Aug. 11, 1931. H. A. GEAUQUE 1,818,471

BURNER

Filed Jan. 15, 1930

Fig. 2.

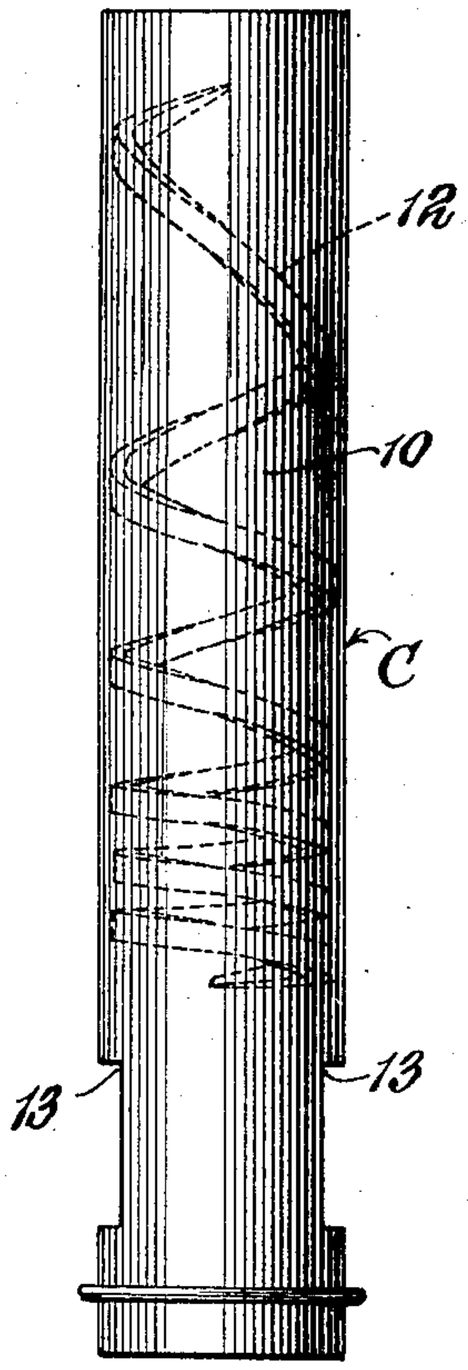


Fig. 1.

