March 3, 1931. C. J. SCHIFFERLE 1,794,869

GAS BURNER

Filed Aug. 9, 1930

Fig. 1

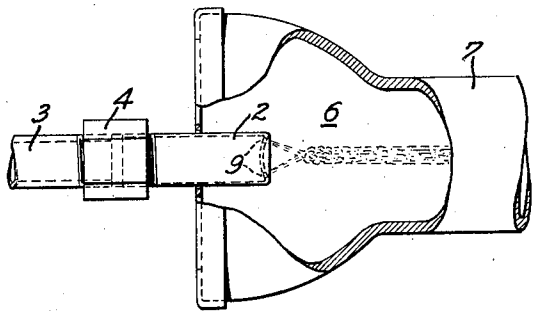


Fig. 4

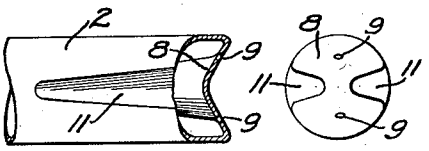


Fig. 5

Fig. 2

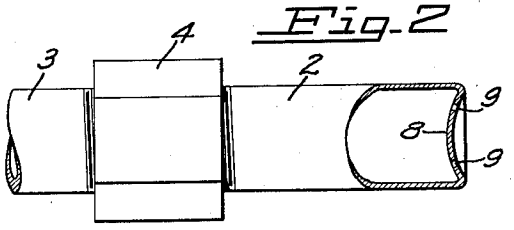


Fig. 3

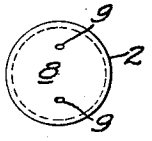
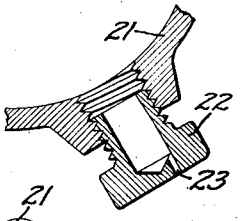


Fig. 10



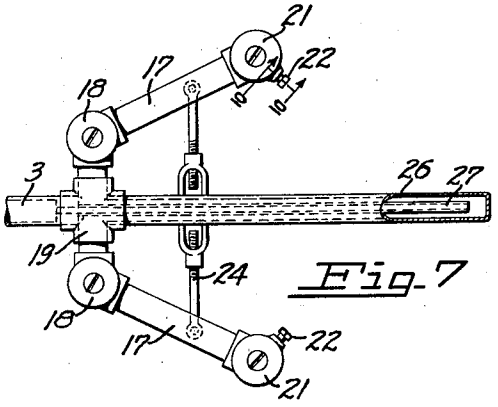


Fig. 7

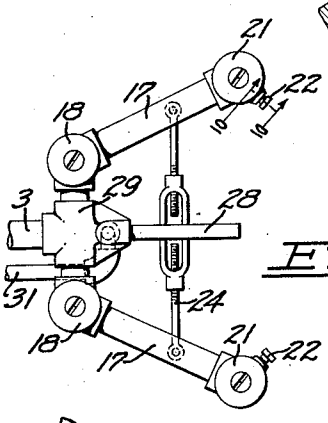


Fig. 9

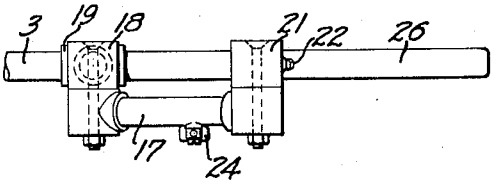


Fig. 8

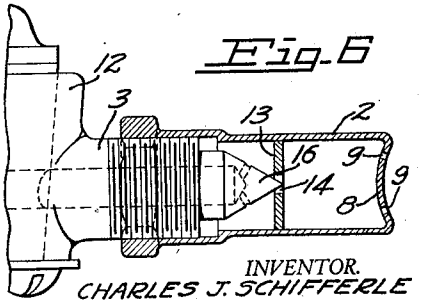


Fig. 6

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Patented Mar. 3, 1931 1,794,869

UNITED STATES PATENT OFFICE

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GAS BURNER

Application filed August 9, 1930. Serial No. 474,134.

