

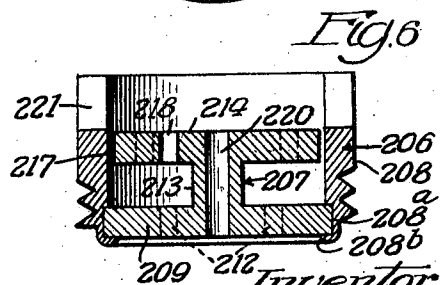
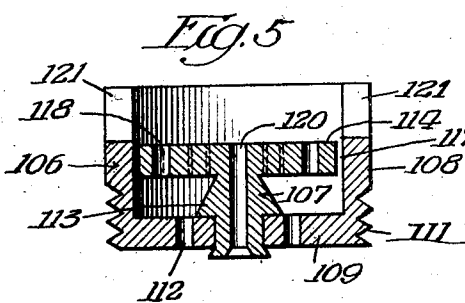
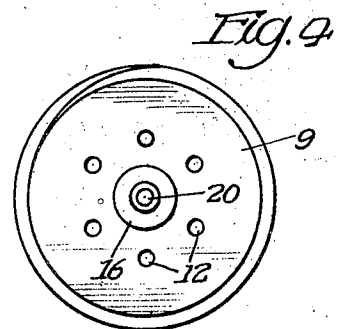
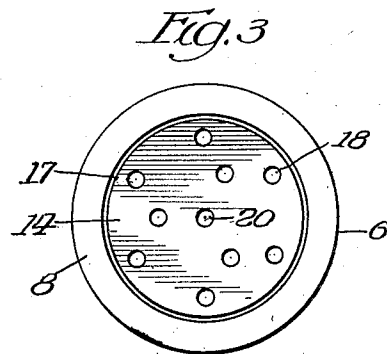
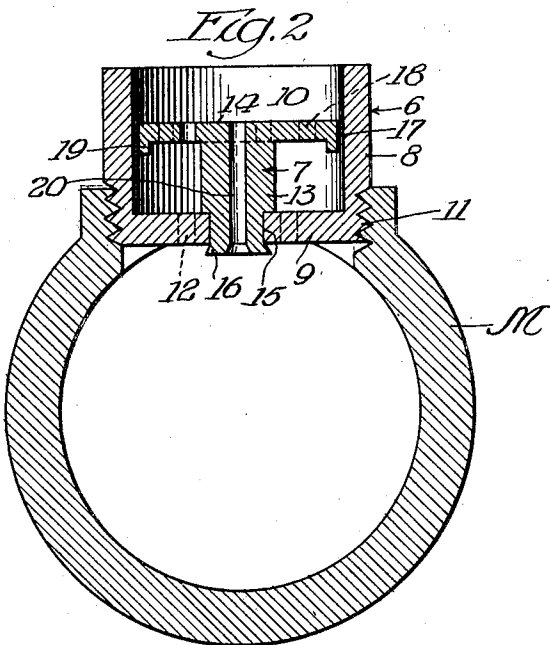
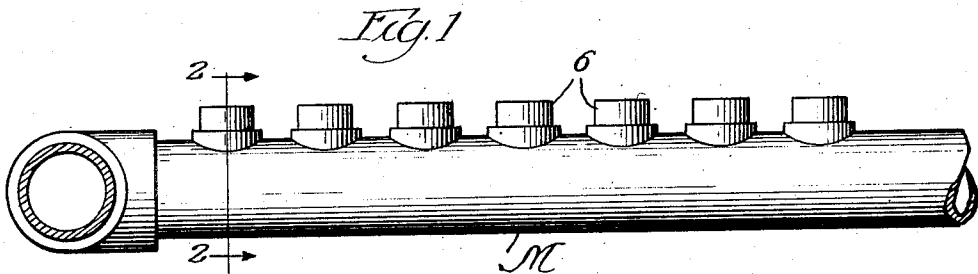
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G. W. McKEE

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BURNER

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UNITED STATES PATENT OFFICE

GARNET W. MCKEE, OF ROCKFORD, ILLINOIS

BURNER

Application filed October 5, 1931. Serial No. 566,831.