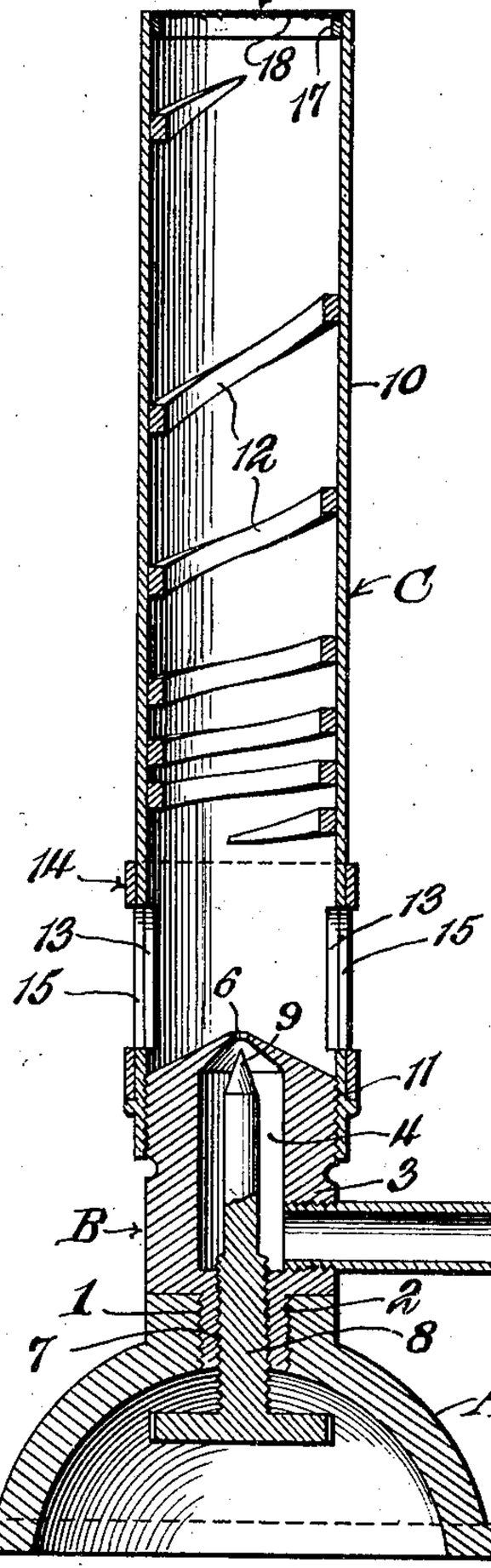


Fig. 3.

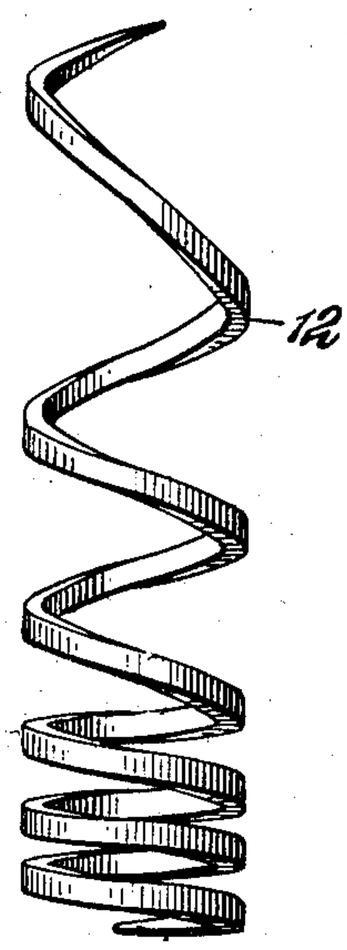


Fig. 4.

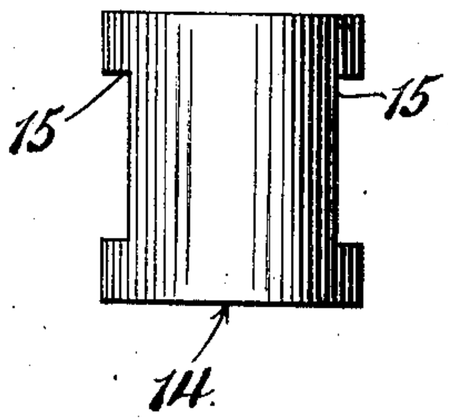
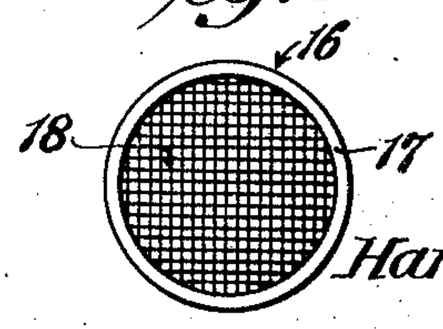


Fig. 5.



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Patented Aug. 11, 1931 1,818,471

UNITED STATES PATENT OFFICE

HARRY A. GEAUQUE, OF GALESBURG, ILLINOIS

BURNER

Application filed January 15, 1930. Serial No. 420,897.

My invention relates to burners of the class generally designated Bunsen burners, and more particularly to gas and air mixing tubes for this kind of burner.

