(12) UK Patent Application (19) GB (11) 2 207 499 (13) A

(43) Application published 1 Feb 1989

(21) Application No 8817563

(22) Date of filing 22 Jul 1988

(30) Priority data
(31) 8717673 (32) 25 Jul 1987 (33) GB

(51) INT CL⁴
F24C 3/04

(52) Domestic classification (Edition J):
F4W 29 46A 46B
F4S 35B
F4T 279 C

(56) Documents cited
GB A 2183329 GB A 2133530 GB 1266319

(58) Field of search
F4W
F4S
Selected US specifications from IPC sub-class
F24C

(71) Applicant
Glynwed Consumer & Building Products Limited

(Incorporated in United Kingdom)

Headland House, New Coventry Road, Sheldon, Birmingham, B26 3AZ

(72) Inventors
John Owens
Clifford Ronald Cadman

(74) Agent and/or Address for Service
Barker Brettell & Duncan
138 Hagley Road, Edgbaston, Birmingham, B16 9PW

(54) Simulated solid fuel gas fire

(57) An open-fronted gas fire including simulated solid fuel 14, has two separate and independently controlled burners 1,2. A first burner 1 provides a moving flame effect at the simulated solid fuel and the second burner 2 is used to provide a heated air output for convection heating. Flames of burner 1 pass between items of the simulated solid fuel 14 arranged above a lower upwardly and rearwardly inclined section 11 of a facia plate 10, thus presenting an appearance of a burning banked-up pile of fuel. The second burner 2 is below the lower section 11. An air duct 4 is defined between the facia plate 10 and a back wall of a casing 3 of the fire, or the firebrick back of the fireplace opening. A pyramid shaped wire guard 31 protects a flue gas opening 20.

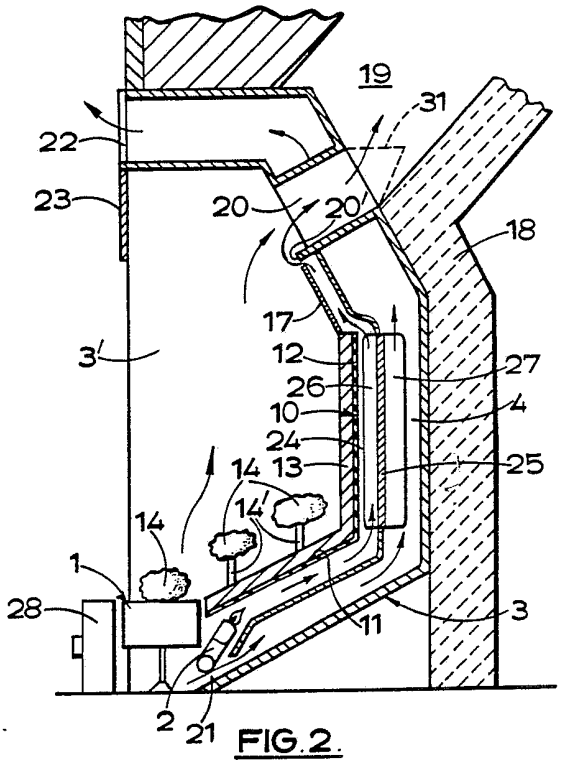

FIG.2.

