Nov. 8, 1927. 1,648,329

C. W. SIEVERT

GAS BURNER

Filed Feb. 2, 1926

Fig. 1.

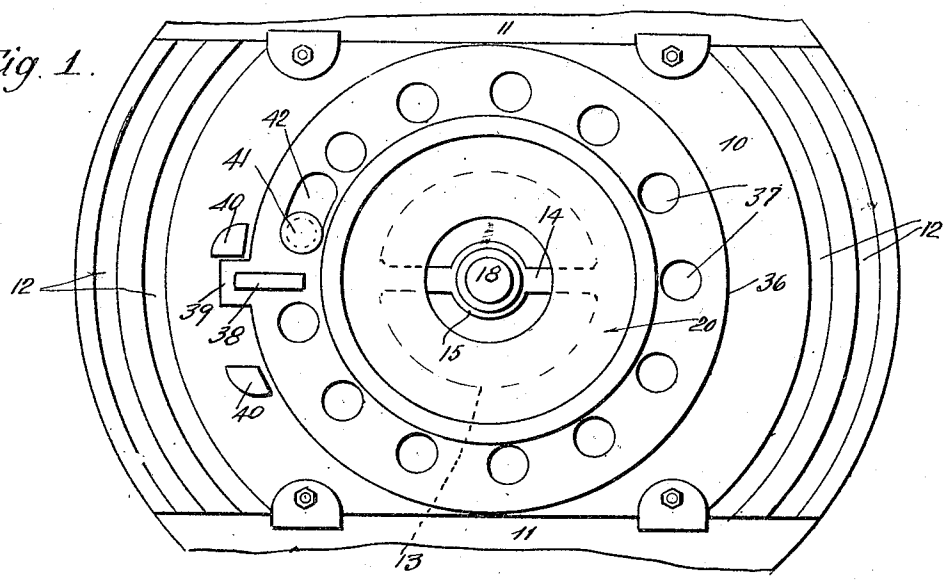
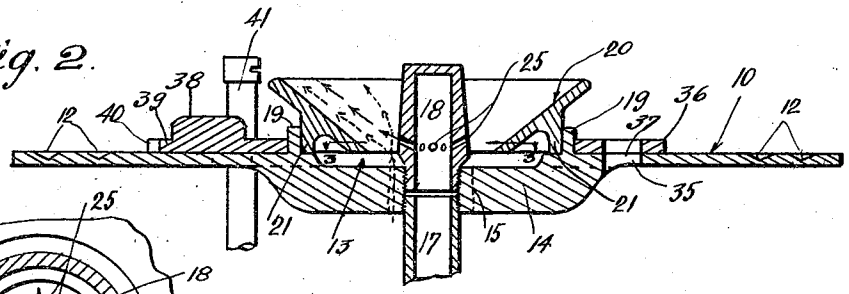


Fig. 2.



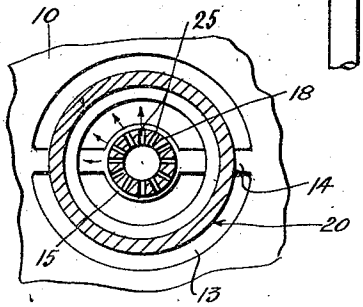
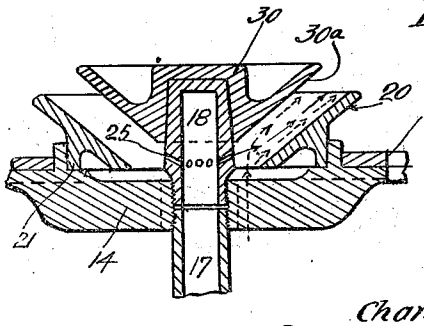


Fig 3.

Fig 4.



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UNITED STATES PATENT OFFICE.

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GAS BURNER.

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This invention has to do with fuel gas burners; and it may be stated as a general object to produce a burner capable of causing highly efficient gas combustion and capable, although not necessarily limited thereto, of burning a large amount of fuel and delivering a large amount of heat in a small and simple apparatus occupying a comparatively small space and burning the fuel in a small cubic space.

