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GAS BURNER AND MIXING TUBE CONSTRUCTION

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Fig. 2.

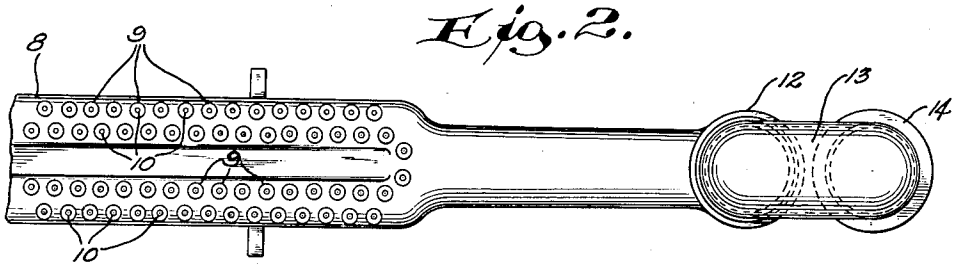



Fig. 3.

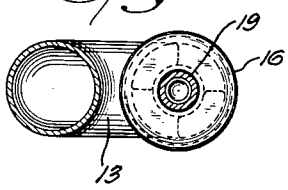
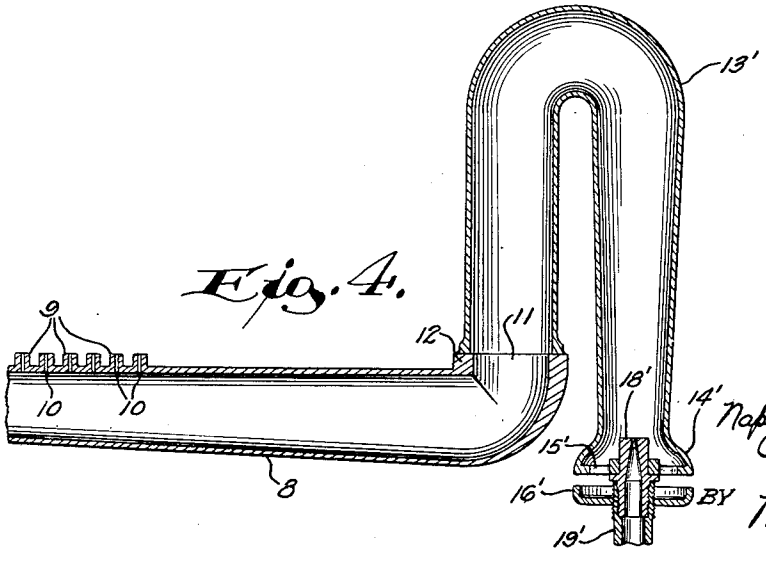



Fig. 1.




Fig. 4.

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## GAS BURNER AND MIXING TUBE CONSTRUCTION

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5 Claims. (Cl. 158—99)

1

This invention relates to improvements in gas burner and mixing tube constructions.

A general object of the invention is to provide an improved gas burner and mixing tube so constructed as to eliminate extinction noise and "flashback" characteristics.

In connection with the operation of gas burners having conventional mixing tubes associated therewith, considerable difficulty has been experienced when burning gas with high ignition velocity characteristics. A very pronounced objection has been the extinction noise and "flashback" characteristics common to the operation of gas burners formed with conventional mixing tubes. It is the theory that in such structures the extinction noise and "flashback" characteristics are caused by the following conditions: When the supply of gas to the burner is shut off, there is, of course, residual gas in the piping between the shut-off valve and the burner ports or orifices. Upon the closing of the gas supply shut-off valve, the quantity of gas within the device and reaching the burner ports is gradually reduced. Consequently, there is less energy in the gas streams leaving the burner ports and the quantity of primary air within the mechanism is consequently reduced. However, the ratio of primary air to gas greatly increases. Up to a definite ratio of primary air to gas, the ignition velocity of the combustible mixture increases and a situation attains wherein after the gas supply shut-off valve to the mixing tube is closed, the ignition velocity increases until it is greater than the velocity of the primary air-gas mixture in the burner ports. At such time the flame will travel back or recede through the burner ports into the burner head and will ignite the primary air-gas mixture therein. If there is a sufficient volume of the combustible mixture within the mechanism, an explosion or extinction noise results.

