

Oct. 1, 1929.

L. B. MILLER

1,729,677

GAS BURNER

Filed July 14, 1926

2 Sheets-Sheet 1

Fig. 1.

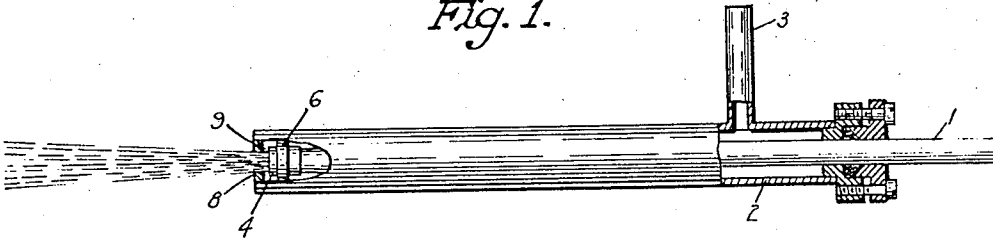


Fig. 2.

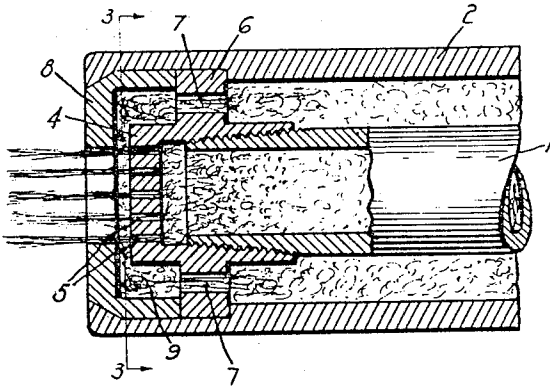


Fig. 3.

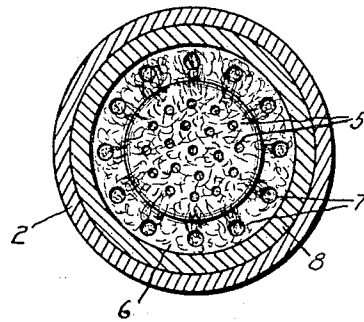


Fig. 4.

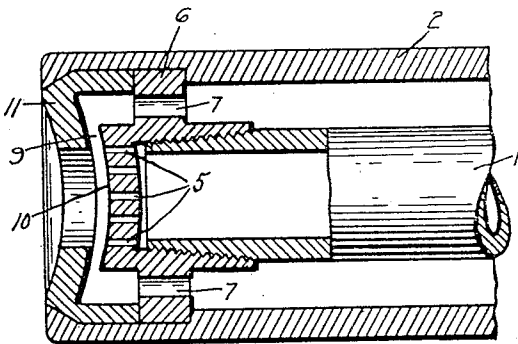
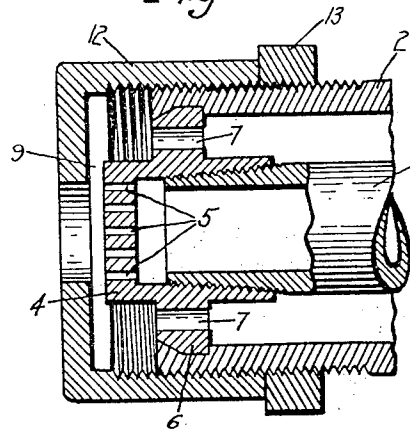


Fig. 5.



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Fig. 6.

