302,197

COMBUSTION CONTROL FOR STOVES AND FURNACES

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Fig. 1

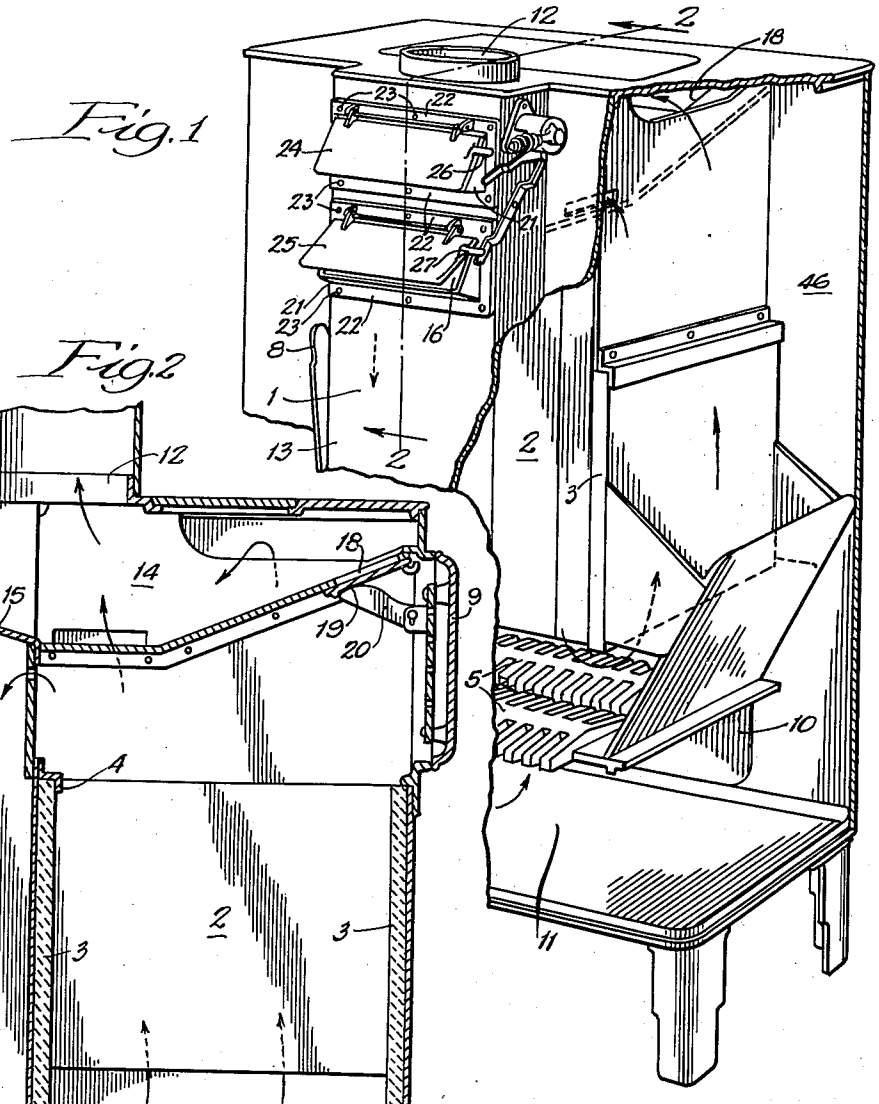


Fig. 2

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Fig. 3

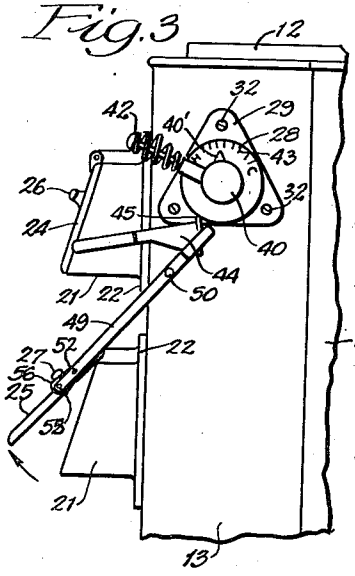


Fig. 4

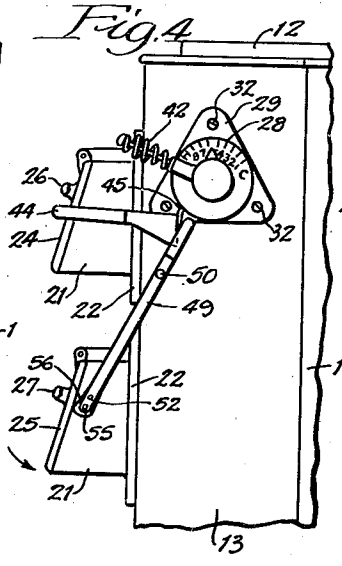


Fig. 5

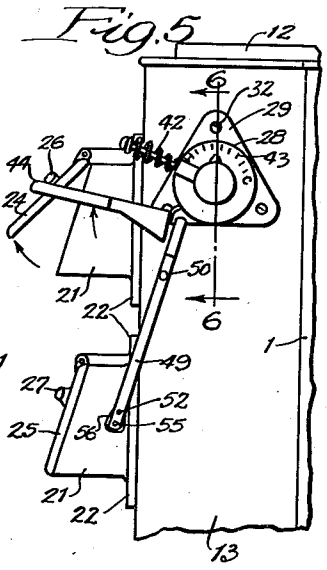


Fig. 6

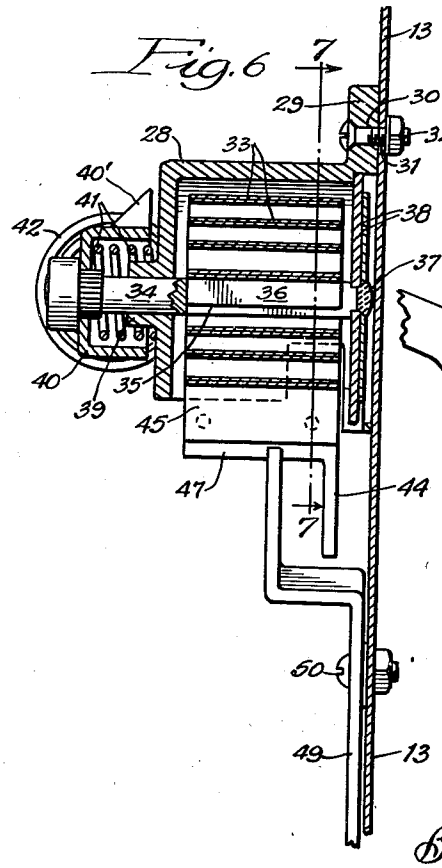


Fig. 7

