H. D. SCHROEDER.

GAS BURNER.

APPLICATION FILED AUG. 19, 1920.

1,428,400. Patented Sept. 5, 1922.

Fig. 1.

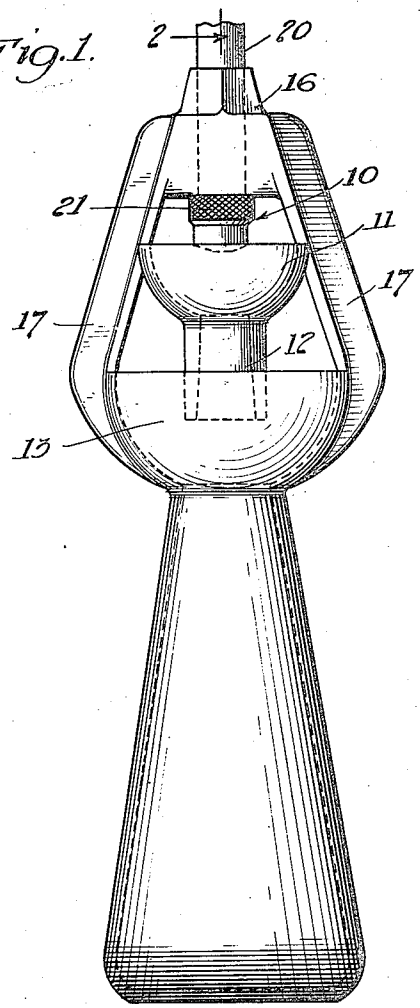


Fig. 2.

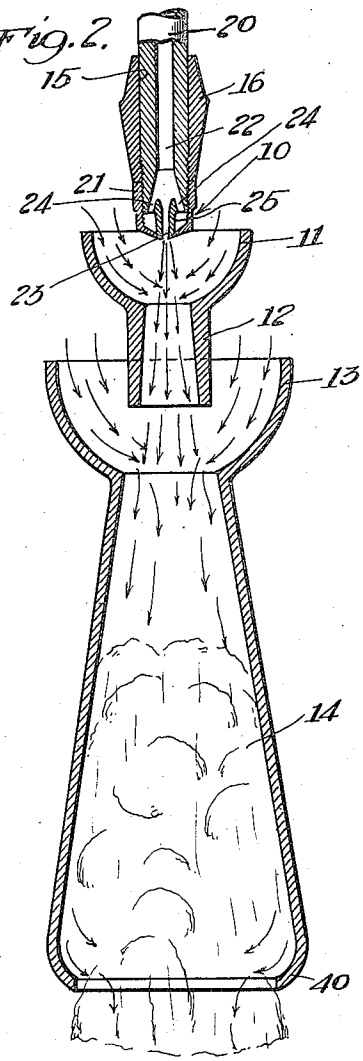


Fig. 3

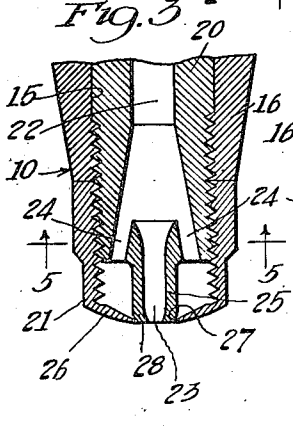


Fig. 4.

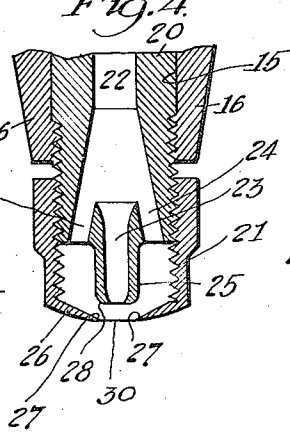
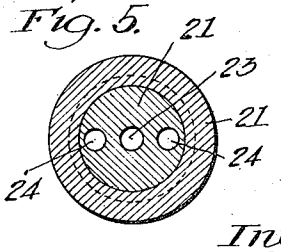


Fig. 5.



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UNITED STATES PATENT OFFICE.

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GAS BURNER.

Application filed August 19, 1920. Serial No. 404,609.

To all whom it may concern:

Be it known that I, HERMAN D. SCHROEDER, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles, State of California, have invented certain new and useful Improvements in Gas Burners, of which the following is a specification.

