GAS HEATED APPLIANCE

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The present invention relates to gas heated appliances.

In gas-heated appliances (water heaters and stoves for bath-rooms and other rooms) which are connected to a chimney, the danger always exists that the waste gases may be held back in the burner chamber by an unfavourable wind, and that incomplete combustion takes place, so that carbon monoxide is formed. Such appliances have therefore been provided with the waste gas outlet pipe or conduit with back-draught safety devices in the form of draught-intercepting openings, which allow the dammed-back waste gases to escape from the appliance, so that they do not affect the combustion. By such safety devices defective combustion is indeed prevented, but they do not afford any security against fatal accidents; on the contrary, the waste gases entering into the room are very dangerous, since they contain great quantities of poisonous gases which are dangerous to respiration, so that even a short stay in rooms filled with the back-draught gases may cause insensibility and, finally, death. The danger, of course, particularly great in bath-rooms, which generally have only a small air capacity.

The present invention removes the danger of back-draught persisting for any substantial length of time by providing safety devices in the back-draught passages actuated by the back-draught gases to cut off the supply of gas to the burners (at least to the main burner). By the interruption of the supply of gas the burner flames are extinguished, so that the further discharge of waste gases into the room ceases. In this way the danger of the filling of a room with poisonous gases is also removed.

The safety devices provided in the path of the back-draught gases may be of the most varied kind so long as they are responsive to the back-draught gases. Thus, a thermostat can be arranged in the path of the back-draught gases which is actuated by the heat of the back-draught gases, and, for example, effects the release of a self-closing main gas-valve, so that it interrupts the main gas supply. Preferably the back-draught gases are conducted in or through the combustion chamber to a guardian flame which controls, by means of a thermostatic valve, a gas current which in turn controls the main gas valve pneumatically in known manner. As soon as a return flow of waste gases takes place owing to back-draught in the outlet pipe, the guardian flame is on extinguished in the gases which are poor in oxygen, so that the thermostatic valve closes and thereby also effects the instantaneous closing of the main gas valve.

In the drawings, three examples of construction of the invention are diagrammatically shown in which:

Figure 1 is a liquid heater with the known back-draught safety device.

Figures 2 and 3 show the same type of heater with a thermostat installed in the back-draught opening in accordance with the present invention, these views showing the positions during normal draught and back-draught respectively.

Figures 4-6 present a second example of construction of the invention and show a liquid heater with a guardian flame safety device in differing conditions as to the flame, before, during and after the back-draught.

Figure 7 presents a third example of construction of the invention and shows a further form of construction of the guardian flame safety device.

Referring first to the prior art or known arrangement, as illustrated in Fig. 1, above the combustion chamber 11 of a heat-exchange arrangement 10 a draught-intercepting hood 12 with waste gas outlet pipe 13 is arranged. A deflecting cone 14 diverts the waste gases flowing back from the waste gas outlet pipe laterally into the draught-intercepting passages 15, so that they cannot reach the heating chamber 11. The main burner 15 is controlled by the main gas valve 17 and the pilot flame pipe 19 branches off the gas pipe 18 in advance of the main valve. In the right half of Fig. 1 the usual path of the waste gases without back-draught is shown. The left half of Fig. 1 shows the path of the waste gases when a back-draught occurs, and it will be at once seen that the returning waste gases simply enter the room in which the gas-heated appliance is fitted. If the wind persists, it may happen that the apartment (bathroom, kitchen or the like) becomes unduly filled with waste gases so that the persons therein are in danger of their lives.

In Figs. 2 and 3 the same liquid heater is shown provided with a safety device according to the present invention. This device consists of a thermostat, for example, a bi-metallic spring 20, which is arranged in the draught-intercepting flute 16, and in the cold condition holds the valve rod 21 of a main gas valve 22 which closes automatically under spring action and which is shown in the open position in Figure 2. If a back-draught occurs (Fig. 3), the hot waste gases flow...
past the thermostat 20 and cause it to expand and release the valve rod 21, so that the valve 22 closes the intake and stops the supply of gas to the burner 16. The burner flames are thus extinguished and the formation of waste gases ceases. The stove can only be brought into use again by opening the main valve 22 and igniting the gas at the main burner, so that the user will not be surprised by gas poisoning. If back-draught again takes place after the re-ignition of the burner, the safety device will again act after a short time, and the gas supply will again be cut off so that in any case a long continued return flow of waste gases into the room is avoided.

