

Feb. 25, 1936.

A. S. HOPPING

2,031,652

THERMOSTATICALLY CONTROLLED DAMPER DEVICE

Filed March 12, 1935

2 Sheets-Sheet 1

Fig. 1

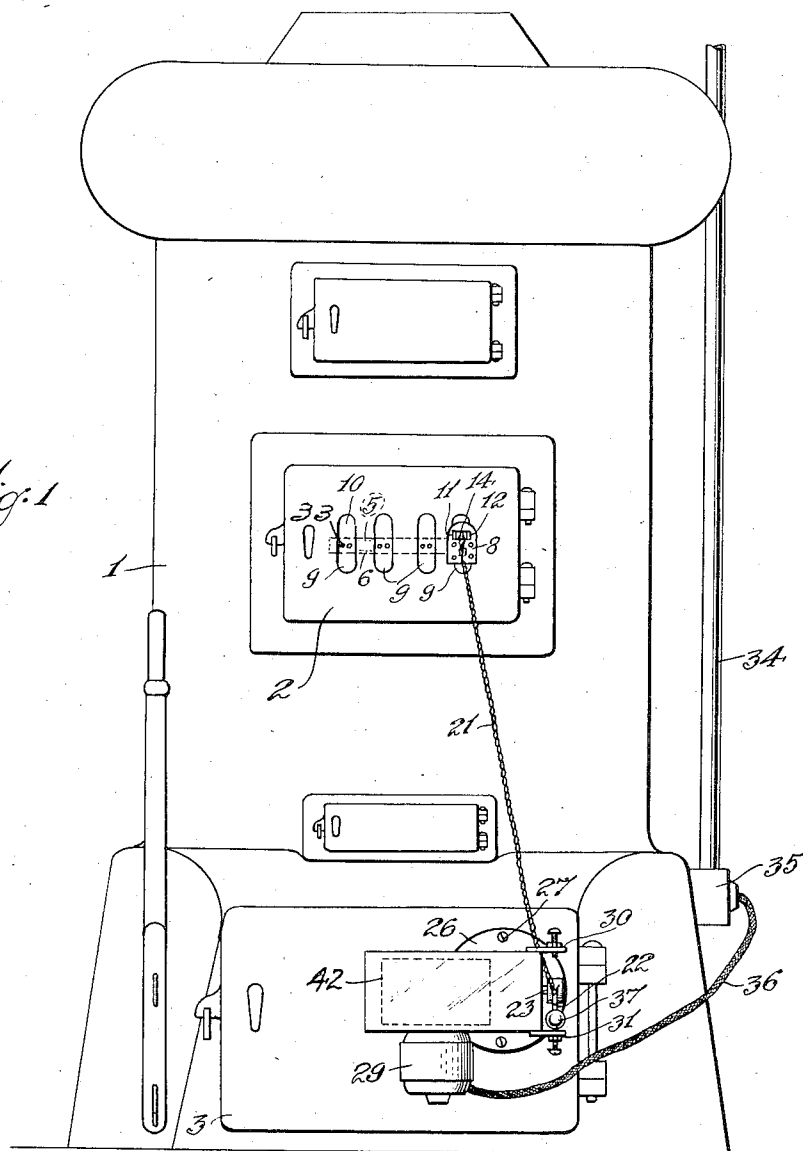
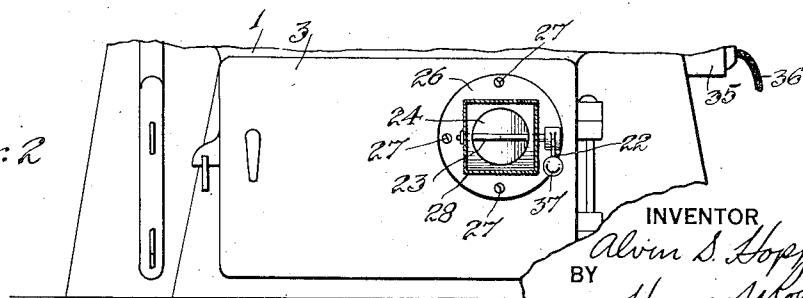