Heretofore considerable difficulty has been encountered in burning a sufficient amount of gas to supply the heat requirements of certain types of apparatus with a restricted combustion space. This difficulty has been at least partially due to the fact that a sufficient amount of fuel gas could not be efficiently burned in the restricted space. My burner has been designed with a particular view to overcoming such difficulties and to providing for the high efficiency combustion of the comparatively large amount of fuel gas in a restricted space. It will be understood, however, that my invention is not necessarily limited to such use, as its simplicity and effectiveness is still maintained even when the burner is used in relatively smaller sizes or for the combustion of smaller quantities of fuel gas in the unit time.

The invention itself will be best understood from the following detailed description of a preferred form of burner, reference for this purpose being had to the accompanying drawings in which—

Fig. 1 is a plan showing my improved burner;

Fig. 2 is a vertical central section of the same;

Fig. 3 is a horizontal section on line 3—3 of Fig. 2; and

Fig. 4 is a vertical central section similar to portions of Fig. 2, but showing the burner with an additional element applied thereto.

In the drawings I show at 10 a plate which forms the base of the burner and which may be in any suitable form or size for mounting the burner in any kind of furnace chamber. In the particular illustration here given, this base plate is formed to mount between two sector shaped plates 11 in a circular furnace chamber; and, to provide for easy adaptation to furnace chambers of different diameters, the base plate, made of cast iron, is provided with circular grooves 12 on which the plate may be broken at its edges to reduce its size.

Base plate 10 has in it a central opening 13, and across this opening a web 14 carrying a central box 15 bored and screw-threaded as at 16 to receive the gas feed pipe 17 and the nozzle 18, the nozzle standing centrally in and above the base plate opening 13.

Around opening 13 the base plate has a circular flange 19, spaced a little outside the edge of opening 13, and an open bottomed cone-shaped cup 20 has a supporting flange 21 that sets on the ledge inside flange 19 and is confined in proper position by that flange 19. The cup thus located is concentric with opening 13 and with nozzle 18. The conical angle of cup 20 may be somewhat varied, to pass varying amounts of air, depending upon the amount of gas being burned. Thus, to suit varying situations, I supply, in practice, cups 20 of somewhat varying angles, and of varying diameters of bottom openings, the smaller openings being used where less gas is being burned, and the larger openings being used where the burning of a larger quantity of gas is required.

Nozzle 18 has through its circular wall a plurality of gas delivery orifices 25 spaced equally around the nozzle and pointing radially outwardly and upwardly at such an angle that the gas projected through these orifices would, if it traveled on a straight line, strike the inner surface of cup 20 near or about its upper edge. In the average operation of the burner, however, the stream of air that flows upwardly through the open cup bottom carries the gas jets somewhat upwardly from what would otherwise be their straight line of travel, so that the gas, as it actually travels, upwardly through the cup travels in lines more or less parallel with the conical elements of the inner surface of the cup. This line of travel is indicated by the full line arrows on Fig. 2. The air, passing up through the open cup bottom, is indicated in its travel by the dotted line arrows, and from what is indicated it will be seen that the air travels upwardly and outwardly both below and above the gas jets, traveling between the gas jets and the cup surface, and also traveling over the gas jets and in the same general direction as those jets. In the form of device shown in Fig. 4 where a cone-shaped cap 30 is used, the air that travels

over the gas jets travels between them and the lower conical surface of the cap. At the same time, in either form of device, the air that passes up through the open cup bottom passes upwardly between the spaced gas jets, as will be readily understood from a consideration of Fig. 3; and as a result of all this it will be seen that each gas jet in its travel is surrounded by an upwardly and outwardly flowing stream of air which mixes with the gas of the jet. By the time the gas and air have mixed sufficiently to form a combustible mixture, in the form shown in Fig. 2, combustion begins to take place in the usual case within the cup, and continues to take place above the cup until all the fuel is consumed. Due to the nature of the device, the outward and upward travel of the gas jets, and the outward travel of the air with the jets, and the travel of the air between and around the jets, a very uniform and intimate mixture is attained, and, consequently, a very uniform combustion of high efficiency is attained.

In the form shown in Fig. 4, actual combustion does not start until the mixture has reached a point somewhat beyond the upper edge of the cup. In this form it will be seen that the cup and cap confine between them a sort of cone-shaped chamber that is in effect a mixing chamber, in which combustion is inhibited by reason of the comparatively heavy metal walls of the cup and cap. Consequently, in this form, combustion does not start until the mixture has passed out of this mixing chamber space. In some cases also the cap is useful in preventing the flame from curving upwardly and then inwardly upon itself, keeping the flame spread and thus helping good mixture of the gas and air.