In Figures 4–6 a further liquid heater is shown which however possesses a back-draught safety device which becomes operative by the extinction of a guardian flame. Between the main burner 16 and the main gas-pipe 15 a diaphragm valve 23 is arranged, the diaphragm 24 of which contains a throttle opening 25 through which a weak current of controlling gas constantly flows from the high pressure side 26 of the diaphragm into the control chamber 27. From the control chamber 27 a controlling gas-pipe 28 leads to the burner 29 of a guardian flame, which acts on a thermostat valve controlling the gas-pipe 28. In the example shown, the guardian flame burner 29 is itself formed as a safety burner by the burner casing 25 being closed by a thermostat disc 30 which contains a burner opening 31 and carries a valve plate 32. When the thermostat disc 30 is cold, it presses the valve plate 32 on its seat and thereby closes the outlet of the control pipe 28, so that the control gas collects in the control chamber 27 of the main valve and presses the diaphragm 24 against the main valve seat (Fig. 6). If however the thermostat disc 30 is heated by a flame, for example, the guardian flame, it curves and opens the valve 32, so that the pressure escapes from the control chamber 27 and opens the main gas valve (Fig. 4). This guardian flame, the burner of which may of course have a different construction, is so arranged that it lies in the path of the returning waste gas when a back-draught occurs and is extinguished thereby. It could thus (like the thermostat 30 in Figs. 2 and 3) be arranged in the draught-intercepting hood 13 so extended that it forms a casing 33 which extends down below the burner 16 and has a bottom 34 containing a fresh air opening 35. If now a back-draught occurs, the returning waste gases are conducted round the heat exchanger to the guardian flame chamber 36. On a back-draught, the chamber 36 is filled to such an extent with waste gases poor in oxygen that the guardian flame in the waste gas sump (Fig. 5) becomes extinguished. This has for its consequence that the thermostat disc 30 becomes cold and closes the control valve 22, so that the main valve 23 also closes and shuts off the gas supply to the burner 16 as shown in Fig. 6. In order to increase the action of the chamber 36, a non-return flap-valve 37 can be provided on the fresh air opening 35 which is held open by a weight 38, a spring or the like, and is closed by the back-draught pressure.

In the construction shown in Fig. 7 the burner chamber 11 is completely shut off by the walls 39 from the guardian flame chamber 36, and has its own fresh air inlet 40. Only one opening 41 in the wall 39 behind the inlet arrangement 42 allows that the guardian flame to pass through to the main burner 16, so that it can be used at the same time as a pilot flame.

It is further to be noted that the deflecting cone 43 shown in Figs. 4–7 has the form of a cup directed towards the outlet pipe or flue 44, so that the condensed water, soot and so forth cannot reach the heating chamber 11 or the burner 16.

What is claimed is:

1. A gas-heated appliance comprising a heat interchanger, a combustion chamber, a main gas burner therein, a flue leading from said combustion chamber, a return conduit for back-draught gases opening into said flue and means arranged in the path of the back-draught gases in said conduit and responsive to the flow thereof to automatically interrupt the supply of gas to said main gas burner.

2. A gas-heated appliance comprising a heat interchanger, a combustion chamber, a main gas burner therein, a flue leading from said combustion chamber, a return conduit for back-draught gases opening into said flue and means arranged in the path of the back-draught gases in said conduit and responsive to the flow thereof to automatically interrupt the supply of gas to said main gas burner.

3. A gas-heated appliance comprising a heat interchanger, a combustion chamber, a main gas burner therein, a flue leading from said combustion chamber, a return conduit for back-draught gases opening into said flue and means including a thermostat operable to interrupt the supply of gas to said main gas burner and a governor interposed on said gas supply and operable to respond to the temperature of said gas and so arranged as to interrupt the passage of gas to said main gas burner where the temperature of the gas passes a predetermined value when said gas is not in use.

4. A gas-heated appliance comprising a heat interchanger, a combustion chamber, a main gas burner arranged in said combustion chamber, a main gas valve controlling the supply of gas to said main gas burner, a flue leading from said combustion chamber, a return conduit for back-draught gases opening into said flue, means including a thermostat operable to interrupt the supply of gas to said main gas burner and a governor positioned to heat said thermostat, said guardian burner being positioned in said conduit in the path of the back-draught gases and extinguishable thereby.

5. A gas-heated appliance comprising a heat interchanger, a combustion chamber, a main gas burner arranged in said combustion chamber, a main gas valve controlling the supply of gas to said main gas burner, a flue leading from said combustion chamber, a return conduit for back-draught gases opening into said flue, means including a thermostat operable to interrupt the supply of gas to said main gas burner and a governor positioned to heat said thermostat and a guardian burner positioned to heat said thermostat by its flame and arranged in said sump.

6. A gas-heated appliance comprising a heat interchanger, a combustion chamber, a main gas burner arranged in said combustion chamber, a main gas valve controlling the supply of gas to said main gas burner, a flue leading from said combustion chamber, a return conduit for back-draught gases opening into said flue, a sump arranged to receive and store a volume of gas sufficient to allow gas to pass through the heat exchanger and into a sump of gas sufficient to prevent said gas from being ejected from the unit by depressurization of the gas supply system.
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the flame of said guardian burner projects through said opening and serves as a pilot flame to said main gas burner.

6. A gas-heated appliance comprising a heat inter-changer, a combustion chamber, a main gas burner arranged in said combustion chamber, a main valve controlling the supply of gas to said main gas burner, a flue leading from said combustion chamber, a return conduit for back-draught gases opening into said flue, a sump arranged in said return conduit, a flap valve in said sump controlling the supply of air thereto and closing under pressure of the back-draught gases, and means responsive to the flow of back-draught gases in said conduit for controlling said main valve comprising means including a thermostat operable to close said main valve and thereby interrupt the supply of gas to said main gas burner on cooling of said thermostat and a guardian burner positioned to heat said thermostat by its flame and arranged in said sump.

7. A gas-heated appliance comprising a heat interchanger, a combustion chamber, a main gas burner therein, a flue leading from said combustion chamber, a return conduit for back-draught gases opening into said flue, a deflector arranged in said flue to deflect back-draught gases into said return conduit and means arranged in the path of the back-draught gases in said conduit and responsive to the flow thereof to automatically interrupt the supply of gas to said main gas burner upon flow of back-draught gas.

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