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(54) HEATING APPLIANCE

(71) I, DONALD LEON SMITH, a Citizen of the United States of America, of P.O. Box 206, Salem, State of Illinois, United States of America, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following invention:–

This invention relates to improvements in heating appliances such as air-heating stoves, boilers or the like having a venting system, and is an improvement in or modification to the heating appliance described in complete Specification No. 1553365.

In my complete Specification No. 1553365 I have described and claimed a heating appliance having a combustion chamber provided with burners each having a flue leading to a collection box with a flue outlet for the outlet passage of combustion gases to be conveyed to a chimney flue for the heating appliance and a venting system for the combustion chamber comprising a first piping connected to the flue outlet, a second piping connected to the chimney flue, a diverter box arranged exterior to the heating appliance and having an upper portion and a lower portion, said diverter box being connected to and intercommunicating with both of said pipings at its upper portion and having a bottom provided with a substantial opening disposed well above the base of the heating appliance at the upper portion of the heating appliance with said opening being at or above the level of the bottom of the collection box and in constant free communication with the atmospheric air surrounding the heating appliance which air enters the diverter box through the opening in the bottom as cold air to establish a cold air pressure head below the first piping and establish a thermal barrier to slow down the speed of the hot gases leaving the collection box and also to prevent down drafts from the chimney flue attempting to pass down through the second piping from reaching the combustion chamber of the heating appliance.

The present invention provides a heating appliance having a combustion chamber provided with burners each having a flue leading to a collection box with a flue outlet for the outlet passage of combustion gases to be conveyed to a chimney flue for the heating appliance, and a venting system for the combustion chamber comprising a first piping connected to the flue outlet, a second piping connected to the chimney flue, a diverter box arranged exterior to the heating appliance and having an upper portion with a top wall and a lower portion, said diverter box having an inlet and an outlet connected to and intercommunicating with the first and second pipings respectively at its upper portion and having a bottom in its lower portion provided with a substantial opening disposed well above the base of the heating appliance with said opening being at or above the level of the bottom of the collection box and in constant free communication with the atmospheric air surrounding the heating appliance, and said diverter box having a heat resistant baffle plate disposed vertically thereof midway between the inlet and outlet to which the first and second pipings are respectively connected, and said baffle plate preventing flow of gases directly from the inlet to the outlet, whereby the flow of hot gases from the collecting box is slowed down and downdrafts from the chimney flue attempting to pass back down through the second piping are prevented from reaching the combustion chamber of the heating appliance.

Preferably said baffle plate has a lower free end disposed above the bottom of the diverter box which has an interior first vertical section communicating with the first piping and an interior second vertical section communicating with the second piping with cross flow of fumes being present therebetween from the first piping to the second piping below the lower free end of the baffle plate.

A safety limit switch may be housed in the first vertical section and connected to a thermostat for the heating appliance to control thereby the supply of fuel to the burners, the switch being activated by temperature of fumes from the combustion chamber

passing into a lower end section of the diverter box from the first piping to shut off the fuel supply.

Preferably, the heating appliance includes means protecting said switch from cold air down-drafts from the chimney flue that would otherwise influence the activation of the switch.

Reference will now be made to the accompanying drawings which illustrate one embodiment of the invention by way of example, and of which:

Figure 1 is a front elevational view of a gas-fired heating plant, such as a typical air-heating appliance, equipped with a venting system in accordance with the present invention.

Figure 2 is a side elevational view of the appliance and venting system of Figure 1 and is taken on the lines 2—2 of Figure 1.

Figure 3 is a perspective view of a venting system, according to the invention, and shown apart from any heating plant; and

Figure 4 is a fragmentary vertical sectional view taken on line 4—4 of Figure 3.

Considering now the showing in Figure 3, the venting system 10 includes an elongate substantially rectangular diverter box 12 which is fabricated from 24 gauge galvanized iron or other sheet metal. The diverter box in use, as shown in Figures 1 and 2, is arranged vertically and attached by suitable means to the outside casing 14 of an air-heating appliance 16 or other type of heating-plant.