GB 2 207 499 A

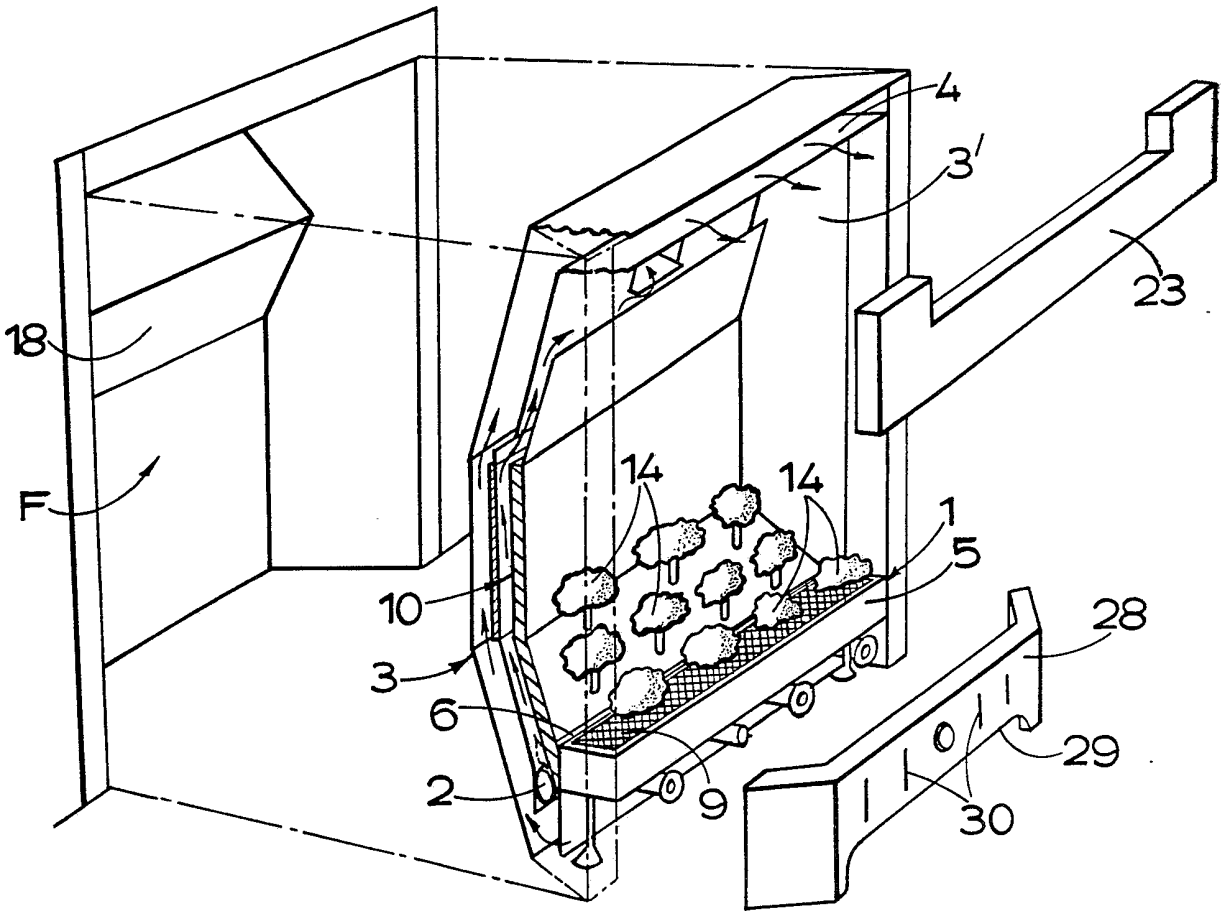
4
3'
23
18
F
14
14
1
5
10
28
3
6
29
2
9
30

FIG.1.

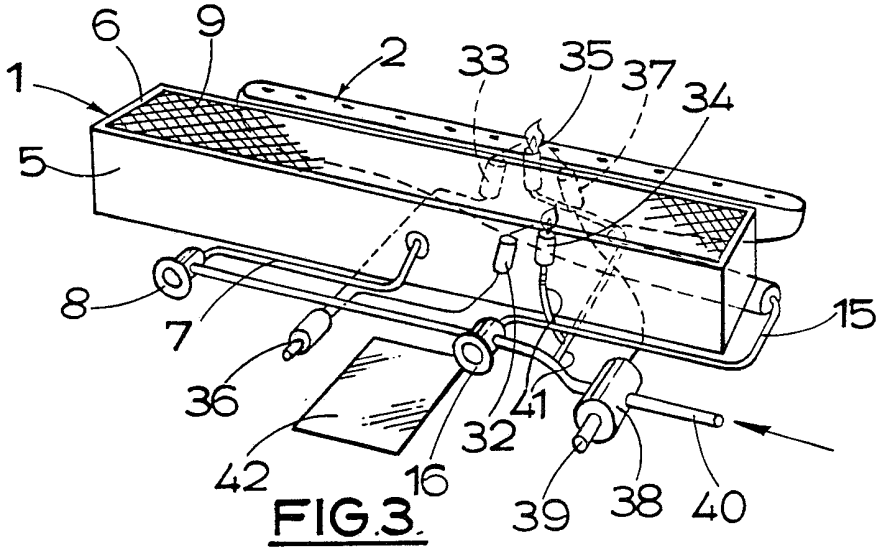
6
9
1
2
33
35
37
34
5
8
7
15
36
41
32
42
16
39
38
40

FIG.3.

