Sept. 24, 1940. A. SMITH 2,215,983

GAS BURNER

Filed Feb. 18, 1938

Fig. 1.

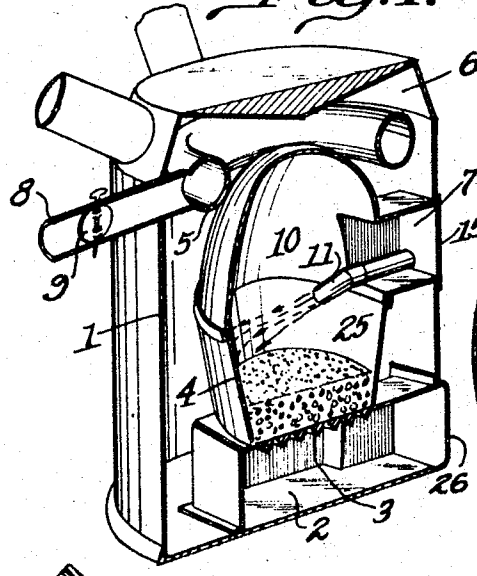
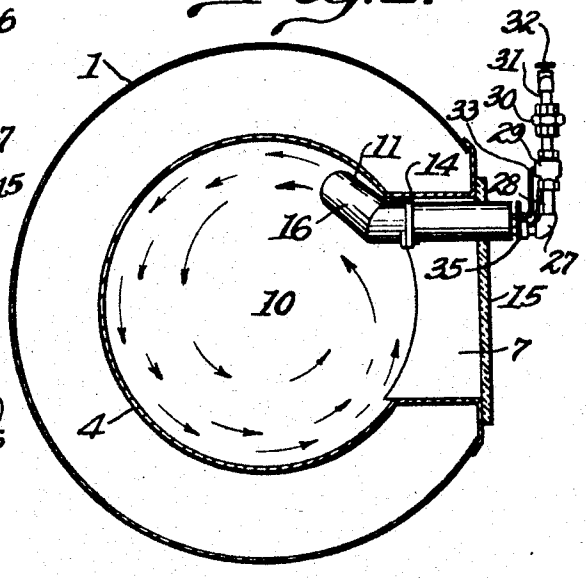


Fig. 2.



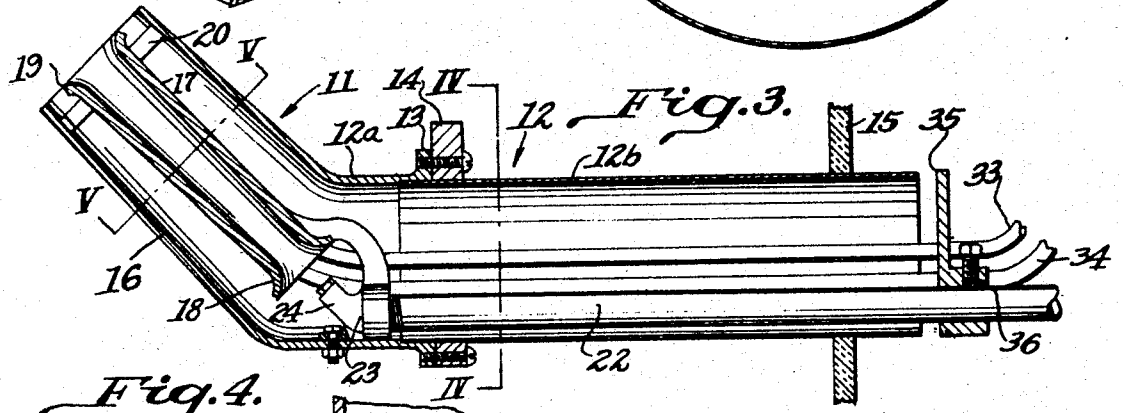


Fig. 3.

Fig. 4.