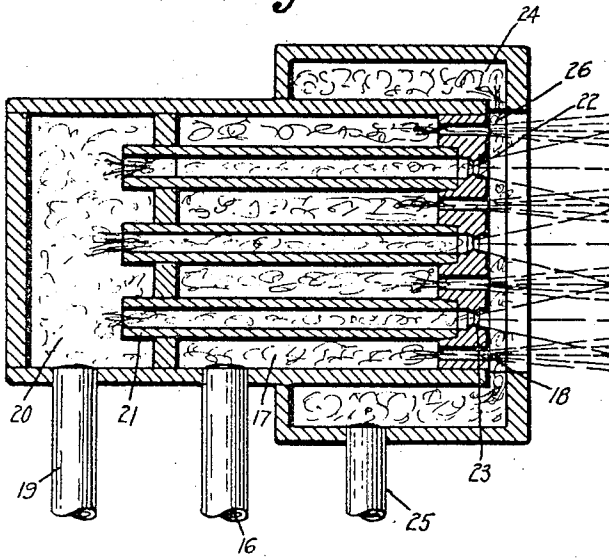


Fig. 7.

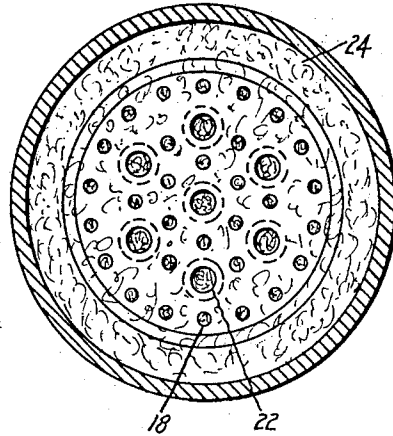
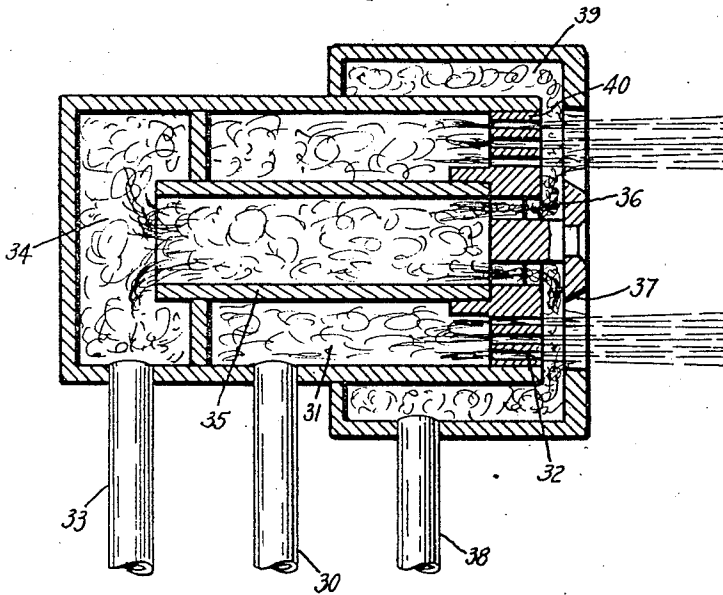


Fig. 8.



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UNITED STATES PATENT OFFICE

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GAS BURNER

Application filed July 14, 1926. Serial No. 122,492.

The present invention comprises a burner or a gas combustion device which is constructed to give a flame of high heat intensity and which is quiet and non-exploding in its operation.

In some forms of gas combustion devices which are in common use the combustible gas and the combustion supporting gas are mixed in a conduit before issuing from the burner or are kept in a mixed, uncombined state outside the burner, by means of the high velocity of the issuing gases. In order to prevent the combustion from traveling back into the mixing chamber or conduit, the speed of the mixed gas to the orifice was made greater than the speed of the propagation of the combustion in the gas. This type of burner is noisy especially in large sizes and produces extremely disagreeable working conditions for uses in which it is necessary for the operator to closely supervise the combustion as, for example, in the fabrication of fused quartz devices.

In accordance with my invention, I have provided a burner which is quiet in its operation, and which is constructed to supply the combustion supporting gas through a plurality of orifices and the combustible gas through an annular space, or a plurality of orifices, or a combination of both, arranged in such a way that thorough mixing of the gases is brought about external to the conduit through which the gas is delivered before the gases have traveled a great distance beyond the burner, and in such a way that the mixed gases do not attain a velocity greater than the speed of combustion propagation.

