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A. J. WILTSHIRE

2,166,834

DRAFT CONTROL FOR FURNACES

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2 Sheets-Sheet 1

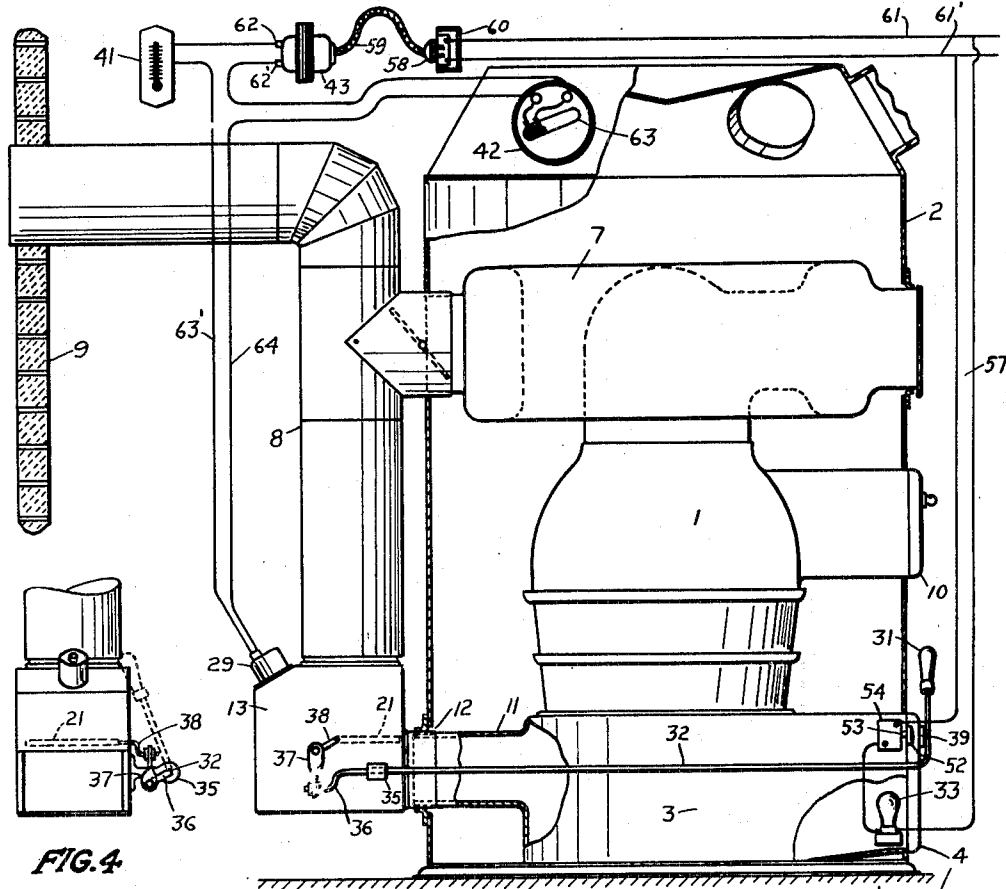


FIG. 4

FIG. 1

FIG. 5

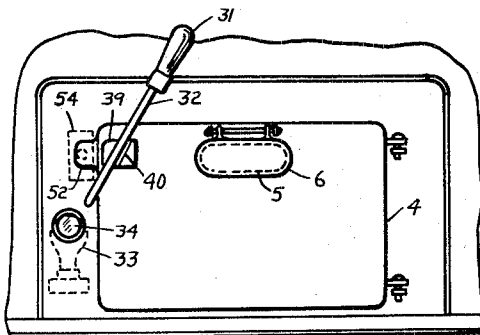


FIG. 2

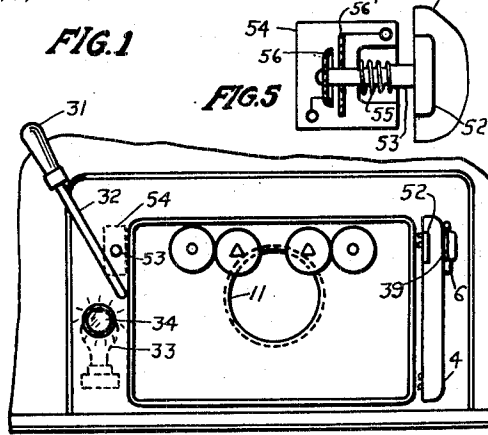


FIG. 3

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2 Sheets-Sheet 2

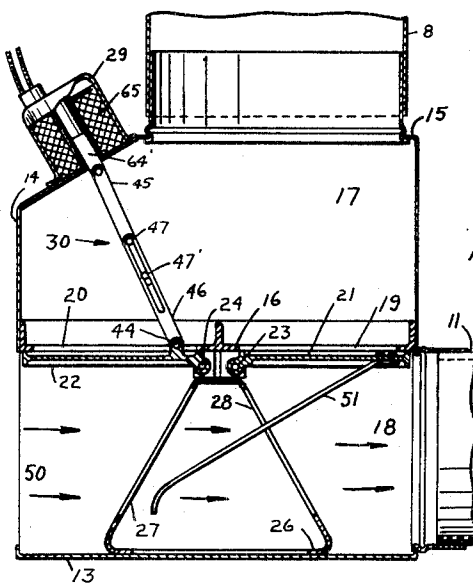


FIG-10

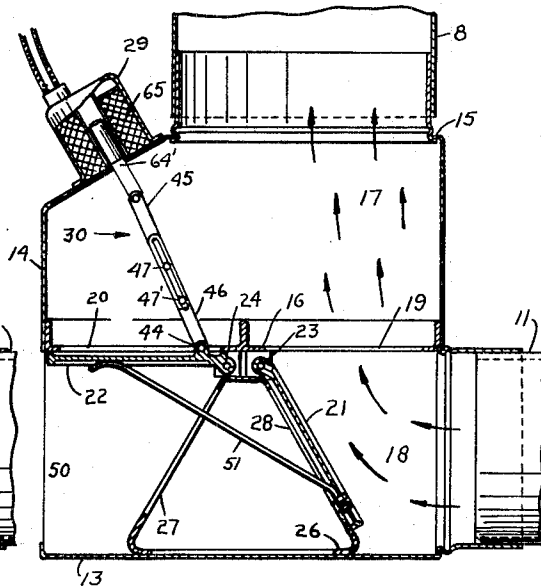


FIG.-11

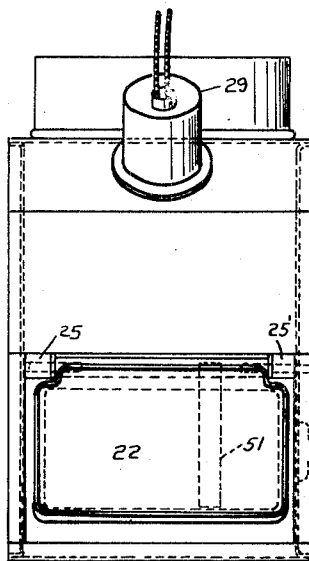


FIG. 6

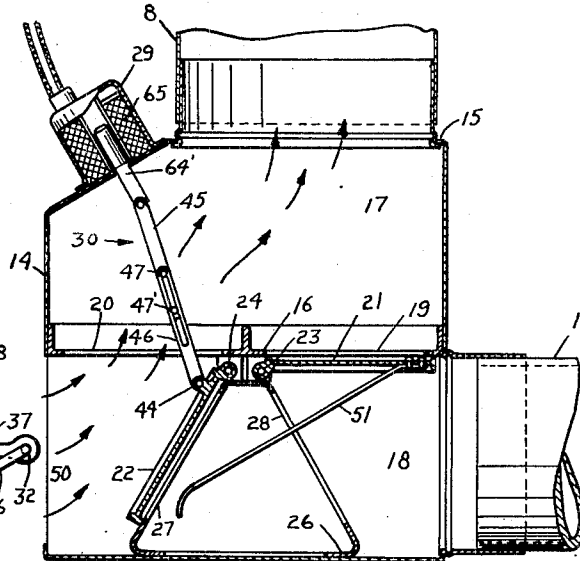


FIG-7

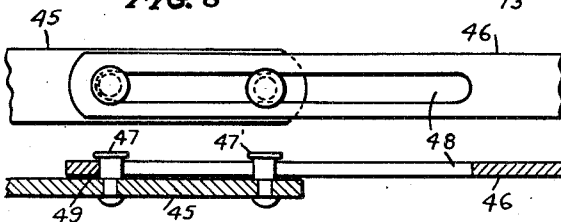


FIG. 8

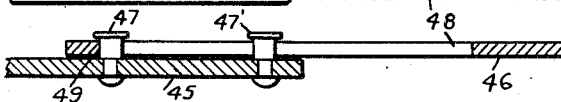


FIG-9

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2,166,834

DRAFT CONTROL FOR FURNACES

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Application August 25, 1938, Serial No. 226,803

17 Claims. (Cl. 110—147)

My invention relates to draft control for furnaces, boilers and the like.

The general object of the invention is to provide conveniently arranged and operable means for preventing the escape of dust from the ash pit into the room during shaking and sifting operations or when firing the furnace.

Another object is to combine the draft and check dampers in a single unit located at the rear of the furnace in direct communication with the ash pit and flue.

Still another object of the invention is to provide means for automatically introducing a current of air through the draft and check damper unit to the ash pit and fire box when the room temperature drops below normal and for shutting off the flow of air therethrough when the desired temperature is reached.

