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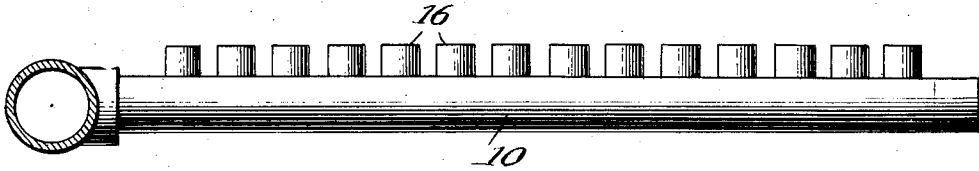
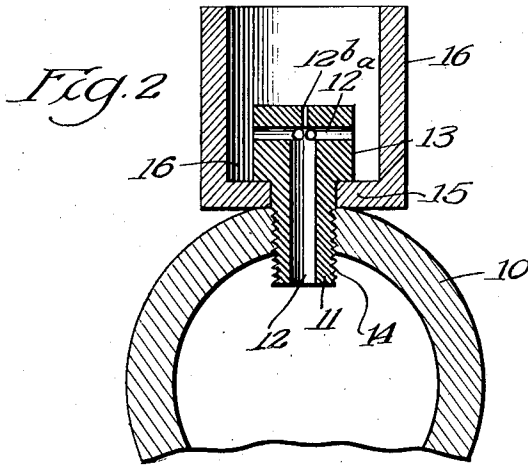
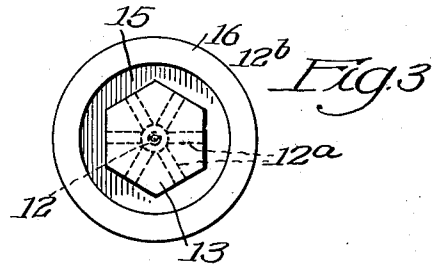
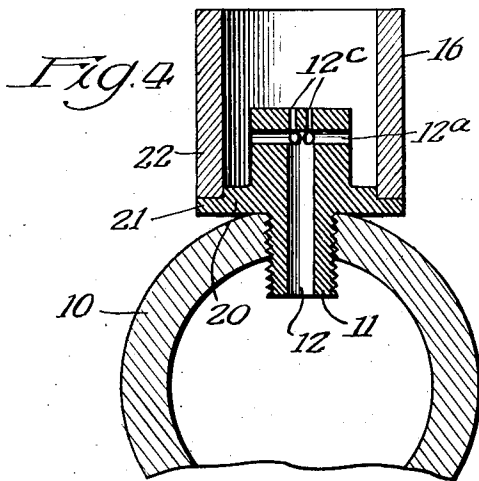
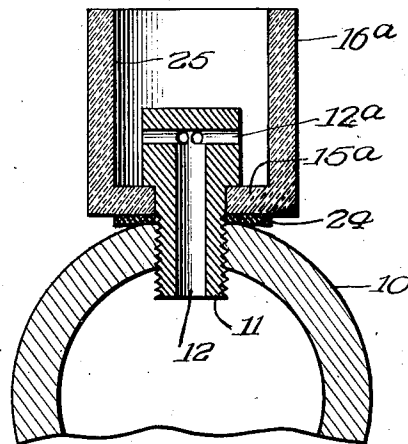
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2,005,801

BURNER FOR VARIOUS GASES

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Fig. 1



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BURNER FOR VARIOUS GASES

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4 Claims. (Cl. 158—116)

The present invention relates generally to burners for various gases which are usually mixed with air to produce a combustible mixture. More particularly the invention relates to that type of burner which is adapted for burning gas of high calorific value, such as natural gas, propane, butane and other gases which, because of their rate of flame propagation, burn slowly. Due to the slow burning quality of these gases, it is extremely difficult to prevent the flame from leaving the burner which causes the flame to be extinguished and causes back-firing.

One object of the invention is to provide a burner of this type which is generally an improvement upon and more efficient in operation than previously designed burners of the same general character and operates to burn slow burning gases of high calorific value without likelihood of extinguishment of the flame. Another object of the invention is to provide a burner of the type under consideration in which the nozzle for discharging the mixture of gas and air has a central duct through which the combustible mixture flows and a series of smaller transverse ducts leading from the axial duct into the combustion chamber to direct a series of small streams against the wall of the combustion chamber at substantially right angles to said wall to reduce the velocity of the mixture and to prevent extinguishment of the flame and back firing.

Another object is to provide an improved simple and efficient construction of burner for this purpose which can be readily manufactured at a low cost. Other objects of the invention and the various advantages and characteristics of the present burner construction will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawing which accompanies and forms a part of this specification or disclosure and in which like numerals of reference denote corresponding parts throughout the several views: Fig. 1 is a side elevation of the manifold equipped with a series of burners embodying one form of the invention. Fig. 2 is a transverse section through one of the burners and the manifold. Fig. 3 is a plan of the burner. Fig. 4 is a vertical section of a burner embodying another form of the invention. Fig. 5 is a vertical section of a third form of burner.