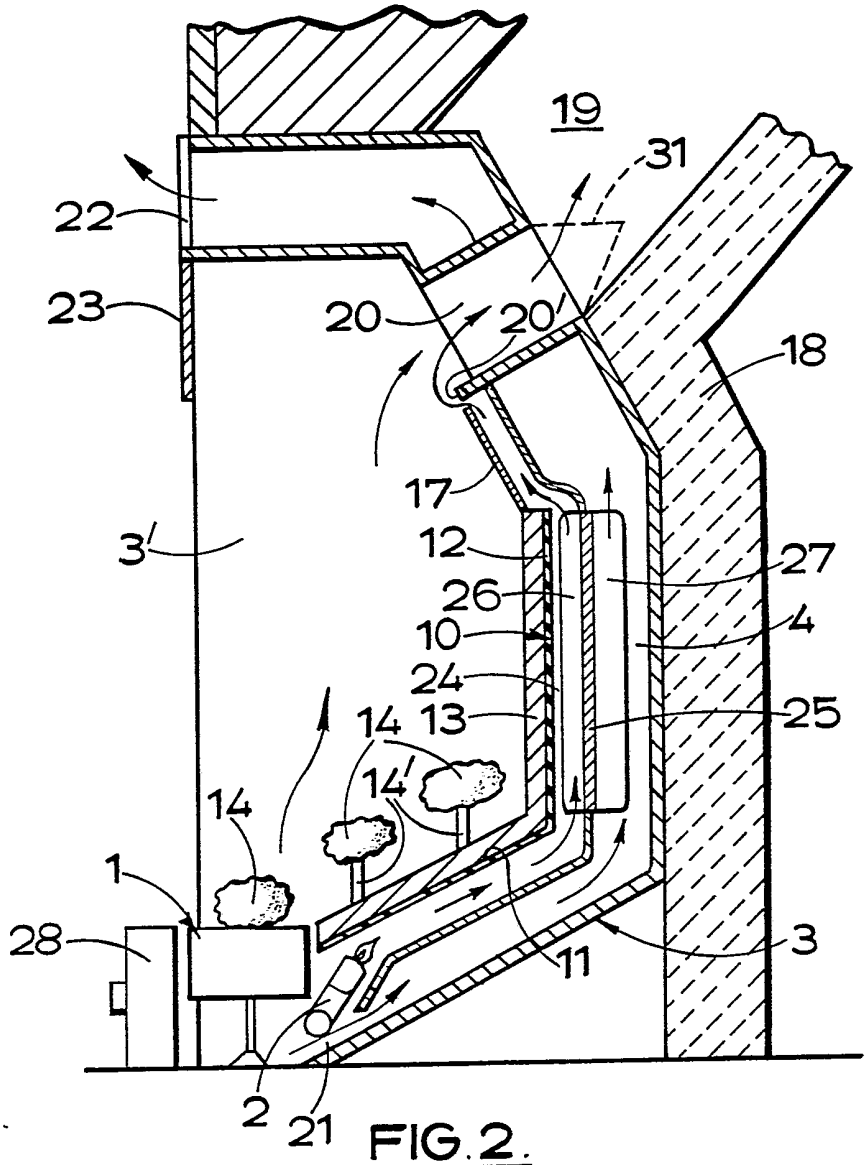

FIG.2.