Such burners comprise, in general, a gas and air mixing tube, a gas inlet orifice which is arranged axially of the tube, and one or more relatively large valved air inlet ports in the tube. The gas and air enter one end of the tube, and, in burners heretofore provided, are mixed to a greater or lesser extent as they pass through the tube. Although burners of this simple construction have been quite well adapted for ordinary uses, they have been subject to disadvantages resulting from inadequate mixing of the gas and air, one of the chief disadvantages being that such burners have exhibited a marked tendency to backfire, so that combustion, instead of taking place only at the outlet end of the tube, has at times taken place immediately adjacent the gas inlet orifice. This tendency is, I believe, fundamentally due to the fact that the gas which enters the tube from a relatively small orifice at the center of the tube flows through the center of the tube at a high velocity, whereas the air entering from the sides of the tube, and through relatively large ports, passes up through the tube adjacent its inner surface at a relatively low velocity. By the time the air and gas have reached the outlet end of the tube, a combustible mixture has been formed adjacent the inner surface of the tube, and, since this mixture is travelling at a low velocity, it is quite easy for the flame to travel down through the tube along its inner surface until the gas issuing from the gas nozzle is ignited at that point.

I have found that by increasing the velocity of that part of the mixture of gas and air which passes through the tube and close to its inner surface, the tendency for the flame to backfire is practically eliminated.

Accordingly, the main object of my invention is to provide a burner tube so equipped as to cause the gas and air passing through the tube to be given a rapid swirling movement and an expansion of the mixture for effecting better mixing of the gas and air and at the same time deflecting the mixture towards the center of the tube so as to prevent the slow movement of a combustible mixture along the inner surface of the tube.

Other objects will become apparent from the following description, the appended claims, and the several views of the invention illustrated in the drawings, in which:

Figure 1 is a central vertical sectional view of a burner embodying my invention;

Figure 2 is a detail view in front elevation of a mixing tube, with parts within shown by dotted lines;

Figure 3 is a detail perspective view in elevation of a helix;

Figure 4 is a detail view in elevation of an air valve sleeve; and

Figure 5 is a top plan view of the burner tube.

In the drawings, there is shown a burner including a base A, a gas valve B secured to the base, and a burner tube generally designated C mounted on the gas valve.

The base A is formed with a centrally located threaded opening 1 into which is screwed an exteriorly threaded boss 2 on a gas valve casing 3. The valve casing is formed with a central chamber 4 which is adapted to receive gas from a nipple 5 threadably connected to the body 3, and to discharge gas upwardly into the tube C through a gas orifice 6 located axially of the tube.

The boss 2 on the valve body is formed with an internally threaded opening 7 into which is screwed a threaded valve stem 8, the upper end of which is formed with a point 9 adapted to cooperate with the orifice 6 for controlling the flow of gas therethrough.

The mixing tube C includes a cylindrical barrel 10 of uniform diameter which has a threaded connection with the valve body B as at 11, and a helix 12 located within the barrel 10 between the gas inlet orifice 6 and the upper or outlet end of the barrel. The barrel is also provided with air inlet ports 13—13 and with a rotatable sleeve 14 mounted on the outside of the barrel and having openings 15—15 adapted to register with the openings 13—13 in the barrel for controlling the flow of air into the barrel.

In accordance with my invention, the helix 12 is so constructed that its pitch, or in other words the distance between adjacent turns of the helix, increases from the inlet end of the tube towards the outlet end thereof. Because of this increasing pitch of the helix, the air entering the tube and travelling close to the inner surface of the tube and upwardly towards the outlet end will be given a rapid swirling motion and also an expansion of the air which promotes better mixing of the air and gas; and, at the same time, the air is deflected inwardly towards the center of the tube which prevents the slow movement of a combustible mixture along the inner surface of the tube and thus lessens the tendency for the flame to backfire. The helix is preferably of gradually increasing pitch and thus produces the same effect as a Venturi tube in that the gas is gradually expanded as it flows around the successive turns of the helix and up through the tube. It is evident that any particular volume of gas, say for instance that contained between the second and third turns of the helix at a given instant, will, upon flowing into the space between the third and fourth turns thereof, tend to occupy a larger volume, since the third and fourth turns are spaced farther apart than the second and third turns. This of course results in an expansion of that volume of gas and a consequent more perfect mixing thereof. When gas flows toward the outlet end of the tube and thereby successively passes around the several turns of the helix, it will be still further expanded. This combined swirling and simultaneous expansion of the gas and air mixture has been found to mix the air and gas more efficiently than was heretofore possible and to also prevent backfiring of the flame.