This invention has to do with a gas burner, and it is an object of the invention to provide a simple, inexpensive device of this character which will operate effectively under comparatively high pressure.

The burner provided by the present invention is of such character as to be applicable for use in various arts and in connection with various apparatus; for instance it can be advantageously used in retort, ovens, furnaces, and in various other apparatus of that general character. Therefore, it will be understood that the invention is not limited in its scope to any specific use or application and, in fact, that it is general in its nature rather than specific.

A particular feature of the invention is the provision of a gas burner which will effectively operate under comparatively high pressure without blowing out. This feature is noteworthy in that ordinary gas burners operating under any considerable pressure blow out very easily and, in fact, often times blow themselves out. In the present burner a perfect mixture of gas and air is had under all working conditions and the flame is held or kept at the burner and prevented from separating from the burner.

Another feature of the invention is the extremely simple and inexpensive construction of the device. The extreme simplicity of principle and operation of the burner makes possible its simple, neat and inexpensive construction and makes the invention of particular commercial importance.

Other objects and features of the invention will be best understood from the following detailed description of a preferred embodiment of the invention throughout which reference is had to the accompanying drawing in which—

Fig. 1 is a side elevation of the burner; Fig. 2 is a longitudinal sectional view of the burner taken as indicated by line 2—2 on Fig. 1; Fig. 3 is an enlarged detail sectional view of the gas nozzle; Fig. 4 is an enlarged detail sectional view similar to Fig. 3 with the nozzle adjusted to a different position, and Fig. 5 is a sectional view taken as indicated by line 5—5 on Fig. 3.

Throughout the drawings numeral 10 designates the gas nozzle which is positioned to direct gas into a bell or cup which in turn is formed with a nozzle 12 arranged to issue into a bell or cup 13 connected with the combustion chamber 14. These parts which, generally speaking, comprise, or go to make, the burner, are preferably interconnected or secured together in a manner to form a unitary structure. In the preferred form of the invention the gas nozzle 10 is carried in a bore 15 formed in a frame member 16 supported over the cup 11 by a pair of side members 17. The side members 17 extend between and connect the frame member 16, cup 11 and cup 13 thereby securely and rigidly holding the various parts of the burner in their proper relative positions. The side members 17, frame member 16, cups 11 and 13, and combustion chamber 14, are preferably cast or formed intrically as such form of construction permits of extremely simple and inexpensive manufacture. Further, this form of construction, that is the provision of two side members 17 to connect and tie together the various parts of the burner, makes for particularly effective operation of the burner in that it allows an unrestricted flow of air into the cup 11 and 13.

The gas nozzle 10 comprises a tube 20 into one end of which gas is supplied under pressure from any suitable source and at the other end of which is formed suitable ports and is adjustably carried a cap 21. The tube 20 is carried in the bore 15 so that the cap 10 extends slightly into the cup 11, as clearly shown in Figs. 1 and 2 of the drawings. The tube 20 is formed with a central opening 22 which extends completely through it and into and extended portion 25, the outer end portion 23 of which is slightly contracted or reduced in size, as clearly shown in Figs. 3 and 4 of the drawings. Two openings or ports 24 are formed in the tube 20 to connect into the central or main opening 22 and to open into the cap 21 at the base of the extended portion 25. The cap 21 screw-threads onto the end portion of the tube 20 and is formed with an end 26 the inner surface 27 of which is adapted to fit against the end 28 of the extended portion 25 in the manner clearly shown in Fig. 3 of the drawings. An opening 30 is formed in the cap 21 to regis-

ter and be somewhat larger than the opening in the extended portion 25 so that gas is free to flow from the opening the extended portion 25 at all times. When the cap 21 is screw-threaded on the end portion of the tube 20 so that the inner surface 27 of the end 26 seats on the end 28 of the extended portion 25, as shown in Fig. 3, gas is free to issue from the nozzle from the opening in the extended portion 25 but cannot pass through the ports 24, around the extended portion 25, and then outwardly through the opening 30. However, when the cap 21 is adjusted or positioned on the end portion of the tube 20 so that the surface 27 and 28 are separated, as shown in Fig. 4, it will be readily understood how the gas is not only free to pass through the extended portion 25 but can also flow through the ports 24, around the extended portion 25 and the outwardly through the opening 30. This form of construction provides an extremely simple and inexpensive nozzle which can be very effectively regulated to allow a suitable amount of gas to issue from it into the cup 11.