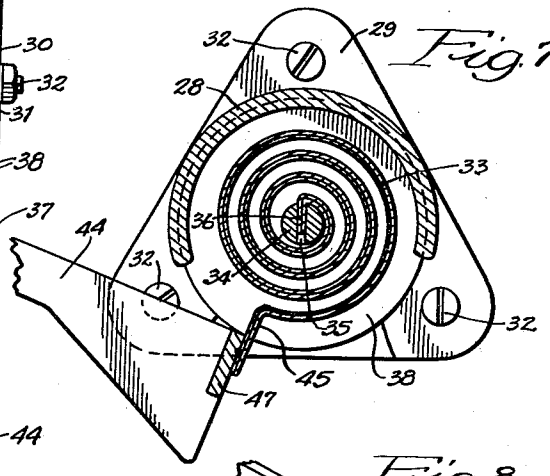
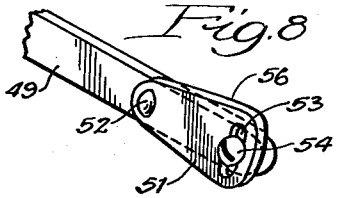


Fig. 8



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2,302,197

COMBUSTION CONTROL FOR STOVES AND FURNACES

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Application February 3, 1941, Serial No. 377,146

3 Claims. (Cl. 236—16)

This invention relates to improvements in stoves and furnaces and more particularly to combustion controls therefor.

