Jan. 15, 1952 C. R. BOTTOM 2,582,582

DUAL FUEL JET FOR DUAL FUEL BURNERS

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Fig. 1.

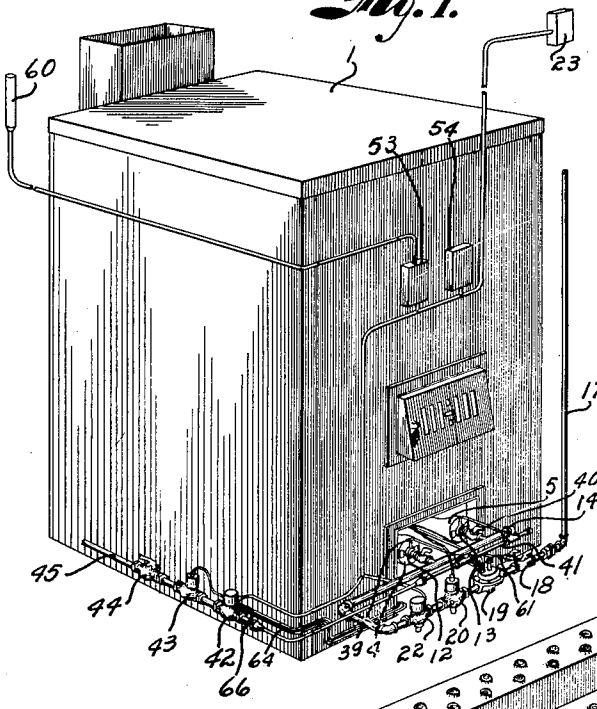


Fig. 2.

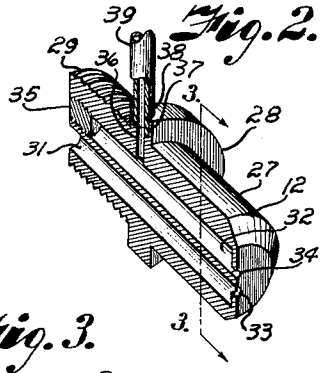


Fig. 3.

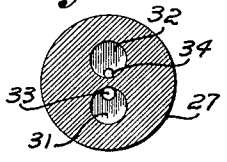
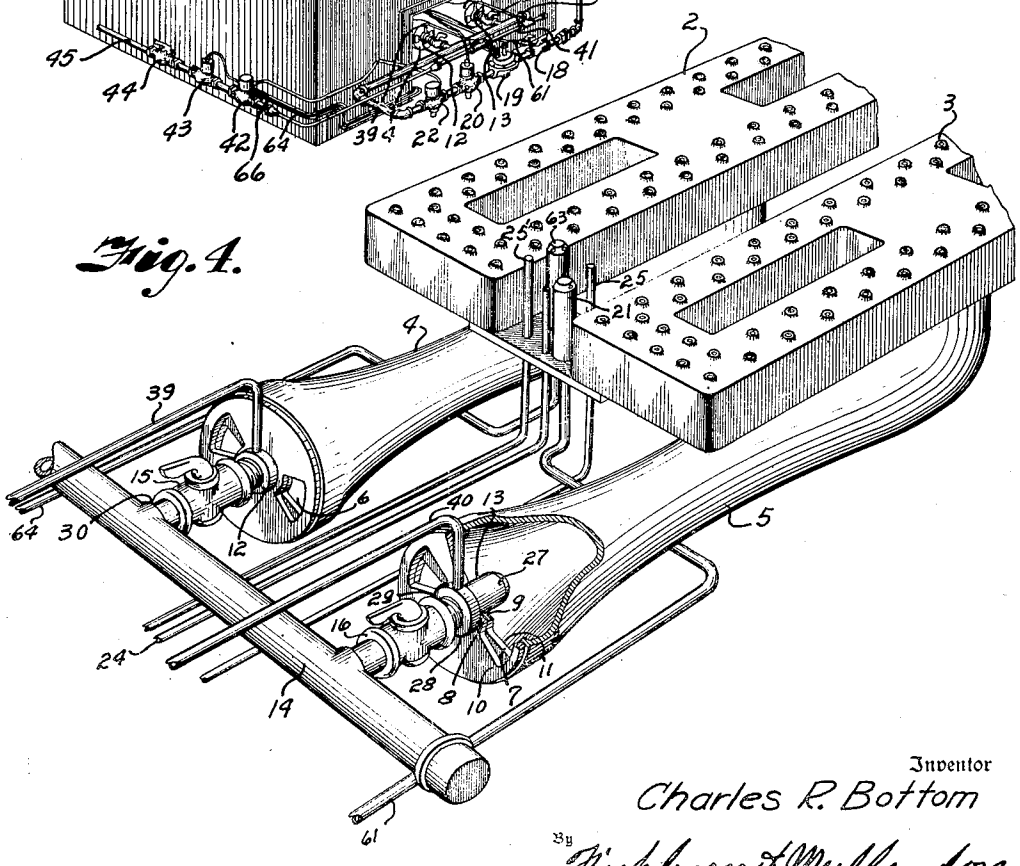


Fig. 4.



