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W. M. HEPBURN

2,015,934

GAS BURNER

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2 Sheets-Sheet 2

Fig. 4.

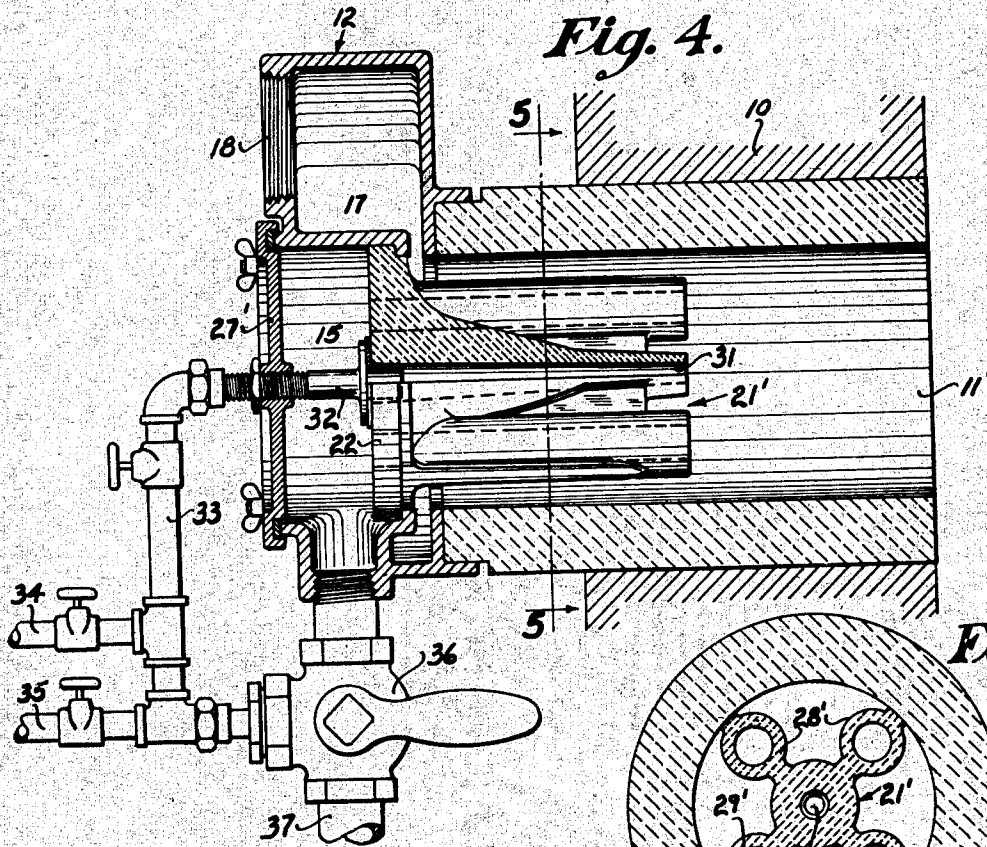


Fig. 5.

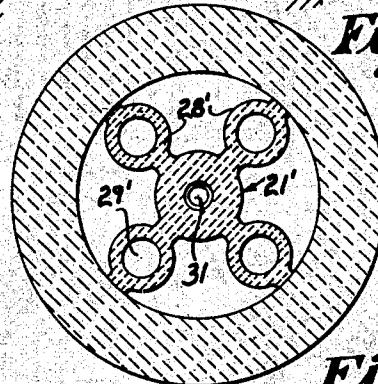


Fig. 6.