The diverter box is composed of opposing vertical side walls 18 and 20 and opposing vertical end walls 22 and 24. The top of the box is open and closed off by a removable lid or cover 26 having side and end flanges that fit over the upper edges of the side and end walls of the box and to which they are releasably fastened by metal screws 28. The bottom 30 of the bottom is completely open or it may be somewhat closed and formed with a substantial opening for the ingress into the box of atmospheric air.

Having reference to Figures 1 and 2, the air-heating appliance 16 is of modern conventional construction and includes a jacket 32 containing a burner compartment, composed of the pilot and main burners, a heat exchanger, a blower compartment and suitable openings in the jacket for supply ducts 34 and return ducts. The appliance has a factory installed, built-in draft diverter 36 shown in dotted lines in Figures 1 and 2. The factory diverter 36 has an open bottom and flue outlets open thereinto. Usually, there is a flue outlet for each main burner 38, so, if there are the usual three burners 38, then there are three flue outlets, as exemplarily shown in Figure 1.

The first step that is taken in the installation of the venting system 10 of the present invention is to seal off tight the open bottom of the factory diverter 36 so that it becomes a collection box. Then, the diverter box 12 of the present invention is attached to the outside of the furnace jacket 32, as shown in Figures 1 and 2. The open bottom diverter box 12 is vertically positioned so that its open bottom 30 is at the same elevation as the factory diverter 36. It is important that the diverter box 12 be positioned so that it has its open bottom 30 lying in a horizontal plane above or, at least, in the same plane in which the bottom of the factory diverter lies. This is important so that sufficient oxygen enters the diverter box 12 through the open bottom. The proper amount of entering oxygen will keep down the carbon monoxide content in the fumes and will create a thermal barrier in the combustion chamber. Thus the fumes in the diverter box become cooler and flow more slowly out to the chimney flue, which is thereby kept cool. Thus, the generated heat is retained inside the combustion chamber of the appliance and the heat exchanger gives off the heat through the warm air supply duct to the rooms in the building.

As can be seen, the diverter box 12 is provided in the upper end portions of its side and end walls with potential openings 40 in the form of scribe or score lines 42 that indicate where the actual openings (preferably circular) should be cut on the job. The openings are made to accommodate the installed ends of horizontally disposed pipes 44 and 46. The pipe 46 extends straight out from the box to the chimney flue (not shown) while the pipe 44 extends straight into the box from the vertical pipe section 48 connected to the top of the air-heating appliance. The pipe 44 is attached to the vertical flue outlet pipe section 48 by an elbow 50. The pipes 44 and 46 are so attached to the opposing end walls 22 and 24 of the diverter box, as shown, or the side walls 18 and 20, as can be appreciated, in a way so that they are substantially coplanar and enter the upper portion of the diverter box in an opposing manner.

The opposing openings 42 for the opposing pipes 44 and 46, whether in the side walls or in the end walls as shown in Figure 3, are separated by a baffle plate 52. The plate 52 is formed from asbestos or other heat resistant material and is positioned vertically in the diverter box 12, in the manner shown in Figure 3. The baffle plate extends between the side walls in the instance of the pipes 44 and 46 coming into the end walls, as shown in Figure 3. It has its side edges suitably secured to the inner surface of the side walls centrally of the box or midway between the end walls. The upper end of the baffle plate is in gas tight engagement of the lid or cover 26 while the side edges thereof

are in gas tight engagement with the side walls. The lower free end of the baffle plate terminates above the open bottom 30 but the baffle plate extends more than half the vertical extent of the diverter box and preferably approximately three quarters of the vertical extent.

The baffle plate divides the diverter box 12 into a combustion flue section 54 and a chimney flue section 56^1 with the combustion flue section 54 being communicated with the pipe 44 and receiving therefrom the combustion gases from the combustion chamber of the appliance while the section 56^1 is in communication with the chimney flue pipe 46.

The sections 54 and 56^1 are provided in their upper portions just below the pipes 44 and 46 with thermostatic means in the form of sensor tubes 56 mounted in the walls of the diverter box and extending into the interior of the sections. The tubes are disposed within the sections so that they are passed over by the hot combustion gases as they enter to box and the cooler gases as they leave the box for passage through the pipe 46 to the chimney flue (not shown). The tubes have outer ends provided with indicating dials 58 which are located on the outside of the walls and give temperature readings to an observer.