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DUAL FUEL JET FOR DUAL FUEL BURNERS

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2 Claims. (Cl. 158—118)

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This invention relates to a dual fuel jet for dual fuel burners of heating equipment and particularly space heaters using gaseous fuel. Natural gas is subject to failure of supply at times when the demand is excessive. Gas companies usually exert every effort to supply customers with gas but their pipe line and storage facilities are limited and on sudden drops in temperature, the storage is not adequate and the gas cannot be transported with sufficient rapidity to meet the increased demand or in case of a prolonged cold spell, the available supply is simply not adequate to meet a continuous excessive demand with the result that the gas burning equipment of many customers is out of service. Such a failure of supply is not only hazardous but results in actual hardship on many of the customers because their heating equipment is not capable of operation on any other fuel. Consequently, the gas companies are endeavoring to avoid such crises by refusing to allow installations of gas burning heating equipment in excess of the equipment that can be safely supplied or they are demanding that new customers provide other fuel facilities when the weather gets below a certain minimum.

It is, therefore, the principal object of the present invention to provide a dual fuel jet for use with an auxiliary or standby fuel supply and a control apparatus therefor which acts in conjunction with a main fuel supply and its control mechanism so that fuel from either source is burned efficiently to maintain the B. t. u. rating of the heating equipment.

It is also an object of the invention to provide each burner of the apparatus with a single jet having dual orifices, one of which is adapted for connection with the main fuel supply without change in the manifold and control apparatus and the other of which is adapted for connection with the auxiliary fuel supply.

In accomplishing these and other objects of the invention, I have provided improved structure, the preferred form of which is illustrated in the accompanying drawings wherein:

Fig. 1 is a perspective view of a gas burning furnace equipped in accordance with the present invention.

Fig. 2 is a perspective sectional view through one of the fuel jets equipped with dual orifices.

Fig. 3 is a cross section through the jet on the line 3—3 of Fig. 2.

Fig. 4 is a perspective view of the burner of the heating unit showing connection of the separate fuel supplies and pilot arrangement.

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Referring more in detail to the drawings:

1 designates a conventional heating unit, for example, a gas burning furnace having a pair of burners 2 and 3 supplied with a combustible mixture through mixing tubes 4 and 5 having shutter-controlled air inlets 6 and 7 for regulating the air supplies admitted to the mixing tubes.

Supported in axial nozzle receiving openings 8 and 9 of air regulating plate 10 and supporting spider 11 at the ends of the mixing tubes are jets 12 and 13 that are connected with a gas manifold 14 through outlet connections that are in coaxial alignment with the nozzle receiving openings 8 and 9 and which, in the illustrated instance, are shut-off valves 15 and 16 whereby either one or both burners 2 and 3 may be operated depending upon the weather. The manifold 14 is connected with a gas supply pipe 17 leading to a gas service line through which a gas is adapted to be supplied. Connected between the pipe 17 and manifold 14 is a manually operated stop valve 18 which is usually closed during the summer season; a pressure regulator 19 which automatically supplies gas to the burners at a predetermined pressure; a pilotstat valve 20 which cuts off the gas supply on failure of a pilot burner 21; and a thermostat controlled valve 22 which is operated by a room thermostat diagrammatically illustrated at 23 (Fig. 1). The pressure regulating valve, as in conventional practice, is vented into the furnace through a tube 24.

The pilotstat is operated by a thermocouple 25 that is supported in position to receive the heat of the pilot so that as long as the pilot is in operation the pilotstat valve is open but should the pilot flame become extinguished the thermocouple will permit closing of the pilotstat and shut off the supply of gas to the burners. The thermostat control valve is operated in accordance with the predetermined room temperature and is opened responsive to the room thermostat when the space to be heated drops below a set temperature to admit gas from the supply pipe to the respective burners. The gas mixes with the air admitted through the inlets 6 to form a combustible mixture which is ignited by the pilot burner 21.