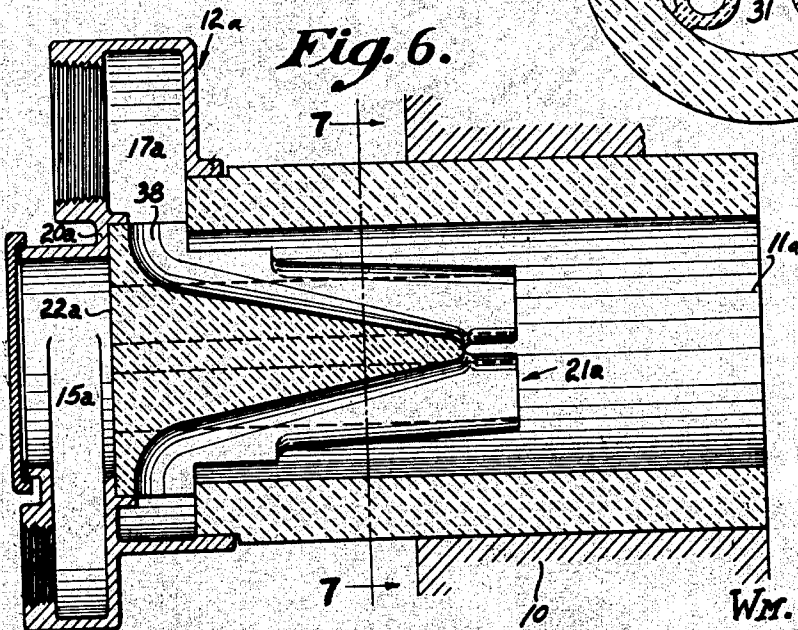
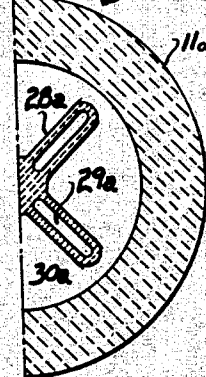


Fig. 7.



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GAS BURNER

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9 Claims. (Cl. 158—99)

In heating operations conducted in a fuel fired furnace, it is sometimes desirable to produce a relatively long and at other times a relatively short flame.

The present invention, therefore, has for its object to provide a gas burner which may be operated to produce either a relatively long or a relatively short flame depending upon requirements and withal to provide a gas burner which shall be simple in construction and otherwise well adapted for its intended purpose.

The various features of novelty and invention will appear from the detailed description taken in connection with the accompanying drawings forming part of this specification and wherein,—

Fig. 1 is a longitudinal sectional view through the improved burner, a portion of the wall of the furnace to be fired being also shown;

Fig. 2 is a half elevational and half sectional view, the view being taken on line 2—2 of Fig. 1;

Fig. 3 is a section on line 3—3 of Fig. 1;

Fig. 4 is a longitudinal sectional view of a modified form of the invention;

Fig. 5 is a cross section on line 5—5 of Fig. 4;

Fig. 6 is a longitudinal sectional view of still another modified form of the invention, and

Fig. 7 is a half sectional view on line 7—7 of Fig. 6.

Referring first to the embodiment of the invention shown in Figs. 1 to 3, 10 indicates a portion of the wall of the furnace to be fired, the wall being apertured to receive an apertured refractory body or tunnel 11 forming part of the burner construction. At one end of the tunnel is a chambered casing generally indicated at 12. This casing has a side wall 13 provided with an annular flange 14 which cooperates with the adjacent end of the tunnel for maintaining the tunnel and casing in alignment. Formed in the casing 12 is a gas chamber 15 having an inlet 16 and an air chamber 17 having an inlet 18. The chamber 17 is in direct communication with the tunnel 11 by way of a passage 19 formed between the inner side of the wall 13 and an annular flange 20 at one end of the chamber 15.

Generally indicated at 21 is an elongate refractory body having a circular head 22 which forms a closure for one side of the chamber 15, the head having a rim 23 which cooperates with the flange 20 to hold the body in axial alignment with the tunnel 11. For more securely holding the rim 23 and the flange 20 in abutting relation, there may be provided a spring-pressed post 24, spring 25 of which is contained within a housing 26 secured to a cover plate 27 forming

a closure for the outer end of the gas chamber 15. As shown in Fig. 1, the body 21 is readily removable and replaceable through the chamber 15 by removal of the cover plate 27.