In Fig. 1 a series of burners embodying the

preferred form of the invention are applied to a manifold 10, to which air and gas are delivered in any suitable manner. These burners may be connected to any form of conduit or head, as well understood in the art.

In the form of the invention illustrated in Figs. 1, 2 and 3, the burner consists of a nozzle and a cup-shaped or outer member. The nozzle comprises a shank 11 having a central axial duct 12 formed therein and an integral head or enlarged portion 13 within the outer member. This head is provided with a series of radial ducts 12^a which lead transversely from the central duct 12 to the sides of the head. The outer or lower end of the shank has a screw-thread 14 to engage a thread in the manifold 10 for attaching the burner to the manifold. The outer member is cup-shaped and comprises a bottom wall 15 and an integral upstanding cylindrical wall 16. The chamber in the cup-shaped member constitutes a combustion chamber for gaseous fuel discharged from the nozzle. The shank 11 extends through a central hole in the bottom wall 15. The head 13 of the nozzle seats on said wall and serves to clamp the outer member against the manifold. To prevent separation of the nozzle and outer member during shipment, a tight or drive fit may be used between the shank 11 and bottom wall 15. The head 13 has polygonal sides, so that the radial ducts 12^a can be drilled into the head from the outside and so that a suitable wrench may be applied to the nozzle to screw it into the manifold. The nozzle is preferably made of polygonal stock, machined to form the shank and drilled to form the axial central duct 12 and the transverse radial ducts 12^a. The nozzle and outer member are formed of steel, brass alloy or any suitable machinable heat resisting alloy.

The axial duct 12 terminates below the top of the nozzle. The outlets of the transverse ducts 12^a terminate at the center of the flat side portions of the polygonal head so their terminals will be spaced from the inner face of the wall 16 of the combustion chamber. The aggregate cross-sectional area of the transverse holes 12^a is considerably greater than the cross-sectional area of the duct 12 to reduce the velocity of the combustible mixture in the combustion chamber and assist in retaining the flame therein. The axes of the ducts 12^a are substantially at right angles to the axis of the duct 12 to cause the streams from the duct 12^a to be directed toward or against the inner face of the cylindrical wall 16 of the combustion chamber at substantially right angles

to said face. This further reduces the velocity of, or retards the mixture in, the outer member, and assists in retaining the flame within the burner and preventing its extinguishment. The mixture will at all times have sufficient velocity in the axial duct 12 in the shank to prevent back-firing. A small hole 12^b is drilled through the top of the nozzle to the duct 12 to form a small upwardly extending duct which will deliver a small portion of the mixture into the combustion chamber and above the nozzle. The escape of a small portion of the mixture upwardly through duct 12^b will reduce the velocity of the streams through ducts 12^a, and assist in keeping the tongues of flame in the combustion chamber and adjacent the outer ends of ducts 12^a and away from the wall 16, and will also lessen the disturbance due to small eddy currents when the flow of mixture is low. The shank 11 is extended through the wall of, and into, the manifold to subject the nozzle to the cooling effect of the mixture in the manifold. This results in cooling the nozzle when it is made of brass or metal of high heat conductivity.

In operation: The combustible mixture flows through the axial duct 12 to the transverse ducts 12^a where it is divided into a series of small streams of reduced velocity. These streams are directed toward or against the wall 16 of the combustion chamber around the nozzle and substantially at right angles thereto further to reduce the velocity and cause the flame to be confined to the combustion chamber. As a result, the flame will be continuous, particularly when the mixture contains slow burning gases of high calorific values, and all of the gas will be consumed. The small stream of the mixture escaping through hole 12^b will assist in keeping the tongues of flame adjacent the outer ends of ducts 12^a and lessen the disturbance due to small eddy currents when the mixture supply is turned low.

In Fig. 4, the invention is exemplified in a burner in which the nozzle is provided with an integral flange or base 20 having an annular shoulder 21 and a cylindrical section or ring 22 is seated and secured on said shoulder to form the combustion chamber around the nozzle. A plurality of small ducts 12^c are drilled in the top of the nozzle in this form of the invention.

In the exemplification of the invention shown in Fig. 5, the cup-shaped outer member 25 is made of refractory material, and a washer 24 of asbestos or other suitable material is placed between the manifold and the bottom wall of the outer member to permit the expansion and contraction of the refractory outer member. This prevents fracture of the outer member. The nozzle is of the same construction as illustrated in Fig. 2, except that the hole 12^b is omitted.