The present invention relates generally to burners for gaseous fuel, that is, mixtures of air and gas. More particularly the invention relates to that type of burner which is especially adapted for use in connection with slow burning gases of comparatively high calorific value, such, for example, as natural gas, propane and butane, is designed to be used with other burners of like character on a manifold to which is supplied the fuel to be burnt, and comprises a cup-shaped member which forms a combustion chamber, is provided at the lower end thereof with an external screw thread for connection to the manifold and embodies a plurality of holes in its bottom wall whereby fuel is introduced into the combustion chamber from the manifold for combustion purposes.

One object of the invention is to provide a burner of this type in which backfire and isolation or blowing off of the flame from the burner are more readily and effectively prevented than in previously designed burners of the same general design or type, by virtue of the fact that it comprises, in addition to the cup-shaped member, a member which is secured to and projects upwardly from the bottom wall of the cup-shaped member and is equipped at its upper end with an annular, outwardly extending flange for deflecting outwardly against the side wall of the cup-shaped member, and reducing the velocity of the jets of fuel emanating from the holes in the bottom wall of the cup-shaped member, in order to keep the flame within the combustion chamber and thus prevent extinguishment thereof.

Another object of the invention is to provide a burner of the last mentioned character in which the flange of the flange-equipped member is provided with vertical holes which are of greater total cross sectional area than, and are vertically offset with respect to, the holes in the cross wall of the cup-shaped member in order to reduce further the velocity of the fuel in the combustion chamber and improve the character of the flame.

Another object of the invention is to provide a burner of the character under consideration in which the flange-equipped member

in the combustion chamber extends through the bottom wall of the cup-shaped member and into the manifold, and embodies a vertical bore whereby a small portion of fuel at high velocity is introduced upwardly into the central portion of the combustion chamber so as to concentrate the heat and prevent flaring of the flame.

A further object of the invention is to provide a gaseous fuel burner of the type here under consideration in which the upper end of the side wall of the cup-shaped member is provided with a pair of diametrically opposite slots which permit the cup-shaped member to be turned into connected relation with the manifold by the use of a screw driver or piece of flat stock and permit of ready lighting of the adjoining or contiguous burners on the manifold.

A still further object of the invention is to provide a burner of the type here under consideration which is generally of new and improved construction and may be manufactured at a comparatively low cost by virtue of the fact that the parts thereof may be made in automatic screw machines.

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 which are hereinafter set forth and are more particularly defined by the 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 view of a fuel supply manifold having a series of burners embodying the invention;

Fig. 2 is a vertical section through a burner embodying one form of the invention;

Fig. 3 is a plan view of the burner of Fig. 2, illustrating in detail the arrangement of the holes in the flange of the flange-equipped member;

Fig. 4 is a bottom view of the burner of Fig.

2 showing the arrangement of the holes in the bottom wall of the cup-shaped member and the manner in which the flange-equipped member is secured to the cup-shaped member;

5 Fig. 5 is a vertical section of a burner embodying another form of the invention; and Fig. 6 is a vertical section of a burner embodying still another form of the invention.

10 The burner of Figs. 2, 3 and 4 is especially adapted to be used in connection with the burning of low burning gases of comparatively high calorific value, such, for example, as natural gas, propane and butane. It

15 comprises an outer, cup-shaped member 6 and an inner member 7 and is designed to be used with other burners of like character on a manifold M to which a combustible mixture of air and gas is delivered under pressure,

20 as well understood in the art. The cup-shaped member 6 is formed of steel, brass, a heat-resisting alloy, a refractory substance or any other suitable material, and consists of a cylindrical side wall 8 and a circular bottom wall 9. The bottom wall 9 is formed