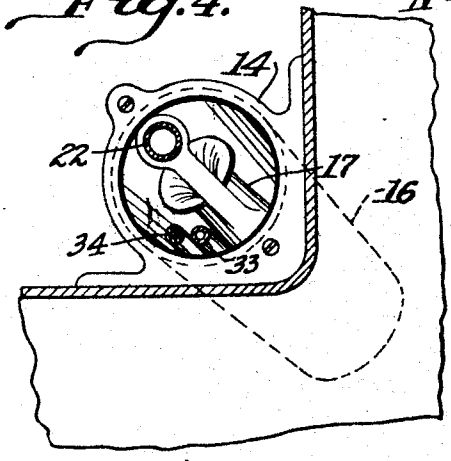
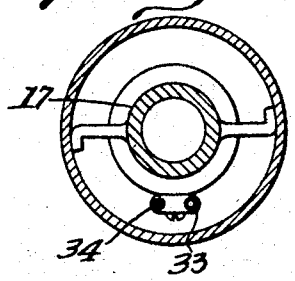


Fig. 5.



Inventor
Auburn Smith

By W. S. McCluer

Attorney

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GAS BURNER

Auburn Smith, Columbus, Ohio

Application February 18, 1938, Serial No. 191,214

1 Claim. (Cl. 158—99)

This invention relates to gas burners and has particular reference to gas burners of the low-pressure jet inspirator type wherein fuel gas, under ordinary main pressure, is the motivating fluid and atmospheric air the induced fluid, the construction of the burner providing automatically for the proper mixing and proportional blending of the fluids comprising the final combustible mixture.

An outstanding object of the present invention resides in the provision of a simple and efficient gas burner primarily constructed and adapted for use in ordinary coal burning furnaces of the type widely employed in connection with residence heating systems.

The convenience and usefulness of fuel gas as a heat source in the operation of house heating systems are well recognized. However, in most localities, the relative higher cost of fuel gas in comparison with solid fuels, such as coal or coke, militates against its general use. Therefore, during cold winter periods, when fuel demand is heavy, it is considered desirable by many to burn the more economical solid fuels, but during periods of milder temperature, when solid fuel fires are difficult and troublesome to maintain, it is quite desirable to use gas as the source of heat. Hitherto, this selected and seasonal use of gaseous and solid fuels has been accomplished by the employment of either separately constructed furnaces or by means of combination units having spaced combustion chambers specifically adapted and constructed for the fuels burned therein. Such equipment, however, is too costly to admit of popular use thereof, since installation expenses are high and, moreover, a considerable amount of floor space is required which, quite often, is not readily available.

It is, therefore, one of the main objects of the present invention to provide an improved gas burner of sturdy, simple and economical construction which may be readily installed in or removed from the fuel burning chamber of an ordinary coal furnace, this being accomplished without involving any material change or alteration in the constructional features of the furnace so that, in a minimum of time and at low expense, such a furnace may be conveniently adapted for the efficient burning of either coal or gas.

Another object of the invention resides in the provision of an auxiliary gas burner for coal furnaces so constructed and mounted in the interior of the furnace as to cause circular or swirling impingement of the flames issuing from the outlet of the burner against the inner surfaces of the furnace fuel bowl, whereby to quickly and economically raise the temperature of the heat transferring surfaces of the furnace through direct and prolonged contact of the gas burner flames therewith.

A still further object resides in a gas burner having a wide combustion range and one which is not likely to back-fire even though the fuel pressure may be reduced to a minimum, to the end of providing a burner which may be safely used and operated in the heating system of an ordinary residence without requiring undue attention or the services of a skilled operator.

Further objects and advantages will become apparent as the description proceeds.

In the accompanying drawing:

Fig. 1 is a sectional perspective view taken through an ordinary coal burning furnace and disclosing the operating position of the auxiliary gas burner comprising the present invention therein; Fig. 2 is a horizontal sectional view taken through the furnace in the plane of its fuel admitting door opening and disclosing in plan my improved gas burner in its operating position in relation to the walls of the furnace fuel bowl;

Fig. 3 is a horizontal sectional view taken through my improved gas burner.