The main objects of this invention are to provide an improved combustion control for stoves, furnaces, or the like whereby greater uniformity of control is obtained; to provide a simplified unitary thermostatic control for both the check and primary draft dampers of stoves, furnaces and like apparatus; to provide, in an apparatus of this character, a direct acting arrangement of single thermostatic means for automatically actuating a check damper and a primary draft damper in inverse relation; and to provide a device of this character which is simple in construction, both manually and automatically operable and inexpensive to manufacture.

An illustrative embodiment of this invention is shown in the accompanying drawings in which:

Figure 1 is a fragmentary perspective view of the back and side portions of a stove having the improved control device, parts being broken away.

Fig. 2 is a cross sectional view taken on the line 2—2 of Fig. 1.

Figs. 3 to 5, inclusive, are fragmentary side plan views illustrating the operation of the improved combustion control device.

Fig. 6 is a cross sectional view taken on the line 6—6 of Fig. 5.

Fig. 7 is a cross sectional view taken on the line 7—7 of Fig. 6.

Fig. 8 is a fragmentary perspective view of the end of the lever arm which actuates the primary draft door.

Referring to the drawings, the stove therein shown and in which my invention is embodied for illustrative purposes is fully disclosed and claimed in the copending application of Paul Wingert, Serial No. 377,146, filed February 3, 1941, for improvements in Internal construction for stoves and furnaces.

This stove comprises a shell 1, preferably constructed of sheet metal or suitable material, completely enclosing the internal structure of the stove; a sealed magazine 2, the lower portion of which comprises a fire pot defined by fire bricks 3 held in position by suitable flanges 4; a grate 5 which is operable through a series of depending lugs 6 pivotally attached to a common link 7; and a shaker bar 8. The stove is also provided with a feed door 9, an ash pit door 10, an ash pit 11 and a stack connection 12. The draft tube 13, as shown, is secured to the back side of the stove and is more fully disclosed and claimed in detail in the copending application of Paul Wingert, Serial No. 377,511, filed February 5, 1941, for improvements in Draft tube for stoves and furnaces. This draft tube is provided with an opening at its lower end, below the grate line, where it communicates with the ash pit 11 while the upper end terminates in a separate upper chamber 14, from which the stack connection 12 leads.

The draft tube 13 is provided with a partition plate 15 for separating air intake inlets 16 and 17 which are controlled by a primary damper door 25 and a check damper door 24, respectively. This is to provide for ingress of air from the outside of the stove into the upper chamber 14 and stack 12 when the check damper door 24 is in open position; and into the draft tube 13 and thence to the fire pot when the primary draft 25 is in open position. The stove shown is also provided with an auxiliary by-pass opening 18 having a pivoted closure plate 19 which is controlled by the opening and closing of the fuel feed door 9 to which a loosely anchored upwardly and inwardly extending arm 20 is attached on the inner side. This feature is to provide for ready passage of any gas, accumulating above the fuel bed; into the upper chamber 14 when the feed door 9 is opened, and is more fully disclosed in application of Paul Wingert, filed February 7, 1941, Serial No. 377,825, for Safety-by-pass for stoves and furnaces.

The present invention relates particularly to a unitary control mechanism for automatically controlling and operating the check and primary draft damper door. This control mechanism is mounted on the side wall of the draft tube 13 substantially at the level of the check inlet 17.

The primary draft and check damper doors 25 and 24 are mounted on respective shells 21 each having marginal flanges 22 provided with spaced apertures, corresponding with like apertures in the tube 13, through which bolts, rivets or the like 23, are inserted to secure the shell to the tube 13. The doors 24 and 25 respectively are each swingable upwardly on pintles and are each provided with sidewardly projecting lugs 26 and 27 respectively, the purpose of which will hereinafter be described.