25 integrally with the cylindrical side wall 8 and forms with the latter a combustion chamber 10. The lower end of the side wall 8 is provided with an external screw thread 11

30 whereby the cup-shaped member 6 of the burner may be connected to an internal screw thread in the top of the manifold M in such a manner that the circular bottom wall 9 is disposed within the manifold. Gaseous fuel

35 is supplied from the manifold to the combustion chamber 10 by way of an annular series of holes 12 in the circular bottom wall 9 of the cup-shaped member 6. These holes are drilled in the bottom wall 9 and extend vertically

40 so as to effect direct communication between the interior of the manifold and the combustion chamber. By virtue of the fact that the gaseous fuel is under pressure in the manifold, the fuel passing upwardly into

45 the combustion chamber by way of the holes 12 is in the form of an annular series of jets of comparatively high velocity. The inner member 7 serves to reduce the velocity of the fuel entering the combustion chamber so as

50 to prevent backfire and the isolation or blowing away of the flame from the combustion chamber. It is formed of steel, brass, a heat-resisting alloy, a refractory substance or any other suitable material, and consists of a

55 shank 13 and an annular flange 14. The shank 13 is cylindrical in conformation, extends vertically within the combustion chamber 10 and embodies a reduced lower end which extends through a hole 15 in the center

60 of the circular bottom 9 of the cup-shaped member 6. The inner member 7 is secured fixedly to the cup-shaped member by expanding with any suitable tool the extreme lower end of the reduced end portion of the shank

65 13 so as to form a bead or outstruck por-

tion 16 which abuts against the under-face of the bottom wall 9 and coacts with the shoulder that is formed between the reduced end portion of the shank and the shank proper. The holes 12 extend around the hole

70 15 and are positioned slightly outwardly of the shank 13. The annular flange 14 projects outwardly from and is formed integrally with the extreme upper end of the shank 13. It is positioned adjacent the central portion of the combustion chamber and is of such

75 size that the edge or margin thereof is spaced slightly inwardly from the inner periphery of the cylindrical side wall 8 and forms therewith an annular passageway 17 whereby the jets of fuel emanating from the holes 12 are

80 permitted to pass upwardly from the lower portion of the combustion chamber to the upper portion. The under side of the annular flange operates as a baffle for the jets

85 of fuel passing upwardly into the lower portion of the combustion chamber through the openings 12, and serves to direct the jets outwardly against the inner periphery of the side wall 8 so as to reduce the velocity there-

90 of. By reducing the velocity of the jets of fuel prior to passage of the fuel into the upper portion of the combustion chamber, backfire is prevented and the flame is caused to stay in, and in close proximity to, the upper portion

95 of the combustion chamber, with the result that there is little, if any, likelihood of it being extinguished. In order to reduce further the velocity of the jets of fuel entering the combustion chamber and to improve the

100 flame, holes 18 are drilled in the flange 14 of the inner burner member 7. These holes extend vertically and are offset with respect to the holes 12 in the circular bottom wall 9

105 of the cup-shaped burner member 6 so that the jets of fuel are not permitted to pass directly into the upper portion of the combustion chamber without first being arrested or retarded. When the jets of fuel enter the

110 lower portion of the combustion chamber from the manifold, they pass upwardly and strike against the under face of the annular flange 14. A portion of the jets is directed

115 outwardly and impinges against the inner periphery of the side wall 8 and then passes upwardly through the annular passage 17 into the upper portion of the combustion chamber. The remainder of the jets flows

120 upwardly through the holes 18. By virtue of the fact that the jets of fuel entering the lower portion of the combustion chamber are momentarily retarded or arrested by striking

125 against the under face of the annular flange 14, there is a material reduction in the velocity of the jets. The holes 18 are of such number or size that the total cross sectional area thereof is greater than that of the holes 12. An

130 annular bead 19 is formed integrally with and depends from the margin or edge portion of the flange 14. This bead operates to

increase the frictional retardation of the portion of the fuel that passes into the upper portion of the combustion chamber through the annular passageway 17. In order to concentrate the heat produced by the flame and to prevent flaring of the flame, a hole 20 is drilled in the center of the shank 13. This hole extends from one end of the shank to the other and permits a single jet of fuel of comparatively high velocity to enter the upper portion of the combustion chamber. This single jet of high velocity fuel concentrates the heat and prevents the flaring of the flame.

