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RADIANT CUP TYPE GAS BURNER

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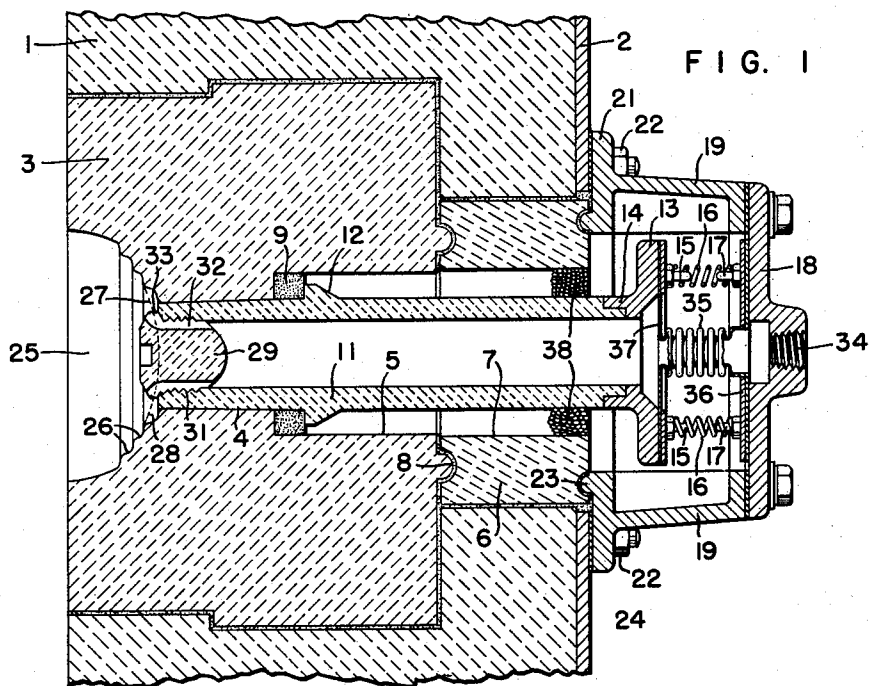


FIG. 1

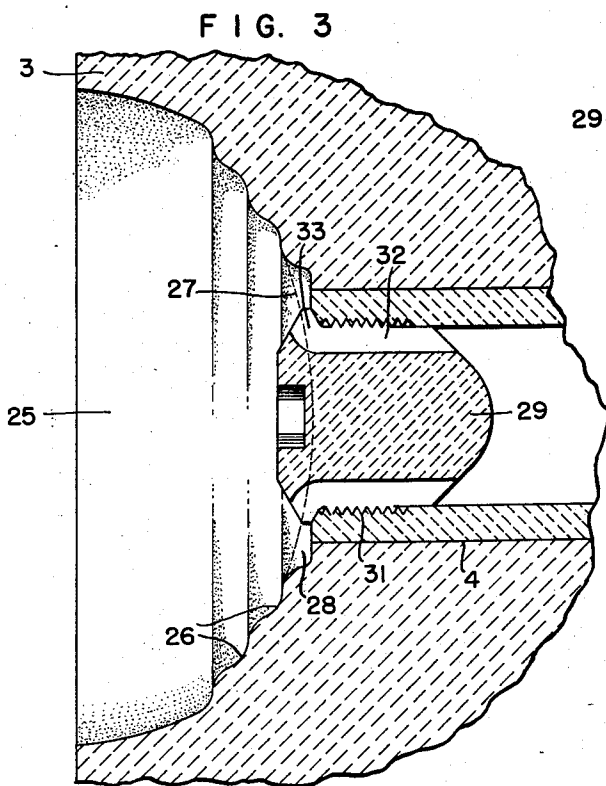


FIG. 3

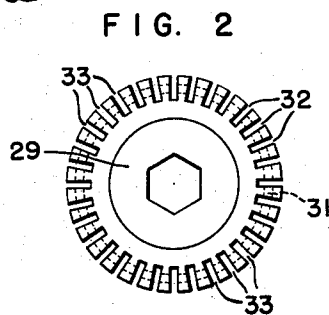


FIG. 2

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RADIANT CUP TYPE GAS BURNER

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3 Claims. (Cl. 158—113)

The present invention relates to gas burners, and more particularly to a gas burner of the radiant cup type that is provided with a distributing tip which does not project into the cup.

Radiant burners of the type with which this invention is concerned are in wide commercial use. Such burners are shown in Hess Patent 2,215,079, issued September 17, 1940 and comprise a ceramic block having a cup shaped depression formed in one face with an opening extending from the base of the depression to an opposite face of the block. Received in the opening, and extending into the cup is a distributor member that is provided with a plurality of grooves around its periphery through which fuel is supplied to be burned in the cup. The end of the distributor in the cup includes a relatively heavy and thick ceramic mass that has formed on its lower face substantially radial extensions of the grooves to direct the fuel into the cup in a plurality of substantially radially directed jets.