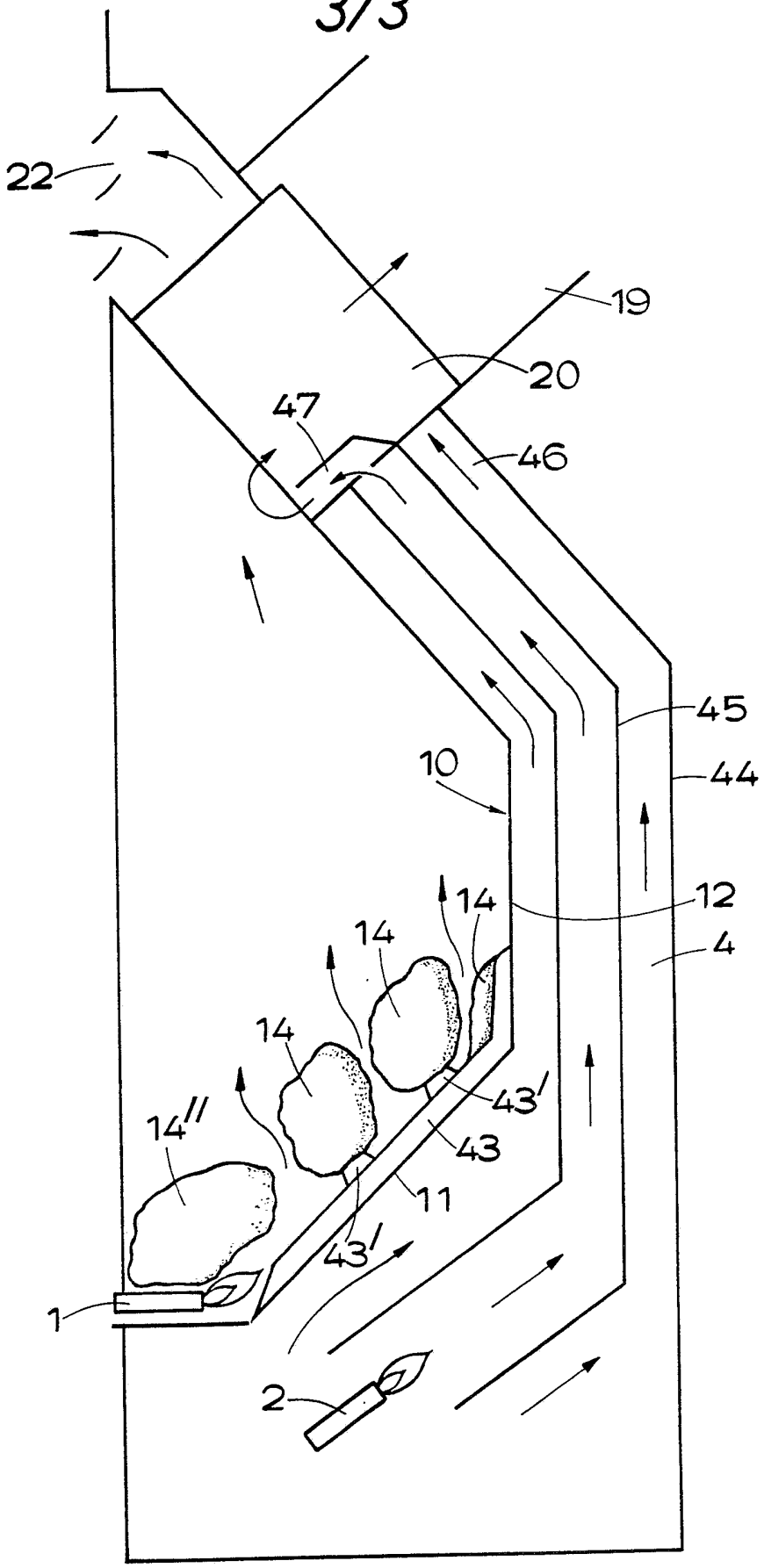

FIG. 4.

GAS FIRE

This invention relates to an open-fronted gas fire intended to be fitted into a fireplace opening or recess and being of the kind which includes simulated solid fuel and in use provides a moving flame effect so that an appearance resembling that of an open solid fuel fire is presented. Such a gas fire is hereinafter referred to as "of the kind described".

Gas fires of the kind described have enjoyed considerable popularity because of their realism as compared with conventional gas fires. In order to accommodate an effective heat exchanger the casing of the conventional gas fire normally projects forwards to a substantial extent from the fireplace opening. Because of the projecting casing such a gas fire looks quite different from the original solid fuel fire, although in general it does offer a high thermal efficiency, typically of around 60%. On the other hand, gas fires of the kind described, lacking any heat exchanger, have had low thermal efficiencies, typically of the order of no more than 20%, and they have been criticised because of that. To meet this criticism, fires have been designed to increase the efficiency, to say 40%, while retaining realism as far as possible. These fires have commonly employed a heat exchanger which is concealed within the fireplace opening or recess. In several examples, the size of the heat exchanger together with the space needed in the fireplace behind the fire to accommodate debris which may fall down the chimney, has made it necessary for the firebrick back (or "chairbrick") of the fireplace to be removed, which adds to the work and cost of the installation of the fire.

Another consideration is that although some customers are seeking more heat output, i.e. more efficiency, from their gas fires of the kind described, there are times, as for example when the weather is mild, when the moving flame effect is required but not the higher heat output.

The present invention consists in an open-fronted gas fire of the kind described having a first burner by means of which the moving flame effect is provided, and a second separate and independently controlled burner by means of which a heated air output is able to be provided from the fire for convection heating.

Thus an open-fronted fire with a moving flame effect is provided, and the second burner for the convection heating enables a higher heat output efficiency to be achieved. The arrangement gives flexibility in the use of the fire because the first and second burners may be selectively operated so that either one of them may be in use on its own, or they may both be in use together. The user, therefore, has the choice of using the fire essentially for the open solid fuel fire appearance by having the first burner operative on its own, for the heat output of the second burner alone, or the combination of solid fuel fire appearance and heat output provided by operating the two burners together.

The first burner may comprise a plenum chamber having an upwardly presented mouth, mixing means communicating with the plenum chamber for mixing a flow of gaseous fuel with air, and a flame trap at the mouth through which the gas/air mixture passes. Radiant material simulating solid fuel bodies may be suitably arranged above the flame trap material between which

the gas/air mixture burns with the moving flame effect. Preferably the flame trap material is gauze or perforated sheet extending across the mouth of the plenum chamber. Ceramic plaque or other suitable material may be used. The radiant material may simulate coals or logs and embers, of various sizes and/or densities. The material may be a ceramic material which in use glows as if burning so as to enhance the realism of the solid fuel fire appearance. The first burner may be of another form which provides visible flames to rise up between the simulated solid fuel bodies and give a realistic fire appearance.