The operation of the burner of Figs. 2, 3 and 4, is as follows:

The gaseous fuel in the manifold flows upwardly into the lower portion of the combustion chamber 10 via the holes 12 and is in the form of jets of comparatively high velocity. The jets flow upwardly until arrested by the under face of the flange 14 and then flow outwardly. A portion of the jets flows around the annular bead 19 and then passes upwardly through the annular passageway 17 into the upper portion of the combustion chamber 10. The remainder of the jets flows upwardly into the upper portion of the combustion chamber via the holes 18. As the fuel strikes against the flange and passes upwardly through the passageway 17 and the holes 14, the velocity thereof is reduced to the desired extent. Upon entry of the fuel into the upper portion of the combustion chamber, combustion takes place. The fuel passing upwardly into the upper portion of the combustion chamber through the hole 20 in the shank 13 is of comparatively high velocity and serves, as previously pointed out, to concentrate the heat and flaring of the flame resulting from combustion. By virtue of the fact that the major part of the fuel enters the upper portion of the combustion chamber at comparatively low velocity, there is little, if any, likelihood of backfire and the flame is not blown away from the burner.

The burner of Fig. 5 is the same in general design as that of Figs. 2, 3 and 4. It comprises a cup-shaped outer member 106 and an inner member 107. The cup-shaped member comprises a cylindrical side wall 108 and a circular bottom wall 109. The latter embodies an annular series of openings 112 and forms with the side wall a combustion chamber. The burner is secured in place by means of an external screw thread 111 on the end of the side wall 108. The inner member 107 consists of a shank 113 and an annular flange 114. The shank extends through the center of the bottom wall 109 and has a longitudinal hole 120 for supply a single high velocity jet of fuel to the combustion chamber. The portion of the shank above the bottom wall 109 is tapered so that the upper part of the lower portion of the combustion chamber is of greater volume than the lower part and tends

to reduce the velocity of the fuel as the latter passes upwardly in jet form from the holes 112. The flange 114 has holes 118 drilled therein and is spaced from the side wall 108 so as to form an annular passageway 117 for the passage of fuel from the lower portion of the combustion chamber to the upper portion. The holes 118 are offset with respect to the holes 112 in the bottom wall 109. The upper end of the cylindrical side wall 108 of the cup-shaped member 106 is provided with a pair of diametrically opposite slots 121 which make it possible to screw the burner into place by the use of a screw driver or a piece of flat stock and tend to facilitate lighting of adjoining burners. In applying the burner of Fig. 5 to a manifold, the cup-shaped member 106 is positioned so that the slots 121 face the adjoining burners on the manifold. The operation of the burner of Fig. 5 is the same as that of Figs. 2, 3 and 4.

The burner of Fig. 6 is generally the same in principle and design as the burner of Figs. 2, 3 and 4 and that of Fig. 5. It comprises an outer member 206 and an inner member 207. The outer member comprises a cylindrical side wall 208 which forms the combustion chamber of the burner and has an annular groove 208^a in the lower end thereof. The inner member 207 consists of a circular bottom piece 209, a shank 213 and an annular flange 214. The circular bottom piece 209 fits within the annular groove 208^a in the lower end of the side wall 208 and is held in place by means of a bead 208^b. The latter is formed by deflecting or bending inwardly the extreme lower end of the side wall. The bottom piece 209 is formed integrally with the shank 213 and embodies an annular series of openings 212 for admitting fuel into the combustion chamber. A longitudinal hole 220 through the flange, shank and bottom piece, supplies a single high velocity jet of fuel to the upper end of the combustion chamber and corresponds with the hole 120 of the burner of Fig. 5. The flange 214 has holes 218 drilled therein and is spaced from the side wall 208 so as to form an annular passageway 217 for the passage of fuel from the lower portion of the combustion chamber to the upper portion. The holes 218 are offset with respect to the holes 212 in the bottom piece 209. A pair of diametrically opposite slots 221 are formed in the upper end of the cylindrical side wall 208 to permit a turning tool to be applied to the burner in the installation of the latter and to facilitate lighting of adjoining burners.