My invention relates to a gas burner, and particularly to a burner for effecting the proper combustion of natural gas.

It is among the objects of my invention to provide means whereby natural gas may be efficiently burned in a burner designed for use with artificial or producer gas.

Another object of my invention includes the provision of means for thoroughly mixing air with a moving column of gas.

Further objects of my invention include the provision of means for regulating and controlling the amount of air mixed with the gas, so that, for a given set of conditions, sufficient air is entrained by the gas to support combustion.

The invention possesses numerous other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of my invention. It is to be understood that I do not limit myself to this disclosure of species of my invention, as I may adopt variant embodiments thereof within the scope of the claims.

Referring to the drawings:

Figure 1 is a side elevational view of the gas burner embodying my invention; portions of an ordinary stove burner mixing chamber are shown to indicate the operative relationship.

Figure 2 is an enlarged view, partly in elevation and partly in vertical section, showing the burner tip construction; and

Figure 3 is an end view of the same.

Figure 4 is an enlarged elevational view of a burner tip showing a modification of my invention; portions of the view are in vertical section to show the construction; and

Figure 5 is an end view of the same.

Figure 6 is vertical sectional view, partly in elevation, showing the burner tip of my invention with a needle valve adjustment.

Figure 7 is a plan view showing a gas burner, and illustrates another embodiment of my invention; and

Figure 8 is a side elevation of the same.

Figure 9 is a plan view of a similar burner incorporating another embodiment of my invention; and

Figure 10 is a vertical sectional view of the burner tip, taken in a plane indicated by the lines 10—10 of Figures 7 and 9.

In many localities, and particularly on the Pacific coast in the United States, the artificial or producer gas which has been in common use is being replaced with natural gas. The vast number of gas burners already installed and in use represents a substantial investment to the consumers; consequently, it becomes a matter of considerable concern to the general public to be able to use these burners in connection with the natural gas. The burners in use, however, are designed for use with artificial gas, and any attempts made to burn the natural gas in them meet with serious difficulties.

Chief among these difficulties is due to the fact that the heat value per unit volume of the natural gas is substantially twice that of an equivalent amount of artificial gas under the same conditions. This inherent difference between the two gases results in incomplete combustion when attempts are made to burn the natural gas in an artificial gas burner, due largely to the inability of the burner to supply sufficient air to support combustion.

The broad object of my invention is to provide means for overcoming these difficulties, and make it possible to utilize the burners which had previously been in use in conjunction with the artificial gas.

In terms of broad inclusion, the gas burner embodying my invention comprises an inlet duct for feeding the gas to be burned. A plurality of discharge outlets are provided in the duct for directing the gas in a plurality of converging streams; and adjustable mounting means are provided for the outlets, so that the focus of the streams may be adjusted to a position where sufficient air is entrained by the gas to support combustion.

In greater detail, referring particularly to Figures 1 to 3, the gas burner embodying my invention comprises a burner tip 2 connected to the end of a gas inlet duct 3 by a suitable coupling 4. The tip is arranged to project into the mixing chamber 6 of an ordinary artificial gas stove burner 7. Although shown in conjunction with a particular type

of burner, it is to be understood that the tip may be used to equal advantage in other types of burners.

As best shown in Figure 2, the burner tip 2 is provided with a head 8 covering the discharge end of the tip. A plurality of discharge openings 9, two being shown for the purposes of illustration, are provided in the tip head 8, and are preferably disposed at equal distances from the center of the head. The head 8 is of any suitable formable material, such as brass or copper, so that the curvature of the head depression may be varied to adjust the angle between the discharge outlets 9.

In making the tips, either a slight depression, or no depression is provided; and when the tip is installed in a burner, the depression may be formed by any suitable tool to provide the proper angle between the discharge outlets. This angle will vary for different types of burners, depending upon the shape characteristics of the burner and its mixing chamber. For burners having long mixing chambers the angle between the discharge outlets 9 will be less than for shorter mixing chambers.