Other objects and advantages will be apparent as the description is considered in connection with the accompanying drawings, in which:

Figure 1 is a side elevation of a furnace embodying my control unit showing the furnace casing, ash pit and chimney partly in section;

Figure 2 is a front elevation of the ash pit door of the furnace in normal operating position;

Figure 3 is a front elevation of the ash pit opening in position for removing or sifting ashes and with the ash pit lamp lighted;

Figure 4 is a rear elevation of the control unit;

Figure 5 is a diagrammatic view of the momentary contact switch for controlling the ash pit lamp;

Figure 6 is an enlarged rear elevation of the control unit;

Figure 7 is a cross section through the control box showing the control in the checked operating position;

Figures 8 and 9 are plan and sectional views respectively, of the check door operating link shown in Figure 7;

Figure 10 is a cross section through the control box, showing the control in the draft operating position with the thermostat calling for heat; and

Figure 11 is a cross section through the control box, showing the control in the ash pit in ventilating position.

Referring more particularly to the drawings, 1 denotes a furnace enclosed within a sheet metal casing 2. The ash pit 3, which extends beneath the fire box of the furnace 1, is provided at its front end with a door 4, having the usual shaker opening 5, normally closed by a small hinged closure 6. A heating drum 7 places the fire box and

ash pit 3 in communication with a main flue pipe 8, leading at its upper end to a chimney 9. The fire box is provided with a hinged door 10.

The ash pit 3 is provided with an extension 11 which passes through an opening 12 at the rear of casing 2 where it communicates with a control and check damper box or housing 13. The rear wall 14 of this box opens to the atmosphere and the upper wall 15 thereof supports the lower end of the flue pipe 8, previously mentioned. A horizontally disposed partition plate 16 divides the damper box into upper and lower compartments 17 and 18 respectively which communicate with each other through damper controlled openings 19 and 20, formed in the plate 16. Dampers 21 and 22 for the respective openings 19 and 20 have shafts 23 and 24 at their adjacent inner ends journaled in adjustable bearings 25 and 25' depending from the under side of plate 16. When the respective dampers are lowered to uncover the openings 19 and 20, the dampers rest against opposite sides of an inverted V-shaped partition and stop member 26, extending transversely of the lower compartment 18, of the damper box to close openings 27 and 28, in the side walls thereof. When the dampers are in raised or horizontal position the latter close their respective damper openings 19 and 20, and uncover openings 27 and 28. Check and draft damper 22 is actuated by means of an automatic thermostatic damper control 29, of standard construction, with the exception of the connecting linkage 30, between the control and damper, hereinafter described. The ventilating damper 21 is manually controlled by means of a handle 31 on the end of a lever control rod 32.