A convector unit forming part of the fire and through which air heated by the second burner passes conveniently extends behind the part of the fire at which the first burner and simulated solid fuel are provided. The convector unit may in addition, or even alternatively, extend to the sides of the last-mentioned part of the fire. It is possible for the convector unit to be of a slim construction enabling it to be accommodated in a fireplace opening without the firebrick back having to be removed.

The convector unit may include a casing within which one or more warm air ducts are defined for the passage of air heated by the second burner to a discharge outlet or outlets preferably positioned towards the top of the fire. In another arrangement a casing or screen may be provided which is adapted to define with the firebrick back of the fireplace opening in which the fire is installed for use, a warm air duct or ducts for the air to pass along from the second burner. A higher heat output efficiency can be obtained from the first-mentioned arrangement. More

effective heat insulation can be provided by having the warm air duct or ducts contained within the casing.

Heat exchanger means may be provided whereby heat is transferred from products of combustion of the second burner to the warm air duct, or at least one of the ducts where there is a plurality of ducts. The means may include fins or tubes carried by the casing or screen.

The fire may be constructed and arranged such that it can be installed in a standard, usually 16" or 18" (400 mm or 450 mm), domestic fireplace opening without having to remove any part of the firebrick of the opening. This facilitates installation of the fire for use and reduces fitting costs.

Conveniently the first and second burners are arranged substantially parallel to one another with the second burner disposed rearwardly of the first burner. Spark ignition is preferably provided for both burners. There may be a spark ignitor electrode at a pilot light of each burner. A mirror may be provided to facilitate viewing of the pilot light of the second burner. The pilot lights may be linked such that the pilot light of the first burner will not be maintained if the pilot light of the second burner does not ignite, or is extinguished. Operation of a valve for supplying gas to the pilot light of the first burner may, for example, be dependent upon the pilot light of the second burner being ignited. Thus if the pilot light of the first burner should not ignite or should be extinguished the user will know that the pilot light of the second burner is inoperative. In another arrangement spark ignitor electrodes may provide direct ignition of the burners, and the second burner may

receive gas through a thermo-electric valve which will not remain operative to allow gas to pass to the second burner unless that burner is ignited. Again a mirror may be provided to enable the second burner to be viewed.

Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings in which:

Figure 1 is a diagrammatic exploded front perspective view, partly broken away, of one embodiment of a gas fire in accordance with the present invention;

Figure 2 is a vertical section through the gas fire,

Figure 3 is a diagrammatic perspective view of burners of the fire, and

Figure 4 is a diagrammatic vertical section through a second embodiment of a gas fire according to the invention.

In both of the embodiments of the invention about to be described an open-fronted gas fire is provided which is constructed and arranged to be installed as an inset fire in a standard domestic fireplace opening F, Figures 1 and 2, without modification of the fireplace opening being necessary.

Referring to Figures 1 to 3 of the accompanying drawings the gas fire has a first burner 1, hereinafter referred to as "the fire burner", a second burner 2,

hereinafter referred to as "the convector burner", and a convector casing 3 defining a warm air duct 4.

The fire burner 1 has a metal burner body 5 which extends from side to side of the fire and is in the form of an elongated, trough-like, plenum chamber 6. Inside the plenum chamber is a venturi, not shown, by way of which a gas/air mixture is supplied into the chamber. The venturi receives air, constituting primary combustion air, from the atmosphere, and receives gas, which will usually be natural gas, through a delivery pipe 7, Figure 3, by way of a knob-operated control valve 8 at the front of the fire. An upwardly-presented mouth of the plenum chamber 6 is completely covered by flame trap material in the form of a stainless steel twill-weave gauze 9. The flame trap material may alternatively be a finely perforated stainless steel sheet. A metal baffle plate may be supported inside the chamber below the gauze 9 to direct the gas/air mixture to peripheral regions of the gauze and to confine the area of the gauze through which the mixture passes to a size compatible with the gas/air input to the fire burner.

Running for the length of the plenum chamber 6 is an imperforate metal facia plate 10 having an upwardly and rearwardly inclined section 11, which extends from the rear of the mouth of the plenum chamber, and an upright section 12 which projects upwards from the upper end of the inclined section. A covering of ceramic fibre, high temperature, insulation 13 is applied to the front face of the facia plate 10. Placed on the gauze 9 and also mounted in a fixed banked arrangement above the inclined section 11, for example on supporting pegs 14', Figure 2, secured on the inclined section, are simulated coals 14 of a

radiant ceramic material which will glow when heated. The "coals" 14 are spaced apart from one another to allow burning space between them, but from the front of the fire they present a life-like appearance of a banked-up pile of real coals.

When the fire burner is in operation, the gas/air mixture from the venturi is diffused through the whole of the plenum chamber 6 and then passes up through the gauze 9. The mixture burns in between the "coals" 14 on the gauze 9 with a moving flame effect, the flames being in a random pattern to give a dancing flame appearance. Portions of the "coals" adjacent to the flames glow as they are heated to give the appearance that they are burning. Secondary air passes over the gauze and inclined section 11 to promote the burning.