The thermostatic control device comprises a casing 28, the lower portion of which is open, provided with flanges 29 having spaced apertures 30 therein corresponding to like apertures 31 in the side wall of the tube 13 through which bolts 32 are inserted for anchoring the casing to the

side wall of tube 13. A relatively wide, spirally wound coil 33 of bimetallic construction is housed within the casing 28 and is anchored at one end to a rotary shaft 34 which is partially cleft endwise as at 35 to receive the end 36 of coil. The inner end of shaft 34 is capped with a bearing 37 and is journaled in and supported by retaining plates 38.

The casing 28 is also provided with a hollow boss 39 in which the outer end of shaft 34 is journalled. This latter end of shaft 34 is also provided with an indicator means comprising a cup-shaped member 40 having an indicator 40' which serves to house a compression spring 41 for holding the shaft 34 in any position to which it may be set by manipulation of the handle 42, the desired setting being indicated on the calibrated gauge 43. The gauge 43 is calibrated to indicate the rate of consumption of fuel desired and the calibration is determined by the manufacturer according to the type of fuel employed and the rate of consumption necessary to obtain the desired temperatures.

The free end of coil 33 is bent substantially at right-angles and one end of an arm 44 is secured thereto in any suitable manner, such as by welding, etc. (see Fig. 7). The end 45 of the coil 33 is bent to a predetermined angle at the time of assembly to adjust the normal position of the arm 44 relative to the indicator and further adjustment is usually unnecessary.

The arm 44 being secured to the free end of coil 33 will move upwardly or downwardly depending upon the expansion or contraction of the coil 33 under the influence of the heat of the gases passing through the chamber 14. The bimetallic coil 33 is so constructed and arranged that increase in heat will cause the coil to contract while decrease in heat will cause the coil 33 to expand.

Upon contraction of the coil 33, the arm 44 will move upwardly and the upper edge of the free end of the arm 44 will abut against the lug 26 on the check damper door 24 and gradually open the door (see Fig. 5), allowing cool air from the outside of the stove to enter the upper chamber 14 and break the draft effect of the chimney, not shown, or flue 12' connected at the outlet 12.

As the stove cools, the bimetallic element of the coil 33 expands, causing the arm 44 to move downwardly until it reaches the position shown in Fig. 4 where the bearing arm 47, which is a projection from the arm 44 extending outwardly at right angles thereto, abuts against the upper end of lever 49. The lever 49 is pivoted, intermediate its ends, on the side wall of tube 13 by any suitable means such as by the bolt 50 and upon continued expansion of the coil 33 and pressure of the bearing arm 47 on the upper end of the lever 49 the lower end of lever 49 will swing upwardly, as shown in Fig. 3, until it abuts against the lugs 27 on the primary draft door 25 to open said door.

This allows air from the outside of the stove to enter the draft tube 13 wherein it flows downwardly to the ash pit 11 and thence upwardly through the grates 5 to the fuel bed. As combustion takes place on the grate, the products of combustion will pass off into the side passageways or radiators 46, see Fig. 1, and thence upwardly into the upper chamber 14 from which it passes through the stack opening 12 and into the chimney, not shown.

The lower end of lever 49 is provided with an adjustable cam 51 pivotally mounted thereon by any suitable means, such as by a loose rivet 52. The large end of the cam 51 is provided with an arcuate slot 53 and a set screw 54 inserted in and through the slot 53 is screwed into a threaded aperture 55 for manual adjustment and setting of the cam to the desired position. It will be apparent that the higher the camming surface 56 is set the faster the door 25 will open to provide greater area for the inlet of air into the tube 13.