A conventional electric lamp 33, in the front of the ash pit adjacent the door 4, provides ample light when sifting ashes and for illuminating a red bull's-eye 34, used to indicate the operating position of certain parts of the installation. For ordinary furnace operation the damper 21 will be maintained in its normal horizontal position thus closing damper opening 19. To move damper 21 from a depending or substantially vertical position in which it closes opening 28 in stop and partition member 26, handle 31 is swung to the right or "Figure 2" position thus turning the lever rod 32 clockwise in its bearing 35. The rear end of rod 32 terminates in a crank arm or offset portion 36, which is connected by means of a link 37, to a crank arm or offset portion 38, fixed to the door 21. Movement of the handle 31 in a clockwise direction, as just stated, lowers the crank arm 38, 51

which in turn causes the door 21, to move up to a horizontal position. In this position of the handle 31, the latter engages a pad 39 and stop 40, formed on and projecting forwardly from the ash pit door 4, and holds the door closed. The furnace can now be used to maintain an even heat in the house by means of a thermostat 41, limit control switch 42, and transformer 43, all of which are of conventional construction and operation. The damper control 29, in the present embodiment, a solenoid, is pivotally connected to the damper and check door 22, as at 44, by means of the overrun linkage 30. This linkage comprises an upper rod 45, connected to the damper control 29, and a lower rod 46, connected to the door 22, the rods being slidably connected together by studs 47 and 47', carried by the rod 45 and having enlarged heads projecting through an elongated slot 48, formed in the lower rod 46.

If heat is required the current is turned on and the thermostat 41 is set, accordingly, whereupon door 22 is automatically elevated to its horizontal position by reciprocating linkage 30. During the up stroke of link 45, a shoulder 49, at the upper end of slot 48 is engaged by the stud 47, thus swinging the door to horizontal position in an obvious manner. However, when the door 22 drops from the horizontal position it can again be elevated, together with the rod 46, independently of the rod 45, by virtue of the slot and stud connection between these parts. With the door 21 in its horizontal position and door 22 in the inclined position the furnace will be in checked position, because the ash pit is sealed against any air supply and the chimney draft is checked due to the fact that air coming into the damper box 13, through the rear opening 50, will be drawn up through damper opening 20 in partition plate 16 and thence into the pipe 8, as shown by the direction arrows in Figure 7, and finally out through the chimney.

Assuming that damper 22 has been automatically moved from an inclined position to a horizontal position for the purpose of increasing the furnace draft, and the manually operable damper 21 remains in its normal horizontal position, air admitted through opening 50 to the ash pit extension 11 and ash pit 3, in the direction shown by arrows in Figure 10, will flow or be sucked up through the furnace to heating drum 7 and thence to pipe 8, leading to the chimney 9. At the same time, all air is sealed from the pipe 8 except that which passes through the furnace, so that the full force of the draft is applied to the fuel bed and combustion correspondingly increased.

Whenever it becomes necessary to shake the grates, sift the ashes in the ash pit or add coal to the fire, the door 21 is first manually lowered to its inclined position to uncover opening 19 in plate 16 and to close opening 28 in stop and partition member 26. This is accomplished by turning handle 31 in an anti-clockwise direction to reverse the movement of crank arms 36 and 38 and link 37, previously described. In addition to having the door 21 in its inclined position it is necessary that the door 22 be moved into position to close the opening 20 in partition plate 16, during the operations just mentioned, assuming that this door happens to be in its inclined position. For the purpose of accomplishing this, the door 21 carries a lifting arm 51, extending downwardly and inwardly from its forward edge, which engages the door 22, and pushes it upward,

as best shown in Figure 6, as the door 21 moves from horizontal to inclined position, this being possible due to the sliding connections between the rods 45 and 46. With the dampers in this position the full force of the chimney draft is applied to the ash pit and fire doors. Consequently if the shaker door 6 is opened to permit customary shaking of the grates the suction through the door will prevent any dust from coming out into the furnace room. Likewise if fire door 10 is opened, as it must be when the furnace is being coaled, the chimney draft through the fire door opening prevents smoke and dust escaping therethrough. It should also be noted that when sifting ashes in the ash pit, by means of a wire mesh shovel or the like, not shown, the door 4 must be open thus permitting practically the full suction of the chimney draft to cause a current of air to enter the ash pit 3 and thence pass through chamber 18, opening 19 and chamber 17 to main fuel pipe 8, in the direction shown by the arrows in Figure 11. The ashes can thus be sifted without dust or dirt escaping from the ash pit into the dwelling.