Behind the fire burner 1 and underneath the lower part of the inclined section 11 of the facia plate 10 is the convector burner 2 which extends parallel to the fire burner. The convector burner 2 is an aerated burner which receives gas through a delivery pipe 15, Figure 3, by way of a knob-operated control valve 16 also at the front of the fire.

Extending upwardly from the top of the upright section 12 of the facia plate 10 is an inclined metal plate 17 which slopes forwardly and upwardly similarly to the upper inclined part of the usual backbrick 18 in the fireplace opening F leading to the chimney flue 19, Figure 2. The casing 3 is supported behind the facia plate 10 and has side wing portions 3' which extend round the sides of the facia plate to the front of the fire burner 1. The casing extends upwards above the level of, and over, the inclined plate 17. Thus the casing of the installed fire extends all around the

sides and back and across the top of the fireplace opening F. A flue gas opening 20, separated from the interior of the casing, passes centrally through the casing above the inclined plate to communicate with the chimney flue 19 of the fireplace opening. There may be more than one flue gas opening. The warm air duct 4, which is defined by the interior of the casing 3 and its side wings 3', extends from an air inlet 21, below the fire burner adjacent to the lower forward end of the inclined section 11 of the facia plate, up through the side wings as well as upwardly and rearwardly beneath the inclined section, vertically upwards behind the upright section 12 of the facia plate, forwardly and upwardly behind, and beyond, the inclined plate 17, and then horizontally forwards to an outlet 22. The outlet 22 is combined with a fireplace cowl 23 and may be louvred. Between the facia plate 10 and the casing and between the inclined plate 17 and the casing there is a continuous space which forms a products passage 24 leading to, and opening to, the flue gas opening 20. Products of combustion from the convector burner pass along the products passage 24.

The convector casing 3 is constructed for the most part from sheet metal components but also includes a cast or extruded metal, conveniently aluminium, heat exchanger 25 formed with vertically extending fins 26, 27 and positioned behind the upright section 12 of the facia plate. Some fins 26 project into the products passage 24 where it passes behind the upright section 12 and other fins 27 of the heat exchanger 24 project into the warm air duct. In use of the fire heat from the products passage is imparted through the adjacent wall of the casing to the warm air duct, and is extracted by the heat exchanger 25 to heat the air passing through the warm air duct. The warmed

air passes out of the duct through the outlet 22 to heat the room in which the fire is installed for use by convection. Whilst the fins 27 in the warm air duct increase heat transfer to air in the warm air duct they do present some resistance to flow of the convection air, because of that, at least where the space available for the warm air duct is restricted the heat exchanger may be provided without the fins 27 for the warm air duct.

A free standing cover 28, similar to an ash pit cover of a solid fuel fire, fits in front of the fire burner and air inlet 21. Air can pass under a raised central portion 29 of the bottom edge of the cover 28 to the air inlet, and through slots 30 in the cover.

As will be seen from Figure 2 of the accompanying drawings, the casing is shaped to fit snugly against the backbrick 18 of the fireplace opening F. Removal or modification of the backbrick is unnecessary. The flue gas opening 20 is of smaller cross-section than the standard flue 19, typically 4" (102 mm) square and it is provided with a pyramid shaped wire guard 31 which projects into the flue to stop larger pieces of debris from blocking the opening 20 which may fall down the flue.

A major consideration with gas fires which are installed in fireplace openings for use is the debris which may fall down the chimney and which ought not be allowed to accumulate unseen, for example behind the fires, and possibly obstruct flue passages. In this embodiment of the invention debris, other than such debris as may be stopped by the wire guard 31, will fall forwards on to the simulated fuel bed where it can be seen and removed, and the exit from the

products passage 24 is protected by an overhanging extension 20' of a bottom wall of the flue gas opening 20 in the casing 3.

Spark ignition is provided for both the fire burner and the convector burner. A spark electrode 32, 33, Figure 3, is positioned adjacent to a pilot light 34, 35 of each of the burners. The two spark electrodes 32, 33 are connected to a common ignitor button 36. A thermocouple 37 of a thermoelectric valve 38 with a push-button 39 for manual operation is positioned at the convector burner to be impinged upon by the flame of the pilot light 35 of that burner. The thermoelectric valve 38 is connected into a gas supply pipe 40 and controls the gas supply to the control valves 8, 16 of the fire burner and convector burner. Gas is taken to the pilot lights by pipes 41 connected to the gas supply pipe 40 downstream of the thermoelectric valve 38. The pilot lights are ignited in the conventional manner by pressing the push-button 39 of the thermoelectric valve which allows gas to pass through the valve to the pilot lights and simultaneously pressing the ignitor button 36 to activate the spark electrodes 32, 33. When the pilot light 35 of the convector burner ignites the thermocouple 37 responds to the flame and holds the thermoelectric valve open. The control valves 8, 16, or either one of them, can then be operated to supply gas to the fire burner and/or convector burner, as desired. If the pilot light 35 of the convector burner is not ignited the thermoelectric valve automatically closes when it is manually released. The pilot light 34 of the fire burner is at the front of the fire and it can be readily seen when it is ignited. A mirror 42 may be provided below the two burners to assist viewing of the pilot light 35 of the convector