The air admitted through the open cup bottom is sufficient in volume to form a perfect or nearly perfect combustible mixture with the fuel, but it is desirable and useful in the average case to supply auxiliary air around the outside of the burner. This is done by having a plurality of air holes 35 through the base, and a control ring 36 with corresponding holes 37, rotatable on the base around circular flange 19. Air holes 35 and 37 are located closely under the edge of cup 20, so that the auxiliary air, passing up through those holes, is drawn quickly upwardly into the upwardly and outwardly flowing gases of combustion. Control ring 36 may conveniently have a handle lug 38, and a stop lug 39 that plays between the two stop lugs 40 on base plate 104. Pilot burner pipe 41 extends up through plate 10 and through a slot 42 in ring 36.

In the specific form and design herein shown the conical face 30^a of cap 30 is parallel to the conical face of cup 20; but that relation may be varied by increasing or decreasing one or both the conical angles. For instance, if it is desired to further increase the gas expansion toward the outer edges of the cup and cap, the cup and cap angles may be made somewhat divergent—for instance— the cap angle (to the horizontal) may be increased. If less expansion is desired an opposite change may be made in the cap angle. In average conditions, however, I find about the right amount of expansion to be given by having the cap and cup surfaces parallel and highly efficient mixing is obtained when the conical surface of the gas is about midway between the conical surfaces of the cap and cup. This arrangement means that the gas jets travel outwardly spaced from both surfaces, allowing air to flow completely around each jet and between it and both conical surfaces.

It will be understood that my burner is so mounted that all the air must come up through the central cup or through the auxiliary air openings. All air is excluded from flowing up around the outside edge of plate 10, usually by that plate fitting the combustion chamber tightly Thus, by proper manipulation, the correct amount of total air may be given the burner; and as much of that air as possible is caused to pass up through the central cup. By using a cup with a proper sized hole, and proper adjustment of the auxiliary air holes, the desired large proportion of air is put through the cup. And both the flame draft and the gas jets tend to draw air through the cup.

I claim:

1. A gas burner including in combination a base plate with a circular air aperture and a web crossing below the aperture, an upstanding cylindrical nozzle mounted centrally on the web, the nozzle standing centrally in and above the aperture, a circular flange on the upper face of the base plate around the air aperture, an open bottom cone shaped cup resting on the plate within the flange, the nozzle having gas orifices placed to deliver gas jets in a conical surface above the cup, but at an angle more nearly horizontal than that of the cup's conical surface, the base plate having a series of air holes arranged in circular formation outside the flange and below the outer cup edge, and a rotatable perforated control ring resting on the base plate over said holes and surrounding the flange.

2. A gas burner including in combination a base plate with a circular air aperture and a web crossing below the aperture, an upstanding cylindrical nozzle mounted centrally on the web, the nozzle standing centrally in and above the aperture, a circular flange on the upper face of the base plate around the air aperture, an open bottom cone shaped cup resting on the plate within the flange, the nozzle having gas orifices placed

to deliver gas jets in a conical surface above the cup but at an angle more nearly horizontal than that of the cup's conical surface, the base plate having a series of air holes arranged in circular formation outside the flange and below the outer cup edge, and a rotatable perforated control ring resting on the base plate over said holes and surrounding the flange, and an inverted cone shaped cap mounted on the nozzle, the conical surface of the cap being substantially parallel to that of the cup and spaced above it and above the gas orifices, so that the gas discharged from the orifices is projected between the cup and cap surfaces.

3. A gas burner including in combination a base plate with a circular air aperture and a web crossing below the aperture, an upstanding cylindrical nozzle mounted centrally on the web, the nozzle standing centrally in and above the aperture, a circular flange on the upper face of the base plate around the air aperture, an open bottom cone shaped cup resting on the plate within the flange, the nozzle having gas orifices placed to deliver gas jets in a conical surface above the cup, the base plate having a series of air holes arranged in circular formation outside the flange and below the outer cup edge, and a rotatable perforated control ring resting on the base plate over said holes and surrounding the flange.

In witness that I claim the foregoing I have hereunto subscribed my name this 15th day of January, 1926.

CHARLES W. SIEVERT.