Fig. 4 is a transverse sectional view, the plane of which being indicated by the line IV—IV of Fig. 3;

Fig. 5 is a similar view on the line V—V of Fig. 3.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawing and will herein describe in detail the preferred embodiment thereof, but it is to be understood that I do not thereby intend to limit the invention to the embodiment disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Referring more particularly to the drawing, the numeral 1 designates the outer casing of an ordinary hand-fired coal burning furnace. Provided within the casing is the usual ash pit 2, grates 3, a fuel receiving bowl 4, smoke ring 5 and a plenum chamber 6. Normally solid fuels are introduced into the bowl 4 and are deposited on the grates 3 by being manually introduced into the furnace through the fuel admitting

opening 7, the front of the latter being normally closed by a removable door, not shown. The smoke ring 5 communicates with a flue 8 leading to a chimney or other point of smoke outlet, the flue being provided with the customary damper valve 9, which may be set to obtain desired draft conditions within the combustion chamber 10 of the furnace, formed by the bowl 4.

The gas burner 11, comprising the present invention, has been particularly designed for use as an auxiliary heat-producing means in a standard coal burning furnace of the type set forth, in order that such a furnace may be conveniently and economically operated, especially during periods of relatively low fuel demand. In the specific form of the burner illustrated, the same comprises an air supplying duct 12, which preferably consists of inner and outer sections 12a and 12b, respectively, secured together as at 13, to form a continuous conduit of substantially uniform diameter throughout its length and open at both ends. The duct, as shown, is adapted to be positioned in the fuel admitting opening 7 of the furnace and preferably to one side thereof. In this instance, the exterior of the duct is equipped with a bracket 14 by which the duct may be conveniently positioned in one of the lower corners of the transversely rectangular opening 7.

With the burner occupying the position disclosed in the drawing, the ordinary outer door or closure of the opening 7 is removed from the furnace casing, and a sheet or panel 15 of asbestos or other heat insulating material substituted therefor by which the front of the opening 7 is closed. The sheet or panel 15 is formed with an opening of sufficient diameter to receive the outwardly projecting end of the duct 12, as disclosed in Fig. 2.

The inner section 12a of the duct is disposed substantially within the confines of the combustion chamber 10 and is formed with an angularly and downwardly directed burner extension 16, which lies closely adjacent to the inner wall of the bowl 4. The extension 16 has its longitudinal axis disposed at an angle of approximately 45 degrees to the longitudinal axis of the main body portion of the duct occupying and extending through the furnace opening 7. The side walls of the extension converge slightly toward the inner end to provide a somewhat restricted outlet.

Disposed axially within the angularly extending portion 16 of the duct is an elongated mixer tube 17 of suitable form. In the present instance, the tube 17 is provided with an inwardly flaring passage of progressively increasing diameter toward the outlet end of the burner. The inlet end of the tube is smoothly rounded on a relatively large radius, as indicated at 18, while the outlet or discharge end of the tube is smoothly rounded on a relatively smaller radius, as indicated at 19. Open webs or spiders 20 are disposed in the angular extension 16 of the duct in order to effect the axial support of the tube 17 within the angular extension of the duct, and with the outer walls of said tube spaced from the inner adjacent walls of the extension 16 to provide an annular and open-ended air space 21 for the travel of air through the extension 16 around or exteriorly of the tube 17.

Extending longitudinally of the main body portion of the duct is a gas supply pipe 22, which has its inner end threaded to receive a jet nozzle 23, the latter being formed with an angular head 24 which is disposed in spaced relation from the inner end 18 of the tube 17 but in axial alignment therewith. It will be understood that the outer end of the head 24 may be provided with one or more restricted orifices for the discharge of a hydrocarbon fuel gas under city main pressure in the form of one or more inspirating jets.

In the operation of the burner, atmospheric air enters the open outer end of the duct 12, which projects beyond the confines of the casing 1. Gas under suitable pressure issues from the orifice or orifices formed in the head 24 and passes under relatively high velocity into the enlarged inlet end of the mixing tube 17. An inspirator action is thus set up by which a certain amount of primary air obtained from the interior of the duct is drawn into the tube 17 with the gas stream passing therethrough so that a primary fuel mixture, composed of fuel gas and a limited amount of air, is produced in the tube 17. Ordinarily this mixture does not burn in said tube because of its velocity of travel and the limited amount of atmospheric oxygen contained therein. Final combustion, however, is obtained by the secondary air, discharged from the angular extension 16 of the duct, combining with the primary mixture and with such oxygen that may exist in the atmosphere of the chamber 10. Combustion of the final fuel mixture, however, takes place following discharge of the gaseous fluids forming the mixture from the angularly directed portion of the duct.