To the attainment of the objects of the invention, it is necessary that the helix be of varying pitch, and preferably the pitch increases from the inner end of the tube to the outer end thereof, although it is not necessary that the pitch vary uniformly or even progressively in a strict sense. Thus, the first and second turns may be spaced the same distance apart as the second and third turns, but the turns adjacent the inner end of the tube should, in general, be closer together than the turns at the outer end of the tube.

The helix 12 is illustrated as comprising a spirally wound spring which is positioned in the barrel 10 and maintained therein by the frictional contact of the several turns of the spring with the inner surface of the barrel. Obviously, the helix may, if desired, be formed integrally with the barrel; but the form illustrated is believed to be most suitable in that it is adapted to be easily applied to a tube of standard form.

For still better mixing of the air and gas emerging from the outlet end of the tube, I employ a reticulated baffle 16 which includes a rim 17 adapted to be frictionally held within the upper end of the barrel and a screen 18 secured to the rim.

Experience has demonstrated that a baffle of this kind when used in connection with a burned tube provided with a helix of varying pitch cooperates with the tube in providing a flame of great uniformity and at the same time eliminates the heretofore existent tendency for the flame to backfire.

I claim as my invention:

1. A mixing tube for a burner, comprising a barrel having an inlet end and an outlet end, and a helix in the barrel and arranged coaxially therewith, the pitch of said helix increasing from the inlet end of said tube to the outlet end thereof.

2. A mixing tube for a burner, comprising a barrel of substantially uniform diameter and having an inlet end and an outlet end, the inner surface of said barrel being provided with a spiral of gradually increasing pitch for expanding gas as it passes from the inlet end to the outlet end of the barrel and adjacent the inner surface thereof.

3. A mixing tube for a burner, comprising a barrel having an inlet and an outlet end, and means in said barrel for expanding gas passing from the inlet end to the outlet end thereof in the manner of a Venturi tube, comprising a spirally wound element the turns of which are arranged in contacting relation with the inner surface of the barrel, the distance between adjacent turns of said element increasing progressively from the inlet end to the outlet end of the barrel.

4. In a burner mixing tube, the combination with a barrel having gas inlet and outlet ends, of a spirally wound spring positioned within said barrel and maintained therein by frictional contact of the spring with the inner surface of the barrel, the pitch of said spring increasing from the inlet end to the outlet end of said barrel.

5. In a burner, the combination with a gas and air mixing tube including a barrel having intake and outlet ends, of a gas inlet opening at the intake end of the barrel and disposed substantially at the axis thereof, an air port in said barrel adjacent the intake end thereof, and a helix mounted in contacting relation with the inner surface of the barrel and disposed between said air port and the outlet end of the barrel, the pitch of said helix increasing from said air port to said outlet end.

6. In a burner, the combination with a gas and air mixing tube including a barrel having intake and outlet ends, of a gas inlet opening at the intake end of the barrel and disposed substantially at the axis thereof, an air port in said barrel adjacent the intake end thereof, and a helix mounted in contacting relation with the inner surface of the bar-

rel and disposed between said air port and the outlet end of the barrel, the pitch of said helix gradually increasing from said air port to said outlet end, and a screen at the outlet end of said barrel.

7. In a burner, the combination with a gas and air mixing tube including a barrel having intake and outlet ends, of a gas inlet opening at the intake end of the barrel and disposed substantially at the axis thereof, and an air port in said barrel adjacent said gas inlet opening, the inner surface of said barrel being provided with a spiral of gradually increasing pitch from the intake end of said barrel to the outlet end thereof, the minimum pitch of said spiral being adjacent said gas inlet opening and said air port, whereby gas and air passing from the inlet to the outlet end of the barrel will be expanded as in a Venturi tube.

In testimony whereof, I have hereunto subscribed my name.

HARRY A. GEAUQUE.