H. C. CALDWELL.

GAS BURNER.

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1,387,450. Patented Aug. 16, 1921.

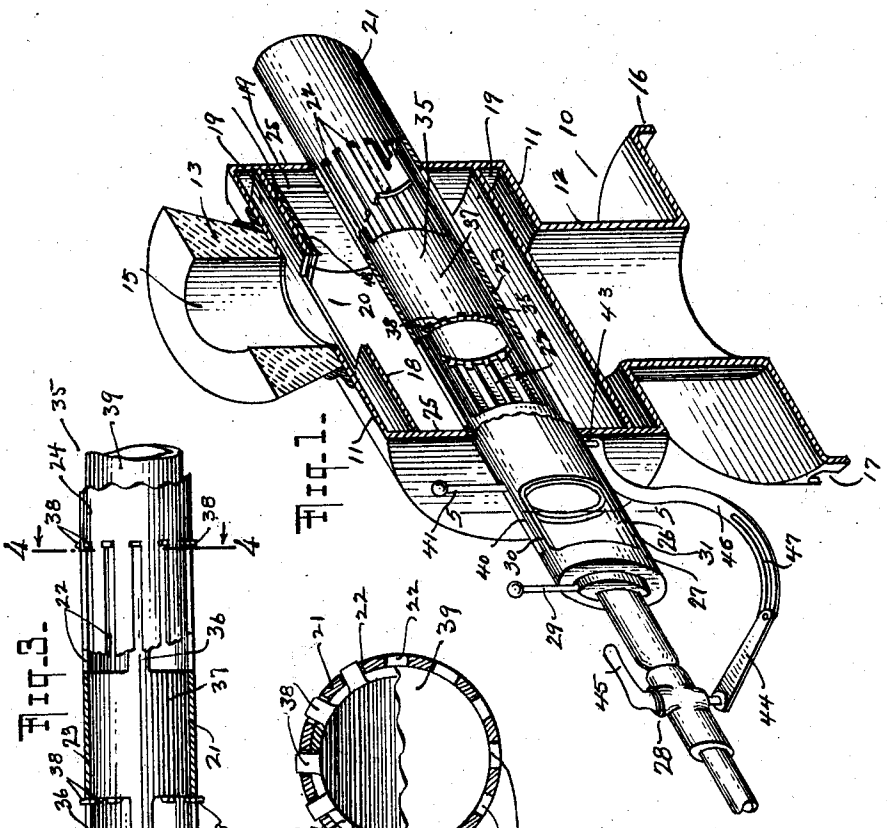


FIG. 1.

FIG. 3.

FIG. 4.

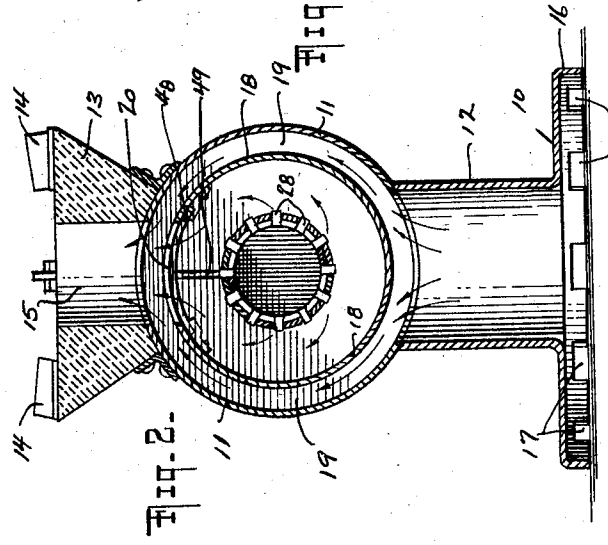


FIG. 2.

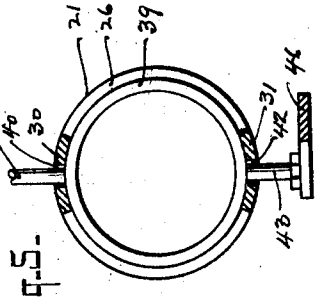


FIG. 5.