The volume of gas admitted into the burners 2 and 3 is dependent upon the orifices of the jets or nozzles 12 and 13. Consequently, the orifices are of a size to admit the amount of fuel to each burner for maintaining operation of the burners at the B. t. u. rating of the furnace. When determining the proper size orifices, both

the draft and composition of the gas is considered, consequently, the jets are individual to a particular gas supply and the burners will not operate efficiently on a gas fuel having a different composition.

In accordance with the present invention, the conventional jets are removed and special jets are substituted which have corresponding body members having cylindrical nozzles 27 to pass through the openings 8 and 9. Each jet also has an annular collar or flange 28 adapted to support the air regulating plates 10 in position against the inlet ends of the mixing tubes. The body members of the jets are also externally threaded as at 29 to connect with the shutoff valves 15 and 16 if such valves are provided or with the outlets 30 of the manifolds as the case may be. The bodies of the jets or nozzles have dual bores or passages 31 and 32 that open inwardly through the threaded ends of the body members and terminate at the discharge ends of the nozzles in orifices 33 and 34 respectively which orifices are sized according to the composition of the main supply delivered through the pipe 17 and an auxiliary supply respectively. The inlets of the bores or passages 31 are directly connected with the main fuel supply manifold and therefore constitute the gas supplies to the orifices 33 which are sized in accordance with the draft and composition of the main gas supply to maintain the burners under optimum operating efficiency. The other bores or passages 32, however, are closed from the main gas supply by plugs 35 that are threaded into the open ends thereof as shown in Fig. 2. The orifices 31 and 32 are located in an end face portion of the nozzle and are spaced apart with one orifice wholly disposed at one side of the other orifice to connect respectively with the passages 31 and 32 which are arranged in the body members similarly to the orifices.

In order to provide auxiliary fuel to the jet orifices 34, the flanges or collars 28 are provided with radial bores 36 having counterbores 37 into which ends 38 of supply pipes 39 and 40 are inserted in an appropriate manner to provide a seal-tight connection as best shown in Fig. 4 and wherethrough an auxiliary fuel is supplied to the jet orifices 34 to maintain operation of the burners in case of failure of the main fuel supply or when the external temperatures drop to the temperature set by the gas company at which the customer must go off the gas service and connect with the supplementary supply. The jet orifices 34 are, therefore, sized in accordance with the composition of the auxiliary supply and the fixed draft through the furnace which was maintained while burning fuel from the main supply so that the air admitted through the openings 6 and 7 provide a combustible mixture capable of maintaining the burners at substantially the specified B. t. u. rating.

In order that the burners may be automatically operated under the auxiliary fuel supply, the pipes 39 and 40 are connected with the manifold 41 through a thermostat operated valve 42, a pilotstat valve 43, and a shutoff valve 44 with a supply pipe 45 leading to an auxiliary source of fuel supply, for example, a tank containing propane or similar gas that is readily obtainable in bottle form or which may be supplied by delivery trucks. The pilotstat valve 43 is provided with a thermocouple element 25' that is supported in position to receive the heat from the pilot burner 63 to hold the pilotstat valve open as long as the pilot burner is in operation.

The thermostat controlled valve 42 and the main thermostat control valve 22 are suitably connected with the room temperature thermostat, and a transfer switch 53 which is adapted to close circuit from a transformer 54 to one or the other regulating valves 22 or 42. The switch 53 is operated by means of a thermostat element 60 that is located externally of the space to be heated and subject to outside temperatures so that when the outside temperatures drop below the set minimum the switch 53 opens the room thermostat circuit to the thermostatic controlled valve 22 and closes circuit to the control valve 42, thereby shutting off the main fuel supply to the burners and establishing the auxiliary fuel supply. The main pilot burner 21 is supplied through a pipe 61 that is connected with the gas supply as indicated at 62 on the upstream side of the shutoff valve 18 and remains in service to effect ignition of the gas furnished to the burners from either source of supply, however, in case of complete failure of the main gas supply, I prefer to provide a secondary pilot 63 which is located in close proximity to the main pilot 21 which is in position to effect ignition of the fuel discharged from the burners when the auxiliary supply is supplied thereto, the auxiliary pilot burner being furnished with gas from the auxiliary supply through a pipe 64 on the inlet side of the thermostat controlled valve 42.

When the auxiliary pilot burner is utilized, a valve 66 is desirable so as to shut off flow of auxiliary fuel to the auxiliary pilot.