In this type of burner it is very essential that the flame be in the form of a solid pillar, rather than a hollow cylinder or tube. To accomplish this it is necessary to use a number of jets scattered all through the area to be covered, rather than one tubular jet of gas, and the greater the number of jets for the same volume of gas, the better mixing will be obtained at a point very close to the burner. The problem, then, is to feed these jets of combustion supporting gas with sufficient fuel gas and to have the latter strike

each jet of combustion supporting gas from all sides instead of merely in one direction. It is necessary then to arrange the holes for the jets so that the fuel gas will strike the combustion supporting gas from all directions, in order that the gases at the center of the pillar will be mixed as well as the gases around the outer edge.

In the preferred form of my invention, the combustion supporting gas (hereinafter referred to as oxygen) is delivered in a longitudinal direction with respect to the burner through a plurality of orifices and the combustible gas (hereinafter referred to as hydrogen) is delivered as a stream surrounding the oxygen, means also being provided to cause the hydrogen to move at an angle to the oxygen jets at a speed regulated to secure an even distribution of the hydrogen with respect to the oxygen.

My invention will be more fully understood by reference to the following description taken in connection with the accompanying drawings in which Fig. 1 shows a side view of a burner, parts of which have been cut away; Fig. 2 is a longitudinal section of one form of burner tip; Fig. 3 is a sectional view taken on the lines 3—3 of Fig. 2 and at right angles thereto; Figs. 4 and 5 are longitudinal sections of modified burner tips embodying my invention; Figs 6 and 8 are sectional views of burners having two sets of jets of combustible gas and Fig. 7 is a front view of the burner shown in Fig. 6.

As shown in Fig. 1, the improved burner comprises in one of its forms two concentric conduits for delivering the gases, oxygen being delivered by a conduit 1 and hydrogen by a surrounding conduit 2, into which it is fed by a supply tube 3. A cap 4 is threaded upon the end of the oxygen conduit.

As best shown in Figs. 2 and 3, this cap is provided with a plurality of orifices or nozzles, 5 arranged in concentric rings. A flange or partition 6 extending radially from the cap 4 is provided with a plurality of orifices 7 for supplying hydrogen. External to these orifices is a cylindrical housing 8 which is shaped to direct the hydrogen issuing from the orifices 7, substantially at right

angles to the oxygen jets by providing an annular passage 9 through which the hydrogen flows in a radial converging stream toward the center of the oxygen jets.

5 As shown in Fig. 3, the outer ring of oxygen jets is staggered with respect to the inner ring of oxygen jets none of the outer ring being directly opposite any of the inner ring. The hydrogen delivered by the surrounding
10 annular nozzle 8 winds between the respective oxygen jets thus producing most complete mixing and causing some of the hydrogen to reach the innermost oxygen jet as indicated by the small shading lines in Fig. 3.

15 In Fig. 4 I have illustrated the slight modification of the burner shown in Fig. 2, the perforated end of the cap 10 and the housing 11 being somewhat curved and arranged in such a way that the hydrogen flow is maintained approximately at right angles to the
20 oxygen flow for a longer period of time than in the arrangement shown in Fig. 2. In the construction shown in Fig. 4 the annular stream of hydrogen is directed back against the oxygen stream so that the forward motion of the oxygen streams will be less effective in carrying along with it the hydrogen, thus securing more complete mixing.

In Fig. 5 I have shown another modification which provides an external nozzle housing 12 which is screw threaded upon the conduit 2, a nut 13 being provided to lock the housing in position. By moving the housing
30 in and out the size for the annular opening 9 for the hydrogen can be adjusted. By screwing the nozzle cap 12 further along upon the housing 2 the size of the annular opening will be decreased, thereby increasing the velocity of the hydrogen. By adjusting the size
40 of the annular opening 9, a most suitable condition can be produced by trial to secure effective mixing of the gases.

It will be observed that in each of the modifications of my invention the oxygen is delivered through a plurality of orifices and a complete mixing of the gas is secured external to these orifices and at the mouth of the burners.