Fig. 2



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2 Sheets-Sheet 2

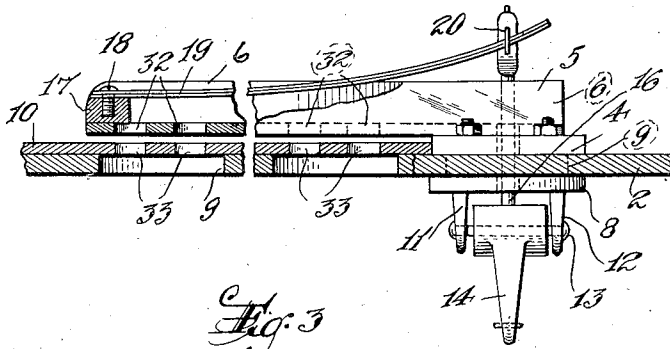


Fig. 3

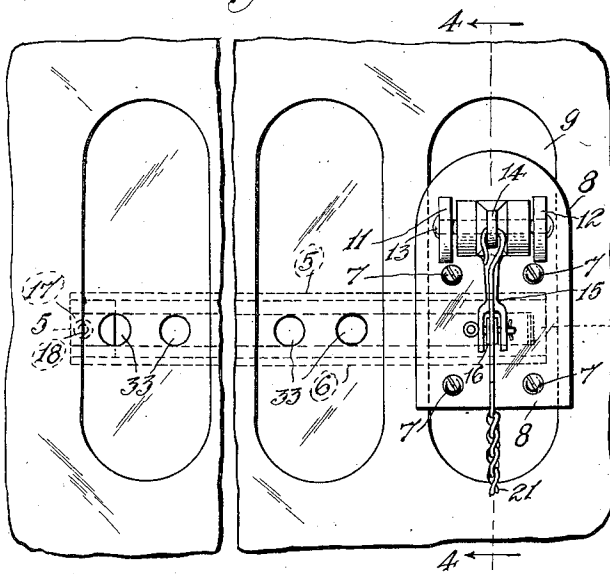


Fig. 4

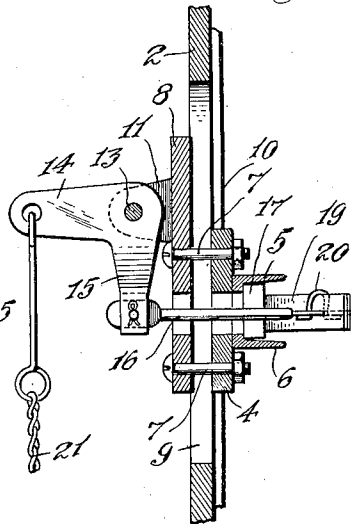


Fig. 5

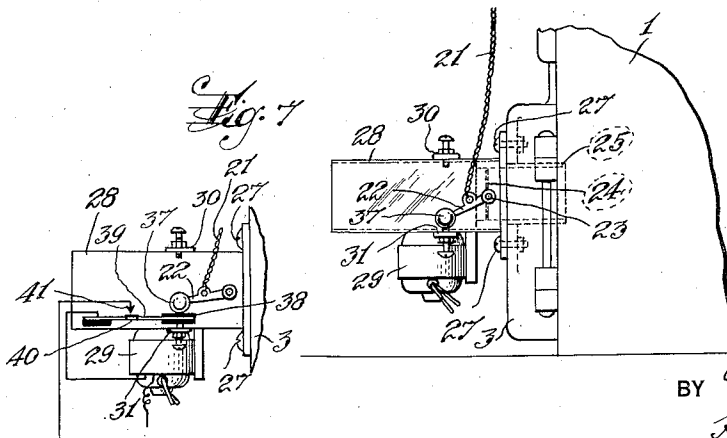


Fig. 6

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UNITED STATES PATENT OFFICE

2,031,652

THERMOSTATICALLY CONTROLLED
DAMPER DEVICE

Alvin S. Hopping, Verona, N. J.