As the gas flows from the outlets 9 it is directed in two converging streams; the focus of these streams depending upon the angular relationship between the outlets. After converging, the two streams continue to the burner proper as a single column of gas. At the point of convergence, or focus, however, considerable turbulence takes place. This turbulence operates to thoroughly mix the air and gas, so that sufficient air is entrained by the gas to support combustion.

In the ordinary artificial gas burner, a tip having a single discharge orifice is employed. As the gas flows from this orifice it moves in a continuous stream, and the only air entrained is that which mixes with surface portions of the stream. The core of the stream is completely enveloped, and does not mix with air. For artificial gas this mixture is sufficient, due to the comparatively low heat value of this gas.

On the other hand, the heat value of natural gas is substantially twice that of artificial gas, and, since about twice as much air is needed to support combustion as compared with the artificial gas, the single orifice tip does not provide sufficient air mixture. In applicant's tip the plurality of streams, converging into the single column under turbulent conditions, operate to mix the air, not only with the surface portions of the resultant column of gas, but also well into its core Greater agitation, and consequently a more complete mixture with air and a lesser subsequent velocity of the united column of gas, results as the angle between the converging streams is increased, and vice versa. Therefore, for a short mixing chamber, such as in the front burner of a stove, a greater angle of convergence is desirable; while for a longer mixing chamber, such as in the rear burner of a stove, a lesser angle of convergence is more effective.

Figures 4 and 5 show a variant construction of my gas burner tip. In this case, the head 8 is indented and provided, adjacent its sides, with the crimps 11, one on each side of the discharge outlets 9. By this construction the angle between the outlets may be adjusted by spreading, or squeezing together the crimped end of the tip. This may conveniently be effected by any suitable tool, such as a pair of pliers.

For the purpose of permitting a finer adjustment of the gas flow, an arrangement such as that shown in Figure 6 may be employed. The inner end of the tip 2 is threaded on the gas duct 3 connected with an ordinary cock 12. A partition 13 having a central aperture 14 is provided in the tip 2 for registration with a needle point 16 projecting from the end of the duct 3. This provides a needle valve control for the inflowing gas; and, by merely turning the tip 2, a fine adjustment is attained

A modification of my invention is shown in Figures 7 and 8. In this embodiment, a plurality of adjustable ducts 17, two being shown for purposes of illustration, are pivotally mounted on the end of the inlet duct 3; this mounting being effected by the rotary couplings 18 connected to a duct mounted in a cross 19. The outer ends of the adjustably mounted ducts 17 are provided with the rotary couplings 21 disposed with their axis of rotation parallel with the axis of rotary couplings 18.

A tip 22, having an eccentrically arranged discharge outlet 23, is adjustably threaded into each of the rotary couplings 21. As the gas streams from these outlets it is directed towards a focus, depending upon the relative positions of the outlets. By swinging the adjustable ducts 17 back and forth, by rotating the tip couplings 21, and by turning the tips 22 to vary the positions of the eccentrically arranged outlets 23, the convergence of the discharging gas streams may be readily controlled. A turnbuckle connecting rod 24 is preferably provided for holding the ducts 17 in adjusted position.

The turbulence resulting from the conflicting steams provides adequate air mixture. Not only does the adjustment of the converging streams provide a control for adjusting the air mixture, but it also provides means for varying the shape factor of the resulting flame. If the streams meet at a point focus, or substantially so, the resultant flow will be largely in a column, while if the two streams intersect only partially the resultant flow will be fan shaped. The elongated or column flow is best suited for long

fire boxes, while the spread or fan shaped flow is best suited for short fire boxes where it is desirable to confine or restrict the flame to smaller areas.

It may be preferable to pheheat the gas, and for this purpose an elongated heater chamber 26 may be employed. The chamber is threaded in the intermediate opening of the cross 19, between the adjustable ducts 17, and extends to a point adjacent the burner flame. A tube 27, communicating with the inlet duct 3, is arranged to project into the heater chamber and discharge adjacent its extended or heated end. As the gas expands and is heated in the chamber its heat value per unit volume is reduced while its pressure is maintained; this increases the burning properties of the gas as fully described in applicant's co-pending application, Serial No. 467,172, filed July 11, 1930.