The combustion end section 54 of the diverter box 12 is provided with a safety spill switch 60 which is tied into one leg of the conventional thermostat for the heating plant and which is activated to shut off the thermostat circuit which controls the gas flow to the main burners through the gas valve. The thermostat works through a high-limit control, a safety-pilot switch and then to the gas valve. When the gas valve is open, gas flows to the main burners where it is ignited by the pilot.

The safety switch operates under the high temperature of fumes or combustion products to prevent lethal carbon monoxide fumes from entering the building should the chimney flue be blocked. To protect the switch from being influenced by cold air drafts, a shield or barrier plate 62 is arranged transversely between the side walls 18 and 20 at the open bottom 30 and transversely in between the openings 40 in the end walls. The shield is disposed below and spaced vertically from the lower free end of the baffle plate 52. The shield keeps cold air from contacting the safety switch, which cold air would otherwise influence the activation of the switch.

As shown in Figures 3 and 4, the safety switch 60 is mounted on one leg 64 of a U-shaped member 66 which is removably fitted over the top edge of the barrier plate 62 that also serves as a brace member for the side walls of the diverter box 12. The member 66 preferably is a resilient clip. The leg 64 is positioned on the side of the plate 62 facing the combustion flue section 54 of the diverter box 12 and has a lateral flange 68 which is normal to the plate 62 and on which the switch 60 is fixedly superimposed.

When installed, as shown in Figures 1 and 2, the elongate diverter box 12 has its bottom located just above or, at least, in the horizontal plane in which the factory box 36 lies so that the open bottom is positioned well above the base of the air-heating appliance. The box has its upper end portion located so that the pipes 44 and 46 come straight thereinto. Thus, there is a minimum of piping coming into and going out of the upper end of the diverter box 12 and such piping comes straight into and straight out of the box and lies in substantially the same horizontal plane.

An advantage of the above described arrangement is that heat can be retained inside the combustion chamber of the heating plant, and hence considerable savings in gas consumption can be realized.

A further advantage is that down-drafts can be diverted so as not to affect the pilot-light.

Furthermore, the above described arrangement cools the fumes emanating from the combustion chamber since the fumes are constrained to pass down and under the baffle plate, thus slowing them down, so as to reduce the temperature of the vent pipe and thereby prevent flue fires. The arrangement also provides an improved safety arrangement which will respond to higher than normal temperatures of the fumes, such as occurring in the instance of blocked flues, to shut off the main burners for the heating plant.

The arrangement can easily be used with modern air-heating appliances having factory installed internal diverters or gas-fired boilers having factory installed draft diverters and can meet the safety standards set by government regulatory agencies and trade associations.

WHAT I CLAIM IS:—

1. A heating appliance having a combustion chamber provided with burners each having a flue leading to a collection box with a flue outlet for the outlet passage of combustion gases to be conveyed to a chimney flue for the heating appliance, and a venting system for the combustion chamber comprising a first piping connected to the flue outlet, a second piping connected to the chimney flue, a diverter box arranged exterior to the heating appliance and having an upper portion with a top wall and a lower portion, said diverter box having an inlet and an outlet connected to and intercommunicating with the first and second pipings

respectively at its upper portion and having a bottom in its lower portion provided with a substantial opening disposed well above the base of the heating appliance with said opening being at or above the level of the bottom of the collection box and in constant free communication with the atmospheric air surrounding the heating appliance, and said diverter box having a heat resistant baffle plate disposed vertically thereof midway between the inlet and outlet to which the first and second pipings are respectively connected, and said baffle plate preventing flow of gases directly from the inlet to the outlet, whereby the flow of hot gases from the collecting box is slowed down and downdrafts from the chimney flue attempting to pass back down through the second piping are prevented from reaching the combustion chamber of the heating appliance.

2. A heating appliance as claimed in claim 1 wherein said baffle plate has a lower free end disposed above the bottom of the diverter box which has an interior first vertical section communicating with the first piping and an interior second vertical section communicating with the second piping with cross flow of fumes being present therebetween from the first piping to the second piping below the lower free end of the baffle plate.