Application March 12, 1935, Serial No. 10,598

10 Claims. (Cl. 110—72)

This invention relates to a thermostatically controlled damper device for automatically regulating a forced draft supplied to a coal burning furnace.

At the outset it should be mentioned that certain precautions are necessary when using a forced draft to burn small size coal in domestic heating furnace. Unless a large part of live coal is left exposed, after adding new coal to the fire, gas is produced by a forced draft and is not ignited until the top surface of the fire becomes incandescent, by which time the furnace and flues may be filled with an explosive mixture of gases, which when ignited may cause damage. If the draft is reduced to the point where there is no danger of such explosions, then insufficient air is furnished to burn the smaller pieces of coal to produce the results obtained with larger size coal using the natural draft provided by the furnace. If the draft is kept low until the gas ignites and then increased up to the point required for the best heating results, then all danger from free gas explosions has been removed.

It is therefore the principal object of my invention to provide an automatically regulated forced draft which will function in a satisfactory manner. A further object of my invention is to provide a forced draft whereby heat is obtained from the furnace in the shortest space of time. My invention will be readily understood by reference to the annexed drawings wherein

Figure 1 is a front elevational view of a furnace showing part of my forced draft apparatus.

Figure 2 is a view of the bottom part of the view shown in Figure 1 but with part of the apparatus removed from the ash pit door and showing the damper for controlling the forced draft.

Figure 3 is a view on a larger scale of the fire box door showing part of the control apparatus applied thereto.

Figure 4 is a section on the line 4—4 of Figure 3.

Figure 5 is a part sectional and part plan view on the line 5—5 of Figure 3.

Figure 6 is a side elevational view of the bottom of the furnace shown in Figure 1 looking at the right hand side of the furnace.

Figure 7 is a partial view of apparatus shown in Figure 6 but showing a control device for the motor that furnishes the forced draft.

In the various views wherein like numbers relate to corresponding parts, 1 is a furnace of a conventional type having a coal firing door 2 and an ash pit door 3. In applying my forced draft system to the furnace, I mount on the in-

side of the fire door 2 and therefore above the bed of coals within the furnace a metallic member having a boss 4 either formed or cast and preferably in the shape of a channel having side members 5 and 6. The boss 4 is held to the back of the door 2 in any satisfactory manner as by means of screws or bolts 7 which are also utilized for mounting a bracket 8 on the exterior portion of the door and over one of the usual check draft openings 9. The check draft slide 10 carried on the rear of the door 2 is preferably moved to closed position so that the openings 9 are closed, before the slide 10 is drilled for the bolts 7. The bracket 8 has arms 11 and 12 carrying a pin 13 on which is pivoted a bell crank lever having arms 14 and 15. To the arm 15 is movably attached a connecting link or rod 16. The free end of the rod 16 extends through the bracket 8 and the door 2 within the furnace and is positioned preferably midway between the sides 5 and 6 of the channel shaped member and to the boss is attached in any satisfactory manner such as by a screw 18, a known type of bi-metallic thermostatic member 19, the free end of which is linked by means of a suitable fastener 20, to the free end of the rod or link 16. The bi-metallic member 19 is so constructed and arranged between the side members 5 and 6 of the channel so that these side members act as shields to the thermostatic member 19 to protect it from excessive temperatures and the direct rays of heat coming from the burning coal as the movement of the member 19, when heated, is toward the fire box door and between the side members 5 and 6 of the channel. The movement of the bi-metallic member 19 is further enhanced by additional structural means which will be later pointed out.

Attached to the arm 14 is a flexible member preferably in the form of a chain 21, the lower end of which is fastened to an arm 22 carried on a pivot pin 23 which also carries a damper 24 positioned within an air outlet nipple 25 of a forced draft unit which is fastened to the ash pit door 3 by a flange 26 attached to the door in any satisfactory manner as by screws 27. The flange 26 also carries a tubular member or blower casing 28 to which is fastened an electric motor 29 which drives the fan or blower 42, adjustable stops 30 and 31 being provided on the casing 28 to limit the movement of the lever 22 and thereby control the amount of opening and closing of the damper 24.