In some cases, particularly for large units, it is desirable to provide a second means for delivering a combustible gas near the centre of the oxygen jets, the various jets being arranged in accordance with the principles above described. Such arrangements are illustrated by Figs. 6, 7 and 8.

Referring to Fig. 6, of the drawing, oxygen may be delivered by the conduit 16 to a chamber 17 from which the oxygen will flow in a forward direction through the nozzles 18.
60 Hydrogen is delivered by a conduit 19 to a chamber 20 which communicates with a plurality of conduits 21 passing through the oxygen chamber and terminating in nozzles 22. These nozzles 22 are provided with deflectors 23 whereby the hydrogen is spread or

deflected so as to encounter the oxygen jets at an angle. Encompassing these oxygen and hydrogen delivery nozzles is a chamber 24 to which hydrogen is delivered by a conduit 25. The hydrogen flows from this chamber through an annular nozzle 26 which surrounds the group of oxygen and hydrogen
70 nozzles and which is so shaped and arranged that the hydrogen flows inwardly at an angle to the jets issuing from orifices 18 and 22. In other words the interspersed oxygen and hydrogen jets are encompassed by an annular hydrogen jet, the oxygen jets flowing in a substantially forward direction and the hydrogen jets being directed at an angle to the oxygen jets. 80

Another modification of my invention is shown in Fig. 8 in which oxygen is delivered by conduit 30 to a chamber 31 from which it passes through a plurality of nozzles 32. Hydrogen is delivered by a conduit 33 to a chamber 34 and from thence by a single large conduit 35 which terminates in nozzles 36. The hydrogen issuing from the nozzles 36 strikes a deflector 37 directing the gas in a flow substantially at right angles upon the oxygen stream. In this case likewise provision is made for an encompassing hydrogen flow, the hydrogen being delivered by a conduit 38 to a chamber 39 from which the flow is substantially at right angles through the annular nozzle 40 upon the gas delivered by the other nozzles. 95

What I claim as new and desire to secure by Letters Patent of the United States is:— 100

1. A gas burner comprising a gas conduit, a tip therefor provided with a plurality of passages arranged to deliver jets of gas in a longitudinal direction, said passages being arranged in staggered formation, a second gas conduit surrounding the first-mentioned conduit and projecting beyond the same, a tip for said second conduit providing an annular passage or passages for gas from said second conduit arranged so as to deliver the gas radially in an inward direction with respect to the passages from said first conduit and in a direction substantially at right angles to direction of jets from said first conduit. 110

2. A gas burner comprising means for delivering a plurality of jets of gas, a casing forming a chamber surrounding said means, a plate on the end of the casing spaced away from said means to form a passage for delivering an encompassing gas flow approximately at right angles to said jets, and means for delivering a flow of gas at or near the centre of said first-named jets independently of said jets. 120

3. A gas burner comprising a gas conduit, a tip therefor provided with a plurality of orifices arranged to deliver jets of gas in a longitudinal direction, a second gas conduit surrounding the first-mentioned conduit and projecting beyond the same, and a tip plate 130

for said second conduit provided with an orifice and spaced from said first-mentioned tip to provide an annular passage for delivering an encompassing gas flow approximately at right angles to said jets.

5 4. A gas burner comprising a conduit provided with a tip having a plurality of orifices for delivering jets of gas, a casing forming a chamber concentric with said conduit and a
10 nozzle plate on the end of the casing having an orifice and arranged in spaced relation to the conduit tip to form a passage for delivering gas approximately at right angles to the jet flow.

15 5. A gas burner comprising a conduit provided at its discharge end with means for delivering a plurality of jets of gas directly to atmosphere, a casing forming a chamber concentric with said conduit, the discharge end
20 of said casing terminating approximately at the plane of the discharge end of said conduit, and a deflection plate at the discharge end of said casing for directing gas flowing through said chamber at an angle directly into the jets
25 of gas as they issue to the atmosphere.

In witness whereof, I have hereunto set my hand this 9th day of July, 1926.

LEVI B. MILLER.

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