The body 21 is provided with radial walls 28 which project into the tunnel 11, and by virtue of these radial walls is star-shaped in cross-section, as appears in Figs. 3, 5, and 7. These walls are individually channelled as indicated at 29, the channels extending through the head 22 of the body. From this it will be seen that gas will flow into the tunnel 11 by way of the channels 29 and that air will flow thereinto by way of the longitudinally extending substantially sector-shaped passages 30 formed between the adjacent walls 28. The walls 28 are of substantial length and hence tend to cause the air from the chamber 17 to flow straightforwardly into the tunnel 11 and the channels 29 in said walls likewise tend to cause the gas from the chamber 15 to flow straightforwardly and in like-directed course into the tunnel.

The air and gas will be supplied to their respective chambers 17 and 15 at relatively low and preferably equal pressures whereby to reduce turbulence to a minimum in the composite stream of air and gas flowing from the tunnel 11. Intermixing of the air and gas in such stream will therefore proceed relatively slowly and the resulting flames of combustion will be luminous.

Other things being equal, the length of the flame will depend upon the thickness of the streams of fuel gas flowing into the tunnel 11. In Fig. 3, the channels 29 are shown as of slot type. The gas issuing from these channels will, therefore, be in streams which are flat and hence the time interval required for interdiffusion of the adjacent streams of air and gas will be relatively short. By making the gas channels circular in cross section as in Fig. 5, the time interval required for complete interdiffusion is materially increased and hence the length of the flame will be materially increased.

There may be times when it is desirable to materially shorten the length of flame without disturbing the governing apparatus (not shown) which controls the admission of air and gas to the chambers 17 and 15, respectively. In Fig. 4, I have shown a simple and practical way of accomplishing this result. In Fig. 4, the body which corresponds to the body 21 in Fig. 1 is indicated at 21'. This body in addition to being provided with channels 29' in the radial walls 28' is also provided with a longitudinally extend-

ing axial channel 31. The channels 29' are shown as circular in cross section, but this circularity is of no particular significance insofar as the central channel 31 is concerned.

5 The central channel 31 is in direct communication with a tubular fitting 32 to which is connected a pipe 33 to which either gas or air may be supplied by the supply pipes 34 and 35, respectively. By discharging a relatively high velocity stream of gas or air or a mixture of air and gas from the channel 31, the otherwise substantially non-turbulent composite stream of air and gas flowing from the tunnel 11' can be made turbulent with consequent more rapid mixing of the air and gas; this rapid mixing resulting in a relatively short flame as will be readily understood.

The arrangement shown in Fig. 4 also permits the composition or quality of the resulting gases of combustion to be readily controlled. Thus assuming that the air and gas flowing from their respective chambers 17 and 15 are in such proportions that the gas is provided with its full complement of air for complete combustion, then by discharging gas from the channel 31 the resultant products of combustion will contain unburned fuel and therefore be "reducing" in character as that term is commonly understood in heat-treating operations involving controlled atmospheres.

The main gas supply pipe for the chamber 15 is indicated at 37, the same being provided with a control valve 36. The air pipe 35 in addition to being utilized for supplying air to the pipe 33 may be utilized for adding air to the gas flowing to the chamber 15. To this end the pipe 35 may be extended to the main gas valve 36, the latter being of such construction that without shutting off the gas it may be operated to allow both air and gas to flow to the said chamber 15.

In Fig. 4, the tunnel 11' is shown as of a length to extend beyond the outer face of the furnace wall 10 and the casing 12 as being disconnected from such wall but these are immaterial details of construction as will be readily appreciated.

The construction shown in Fig. 6 corresponds to that in Fig. 1 in that the body 21a, like the body 21 in Fig. 1, is provided with radial walls 28a having individual channels 29a therein which extend through the head 22a of said body, the head forming a closure for one side of a gas chamber 15a formed in the casing 12a and the spaces 30a formed between the radial walls 28a being in communication with the air chamber 17a in said casing. However, in Fig. 6, the rim of the head 22a is confined between a shoulder 20a and the adjacent end of the tunnel 11a, the head having circumferentially extending passages 38 which are in direct communication with or form the beginning of the spaces 30a between the radial walls 28a.