The lever control rod 32, performs the following important functions: When moved to the right or "Figure 2" position, which may be termed its normal position, the lever rides over the pad 39 on the door and holds the ash pit door 4 closed. At the same time the lug 52 formed on and projecting from the forward edge of the ash pit door presses the plunger 53 of the light contact switch 54, inwardly against the compression of spring 55 thus opening the contacts 56 and 56' in the switch and disconnecting the lamp 33 from the lamp circuit 57. The bull's-eye 34 will then be dark indicating normal furnace operation. Movement of lever 31 to the left, preparatory to sifting ashes, shaking or firing the furnace, releases the pressure of lug 52 on plunger 53, thus permitting the contacts 56 and 56' to close under the action of spring 55 and causing lamp 33 to light and show through bull's-eye 34. The bull's-eye will then indicate that the damper 21 has been moved to an inclined position and that the lifting arm 51 carried by damper 21 has elevated the damper 22 to horizontal position assuming that the latter happened to be in inclined position when the control handle 31 was moved to the left. The lamp 33 now provides ample light in the ash pit for ash sifting purposes and the bull's-eye indicates the position of the control lever and damper 21. Of course it will be understood that the control of damper 22 is completely automatic, through the medium of thermostat 41, under normal operating conditions.

Assuming that the furnace is to be put into operation for the winter heating reason, the plug 58 attached to the extension cord 59 of transformer 43 is inserted in the standard outlet 60. The outlet 60 is provided with a constant supply of electricity by means of the service lines 61 and 61'. These service lines are also used to maintain a constant supply of electricity to the simple lamp circuit 57.

The standard low voltage transformer 43 is thus energized throughout the entire heating season and furnishes a low voltage electricity at the terminals 62-62'. Thus the room thermostat 41, limit control 42 and damper control 29 are all supplied with electric current at low voltage and may be installed as well wiring without the attendant hazard of the high voltage service lines.

The standard thermostat 41 that is located in the living quarters is provided with means for adjusting to any desired temperature within the comfort zone. Standard limit control 42 is provided with a switch 63 and a means of adjusting the temperature at which the switch will open the circuit. This limit control 42 is used to prevent damage to the furnace or the like by opening the electric circuit at a predetermined temperature, that is, below the danger point.

The operation of the circuit is as follows: If the room temperature drops a little below the thermostat setting then the thermostat 41 will close a set of contacts (not shown) inside of the thermostat causing a current of electricity to flow from the transformer terminal 62 thru the thermostat 41, wire 63', solenoid 29, wire 64, closed switch 63 of limit control 42 back to terminal 62' of transformer 43.

The steel plunger 64' is thus raised due to the magnetic action of the coil 65 in damper control 29. This action raises linkage 30 and door 22 of control box 13 thus putting the furnace in the draft position.

Either the thermostat 41 or the limit control 42 may open the series circuit above mentioned and cause the furnace to return to the checked position with the door 22 down against opening 27. When the room reaches the required temperature, the thermostat will open the electrical circuit. If the furnace should reach a dangerous temperature before the room thermostat is satisfied then the limit control switch 63 of control 42 will automatically open the circuit thus returning the furnace to the checked position.