In normal and continuous operation with a stable gas, the construction described above is very satisfactory. When, however, the burners are operated in such a manner that they are heated and cooled frequently, stresses are set up in the distributor and frequently the tip is cracked off from the base. Also, it has been found that burners of this type are relatively difficult to start from cold when using some types of fuel gas having a slow ignition rate.

It is an object of the invention to provide a radiant ceramic burner with the distributor so positioned in the cup that a large tip is not needed on its end.

It is a further object of the invention to provide a radiant ceramic burner and a distributor therefor in which the distributor is so designed and mounted that the tip of the distributor is below the hot cup and is not affected with or by the heat of the cup.

It is a further object of the invention to provide a radiant ceramic burner in which any type of gaseous fuel may be burned, and in which the burner may be started from cold immediately regardless of the rate of ignition of the fuel being burned.

In the present burner, there is provided a depression or recess in the cup surrounding the opening through which the distributor extends. The distributor is so designed and placed that the exit of its fuel ports or slots discharge in a substantially axial direction past the recess. This recess apparently creates a low pressure area adjacent to the exit of the fuel passages that draws the jets of fuel evenly out into the cup. In any event, the flames from the jets sweep across the surface of the cup to heat it evenly to incandescence. Also, the flow of fuel is slowed down sufficiently so that any gas, no matter what its ignition rate, may be ignited immediately, even with a cold burner.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, its ad-

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vantages and specific objects attained with its use, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described a preferred embodiment of the invention.

In the drawings:

Figure 1 is a sectional view through the burner;

Figure 2 is an end view of the distributor; and

Figure 3 is a sectional view of the burner cup and distributor on the same scale as Fig. 2.

Referring to the drawing, there is shown at 1 a portion of a furnace wall which is supported and backed up in the usual manner by sheet metal 2. Placed within the wall of the furnace and forming a part thereof is a refractory ceramic burner block 3 that is provided with a cup shaped depression 25 on its inner face. An opening having a small diameter 4 and a large diameter 5 extends from the base of the cup, and concentric therewith, to the opposite face of the block. Between the rear face of the burner block 3 and the outside of the furnace wall, there is provided a ceramic spacing ring 6 having an opening 7 that forms a continuation of the opening 5 in the burner block. It is noted that the burner block and ring are held in concentric relation by means of a tongue and groove 8 that are formed on these two parts. The shoulder formed between portions 4 and 5 of the opening receives a ceramic washer 9 which forms an abutment for a purpose to be described. The various parts including the furnace wall, burner block, ring and washer are joined together by a suitable cement so that there is no air leakage between these parts, and so that they, in effect, form a single member.

A cylindrical sleeve 11 is received in the opening formed in the burner block and ring. This sleeve has an exterior shoulder 12 that is forced against the back surface of the washer 9 thereby to locate definitely the left end of the sleeve. The shoulder is resiliently held against the washer by means including a metal plate 13 having an extension 14 in telescoping relation with the end of the sleeve. These parts may be cemented together, so that there is a gas tight joint between them. The outer face of plate 13 is provided with pins 15 which receive one end of compression springs 16, the other ends of which are received by pins 17 extending inwardly from a metal plate 18. This plate is held in fixed relation relative to the furnace wall, so that the springs are maintained normally under compression, by means of brackets 19 to which they are suitably bolted. The brackets extend outwardly from and form part of a burner plate 21 that is fastened by bolts 22 to the metal backing 2 of the furnace. It is noted that the plate 21 is held in concentric relation with the ring 6 by a tongue and groove connection 23 between these two parts. A gasket 24 may be used between the plate 21 and the furnace wall.

The block 3 has formed in its face a combustion space consisting of a round, cup shaped depression 25 having a pair of concentric ridges 26 near its base. The contour of the base of the cup, if it were continued, is indicated by the dotted line 27. As shown herein, however, the base of the cup where opening 4 enters it is provided with a concentric recess 28 which extends inwardly for a depth that will bring it substantially even with the left end of the sleeve 11.

Fuel in the form of a combustible mixture of gas and air is supplied through the sleeve into the cup past a distributor 29 that is placed in the end thereof. This distributor comprises a mass of refractory ceramic material, cylindrical in shape with a ledge extending radially from one end at the substantially flat face thereof. Distributor 29 is threaded into the end of the sleeve 11 as shown at 31 with the ledge engaging the end of the sleeve to locate the parts definitely relative to each other. The periphery of the distributor is formed with a

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plurality of parallel grooves 32 extending axially thereof. These grooves bend outwardly as shown at 33 to follow somewhat the contour of the ledge at an angle of approximately 60° to the axis of the distributor, and terminate partly at the face and partly at the periphery thereof.