burner but if the pilot light of the fire burner remains ignited that will be confirmation in any event that the pilot light of the convector burner has also been ignited.

The control valves 8, 16, the thermoelectric valve 38 and the ignitor button 36 are all at the front of the fire. They are normally concealed from view by the cover 28, which allows easy access to them.

Tests have shown that a fire in accordance with the embodiment described and illustrated can have a heat output efficiency of 40%, and possibly higher, when both burners are operative.

The second embodiment illustrated by Figure 4 of the drawings will now be described. For ease of identification parts of the fire corresponding to those of the foregoing embodiment are identified by corresponding reference numerals. The fire differs from the previous fire in two notable aspects, namely the form of its fire burner 1 and the absence of a finned heat exchanger.

In this embodiment the fire burner 1 is aerated and of an elongated generally flat form, preferably fabricated from pressed metal but possibly made as a casting, mounted horizontally along the front of the fire on its one side and having gas/air mixture outlets along a rearwardly facing portion of the burner. Flames from the ignited fire burner are directed rearwardly on to a ceramic radiant bed 43 which is supported on the upward and rearwardly inclined section 11 of the metal facia plate 10 and extends partially up the upright section 12 of the facia plate. The flames are deflected upwards by the radiant

bed 43 to pass between simulating coals 14 some of which are formed integrally with the radiant bed and others are separate items spaced above it on supports 43' integral with the radiant bed. A simulated coal frontal piece 14" fits over the fire burner to conceal it from view and to guide the flames on to the radiant bed. As in the previous embodiment the coals 14" present a life-like appearance of a pile of real coals between which the flames of the fire burner rise up to give a realistic appearance of a burning coal fire. The heated radiant bed and parts of the coals glow to enhance the appearance. Simulated logs may be used instead of simulated coals if preferred.

As before, a warm air duct 4 is defined between the facia plate 10 and a back wall panel 44 of the convector casing 3. A combustion products duct 45, fabricated from sheet-metal, extends centrally up through the warm air duct 4 from beneath the upwardly and rearwardly inclined section 11 of the facia plate 10 to the flue gas opening 20. The convector burner 2 extends parallel to the fire burner and is mounted to fire into the forwardly-directed bottom end of the combustion products duct 45 and its products pass up through the duct. At the flue gas opening 20 apertures 45 are provided for the products to pass out of the combustion products duct 45 and into the flue gas opening where they are directed by a baffle 47 to the front of the opening before passing back along the outlet to the flue 19. As the products of combustion from the convector burner 2 pass through the combustion products duct 45 the duct becomes heated and imparts heat to air passing by convection through the warm air duct 4. The warm air flows round the flue gas opening

and out through the outlet 22 at the front of the top of the fire.

In other respects the fire of the second embodiment is similar to the fire of the first described embodiment.

In each of the two embodiments described and illustrated the convector burner is positioned near to the fire burner adjacent to the forward lower end of the inclined section 11 of the facia plate 10. This extends the products passage 24 and increases the heated surface area of the warm air duct 4. The closeness of the two burners also facilitates ignition.

In another embodiment, not illustrated, the convector casing does not have side wings so that it extends only behind and over the facia plate 10. This arrangement does not necessarily require the casing to have a flue gas opening passing through it. The products of combustion from the fire burner and the convector burner may simply pass around the upper part of the casing to the chimney flue 19.

In yet another embodiment, not illustrated, the convector burner is positioned more rearwardly, behind the vertical plane of the upright section 12 of the facia plate 10. The front of the warm air duct is defined by the upright section and the inclined plate 17, and the back of the duct is defined by the firebrick back of the fireplace opening in which the fire is installed for use, suitable thermal insulation being applied to the firebrick back. An air vent from the warm air duct is provided at the forward end of the inclined plate. The products passage extends centrally up through the duct, spaced from the firebrick back and

the upright section and inclined plate, to a flue outlet in a plate extending across the mouth of the chimney flue. Behind the upright section the products passage extends through a heat exchanger which may be an extrusion of aluminium and may have vertically extending fins which project into the warm air duct in front of and/or behind the products passage. The inclined plate may also have fins inside the warm air duct, and possibly outside the duct as well, for heat-exchanging purposes. A shield extends over the outlet of the products passage at the flue outlet to protect the passage from falling debris in the chimney flue. A flue opening in the inclined plate, fitted with a wire guard, opposite the flue outlet provides access to the chimney flue for the products of combustion from the fire burner.