With the foregoing explanation in mind, the present invention aims at eliminating objectionable explosions and extinction noises inherent to the operation of conventional gas burner mechanisms by providing a gas burner and mixing tube construction wherein the mixing tube communicating with the burner head takes the form of an upwardly projecting elbow or trap having a substantial conduit portion thereof above the level of the burner ports. Inasmuch as the air-gas mixture within the burner head has a specific gravity less than that of air, with the improved upwardly extending trap-like construction of the mixing tube, after the gas supply valve has been shut off, the air-gas mixture in the burner head tends to rise to the highest point in the trap-like

2

portion of the mixing tube. Such trapped air-gas mixture within the elevated portion of the mixing tube then tends to block or counteract the normal flow of air admitted through the air valve in the mixing tube, and by blocking the flow of additional air, the flashback or extinction noise tendency of the burner is overcome.

A more specific object of the invention is to provide a gas burner and mixing tube construction wherein the mixing tube is in the form of an upwardly projecting trap and having located therein at a common point the air and gas inlets.

A further object of the invention is to provide a gas burner and mixing tube construction wherein the mixing tube has a portion of substantial length at an elevation above the elevation of the burner gas ports to receive a light air-gas mixture, with such portion of the mixing tube being interposed between the air and gas inlets and the burner ports.

A further object of the invention is to provide a gas burner and mixing tube construction of such a formation that the primary air and/or the primary air-gas mixture must travel upwardly and then downwardly before reaching the burner head with the uppermost point of flow being substantially above the plane of the burner ports.

A further object of the invention is to provide a gas burner and mixing tube construction which is very simple, is easy to install, service and regulate, is relatively inexpensive, and is well adapted for the purposes described.

With the above and other objects in view, the invention consists of the improved gas burner and mixing tube construction and its parts and combinations as set forth in the claims, and all equivalents thereof.

In the accompanying drawing in which the same reference characters indicate the same parts in all of the views:

Fig. 1 is a longitudinal vertical sectional view of the improved gas burner and mixing tube construction with an outer end portion of the burner head being broken away;

Fig. 2 is a plan view of the showing in Fig. 1;

Fig. 3 is a sectional view taken on line 3—3 of Fig. 1, and

Fig. 4 is an enlarged fragmentary longitudinal sectional view of a gas burner and mixing tube construction illustrating a slight modification of the invention.

Referring now more particularly to the drawing, it will be observed that a hollow burner is indicated generally by the numeral 8. In a top wall portion of a longitudinal extent of the

burner head there are a plurality of burner port stools 9 with drilled gas ports or orifices 10 therethrough. The particular type of gas port referred to is merely by way of illustration and the burner head may, within the purport of the invention, be formed with any conventional type of gas port. The inner end of the burner head 8 is curved upwardly and the gas entrance 11 therein is surrounded by an annular shoulder 12 adapted to have seated thereon the adjacent end of a mixing tube, indicated generally by the numeral 13. The end portion of the mixing tube 13 referred to, is securely connected to the shoulder 11 of the burner head and is provided with any suitable form of gas tight joint.

The mixing tube 13 is in the form of an elbow or trap having a vertical portion extending substantially upwardly from the burner head at an elevation considerably above the plane of the burner gas ports 10. The mixing tube 13 is then curved downwardly, and in the form of the invention disclosed in Figs. 1, 2 and 3 its outer end terminates in a flared portion 14 having an opening therein in a horizontal plane above the plane of the gas burner ports 10. Within said flared end of the mixing tube are spaced webs 15 adapted to cooperate with an air shutter 16 and which carry a central boss 17 having secured through the opening therein a gas orifice nipple 18 whose threaded depending extremity receives the end of a gas supply pipe 19. The adjustable air shutter 16 may be movably associated with the flared end of the mixing tube 13 in any desired manner, and one convenient mode of connection is that illustrated wherein the shutter 16 is adjustably threaded onto the threaded inner end of the gas supply pipe 19 whereby it may be turned into and out of selected proximity to the open end of the mixing tube and the webs 15 therein.

In the form of mixing tube illustrated in Figs. 1, 2 and 3, it is apparent that the outer end of the mixing tube terminates in a horizontal plane slightly above the plane of the gas ports 10 in the burner head and said end of the mixing tube forms a common inlet for primary air and gas. The air-gas mixture is caused to flow first upwardly in the elbow-like mixing tube 13 and then downwardly to the burner head and longitudinally through the interior of the burner head, being exhausted through the gas ports 10 where ignition takes place.