Fuel is supplied to the sleeve 11 through an opening 34 in plate 18 and a flexible connection 35 in the form of a bellows. The bellows has its ends fastened respectively to plates 36 and 37 that are bolted to the plates 18 and 13 by means of the bolts which hold the spring supporting studs in place. It is noted that the annular space between the exterior of the sleeve and the opening in ring 6 is filled with a suitable packing 38 such as asbestos rope to prevent the infiltration of air through the space and into the cup.

In the operation of the burner, a fuel mixture of gas and air under suitable pressure is supplied through a pipe from a mixing machine to the opening 34 in plate 18. This fuel travels through the sleeve 11 and through the grooves 32 formed in the distributor into the cup 25 where it is discharged in a more or less axial direction as a plurality of jets. When the fuel is ignited, it will burn in a plurality of flames along the surface of the cup to heat the same to incandescence. It would normally be expected, particularly when the fuel is supplied under relatively high pressure, that the jets of fuel flowing through the slots 32 would project into the cup and burn freely in space. This is not the case, however, and it is believed that the action of the jets moving past the recess 28 creates a low pressure area that tends to draw the jets outwardly against the surface of the cup where they are burned. Thus, the flames are held against the surface of the cup to heat it to incandescence. The low pressure area created by the recess 28 and additional low pressure areas that are formed by and between the ridges 26 seem to slow down and trap enough fuel so that ignition is completed and the flames will burn in a steady manner. In any event, it has been found with a burner of this type that fuels having a slow ignition rate such as natural gas and propane can be burned readily and without the fluttering of the flame that usually accompanies this type of a fuel prior to the time that the surface of the cup is heated to incandescence. It has been found that a burner with a cup shaped in the manner disclosed herein having a distributor with the slots open axially, will light from cold and burn gaseous fuel of any type with no apparent difference, regardless of the ignition rate of the particular gas that is being used. Burners of this type can be operated with fuel pressures in a range of 3 to 60 or more inches of water, which gives a remarkable turn down ratio, particularly when natural gas is the fuel. Below about 3 inches of water pressure, the flames burn straight out from the distributor rather than against the surface of the cup.

With the present burner, the contour of the cup and the recess at its base taken in connection with the shape of the fuel slots in the distributor insures that the fuel will burn along the surface of the cup to heat the same to a high degree of incandescence. It will be noted that the distributor barely reaches the bottom of the cup. Due to this location of the distributor, as well as its construction, it will not be subjected to any appreciable extent to the high radiant heat which is produced on the surface of the cup. Therefore, the distributor will remain relatively cool. This means that large thermal stresses will not be set up in the distributor with a consequent tend-

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ency to cause breakage of the same. Furthermore, the relative coolness of the distributor, combined with the cooling effect of the fuel flowing past it, will reduce to a minimum any tendency for backfire.

While in accordance with the provisions of the statutes, I have illustrated and described the best form of embodiment of my invention now known to me it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit and scope of the invention as set forth in the appended claims, and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

What is claimed is:

1. A distributing member for use in a radiant type ceramic burner comprising a ceramic mass cylindrical in shape and having a ledge on one end, said ledge having a face transverse to said end, said mass being provided with a plurality of parallel axially extending grooves on its surface, said grooves bending toward a radial direction in said ledge and terminating partly in said face and partly at the periphery of said ledge with the radial inner edge of the said grooves being radially inward of the periphery of the cylindrical portion of said mass at the point where said grooves terminate at said face whereby there is an axial component and a radial component for gas flow through said grooves.

2. The combination of claim 1 including an elongated cylindrical sleeve adapted to receive said distributor, threads on the interior of one end of said sleeve and threads formed on the exterior of said distributor to cooperate with the threads in said sleeve, said ledge acting to locate said distributor with respect to said sleeve.

3. In a burner, the combination of means forming a combustion space having a cup shaped surface, a plurality of undulating concentric ridges formed on said surface only adjacent to the base thereof, said means including an opening concentric with said space and extending away from the base thereof, means forming a concentric recess at the junction of said opening and the base of said space, distributing means in said opening formed with a plurality of passages adjacent to the surface of the opening through which a combustible mixture of fuel and air may be passed into said space, the ends of said passages toward said space having an axially directed portion and terminating in a substantially axial direction adjacent to said recess, the fuel mixture passing through said passages and into said space in a substantially axial direction, said recess and ridges creating low pressure areas drawing the mixture against the surface of said space, and means to supply the fuel mixture to said opening.

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