The web of the channel shaped member 4 preferably is provided with holes or openings 32

which are in alinement with holes 33 that are made in the check draft slide, if this is retained, or the holes 33 are in a piece which may be substituted for the slide 10. The object of the holes 32 and 33 is to permit cool air to pass from the exterior of the furnace into contact with the thermostat element 19 to cause the same to respond quickly to reduced temperature within the furnace after putting in coal, as a quick reduction in the draft is necessary immediately after adding new coal, to prevent free production of gas as has been previously referred to. Also, it may be noted that the channel shaped part of the boss 4 and the bi-metallic member 19 are made relatively light in weight so as to ensure quick response to changes in temperature. Thus the construction of the member 19 and its mounting together with the cooling holes 32 and 33, provide the desired movement of the thermostatic member 19 in accordance with the variations of the temperature within the furnace and hence a substantially uniform control on the forced draft.

A supply conduit 34 is used to bring the wires down to a junction box 35 from which a cable 36 extends to the motor 29.

In the operation of my forced draft system, it will be understood that after coal has been put into the furnace, there is some draft past the damper, sufficient to start the coal burning and ignite the gas coming therefrom. As the temperature within the furnace is raised and the thermostat 19 is heated, it pushes the link or rod 16 connected to the arm 15 and raises the arm 14 thus applying an upward pull to the chain 21. This raises the arm 22 and starts opening the damper 24 more allowing the motor to blow air through the pipe or nipple 25 into the ash box and up through the grates. The action of the thermostat 19 as has been previously explained serves to control the operation of the damper 24, whereby the forced draft is regulated, the amount of opening and closure of the damper 24 is limited by the adjustable stops 30 and 31.

In the arrangement so far described, the motor 29 is continually running and turning the blower fan 42, but the amount of power required for a small motor suitable for this purpose is exceedingly small and the closing of the valve 24 will not overload the motor or cause any trouble so that I have not found it necessary to use a bypass device for the air in the blower housing when the valve 24 is closed.

In Figure 7, however, I have shown an arrangement by which the motor 29 is stopped and started automatically by the arm 22. In this arrangement the arm 22 carries a small weight 37 which is adaptable to engage an insulator 38 carried on the end of a spring arm 39 carrying a contact 40 adaptable to engage a cooperating contact 41 when the arm 22 is raised a small amount, thereby closing the circuit to the motor 29.

This arrangement of Figure 7 provides very low draft when new coal is put into the furnace, because when the motor 29 is stopped, the only draft past the valve 24 is the natural draft through the casing 28, this natural draft being regulated by the adjustable stops 30 and 31, as in Figure 6, that is, these stops would be set to allow greater space around the edge of the valve when the motor is allowed to stop running as in Figure 7, and the gas coming from the coal ignites before the forced draft is fully applied, i. e. the forced draft is supplied in gradually increasing amount, thereby fulfilling one of the necessary conditions for a successful operation of a

forced draft system of the general character described.

As has been indicated, the thermostatic device 19 and its associated parts may be used as the only control for the forced draft but it may be supplementary to the usual automatic room control, so that after the temperature in the fire has reached a predetermined point the draft may be automatically regulated in accordance with room temperature as usual or otherwise as desired.

It will be readily understood that various mechanical details may be varied to a considerable extent and therefore I do not wish to be unduly limited in the interpretation of the claims.

Having thus described my invention, what I claim is:

1. A forced draft mechanism for a coal heating furnace, including a thermostat device mounted on the interior part of the furnace and preferably on the firing door, an electrically operated fan blower mechanism attached to the exterior part of the ash pit door and having a part extending therethrough with a damper valve therein and means inter-connecting said damper valve and the thermostat device which acts to start the opening of the damper valve only after gas, coming from newly applied coal to the furnace, has ignited and assisted in raising the temperature within the furnace.