Inventor
Henry C. Caldwell
By J. W. Ellis
Attorney

UNITED STATES PATENT OFFICE.

HENRY C. CALDWELL, OF BUFFALO, NEW YORK.

GAS-BURNER.

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To all whom it may concern:

Be it known that I, HENRY C. CALDWELL, a citizen of the United States of America, and a resident of the city of Buffalo, county of Erie, State of New York, have invented certain new and useful Improvements in Gas-Burners, of which the following is a full, clear, and exact description.

It is well known to those skilled in the art that, in the present day type of burners, combustion of the fuel elements takes place at the point where the heat is to be utilized, thus resulting in a large percentage of heat being lost by direct radiation into the atmosphere and also by convection through the parts of the burner. Furthermore, in this type of burner when an attempt is made to add the proper amount of air necessary for proper combustion, back-firing into the mixer of the burner usually occurs.

In producing my invention, I have sought to overcome the disadvantages above enumerated and to construct a burner in which substantially perfect combustion of the fuel elements shall take place within the burner itself and before the flame reaches the point of utilization.

Furthermore, in my burner, large amounts of air are supplied at the mixer of the burner to provide for proper initial combustion; and these amounts of air are reduced in volume when the burner is shut off, thereby preventing the possibility of back-firing.

Moreover, by providing one or more chambers through which auxiliary air is supplied to the other fuel elements combustion occurs within the burner, and thereby produces a natural draft through the burner which aids in drawing in the fuel elements and, further, prevents back-firing.

Another object of my invention has been to provide a burner having a mixer tube provided with slotted outlet openings which are controlled by the action of the mixer valves.

Another object has been to provide means for automatically cleaning the slots of the mixer tube.

The above objects and advantages have been accomplished by the device shown in the accompanying drawings, of which:

Figure 1 is a sectional, perspective view of my complete burner.

Fig. 2 is a transverse, sectional elevation of the same.

Fig. 3 is a fragmentary elevation, partly in section, of the mixer tube of my device.

Fig. 4 is a fragmentary cross-sectional view of the mixer tube and is taken on line 4—4 of Fig. 3.

Fig. 5 is a cross-sectional view taken on line 5—5 of Fig. 1.

My device comprises a base 10 which supports all the parts of the burner. Above the base is arranged the outer jacket or body 11 of my burner, which is connected with the base 10 by means of a tubular extension 12. This tubular extension is open at the bottom of the base at its lower end and opens into the inside of the outer jacket or body 11 at its upper end. The base 10 is provided with a depending flange 16 which is provided around its periphery with a plurality of openings 17, whereby air from the atmosphere will be admitted to the tubular extension 12. Supported on top of the outer jacket or body 11 is a combustion chamber 13, which incloses the major portion of the combustion zone of my burner, and which also provides a support for the grid members 14 (see Fig. 2). The combustion chamber 13 is provided with a central opening 15 which communicates with a suitable opening formed in the top of the outer jacket 11.

Arranged within the outer jacket or body 11 and in interspaced relation therewith is an inner jacket 18. Between the inner and outer jackets 11 and 18, respectively, there is provided an auxiliary air space 19 which receives its supply of air through the center of the tubular extension 12. An opening 20 is provided in the top of this inner jacket which is in registering position with the opening 15 of the stack 13.

The inner and outer jackets 11 and 18, respectively, are closed at their ends by means of end walls 25. 21 is a mixing tube which

forms a primary mixing chamber and is supported by the end walls 25. The tube is arranged preferably concentric with the jackets 11 and 18, and is provided with two series of longitudinal slots 22. A solid portion 23 of substantially the same length as the slots 22, connects the portions of the tube in which the slots are provided. A solid portion 24 is also provided at the end of the tube, which portion preferably extends beyond the end walls 25 of the burner. The opposite end of the tube 21 preferably extends from the end wall 25 and is cut away to provide an air space or large air inlet openings 26. To the extreme outer end portion 27 of the mixing tube is attached the gas shut off valve 28 and the gas regulating valve 29. The shut off valve 28 and gas regulating valve 29 may be of any suitable or well known type. Connecting the extreme outer end portion 27 of the tube with the body thereof are two webs 30 and 31.