The cup 11 is an open or unrestricted bowl shaped member stranged concentrically with the nozzle 10. The general design and proportion of the cup 11 relative to the nozzle 10 and other parts of the burner is best shown in Fig. 2 of the drawings. In the particular burner shown in the drawings the nozzle 10 extends slightly into the cup 11. It is understood, of course, that this particular relative positioning of the cup and nozzle is merely that best adapted for the particular burner being set forth.

The nozzle 12 is formed at and connects into the bottom of cups 11 and preferably extends therefrom somewhat into the cup 13. The nozzle 12 is not of the same character as the nozzle 10 but is merely formed with a uniformly tapered opening larger at its outer end than at its inner end. The nozzle is adapted to direct gas and air from the cup 11 into and through the cup 13. It will be noticed from the drawings that the size or diameter of the nozzle 12 is comparatively large relative to the opening in the nozzle 10.

The cup 13 is substantially the same in design and construction as the cup 11 and is positioned relative to the nozzle 12 in substantially the same manner as the cup 11 is positioned relative to the nozzle 10, as is clearly shown in the drawings. It will be noted that the cup 13 is considerably larger than the cup 11 although it is of substantially the same design and proportions.

The combustion chamber 14 connects into the bottom of the cup 13 and extends therefrom in the manner clearly shown in Figs. 1 and 2 of the drawings. It will be noted from the drawings that the connecting opening between the cup 13 and combustion chamber 14 is comparatively large relative to the nozzle 12 and that the combustion chamber 14 flares or diverges towards its outer end with substantially the same amount of taper as there is in the nozzle 12. The outer end portion of the combustion chamber 14 is therefore comparatively large relative to the inner end, or that part where it connects with the cup 13. The outer end of the combustion chamber, which is unrestricted except for an inwardly curved flange 40, which is clearly shown in Fig. 2, is comparatively large and is concentric with the various other parts of the burner.

In operation gas issues from the nozzle 10 under pressure and in a quantity depending upon the manner in which the cap 21 is adjusted. The gas passes in a jet into and through the cup 11 and into the nozzle 12 and causes air to be drawn into the cup, as indicated by the arrows in Fig. 2. The curvature of the cup 11 directs the air into the jet of gas at right angles to its direction of flow, thereby causing its velocity to be somewhat decreased and causing the air and gas to become very effectively mixed. The mixture of gas and air passes through the nozzle 12 and is directed by the nozzle 12 into and through the cup 13. The mixture upon passing through the cup 13 causes air to be drawn into the cup and directed transversely into the jet of gas and air in the manner just described in the case of the cup 11. In other words, an aditional supply of air is effectively and thoroughly mixed with the mixed with the mixture of air and gas from nozzle 12 upon its passing through cup 13 and just before it enters the combustion chamber 14. The velocity of the jet of gas and air from nozzle 12 is somewhat reduced by the air which enters at cup 13 and the final mixture of gas and air decreases in velocity as it passes through the combustion chamber due to the shape of the combustion chamber. In practice the gas may issue from nozzle 10 at a high velocity, or under high pressure and yet be reduced in velocity in the burner so that combustion will start to take place in the combustion chamber and not outside of or near the combustion chamber. Combustion of this mixture takes place, or at least, starts in the combustion chamber about as indicated in Fig. 2 of the drawing. In practice it has been found that when the various parts of the burner are properly designed, proportioned and positioned, a perfect mixture of gas and air is supplied to the combustion chamber at a velocity so that combustion will always take place, or start to take place, in the combustion chamber. The fact that combustion always starts to take place in the combustion chamber may be said to be due to the fact that the velocity of the gas and

air entering the combustion chamber is not excessively high, that a sufficient amount of air is supplied to the gas at the cups 11 and 13 and that the flange 40 at the outer end of the combustion chamber directs the flow of gases or flames at the outer parts of the combustion chamber more or less inwardly, as indicated by the arrows in Fig. 2, and thereby causes more or less decrease in velocity and increase in pressure in the combustion. It will be readily understood that with combustion starting in the combustion chamber 14 it is impossible for the burner to be blown out by a draft, or the like, and that it will not blow itself out as do ordinary devices of this character. In practice if the burner is turned down somewhat combustion will take place at the mouth of nozzle 12 and before the mixture is thinned by the addition of air at cup 13, while if the nozzle is turned down very low, for instance when a pilot frame is required, combustion will take place in the cup 11. When the burner is operating in the last mentioned manner and it is desired to turn it full on, this may be done with perfect safety and without causing back fire or combustion to take place in the cups 11 and 13. It also may be stated that the burner will operate effectively at any angle or in any position and it may be again stated that the burner can be used in any part or in connection with any form or type of apparatus.