The herein disclosed burners may be manufactured at a comparatively low cost by virtue of the fact that they consist of but two parts which may be readily formed by automatic screw machines. Inasmuch as simple and improved means is provided for reducing the velocity of the fuel entering the combustion

tion chamber, the burners are extremely efficient in operation.

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 provided with means for connection to a fuel supply manifold and consisting of a continuous side wall and a bottom wall forming with the side wall a combustion chamber and having vertical holes therein for admitting jets of fuel directly from the manifold into the chamber, and means in the central portion of the combustion chamber for baffling and deflecting laterally the jets of fuel emanating from the holes so as to reduce the velocity thereof prior to passage of the fuel into the upper portion of the combustion chamber.

2. A gaseous fuel burner of the character described, comprising in combination a cup-shaped member provided with means for connection to a fuel supply manifold and consisting of a continuous side wall and a bottom wall forming with the side wall a combustion chamber and having vertical holes therein for admitting jets of fuel directly from the manifold into the chamber, and means in the central portion of the combustion chamber for baffling, and deflecting outwardly against the inner face of the side wall of the cup-shaped member, the jets of fuel emanating from the holes so as to reduce the velocity thereof prior to passage of the fuel into the upper portion of the combustion chamber.

3. A gaseous fuel burner of the character described, comprising in combination a cup-shaped member provided with means for connection to a fuel supply manifold and consisting of a cylindrical side wall and a circular bottom wall forming with the side wall a combustion chamber and having vertical holes therein for admitting jets of fuel directly from the manifold into the chamber, and an element in the central portion of the combustion chamber spaced from the side wall of the cup-shaped member so as to form an annular fuel passageway therebetween and operative to baffle, and deflect outwardly against the inner face of the side wall of the cup-shaped member, the jets of fuel emanating from the holes in order to reduce the velocity thereof prior to passage of the fuel through the passageway into the upper portion of the combustion chamber.

4. A gaseous fuel burner of the character described, comprising in combination a cup-shaped member provided with means for connection to a fuel supply manifold and con-

sisting of a continuous side wall and a bottom wall forming with the side wall a combustion chamber and having holes therein for admitting jets of fuel from the manifold into the chamber, and an element for reducing the velocity of the jets of fuel emanating from the holes, disposed in the central portion of the chamber and arranged so that it is spaced from the inner face of the side wall of the cup-shaped member and forms therewith a passageway for the fuel, said element being operative to deflect laterally against the side wall a portion of the fuel for passage into the upper portion of the combustion chamber through the passageway and having holes therein whereby the remainder of the fuel is permitted to enter the said upper portion of the combustion chamber.

5. A gaseous fuel burner of the character described, comprising in combination a cup-shaped member provided with means for connection to a fuel supply manifold and consisting of a continuous side wall and a bottom wall forming with the side wall a combustion chamber and having holes therein for admitting jets of fuel from the manifold into the chamber, and an element for reducing the velocity of the jets of fuel emanating from the holes, disposed in the central portion of the chamber and arranged so that it is spaced from the inner face of the side wall of the cup-shaped member and forms therewith a passageway for the fuel, said element being operative to deflect laterally against the side wall a portion of the fuel for passage into the upper portion of the combustion chamber through the passageway and having holes therein offset with respect to the holes in the bottom wall of the cup-shaped member, for permitting the remainder of the fuel to pass upwardly into the said upper portion of the combustion chamber.