Mounted within the mixing tube 21 is a throttle tube 35 which is provided with two open portions 36 connected by a solid portion 37. When the throttle tube is in its full open position the open portions 36 are in register with the slotted portions 22 of the mixing tube and the solid portion 37 is in registering position with the solid portion 23 of said tube. The throttle tube is provided at the right hand end of each of the open portions 36 with a plurality of radially extending tabs 38, which are disposed, one within each of the series of longitudinal slots 22. The throttle tube 35 is also provided with a solid portion 39 at its extreme right hand end. As the throttle tube is drawn endwise within the mixing tube 21, the solid portions 37 and 39 will serve to throttle or close the series of longitudinal slots 22. By moving this tube, the air openings 26 in the left hand end of the tube will also be partially closed. If the throttle tube is moved back and forth, it will be seen that the tabs 38 will keep the slots 22 free from accumulation of dirt or carbon. In the web 30 a slot 40 is provided through which an operating rod 41 is slidable. This operating rod is connected to the throttle tube 35, and provides means for actuating this tube. The web 31 is provided with a slot 42 in which a rod 43, connected with the throttle tube 35, is slidable. The gas shut off valve 28 is provided with an arm 44 which is arranged preferably at right angles to the handle 45 of the valve, and connecting the outer end of this arm with the rod 43 is an S-shaped link 46. The outer end of the link is bent in the form of a semi-circle, having its radius equal to the radius of the arm 44, whereby, when the throttle tube 35 is in its closed position, the gas valve 28 may be opened while the outer end of the arm 44 passes through a slot 47 formed in this portion of the link. This motion permits the valve to be opened without actuating the throttle tube. By this construction, it will be seen that the throttle tube may be opened without altering the position of the gas valve 28, and that when it is in its full open position as shown in the drawings, the tube will be pulled to its closed position while the gas valve 28 is being closed, thus partially closing the air openings 26 and effectively preventing any possibility of back-firing.

A slide 48 is arranged preferably on the inside of the inner jacket 18 and it is movable over the opening 29 in this jacket. A rod 49 connects the slide with the throttle tube 21 so that they are operated in unison. The size of the opening 20 is thus controlled as the size of the slot 22 is controlled. This keeps the point of initial combustion always at the opening 20.

It will thus be seen that when my burner is first lighted, the throttle tube 35 is in its closed position. The gas valve 28 is moved to its full open position and the supply of gas is regulated by the gas regulating valve 29. Additional air is supplied to the mixer by moving the throttle tube 35 inwardly, which increases the effective size of the air openings 26 and at the same time increases the effective size of the longitudinal slots 22 in the mixer tube. As the products of combustion pass through the slots 22 into the secondary mixing chamber 50, they are more thoroughly commingled and pass thence upwardly through the opening 20 formed in the inner jacket 18 and pass up through the opening 15 of the stack 13. As the products of combustion pass through the opening 20, auxiliary air coming in through the opening 17 of the base 10 passes up through the tubular extension 12 and into the auxiliary air space 19, where it mixes with the fuel elements after it has circulated around the air space. As this air passes through this space, it takes up the heat produced in the jackets by radiation or convection and as the auxiliary air is mixing with the products of combustion coming through the opening 20, combustion is produced at this point within the burner. It will be clear that when the gas valve 28 is shut off, the throttle tube 35 will be drawn forwardly and partially close the air opening 26 in the mixing tube, thereby effectively preventing back-firing. Therefore, by the device herein described, it will be clear that I am enabled to supply all the air necessary for proper and efficient combustion of the fuel elements without the possibility of back firing when the gas is shut off and also to accomplish the other objects and advantages herein set forth.

While I have shown but one auxiliary air space, it is obvious that more than one may be provided for supplying additional air to the fuel mixture. This and other modifications of the details herein shown and described may be made without departing from the spirit of my invention or the scope of the appended claims and I do not, therefore, wish to be limited to the exact embodiment herein shown and described, the form described being merely a preferred embodiment thereof.