Under various circumstances and working conditions the proportions, sizes and positions of the various parts of the burner may vary considerably from that herein specifically set forth. Further, under certain circumstances it may be desirable to construct the burner with three or more cups such as the cups 11 and 13. In this connection it may be stated that the burner herein set forth is merely a form of the invention embodying two cups. A burner to operate under higher pressure than the particular burner herein disclosed may be constructed with more space between the various parts, with more parts (or states), with a finer or smaller nozzle 10, or with any combination or with all of these variations. By increasing the space between the parts, by increasing the number of parts (cups), or by decreasing the size of the gas nozzle, the final velocity of the mixture in the combustion chamber will be decreased.

In practice the introduction of the air transversely into the jet of gas, or into the jet of gas and air, causes very effective mixing of the air with the gas and thereby makes for perfect combustion. Although combustion always starts to take place within the combustion chamber most of the combustion takes place outside of the combustion chamber. The amount of combustion taking place within the combustion chamber relative to the amount of combustion taking place outside of the combustion chamber will vary with, or be dependant upon the velocity of the mixture in the combustion chamber.

Having thus described my invention, what I claim is:

1. In a gas burner, a gas nozzle, an open cup-shaped member arranged in front of the gas nozzle, a nozzle in connection with said member, a second open cup-shaped member larger than the first mentioned cup-shaped member and arranged in front of said second nozzle, and an outwardly diverging open ended combustion chamber in connection with the second cup-shaped member.

2. In a gas burner, a gas nozzle, an open cup member arranged in front of the nozzle, an expanding nozzle leading from said member on the axis of the gas nozzle, a second open cup member into which the expanding nozzle discharges, and an expanding open ended combustion chamber leading from the second mentioned cup member.

3. In a gas burner, a gas nozzle, an open cup member arranged in front of the nozzle, an expanding nozzle leading from said member on the axis of the gas nozzle, a second open cup member into which the expanding nozzle discharges, and an expanding open ended combustion chamber leading from the second mentioned cup member; the combustion chamber being larger than the expanding nozzle walls would be if projected forward to the combustion chamber, so as to accommodate air drawn into the combustion chamber at the second mentioned cup member.

4. In a gas burner, a gas nozzle, an open cup member arranged in front of the nozzle, an expanding nozzle leading from said member on the axis of the gas nozzle, a second open cup member in which the expanding nozzle discharges, and an expanding open ended combustion chamber leading from the second mentioned cup member; the walls of the cup members curving inwardly and transversely of the axis of the nozzles so as to direct air transversely into the gas stream discharged from the nozzles.

5. In a gas burner, a gas nozzle, a conical expansion nozzle arranged forward of the gas nozzle with its smaller end in position to take the gas discharged from the gas nozzle and spaced therefrom for entry of air, and an open ended combustion chamber arranged forward of the expanding nozzle to take discharge therefrom and spaced therefrom to allow entry of air, the diameter of the open end of the chamber being larger than the discharge end of the expansion nozzle would be if projected forward to the combustion chamber, so as to accommodate the air drawn in between the expanding nozzle and the chamber.

6. In a gas burner, a gas nozzle, a conical

expansion nozzle arranged forward of the gas nozzle with its smaller end in position to take the gas discharged from the gas nozzle and spaced therefrom for entry of air, and an open ended combustion chamber arranged forward of the expanding nozzle to take discharge therefrom and spaced therefrom to allow entry of air, the combustion chamber being conical with its smaller open end toward the expanding nozzle, and the diameter of the open end of the chamber being larger than the discharge end of the expansion nozzle would be if projected forward to the combustion chamber, so as to accommodate the air drawn in between the expanding nozzle and the chamber.

In witness that I claim the foregoing I have hereunto subscribed my name this 10th day of August 1920.

HERMAN D. SCHROEDER.

Witness:

VIRGINIA BERINGER.