The combustion flames are so directed as to impinge the inner surfaces of the bowl 4 and travel in a generally circular path around the bowl, as disclosed by the arrows in Fig. 2. The flame is directed generally downwardly in the bowl by reason of the angular disposition of the burner head. Preferably, a bed of ashes, as indicated at 25, is maintained on the grates 3 in order to better regulate draft conditions within the combustion chamber of the furnace. In the operation of the burner, the ash pit door 26 of the furnace and its associated draft controls are kept closed.

Due to the angularity of the burner head and its position within the chamber 10, prolonged flame travel is obtained due to the swirl of the flame in the bottom of the chamber 10. Also, improved heat transfer is secured due to the wiping action of the hot gases of combustion directly contacting with the walls of the bowl 4. The walls of said bowl are uniformly heated by reason of the spinning motion of the burner flames and there exists ordinarily but an immaterial differential between the temperature of the bowl wall more closely adjacent the outlet of the burner and the wall on the opposite side of the bowl as regards said burner. Excess pressures within the chamber 10, which may exist at the time the operation of the burner is commenced, find ready relief through the duct 12, without interfering with sustained combustion occurring at the outlet of the burner head within the chamber 10. The end of the gas supply pipe 22 disposed exteriorly of the furnace casing terminates in an elbow 27 and is united with a short pipe extension 28 in which may be arranged a thermostatically controlled valve 29. The extension 28, beyond the valve 29 is joined with a removable coupling 30 carried by a stationary gas supply pipe 31. In the pipe 31, there may be arranged a control valve 32, either manually or automatically regulated, to govern the delivery of fuel gas to the burner. Also, a pilot line 33 leads from

the pipe extension 28 to the head of the burner, so that a constant supply of gas for pilot purposes may be provided at the head of the burner to insure continuity of operation.

A thermostat element 34, governing the operation of the valve 29, is disposed in or contiguous to the pilot flame so that if the latter should become extinguished, the valve 29 will be closed to prevent the accumulation of unburned fuel gases in the chamber 10. The flow of air into the outer end of the duct 12 may be controlled in volume by the inclusion of an adjustable shutter 35 which is mounted for movement toward and away from the open outer end of the duct. The adjusted positions of the shutter may be maintained by the use of a set screw 36.

To install the gas burner comprising the present invention in a coal burning furnace of the type set forth, it is merely necessary to remove the usual door closing the fuel admitting opening 7. This may be readily accomplished by taking the door off its hinged mountings. The gas burner is then positioned in said opening and in the furnace as disclosed in Fig. 2 and the asbestos plate or panel 15 applied to seal the entrance to the opening 7. The gas supply pipes 22 and 28 form constituent parts of the burner assembly and it is therefore merely necessary to operate the coupling 30 to unite these pipes with the stationary gas pipe 31 to complete the installation. Similar convenience is of course obtainable in the matter of removing the burner from the furnace. Usually with the gas supply pipe 31 in position, it is only a matter of a few minutes time to either make or remove the installation.

What is claimed is:

In apparatus for firing a house-heating furnace with fuel gas instead of solid fuel, the furnace having a firepot and a firedoor opening; the combination of an air supply conduit extending through said firedoor opening and terminating adjacent said firepot, an air nozzle extending toward the firepot from said conduit and forming in effect a continuation of the latter for supplying secondary air, a mixing tube interiorly of said air nozzle arranged to discharge a mixture into said firepot, a gas supply pipe within said conduit, terminating adjacent said air nozzle and arranged to direct fuel gas into said mixing tube, and means sealing the conduit and firedoor against inflow of air therebetween; whereby to induce primary air from said conduit into said mixing tube to provide a combustible mixture issuing from the outer end of the tube, and to direct secondary air from said conduit through said air nozzle adjacent the outlet of the mixing tube.

AUBURN SMITH.