In the operation of my improved control, the regulating handle 42 of the thermostatic control element is set according to the amount of fuel it is desired to burn per hour in the stove. The gauge 43 is calibrated and provided with indicia to indicate the desired burning rate. By moving the control handle 42 toward the index marked "H," shown in Figs. 3 to 5, inclusive, when more heat is desired, the coil 33 as a unit is rotated counter-clockwise to shift the position of the coil end 45 more to the right, as shown in Fig. 7, thereby causing the bearing arm 47 to abut against the upper end of lever 49 and shift the cammed end of said lever 49 into close proximity with or against the lug 27 in the primary draft door 25, depending upon the desired setting.

The cooling of the products of combustion because the draft door 25 is still closed, will now cause the bimetallic coil 33 to expand, thereby moving the coil end 45 further to the right, as shown in Fig. 7, to bear on the upper end of the lever 49 and raise the cammed end of the lever so as to open the primary draft door. As more draft is created, the fuel will burn faster and produce more heat.

If, for instance, it is desired to maintain an average temperature in a room of approximately 68° F., the regulating handle 42 is shifted so that the pointer 43' registers with number 3 on the gauge 43, which means that the stove will burn 3 pounds of coal per hour, assuming that it requires only 3 pounds of coal consumption per hour to maintain a 68° F., temperature in the room. When the stove burns at a rate of more than three pounds of fuel per hour, the coil 33 will contract, causing the coil end 45 to move to the left or clockwise as shown in Fig. 7, thereby moving the arm 44 upwardly and in the direction indicated by the arrows in Fig. 5, releasing the bearing contact with the lever 49, causing the primary draft door 25 to close and raising the check door 24, thereby checking the combustion taking place in the fire pot.

When the stove cools off because it is checked or not burning the desired three pounds of coal per hour, the bimetallic element will expand, causing the arm 44 to move downwardly toward the position shown in Fig. 4 and to continue this movement until the projection 47 on the arm 44 contacts with the upper end of the lever 49 to swing it about the pivot 50 and move the cammed end of the lever 49 upwardly until it abuts against the lug 27 of the primary draft door 25, thereby opening the draft door to allow intake of air into the draft tube 13 and thence to the fire pot as heretofore explained.

As the magazine of the stove is completely closed on top, with no direct connection with the stack, while the feed door is closed, the gases driven off the fuel bed are forced down through the hot coke on the grate and thence through the side slots where additional air is picked up from the draft tube and ash pit chamber to convert the gases into a flame. Since there is but slight fuel bed resistance, an extremely low draft of only about .05 inch is all that is necessary. This results in a slow lazy flame travel through

the radiators or passageways 46, allowing maximum time to transfer heat to the room and thereby giving lower than average stack-temperatures.

Although but one specific embodiment of this invention is herein shown and described, it will be understood that details of the construction shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims.

I claim:

1. A stove having primary draft opening and check opening and each provided with shiftable closure doors, a lug extending beyond one of the side margins of each of said doors, a thermostatic control means comprising a rotary shaft and a coil of bimetallic material, said coil being adapted to expand and contract according to the temperature changes of the jacket of said stove, one end of said coil being secured to said shaft, an arm secured at one end to the free end of said coil and having a laterally extending bearing arm thereon, the other end of said arm adapted for direct coaction with said lug on said check opening door to actuate said door, and a relatively short diagonally disposed lever pivotally secured intermediate its ends to said stove jacket and adjacent said control means, said bearing arm having direct coaction with said lever whereby upon expansion of said coil said arm is moved in a downwardly direction to actuate said check damper door and said bearing arm simultaneously bears against the upper end of said lever and moves the same downwardly about said pivot, thereby raising the lower end of said lever to bear against said lug on said primary draft door to open said door, and upon contraction of said coil said arm moves in an upwardly direction, whereby said lower end of said lever is moved in a downwardly direction about said pivot closing said primary draft door and upon further upward movement of said arm direct coaction with said lug on said check damper door is effected to actuate said door.

2. The device defined by claim 1 in which said control means may be manually adjusted to angularly set said arm in any predetermined position.

3. The device defined by claim 1 in which an adjustable cam is mounted on the lower end of said lever.

HOWARD C. EDWARDS.