3. A heating appliance as claimed in claim 2 including a safety limit switch housed in the first vertical section and connected to a thermostat for the heating appliance to control thereby the supply of fuel to the burners, the switch being activated by temperature of fumes from the combustion chamber passing into a lower end section of the diverter box from the first piping to shut off the fuel supply.

4. A heating appliance as claimed in claim 3 and including means prote[illegible] said switch from cold air downsrafts from the chimney flue that would otherwise influence the activation of the switch.

5. A heating appliance as claimed in claim 1 wherein portions of said pipings as they enter the diverter box below the top wall are straight and lie in substantially the same horizontal plane.

6. A heating appliance as claimed in any preceding claim wherein said diverter box is substantially rectangular and comprises a first set of opposing vertical end walls and a second set of opposing vertical side walls, said top wall being removable and having means for attaching it to the side and end walls, the inlet and outlet for the pipings being provided in the side or end walls immediately below the top wall.

7. A heating appliance as claimed in any preceding claim wherein a brace plate is fixed within the diverter box between the side walls and adjacent the bottom of the box.

8. A heating appliance as claimed in claims 3 and 7 further comprising removable means for supporting said switch on the brace plate.

9. A heating appliance substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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1592709 COMPLETE SPECIFICATION
1 SHEET This drawing is a reproduction of the Original on a reduced scale

FIG.1.

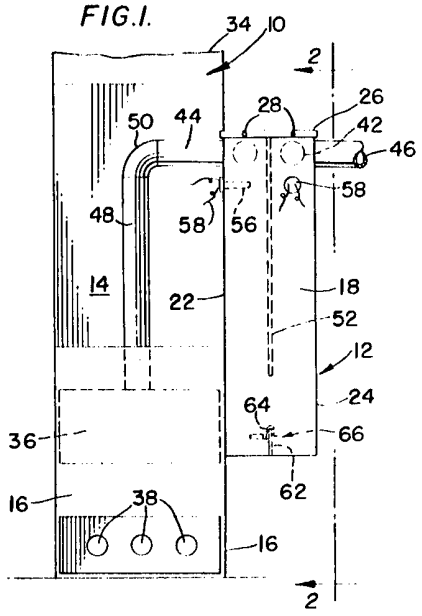

FIG.2.

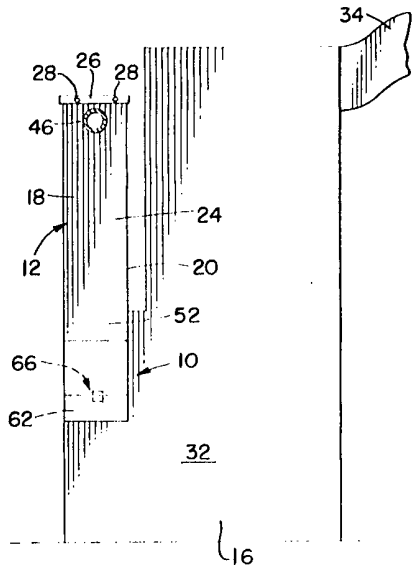

FIG.3.

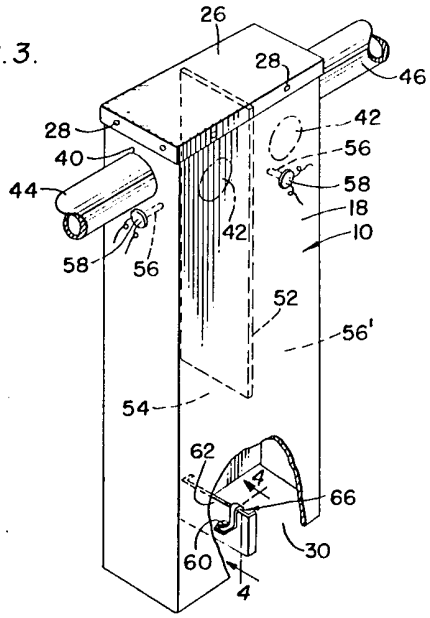

FIG.4.