Another distinction is that whereas in Fig. 1 the walls 28 are of substantially the same cross sectional area throughout their lengths, in Fig. 6 (and this also applies to the walls 28' in Fig. 4) the sides of the respective walls 28a are not in parallelism with channels in the walls but are at an angle with respect thereto as clearly shown in Fig. 6. In other words the space 30a between adjacent walls 28a gradually increases in cross sectional area from the head of the body 21a towards the discharge end thereof. Such construction is conducive to stream line flow of air

from the chamber 17a and withal provides a body of great strength.

What I claim is:

1. A gas burner comprising in combination, an elongate body provided with walls radiating therefrom and extending longitudinally thereof and having a head at one end, a gas chamber wherein said head is positioned and for one end of which the head forms a closure, a tunnel whereinto said body projects, an air chamber in direct communication with the spaces between said walls, and channels extending lengthwise of said body through said walls and head and constituting straight away ducts for gas.

2. A gas burner comprising in combination, an elongate body provided with radial and longitudinally extending walls and with a head at one end, the spaces between the walls being of increasing depth from their inception adjacent the head toward the opposite end, a gas chamber for one end of which the head forms a closure, a tunnel wherein said body projects, the spaces between the radial walls of said body being accessible at their shallow ends when the parts are assembled to the ingress of air, the said body being provided with gas passageways extending from end to end, through the head and the radial walls thereof.

3. A gas burner comprising in combination, an elongate body provided with radial and longitudinally extending walls and with a head at one end, a gas chamber for one end of which the head forms a closure, a tunnel whereinto said body projects, the spaces between the radial walls of said body being accessible at the ends adjacent the head, when the parts are assembled, to the ingress of air, channels extending lengthwise of said body through the head and through the radial walls thereof and constituting straightaway ducts for gas, a channel extending axially through said body, and a source of gaseous fluid in communication with such axial channel.

4. A gas burner comprising in combination, an elongate refractory body provided with walls radiating therefrom and extending longitudinally thereof and having a head at one end, a gas chamber for one end of which said head forms a closure, a tunnel whereinto said body projects, an air chamber in direct communication with the spaces between said walls, and channels extending lengthwise of said body through said walls and head and constituting straight-away ducts for gas.

5. A gas burner comprising, in combination, an elongate body provided with radial and longitudinally extending walls and with a head at one end and being provided with gas passages extending from end to end through the head and the radial walls thereof, walls cooperating with said head to form a gas-supply chamber in direct communication with said passages, a tunnel whereinto said body projects, and means for delivering air to said tunnel by way of the spaces between the radial walls of said body.

6. A gas burner comprising, in combination, an elongate body provided with radial and longitudinally extending walls and with a head at one end and being provided with gas passages extending from end to end through the head and the radial walls thereof, a tunnel whereinto said body projects, means cooperating with said head and one end of said tunnel to form an air supply chamber in direct communication with the spaces between the radial walls of said body, and means

for delivering fuel gas to said passages for flow into said tunnel.

7. A gas burner comprising, in combination, an elongate body provided with radial and longitudinally extending walls and with a head at one end and being provided with gas passages extending from end to end through the head and the radial walls thereof, an air-supply chamber in direct communication with the spaces between the radial walls of said body, a gas-supply chamber in direct communication with said gas passages, said body being provided with a central channel, and means coupled to one end of said channel for delivering gaseous medium thereto for discharge into said tunnel.

8. An article of manufacture for a gas burner comprising an elongate body provided with radially extending walls and with a head at one end of said walls and being further provided with separate and distinct passages which extend through the body from end to end by way of said walls.

9. An article of manufacture for a gas burner comprising an elongate body provided with radially extending walls and with a head at one end of said walls and being further provided with separate and distinct passages which extend through the body from end to end by way of said walls, said passages being of slot type.

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