Having thus described my invention, what I claim is:

1. A gas burner characterized by having a jacket forming a secondary mixing chamber, a combustion chamber mounted on the jacket and in communication with the interior thereof, a mixing tube passing through the secondary mixing chamber and forming a primary mixing chamber, such tube being provided with fuel element outlets, means for projecting gas under pressure through an air space located between the tube and the gas outlets and thence into the tube, and valve controlled means for regulating the quantity of gas introduced into the tube.

2. A gas burner characterized by having a jacket forming a secondary mixing chamber, a combustion chamber mounted on the jacket and in communication with the interior thereof, a mixing tube passing through the secondary mixing chamber and forming a primary mixing chamber, such tube being provided with fuel element outlets, means for projecting gas under pressure through an air space located between the tube and the gas outlets and thence into the tube, valve controlled means for regulating the quantity of gas introduced into the tube, and means for controlling the admission of air to the air space.

3. A gas burner characterized by having a jacket forming a secondary mixing chamber, a combustion chamber mounted on the jacket and in communication with the interior thereof, a mixing tube passing through the secondary mixing chamber and forming a primary mixing chamber, such tube being provided with fuel element outlets, means for projecting gas under pressure through an air space located between the tube and the gas outlets and thence into the tube, valve controlled means for regulating the quantity of gas introduced into the tube, and means for supplying additional air to the fuel elements at the combustion zone.

4. A gas burner characterized by having a jacket forming a secondary mixing chamber, a combustion chamber mounted on the jacket and in communication with the interior thereof, a mixing tube passing through the secondary mixing chamber and forming a primary mixing chamber, such tube being provided with fuel element outlets, means for projecting gas under pressure through an air space located between the tube and the gas outlets and thence into the tube, valve controlled means for regulating the quantity of gas introduced into the tube, and means for regulating the size of the fuel element outlets.

5. A gas burner characterized by having an outer jacket, an inner jacket arranged in interspaced relation with the outer jacket and forming a secondary mixing chamber, a combustion chamber mounted on the outer jacket and in communication with the interior of both inner and outer jackets, a mixing tube passing through the secondary mixing chamber and forming a primary mixing chamber, such tube being provided with fuel element outlets, a base for the jackets, a hollow support connecting the base with the outer jacket, forming an air passage from the base to the space between the jackets, means for projecting gas under pressure through an air space located between the tube and the gas outlet and thence into the tube, and valve controlled means for regulating the quantity of gas introduced into the tube.

6. A gas burner characterized by having a jacket forming a secondary mixing chamber, a combustion chamber mounted on the jacket and in communication with the interior thereof, a mixing tube passing through the secondary mixing chamber and forming a primary mixing chamber, the tube being formed with a series of longitudinal fuel element outlets, a throttle tube for controlling the size of the fuel element outlets, means for projecting gas under pressure through an air space located between the tube and the gas outlet and thence into the tube and valve controlled means for regulating the quantity of gas introduced into the tube.

7. A gas burner characterized by having a jacket forming a secondary mixing chamber, a combustion chamber mounted on the jacket and in communication with the interior thereof, a mixing tube passing through the secondary mixing chamber and forming a primary mixing chamber, the tube being formed with a series of longitudinal fuel element outlets, a throttle tube for controlling the size of the fuel element outlets, and the admission of air to the air space, means for projecting gas under pressure through an air space located between the tube and the gas outlet and thence into the tube and valve controlled means for regulating the quantity of gas introduced into the tube.

8. A gas burner characterized by having a jacket forming a secondary mixing chamber, a combustion chamber mounted on the jacket and in communication with the interior thereof, a mixing tube passing through the secondary mixing chamber and forming

a primary mixing chamber, such tube being provided with fuel element outlets, means for projecting gas under pressure through an air space located between the tube and the gas outlets and thence into the tube, valve controlled means for regulating the quantity of gas introduced into the tube, means for regulating the size of the fuel element outlets and for controlling the admission of air to the air space, and means for supplying additional air to the fuel elements at the combustion zone.

In testimony whereof, I have hereunto signed my name.

HENRY C. CALDWELL.