Another embodiment of my invention is shown in Figure 9. The burner proper is of substantially the same construction as that shown in Figures 7 and 8. In this instance, however, means are shown for injecting air into the focus of the converging gas streams. An air nozzle 28 secured to a T 29 of the burner, communicates with a suitable source of air pressure thru the pipe line 31.

This arrangement is particularly adapted for use in long fire boxes, because the discharge outlets in the burner tips may be adjusted to effect a small angle of convergence to provide a resultant fast moving column, capable of reaching all portions of the fire box. By injecting air into the focus of these converging streams sufficient air is entrained by the gas, including that making up the core of the gas column, to support combustion. This permits effective and efficient burning along the length of the gas column; and overcomes the previous troubles experienced with long column gas burners, due to the fact that first ignition along the gas column enveloped a pure gas core with burned gases which prevented further air mixture and subsequent combustion. In applicant's burner sufficient air is entrained prior to first combustion.

I claim:

1. In a gas burner, an inlet duct for feeding the gas to be burned, said duct having a plurality of discharge outlets arranged with their axes angularly disposed relative to each other for directing the gas in a plurality of converging streams, and a mounting for the outlets adjustable to vary the relative positions of said outlet axes for selectively fixing the degree of intersection of said streams.

2. In combination with a gas burner having a mixing chamber and a gas inlet duct, a tip for said duct having a plurality of discharge outlets for directing the gas into the mixing chamber in a plurality of converging streams, and a mounting for the outlets adjustable to selectively fix the focus of said streams.

3. In a gas burner, an inlet duct for feeding the gas to be burned, a tip for the inlet duct, and a formable head on the tip, said head having a plurality of discharge outlets for directing the gas in a plurality of converging streams, the formable head allowing adjustment of the outlets to selectively fix the focus of said streams.

4. In a gas burner, an inlet duct for feeding the gas to be burned, a tip threaded on the inlet duct, a needle valve cooperating with the tip, and a head on the tip having a plurality of discharge outlets for directing the gas in a plurality of converging streams, said head providing a mounting for the discharge outlets adjustable to selectively fix the focus of said streams.

5. In a gas burner, an inlet duct, a plurality of ducts adjustably mounted on said inlet duct and communicating therewith, and a tip adjustably mounted on each of the adjustable ducts, said tips having discharge outlets for directing the gas in a plurality of converging streams.

6. In a gas burner, an inlet duct, a plurality of ducts adjustably mounted on said inlet duct and communicating therewith, and a tip adjustably mounted on each of the adjustable ducts, said tips having eccentrically positioned discharge outlets for directing the gas in a plurality of converging streams.

7. In a gas burner, an inlet duct for feeding the gas to be burned, said duct having a plurality of discharge outlets for directing the gas in a plurality of converging streams, mounting means for said outlets adjustable to selectively fix the focus of said streams, and means for preheating the gas prior to its discharge from the outlets.

8. In a gas burner, an inlet duct for feeding the gas to be burned, said duct having a plurality of discharge outlets for directing the gas in a plurality of converging streams, adjustable mounting means for said outlets, and means for injecting a stream of air into the focus of the gas streams.

9. In a gas burner, an inlet duct for feeding the gas to be burned, said duct having a plurality of discharge outlets arranged with their axes angularly disposed relative to each other for directing the gas in a plurality of converging streams, and a mounting for the outlets adjustable to vary the relative positions of said outlet axes for selectively fixing the focus and the degree of intersection of said streams.

10. In a gas burner, an inlet duct for feeding the gas to be burned, a tip for the inlet duct, a formable head having a plurality of discharge outlets arranged on the tip, said head being provided with a concave depres-

sion for positioning the outlets to direct the gas in a plurality of converging streams, the formable head allowing adjustment of the depression curvature to selectively fix the focus of said streams.

In testimony whereof, I have hereunto set my hand.

CHARLES J. SCHIFFERLE.