6. A gaseous fuel burner of the character described, comprising in combination a cup-shaped member provided with means for connection to a fuel supply manifold and consisting of a continuous side wall and a bottom wall forming with the side wall a combustion chamber and having holes therein for admitting jets of fuel from the manifold into the chamber, and an element for reducing the velocity of the jets of fuel emanating from the holes, disposed in the central portion of the chamber and arranged so that it is spaced from the inner face of the side wall of the cup-shaped member and forms therewith a passageway for the fuel, said element being operative to deflect laterally against the side wall a portion of the fuel for passage into the upper portion of the combustion chamber through the passageway and having vertical holes therein offset with respect to, and of greater total area than, the holes in the bottom wall of the cup-shaped member whereby the remainder of the fuel is permitted to pass

upwardly into the said upper portion of the combustion chamber.

7. A gaseous fuel burner of the character described, comprising in combination a cup-shaped member provided with means for connection to a fuel supply manifold and consisting of a continuous side wall and a bottom wall forming with the side wall a combustion chamber and having vertical holes therein for admitting jets of fuel directly from the manifold into the chamber, and a member in the cup-shaped member consisting of a shank connected to and extending upwardly from the center of the bottom wall and a laterally projecting flange at the upper end of the shank and in the central portion of the combustion chamber, said flange being spaced from the side wall of the cup-shaped member so as to form a fuel passageway therebetween and operating to baffle, and deflect outwardly against said side wall, the jets of fuel emanating from the holes so as to reduce the velocity thereof prior to passage of the fuel into the upper portion of the combustion chamber through the passageway.

8. A gaseous fuel burner of the character described, comprising in combination a cup-shaped member provided with means for connection to a fuel supply manifold and consisting of a continuous side wall and a bottom wall forming with the side wall a combustion chamber and having holes therein for admitting jets of fuel from the manifold into the chamber, and a member in the cup-shaped member consisting of a shank connected to and extending upwardly from the center of the bottom wall and a flange projecting outwardly from the upper end of the shank, positioned in the central portion of the combustion chamber and so that it is spaced from the aforesaid side wall so as to form therewith a fuel passageway, said flange being operative to reduce the velocity of the jets of fuel emanating from the holes by deflecting a portion of the jets outwardly against the side wall for passage through the passageway into the upper portion of the combustion chamber and having holes therethrough whereby the remainder of the jets of fuel is permitted to pass upwardly into the said upper portion of the combustion chamber.

9. A gaseous fuel burner of the character described, comprising in combination a cup-shaped member provided with means for connection to a fuel supply manifold and consisting of a continuous side wall and a bottom wall forming with the side wall a combustion chamber and having holes therein for admitting jets of fuel from the manifold into the chamber, and a member in the cup-shaped member consisting of a shank connected to and extending upwardly from the center of the bottom wall and a flange projecting outwardly from the upper end of

the shank, positioned in the central portion of the combustion chamber and so that it is spaced from the aforesaid side wall so as to form therewith a fuel passageway, said flange being operative to reduce the velocity of the jets of fuel emanating from the holes by deflecting a portion of the jets outwardly against the side wall for passage through the passageway into the upper portion of the combustion chamber and having vertical holes therethrough offset with respect to the holes in the bottom wall whereby the remainder of the jets of fuel is permitted to pass upwardly into the said upper portion of the combustion chamber.

10. A gaseous fuel burner of the character described, comprising in combination a cup-shaped member provided with means for connection to a fuel supply manifold and consisting of a continuous side wall and a bottom wall forming with the side wall a combustion chamber and having vertical holes therein for admitting jets of fuel directly from the manifold into the chamber, and a member in the cup-shaped member consisting of a shank extending through and projecting upwardly from the center of the bottom wall and a laterally projecting flange at the upper end of the shank and in the central portion of the combustion chamber, said flange being spaced from the side wall of the cup-shaped member so as to form a fuel passageway therebetween and operating to reduce the velocity of the jets of fuel emanating from the holes by deflecting such jets laterally against the side wall prior to passage into the upper portion of the combustion chamber via the passageway, the shank having a hole extending longitudinally therethrough for admitting fuel directly from the manifold into the said upper portion of the combustion chamber without substantial loss in velocity.