A higher heat output efficiency can be obtained from the convector part of the fire in each of the illustrated embodiments described, by virtue of the convector casing extending around the sides and back of the fireplace opening and the warm air duct being inside the casing, than can be expected from the further embodiments described.

Instead of fitting against the backbrick of the fireplace opening, the fire, whilst still being contained to a substantial extent in the fire place opening, may be fitted so as to leave a space behind it into which debris from the chimney can be received, rather than passing through the flue gas opening to the front of the fire.

CLAIMS

1. An open-fronted gas fire of the kind described having a first burner by means of which the moving flame effect is provided, and a second separate and independently controlled burner by means of which a heated air output is able to be provided from the fire for convection heating.

2. An open-fronted gas fire according to claim 1 wherein a convector unit through which air heated by the second burner passes extends behind and/or to the sides of the part of the fire at which the first burner and simulated solid fuel are provided.

3. An open-fronted gas fire according to Claim 2 wherein the convector unit includes a casing within which at least one warm air duct is defined for the passage of air heated by the second burner to a discharge outlet.

4. An open-fronted gas fire according to Claim 3 wherein the warm air duct extends from below the part of the fire at which the simulated solid fuel is provided to the discharge outlet, and the discharge outlet is positioned at or towards the top of the fire.

5. An open-fronted gas fire according to Claim 2 wherein the convector unit includes a casing or screen which is adapted to define with the back of the fireplace opening in which the fire is installed for use at least one warm air duct for the passage of air heated by the second burner to a discharge outlet.

6. An open-fronted gas fire according to any one of claims 3, 4 and 5 wherein heat exchanger means is

provided whereby heat is transferred from products of combustion of the second burner to the warm air duct.

7. An open-fronted gas fire according to Claim 6 wherein the heat exchanger means includes fins disposed in the warm air duct.

8. An open-fronted gas fire according to Claim 6 or 7 wherein the heat exchanger comprises a products duct within the warm air duct through which products of combustion pass from the second burner.

9. An open-fronted gas fire according to any one of Claim 6, 7 and 8 in which the convector unit extends behind the part of the fire at which the burner and simulated solid fuel are provided, and wherein a facia plate extends upwardly at the back of said part, and a or the products duct is defined behind the facia panel for the products of combustion from the second burner to pass through.

10. An open-fronted gas fire according to Claim 9 wherein the facia plate has a lower section which extends upwardly and rearwardly from the first burner and above which at least some of the simulated solid fuel is located, and an upper section which extends upwards from the upper rearward end of the lower section.

11. An open-fronted gas fire according to Claim 10 wherein a radiant bed is supported on the lower section of the facia plate, and the first burner is arranged for flames therefrom to be directed on to the radiant bed be deflected upwards from the radiant bed between items of the simulated solid fuel.

12. An open-fronted gas fire according to Claim 11 wherein some of the simulated solid fuel is formed integrally with the radiant bed and some of the simulated solid fuel comprises separate items supported above the radiant bed.

13. An open-fronted gas fire according to any one of Claims 10, 11 and 12 wherein the simulated solid fuel includes a piece which extends over the first burner to conceal the burner from view.

14. An open-fronted gas fire according to any preceding claim wherein the first burner comprises a plenum chamber having an upwardly presented mouth, mixing means communicating with the plenum chamber for mixing a flow of gaseous fuel with air, and a flame trap at the mouth through which the gas/air mixture passes.

15. An open-fronted gas fire according to any of claims 1 to 13 wherein the first burner is of a generally flat form mounted horizontally on its one side and having gas/air mixture outlets along a rearwardly facing portion of the burner.

16. An open-fronted gas fire according to any preceding claim wherein the first burner and second burner each have a pilot light and a spark ignitor electrode associated with the pilot light, and valve means is provided which controls the supply of gas to the burners and which is caused to be opened to allow gas to pass to the burners when the pilot light of the second burner is ignited and is caused to be closed when the pilot light of that burner is not ignited.

17. An open-fronted gas fire substantially as described herein with reference to Figures 1, 2 and 3 of the accompanying drawings.

18. An open-fronted gas fire substantially as described herein with reference to Figure 4 of the accompanying drawings.

Published 1958 at The Patent Office, State House, 66/71 High Holborn, London WC1R 4TP. Further copies may be obtained from The Patent Office Sales Branch, St Mary Cray, Orpington, Kent BR5 3RD. Printed by Multiplex techniques ltd. St Mary Cray, Kent. Con. 1/67