Assuming that the furnace is equipped with a dual fuel supply apparatus as constructed as described, the burners operate on the gas or main fuel supply as long as external temperature is above a predetermined temperature as set by the gas company, the gas being supplied to the manifold through the valve 18, 20, and 22 and pressure regulator 19.

Assuming that the room thermostat 23 is calling for heat, circuit is closed through the switch 53 to effect opening of the valve 22 whereupon gas is delivered to both burners through the jet orifices 33 to form a combustible mixture within the mixing tubes 4 and 5 for discharge through the burner openings. With the pilot 21 in operation, the combustible mixture is ignited and the burners operate to bring the room temperature to the point set by the room termostat whereupon the room thermostat opens the circuit to the valve 22 to suspend flow of fuel to the burner, however, the pilot continues to operate to relight the burners when the room temperature drops below the temperature maintained by the room thermostat. During this operation of the burner, the thermostat valve 42 is out of circuit. Consequently, the valve 42 remains closed to cut off the auxiliary supply to the burner.

In case the external temperature should drop below the minimum temperature as set by the switch 53, the thermostat element 60 operates the switch 53 to connect the room thermostat 23 with the valve 42 and disconect the room thermostat from the valve 22, thereby cutting off the main fuel supply to the burner and establishing connection of the auxiliary supply. When the room thermostat again calls for heat, it operates the valve 42 to open the auxiliary supply to the manifold 41 and auxiliary fuel, for example, propane, is supplied through the pipes 39 and 40 to the orifices 34 so that the auxiliary fuel when mixed with air in the mixing tubes

forms a combustible mixture which when discharged from the orifices of the burners is ignited by the pilot 21, however, if the gas supply should be insufficient to maintain ignition of the pilot 21, the pilot 63 is effective to maintain ignition of the gas supplied to the burner and the burners function on the auxiliary fuel supply in the same manner as they previously functioned on the main fuel supply.

Attention is directed to the fact that the flame from either pilot will hold both pilotstats open.

In case there are no restrictions requiring the customer to change over at a specified low external temperature, the automatic change-over switch may be eliminated and an ordinary manually operated change-over switch may be substituted therefor. Therefore, the customer may change to the auxiliary fuel whenever the main fuel supply becomes too low for satisfactory operation of the furnace.

From the foregoing it is obvious that I have provided a dual fuel jet for use with a conventional gas fuel burner and control apparatus and with a similar control apparatus for an auxiliary gas fuel whereby one or the other gaseous fuels may be economically used in conventional gas burning equipment and the burners thereof operated at their maximum B. t. u. rating on either fuel.

It is also obpious that I have provided an apparatus and dual fuel jet which are readily adapted to existing equipment merely by providing additional controls for the auxiliary fuel and equipping the burners with the dual fuel jets as illustrated and described.

What I claim and desire to secure by Letters Patent is:

1. A dual fuel jet adapted to replace the jet in a gas burning apparatus which includes a burner having a mixing tube provided with a spider having a nozzle receiving opening and a gas supply manifold having an outlet connection in coaxial alignment with said nozzle receiving opening, said dual fuel jet including a one piece body member of generally cylindrical form and having a nozzle portion adapted for insertion in said opening of the spider and having a connection complementary with the connection of said manifold, said nozzle portion having an end face provided with individual orifices for discharge into said mixing tube of the burner and the body member being provided with separate passages respectively connected with the orifices with one of said passages extending

through the body member of said jet to connect with the gas supply manifold, and a radial flange integral with said body member intermediate the nozzle portion and said complementary connection adapted to engage the spider, said collar having a radial passage connected with the other of the first named passages for supplying an auxiliary fuel independently of said gas supply manifold.

2. A dual fuel jet for use in a gas burning apparatus which includes a dual fuel burner having a mixing tube provided with a nozzle receiving opening and a gas supply manifold having an outlet connection in coaxial alignment with said nozzle receiving opening of the mixing tube, said dual fuel jet including a one piece body member of generally cylindrical form having a nozzle for insertion in said nozzle receiving opening of the mixing tube and having a connection substantially coaxial with the nozzle for connection with the outlet connection of the manifold, said nozzle having an end face portion provided with separate orifices with one of said orifices wholly disposed at one side of the other orifice and said one piece body having separate passages arranged similarly to and respectively connected with said orifices, one of said passages extending through the body member connection for supplying fuel from the manifold, said body member having a radial passageway therein intermediate the nozzle and said connection on the body member in connection with the other of said passages and separate from said manifold for supplying a second gaseous fuel to the burner when the jet is in use and a supply duct separate from the manifold and connected with the radial passageway.

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