What I claim is:

1. In a heater having a fire box and an ash pit therefor and communicating therewith, a damper box open to the atmosphere and communicating with said ash pit, a main flue pipe leading directly from the damper box to the chimney, a heating drum leading from the fire box to said main flue pipe and said chimney, a pair of dampers movable into one position to close direct communication between said damper box and said main flue pipe when the ash pit door is closed and when draft air is required during normal furnace operation, so that the flow of draft air will be through said damper box to the ash pit and to said heating drum and chimney, and movable into another position so that when the ash pit door is open the flow of draft air will be from the ash pit through said damper box into said main flue pipe and around said heating drum to said chimney for ventilating said ash pit.

2. In a heater having a fire box and an ash pit therefor and communicating therewith, a damper box open to the atmosphere and communicating with said ash pit, a main flue pipe leading directly from the damper box to the chimney, a heating drum leading from the fire box to said main flue pipe and said chimney, a pair of dampers movable into one position to close direct communication between said damper box and said main flue pipe when the ash pit door is closed and when draft air is required during normal furnace operation, so that the flow of draft air will be through said damper box to the ash pit and to said heating drum and chimney, and movable into another position so that when the ash pit door is open the flow of draft air will be from the ash pit through said damper box into said main flue pipe and around said flue heating drum to said chimney for ventilating said ash pit, and

means for actuating one of said dampers independently of the other.

3. In a heater having a fire box and an ash pit therefor and communicating therewith, a damper box open to the atmosphere and communicating with said ash pit, a main flue pipe leading directly from the damper box to the chimney, a heating drum leading from the fire box to said main flue pipe and said chimney, a pair of dampers movable into one position to close direct communication between said damper box and said main flue pipe when the ash pit door is closed and draft is required during normal furnace operation, so that the flow of draft air will be through said damper box to the ash pit and to said heating drum and chimney, and movable into another position so that when the ash pit door is open the flow of draft air will be from the ash pit through said damper box into said main flue pipe and around said heating drum to said chimney for ventilating said ash pit and means for simultaneously actuating said dampers.

4. In a heater having a fire box and an ash pit therefor and communicating therewith, a damper box open to the atmosphere and communicating with said ash pit, a main flue pipe leading directly from the damper box to the chimney, a heating drum leading from the fire box to said main flue pipe and said chimney, a pair of dampers movable into one position to close direct communication between said damper box and said main flue pipe, so that the flow of draft air will be through said damper box to the ash pit and to said heating drum and chimney, and movable into another position so that the flow of draft air will be from the ash pit through said damper box into said main flue pipe and around said heating drum to said chimney, automatic means for actuating one of said dampers and manually controlled means for actuating the other of said dampers.

5. In a heater having a fire box and an ash pit therefor and communicating therewith, a damper box open to the atmosphere and communicating with said ash pit, a main flue pipe leading directly from the damper box to the chimney, a heating drum leading from the fire box to said main flue pipe and said chimney, a pair of dampers movable into one position to close direct communication between said damper box and said main flue pipe when said ash pit door is closed and when draft is required during normal furnace operation, so that the flow of draft air will be through said damper box to the ash pit and to said heating drum and chimney, and movable into another position so that when the ash pit door is open the flow of draft air will be from the ash pit through said damper box into said main flue pipe and around said heating drum to said chimney for ventilating said ash pit, automatic means for actuating one of said dampers and manually controlled means for actuating both of said dampers.

6. In a heater having a fire box and an ash pit therefor and communicating therewith, a damper box open to the atmosphere and communicating with said ash pit, a main flue pipe leading directly from the damper box to the chimney, a heating drum leading from the fire box to said main flue pipe and said chimney, a pair of dampers movable into one position to close direct communication between said damper box and said main flue pipe, so that the flow of draft air will be through said damper box to the ash pit and to said heating drum and chimney, and movable into another position so that the flow

of draft air will be from the ash pit through said damper box into said main flue pipe and around said heating drum to said chimney, means for actuating one of said dampers and means carried by said last mentioned damper for slidably engaging the other of said dampers to move the latter from one position to another while said slidably engaging damper is being actuated.