The invention exemplifies a burner which is efficient in producing the combustion of slow burning gases of high calorific value; which consists of a nozzle and outer member in which the velocity of the mixture is reduced by directing small streams transversely or at substantially right angles against the outer wall of the combustion chamber to prevent extinguishment of the flame; in which back firing is prevented; and which consists of a nozzle and outer member which can be readily manufactured at a low cost.

The invention is not to be understood as restricted to the details set forth, since these may be modified within the scope of the appended

claims, without departing from the spirit and scope of the invention.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent, is:

1. A gaseous fuel burner of the character described comprising in combination a cup-shaped member overlying a fuel supply manifold and consisting of a continuous side wall and a bottom wall forming with the side wall a combustion chamber with an open top, and a vertically extending nozzle embodying an enlarged head disposed in the lower part of the combustion chamber and spaced inwardly and centrally with respect to the side wall of the cup-shaped member, and a shank of reduced diameter formed integrally with, and extending downwardly from the lower end of, the head and projecting into a hole in the manifold, said nozzle having a central bore of uniform diameter extending longitudinally through the shank and into the head to a point beneath the upper end of said head and forming a vertical duct for receiving fuel from the manifold, and also having a plurality of transverse ducts extending radially from the upper end of the bore and outwardly through the side portions of the head and serving to jet streams of fuel outwardly against the side wall of the cup-shaped member for passage to the upper part of the combustion chamber, said transverse ducts being of greater total cross sectional area than the vertical duct so that the velocity of the fuel is reduced before jetting of the fuel against the side wall of the cup-shaped member.

2. A gaseous fuel burner of the character described comprising in combination a cup-shaped member overlying a fuel supply manifold and consisting of a cylindrical side wall and a circular bottom wall forming with the side wall a combustion chamber with an open top, and a vertically extending nozzle embodying an enlarged head disposed in the lower part of the combustion chamber and spaced inwardly and centrally with respect to the side wall of the cup-shaped member, and a shank of reduced diameter formed integrally with and extending downwardly from the lower end of the head and provided with an external screw thread for connection to an internally threaded hole in the manifold, said nozzle having a central bore of uniform diameter extending longitudinally through the shank and into the head to a point beneath the upper end of said head and forming a vertical duct for receiving fuel from the manifold, and also having a plurality of transverse ducts extending radially from the upper end of the bore and outwardly through the side portions of the head and serving to jet streams of fuel outwardly against the side wall of the cup-shaped member for passage to the upper part of the combustion chamber, said transverse ducts being of greater total cross sectional area than the vertical duct so that the velocity of the fuel is reduced before jetting of the fuel against the side wall of the cup-shaped member.

3. A gaseous fuel burner of the character described comprising in combination a cup-shaped member overlying a fuel supply manifold and consisting of a continuous side wall and a bottom wall forming with the side wall a combustion chamber with an open top, and a vertically extending nozzle embodying an enlarged head disposed in the lower part of the combustion cham-

ber and spaced inwardly and centrally with respect to the side wall of the cup-shaped member, and a shank of reduced diameter formed integrally with, and extending downwardly from the lower end of the head and projecting into a hole in the manifold, said nozzle having a central bore of uniform diameter extending upwardly through the shank and into the head to a point beneath the upper end of said head and forming a vertical duct for receiving fuel from the manifold, and also having a plurality of transverse ducts extending radially from the upper end of the bore and through the side portions of the head for jetting the fuel outwardly against the side wall of the cup-shaped member for passage into the upper part of the combustion chamber and having a small vertical hole of materially less diameter than the bore leading upwardly from the upper end of said bore through the upper end of the head for delivering a small portion of the fuel upwardly into the upper part of the combustion chamber, said transverse ducts and the hole being of greater total cross sectional area than the bore so that the velocity of the fuel is reduced before entry of the fuel into the cup-shaped member.

4. A gaseous fuel burner of the character described comprising in combination a cup-shaped

member overlying a fuel supply manifold and consisting of a continuous side wall and a bottom wall having a hole in the central part thereof and forming with the side wall a combustion chamber with an open top, and a vertically extending nozzle embodying an enlarged polygonal head disposed in the lower part of the combustion chamber and spaced inwardly and centrally with respect to the side wall of the cup-shaped member, and an integral, depending shank of reduced diameter extending through the hole in the bottom wall of the cup-shaped member and provided with an external screw thread for connection to an internally threaded hole in the manifold, said nozzle having a central bore of uniform diameter extending longitudinally through the shank and into the head to a point beneath the upper end of said head and forming a vertical duct for receiving fuel from the manifold, and also having a plurality of transverse ducts corresponding in number to the sides of the head and extending radially from the upper end of the bore and through the sides of the head respectively for jetting the fuel outwardly against the side wall of the cup-shaped member for passage to the upper part of the combustion chamber.

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