If, as is conventional in the operation of a gas burner, an automatic shut-off valve (not shown) terminates gas flow from the gas supply pipe 19 into the mixing tube 13, a condition exists where only primary air enters the mixing tube and thus dilutes the air-gas mixture within the apparatus. For a time this residual combustible fluid mixture within the system will flow to and through the burner ports 10 but eventually a condition will attain wherein the ignition velocity is greater than the velocity of the air-gas mixture in the burner ports. The tendency would then be for the flame to travel back into the burner head and ignite the primary air-gas mixture therein, resulting in a "flashback" or extinction noise. By virtue of the improved mixing tube 13 in association with the burner head 8, this contingency is prevented because the air-gas mixture in the burner head is lighter than air and consequently flows back in the burner head and rises in the upright portion of the mixing tube 13, the latter having an elevation in excess of that of the burner ports. This light



air-gas mixture, extending up to the highest point of the mixing tube 13, and being interposed between the primary air inlet end 14 of the mixing tube and the gas orifices 10 blocks the normal flow of primary air admitted into the mixing tube.

A slight modification of the invention is illustrated in Fig. 4 wherein the downturned outer extent of the mixing tube 13' terminates in a flared portion 14' which is below the level of the gas ports 10 in the burner head. In this modification the flared portion 14' of the mixing tube carries a gas orifice nipple 18' with attached gas inlet pipe 19' and air shutter 16' in the same manner as in the principal form of the invention.

In both forms of the invention the primary air inlet and the gas inlet or supply are common to the outer extremity of the mixing tube and at a level considerably below the peak of the mixing tube. Consequently, the mixing tube is designed to establish therein, under certain conditions, a column of air-gas mixture interposed between the primary air and gas inlets and the burner ports.

From the foregoing description, it will appear that the improved gas burner and mixing tube construction is simple and novel and is well adapted for the purposes described.

What is claimed as the invention is:

1. In a gas burner construction, a hollow elongated burner head formed with burner ports in the top portion thereof, a mixing tube connected to the burner head at substantially a right angle to the axial line of the burner head and having first and second vertical legs joined by a bight portion, said mixing tube legs extending substantially above the plane of the burner ports, the lower end of said second leg of the mixing tube having a fluid outlet in communication with the interior of the burner head below said bight portion, and means entering a lower portion of the first leg of the mixing tube substantially below said bight portion for admitting primary air and gas whereby the gas-air mixture must flow into said first leg portion and then downwardly through said second leg portion of the mixing tube at right angles to the axial line of the burner head before entering the latter.

2. In a gas burner construction, a hollow elongated horizontally disposed burner head formed with burner ports in its top portion, a vertically directed elbow-shaped mixing tube having first and second vertical legs joined by a bight portion, said mixing tube legs extending substantially above the plane of the burner ports, the lower end of said second leg having a fluid outlet in communication with the interior of the burner head below said bight portion, and means for admitting primary air and gas into a lower portion of the first leg of the mixing tube substantially below said bight portion in a direction parallel to the direction of air and gas flow through the burner ports.

3. In a gas burner construction, a hollow elongated horizontally disposed burner head formed with burner ports in its top portion, a vertically directed elbow-shaped mixing tube projecting substantially above the plane of the burner ports and having first and second vertical legs joined by a bight portion, the lower end of said second leg having a fluid connection with the interior of the burner head below said bight portion, substantial extents of the first and second legs of the mixing tube having their axial lines extend-

ing vertically a substantial distance above the plane of the burner ports, and means entering the lower extremity of the first leg of the mixing tube substantially below said bight portion for admitting primary air and gas.

4. In a gas burner construction, a hollow elongated horizontally disposed burner head formed with burner ports in its top portion, a vertically directed elbow-shaped mixing tube having first and second vertical legs joined by a bight portion with said mixing tube legs extending substantially above the plane of the burner ports, the lower end of said second leg substantially below said bight portion being connected to the burner head and in communication with the interior thereof, and means for admitting primary air and gas into said first leg of the mixing tube substantially below said bight portion but at an elevation substantially above the plane of the burner ports and in a direction parallel with flow through said burner ports.

5. In a gas burner construction, a hollow elongated horizontally disposed burner head formed with burner ports in its top portion, a vertically directed elbow-shaped mixing tube having first and second vertical legs joined by a bight portion with said mixing tube legs extending substantially above the plane of the burner ports, the lower end of the second leg of the mixing tube, substantially below the bight portion, being connected to the burner head and in communication with the interior thereof, and means for admitting primary air and gas into a lower portion of the first leg of the mixing tube below said bight portion and at an elevation substantially below the plane of the burner ports and in a direction parallel with flow through the burner ports.



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