7. In a heater having a fire box and an ash pit therefor and communicating therewith, a damper box open to the atmosphere at one side and communicating with said ash pit at the opposite side thereof, a horizontally disposed partition dividing said damper box into upper and lower compartments, said partition having openings placing said compartments in communication with each other, an inclined partition and stop member extending transversely of said lower compartment having spaced openings therein, a main flue pipe leading from the upper compartment of the damper box to the chimney, a heating drum leading from the fire box to said chimney, a pair of dampers pivoted to said horizontal partition and adapted to close said damper openings in said horizontal partition when swung to horizontal position and to alternately close said damper openings in said inclined partition when either one of said dampers is swung to inclined position and the other one is swung to horizontal position, and means for actuating said dampers.

8. In a heater having a fire box and an ash pit therefor and communicating therewith, a damper box open to the atmosphere at one side and communicating with said ash pit at the opposite side thereof, a horizontally disposed partition dividing said damper box into upper and lower compartments, said partition having openings placing said compartments in communication with each other, an inclined partition and stop member extending transversely of said lower compartment having spaced openings therein, a main flue pipe leading from the upper compartment of the damper box to the chimney, a heating drum leading from the fire box to said chimney, a pair of dampers pivoted to said horizontal partition and adapted to close said damper openings in said horizontal partition when swung to horizontal position and to alternately close said damper openings in said inclined partition when either one of said dampers is swung to inclined position and the other one is swung to horizontal position, and means for actuating one of said dampers independently of the other damper.

9. In a heater having a fire box and an ash pit therefor and communicating therewith, a damper box open to the atmosphere at one side and communicating with said ash pit at the opposite side thereof, a horizontally disposed partition dividing said damper box into upper and lower compartments, said partition having openings placing said compartments in communication with each other, an inclined partition and stop member extending transversely of said lower compartment having spaced openings therein, a main flue pipe leading from the upper compartment of the damper box to the chimney, a heating drum leading from the fire box to said chimney, a pair of dampers pivoted to said horizontal partition and adapted to close said damper openings in said horizontal partition when swung to horizontal position and to alternately close said damper openings in said inclined partition when either one of said dampers is swung

to inclined position and the other one is swung to horizontal position, and means for simultaneously actuating said dampers.

10. In a heater having a fire box and an ash pit therefor and communicating therewith, a damper box open to the atmosphere at one side and communicating with said ash pit at the opposite side thereof, a horizontally disposed partition dividing said damper box into upper and lower compartments, said partition having openings placing said compartments in communication with each other, an inclined partition and stop member extending transversely of said lower compartment having spaced openings therein, a main flue pipe leading from the upper compartment of the damper box to the chimney, a heating drum leading from the fire box to said chimney, a pair of dampers pivoted to said horizontal partition and adapted to close said damper openings in said horizontal partition when swung to horizontal position and to alternately close said damper openings in said inclined partition when either one of said dampers is swung to inclined position and the other one is swung to horizontal position, and automatic means for actuating one of said dampers and manually controlled means for actuating the other damper.

11. In a heater having a fire box and an ash pit therefor and communicating therewith, a damper box open to the atmosphere at one side and communicating with said ash pit at the opposite side thereof, a horizontally disposed partition dividing said damper box into upper and lower compartments, said partition having openings placing said compartments in communication with each other, an inclined partition and stop member extending transversely of said lower compartment having spaced openings therein, a main flue pipe leading from the upper compartment of the damper box to the chimney, a heating drum leading from the fire box to said chimney, a pair of dampers pivoted to said horizontal partition and adapted to close said damper openings in said horizontal partition when swung to horizontal position and to alternately close said damper openings in said inclined partition when either one of said dampers is swung to inclined position and the other one swung to horizontal position, and automatic means for actuating one of said dampers and manually controlled means for actuating both of said dampers.

12. In a heater having a fire box and an ash pit therefor and communicating therewith, a damper box open to the atmosphere at one side and communicating with said ash pit at the opposite side thereof, a horizontally disposed partition dividing said damper box into upper and lower compartments, said partition having openings placing said compartments in communication with each other, an inclined partition and stop member extending transversely of said lower compartment having spaced openings therein, a main flue pipe leading from the upper compartment of the damper box to the chimney, a heating drum leading from the fire box to said chimney, a pair of dampers pivoted to said horizontal partition and adapted to close said damper openings in said horizontal partition when swung to horizontal position and to alternately close said damper openings in said inclined partition when either one of said dampers is swung to inclined position and the other one swung to horizontal position, and means for actuating one of said dampers and means carried by said last mentioned damper for

moving the other of said dampers from one position to another.