2. A forced draft mechanism for a coal heating furnace as set forth in claim 1, further characterized in that said thermostat device comprises a channel shaped member with a bi-metallic strip fastened at one end of the channel and extending toward the other end of the channel between the sides thereof, the inter-connecting means from the damper valve being connected to the free end of the bi-metallic strip.

3. A forced draft mechanism for a coal heating furnace as set forth in claim 1, further characterized in that said thermostat device comprises a support member carrying a bi-metallic strip free to move at one end and having a link member attached thereto and extending through the fire door, a lever on the exterior of the fire door connected to said link and also flexibly attached to said damper valve.

4. A forced draft mechanism for a coal heating furnace as set forth in claim 1, further characterized in that said thermostat device comprises a support member carrying a bi-metallic strip free to move at one end and having a link member attached thereto and extending through the fire door, said fire door having a bracket mounted on the exterior part thereof, a lever pivotally carried by said bracket and having a part thereof connected to said link member and means connecting another part of said lever to said damper valve.

5. A forced draft mechanism for a coal heating furnace as set forth in claim 1, further characterized in that said thermostat device comprises a support member carrying a bi-metallic strip free to move at one end and having a link member attached thereto and extending through the fire door, a lever on the exterior of the fire door connected to said link and also flexibly attached to said damper valve, and further characterized in that the fire door and said support member have openings therein to allow cool air from outside the furnace to strike the bi-metallic strip.

6. A forced draft mechanism for a coal heating furnace, including a thermostat device mounted on the interior part of the furnace firing door and

operative only after a certain temperature has been reached following the addition of new coal to the furnace, said thermostat device comprising; a support having a mounting lug arranged so the main part of the support is spaced from the fire door and a bi-metallic strip fastened to one end to the support; a bracket on the exterior of the firing door and fastened thereto and to said mounting lug, a lever pivoted on said bracket, a link connected to the movable end of the bi-metallic strip and extending through the firing door and connected to a part of said lever, a motor driven fan blower mounted on the ash pit door of the furnace, a damper valve associated with said blower, a lever for operating said valve and means connecting the valve lever to a part of the lever on the firing door.

7. A forced draft mechanism for a coal heating furnace, including a thermostat device mounted on the interior of the firing door and operative only after a certain temperature has been reached following the addition of new coal to the furnace, a motor operated blower mounted on the exterior of the ash pit door, a damper valve associated with the blower and in the path of the air stream therefrom, a lever for operating said valve, adjustable stop means for controlling the amount of movement of said valve, a bracket mounted on the exterior of the firing door, a bell crank lever carried by said bracket, means inter-connecting said valve lever and an arm of the bell crank lever and a link connecting the other arm of the bell crank lever to said thermostat device.

8. A forced draft mechanism for a coal heating furnace as set forth in claim 7, further characterized in that the thermostat device comprises a support member and a bi-metallic strip fastened to one end thereof, the other end of the strip being attached to said link with means for passing cooler air from the exterior of the furnace to and around said support and the bi-metallic strip.

9. The combination of a coal burning furnace having a fire box, an ash pit, and a draft inlet for said ash pit, a forced draft mechanism connected to said draft inlet, a damper for controlling flow of air through said inlet from said forced draft mechanism, a thermostatic device mounted within the fire box above the bed of coals and movable only after the gas coming from the newly applied coal has ignited and raised the temperature in the fire box sufficiently to actuate the thermostatic device, and a mechanical operative connection between said thermostatic device and said damper for opening and closing the damper upon rise and fall of temperature in the fire box respectively.

10. The combination of a coal burning furnace having a fire box, an ash pit, and a draft inlet for said ash pit, a forced draft mechanism connected to said draft inlet and means including a thermostatic device in the fire box above the bed of coal and operable only after a certain temperature has been reached after supplying new coal to the fire for then slowly increasing the air from said forced draft mechanism to said draft inlet.

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