13. In a heater having a fire box and an ash pit therefor and communicating therewith, a damper box open to the atmosphere at one side and communicating with said ash pit at the opposite side thereof, a horizontally disposed partition dividing said damper box into upper and lower compartments, said partition having openings placing said compartments in communication with each other, an inclined partition and stop member extending transversely of said lower compartment having spaced openings therein, a main flue pipe leading from the upper compartment of the damper box to the chimney, a heating drum leading from the fire box to said chimney, a pair of dampers pivoted to said horizontal partition and adapted to close said damper openings in said horizontal partition when swung to horizontal position and to alternately close said damper openings in said inclined partition when either of said dampers is swung to inclined position and the other one swung to horizontal position, and means for actuating one of said dampers, and a lifting arm carried by said last mentioned damper for moving the other of said dampers from an inclined to a horizontal position.

14. In a heater having a fire box and an ash pit therefor and communicating therewith, a damper box open to the atmosphere and communicating with said ash pit, a heating drum leading from the fire box to the chimney, a main flue pipe leading directly from the damper box to the chimney, said damper box having a pair of flue openings leading to said main flue pipe, a stop member extending at an angle to the plane of said flue openings and having damper openings therein, an automatic damper control, said damper control including a pair of relatively slidable rods connected respectively to said control and to one of said dampers for moving said last mentioned damper into positions for opening and closing one of said flue and said damper openings, and manual means for moving the other of said dampers into positions for opening and closing the other flue opening and damper opening, and means carried by said last mentioned damper for moving the other of said dampers to close one of said flue openings without affecting the automatic damper control.

15. In a heater having a fire box and an ash pit therefor and communicating therewith, a damper box open to the atmosphere and communicating with said ash pit, said damper box having a horizontal partition formed with a pair of flue openings, a main flue pipe communicating with the ash pit at one end through said flue openings and at the other end with the chimney,

a heating drum leading from the fire box to said pipe and chimney, said damper box also having a substantially vertically disposed partition formed with aligned damper openings, a pair of dampers pivoted to said horizontal partition and adapted to alternately open said flue openings and close said damper openings when either one of said dampers is swung from a horizontal position to a substantially vertical position and the other one is swung from a substantially vertical position to a substantially horizontal position, one of said dampers having means for elevating the other of said dampers to horizontal position to close one of said flue openings, when said first mentioned damper is moved from horizontal to vertical position and said damper is in a position at an angle to the horizontal position, thermostatic means for actuating the last mentioned damper and a slidable link connection between said control and said last mentioned damper whereby the latter can be elevated by the first mentioned damper and manual means for operating said first mentioned damper.

16. In a heater having a fire box and an ash pit therefor and communicating therewith, a door for said ash pit, a damper box open to the atmosphere and communicating with said ash pit, a main flue pipe leading directly from the damper box to the chimney, a heating drum leading from the fire box to said main flue pipe and said chimney, a pair of dampers movable into one position to close direct communication between said damper box and said main flue pipe, so that the flow of draft air will be through said damper box to the ash pit and to said heating drum and chimney, and movable into another position so that the flow of draft air will be from the ash pit through said damper box into said main flue pipe and around said heating drum to said chimney, automatic means for actuating one of said dampers and a lever for actuating the other of said dampers, said lever when in one position serving to latch said ash pit door and to release said door when moved to another position.

17. In a heater, heating means composed of a fire chamber and ash pit, said ash pit being partially separated from the fire chamber by means of a grate, a heating drum opening at one end into the fire chamber and connected at its other end to the chimney by means of a main flue pipe, a fire box door and an ash pit door, a passageway connecting the ash pit to said main flue, closure means for said passageway, means for simultaneously locking said ash pit door and actuating said closure means to a position closing said passage.

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