11. A gaseous fuel burner of the character described, comprising in combination a cup-shaped member provided with means for connection to a fuel supply manifold and consisting of a continuous side wall and a bottom wall forming with the side wall a combustion chamber, and having holes therein for admitting jets of fuel from the manifold into the chamber, and a member in the cup-shaped member consisting of a shank connected to and extending upwardly from the center of the bottom wall and a flange projecting outwardly from the upper end of the shank, positioned in the central portion of the combustion chamber and so that it is spaced from the aforesaid side wall so as to form therewith a fuel passageway, said flange being operative to reduce the velocity of the jets of fuel emanating from the holes by deflecting a portion of the jets outwardly against the side wall for passage through the passageway into the upper portion of

the combustion chamber and having holes therethrough whereby the remainder of the jets of fuel is permitted to pass upwardly into the said upper portion of the combustion chamber, the shank having a hole extending longitudinally therethrough for admitting fuel directly from the manifold into the said upper portion of the combustion chamber without substantial loss in velocity.

12. A gaseous fuel burner of the character described, comprising in combination a cup-shaped member provided with means for connection to a fuel supply manifold and consisting of a continuous side wall and a bottom wall forming with the side wall a combustion chamber and having holes therein for admitting jets of fuel from the manifold into the chamber, and a member within the cup-shaped member comprising an upwardly tapered shank connected to and extending upwardly from the center of the bottom wall and an outwardly projecting flange at the upper end of the shank and in the central portion of the combustion chamber, said flange being spaced from the side wall thereof so as to form therebetween a fuel passageway and operating to reduce the velocity of the jets of fuel emanating from the holes by deflecting such jets laterally against said side wall prior to passage into the upper portion of the combustion chamber via the passageway.

13. A gaseous fuel burner of the character described, comprising in combination a cup-shaped member provided with means for connection to a fuel supply manifold and consisting of a continuous side wall and a bottom wall forming with the side wall a combustion chamber and having holes therein for admitting jets of fuel from the manifold into the chamber, and a member within the cup-shaped member comprising an upwardly tapered shank connected to and extending upwardly from the center of the bottom wall and an outwardly projecting flange at the upper end of the shank and in the central portion of the combustion chamber, said flange being operative to arrest the jets of fuel emanating from the holes in the bottom wall and having holes therein whereby the fuel is permitted to pass into the upper portion of the combustion chamber.

14. A gaseous fuel burner of the character described, comprising in combination an outer member provided with means for connection to a fuel supply manifold and consisting of a substantially cylindrical, vertically extending side wall, a substantially circular bottom piece formed separately from and secured to the lower end of the side wall, forming with the side wall a combustion chamber and having holes therein for admitting jets of fuel from the manifold into the chamber, a shank formed integrally with and projecting upwardly from the center

of the bottom piece, and a laterally projecting flange at the upper end of the shank and in the central portion of the combustion chamber spaced from the side wall of the cup-shaped member so as to form a fuel passageway therebetween and operating to baffle and deflect outwardly against the side wall the jets of fuel emanating from the holes so as to reduce the velocity thereof prior to passage of the fuel into the upper portion of the combustion chamber through the passageway.

15. A gaseous fuel burner of the character described, comprising in combination an outer member provided with means for connection to a fuel supply manifold and consisting of a substantially cylindrical, vertically extending side wall having an annular groove in the lower end thereof, a substantially circular bottom piece having the marginal portion thereof fitting and secured within the annular groove and having holes therein for admitting jets of fuel from the manifold into the chamber, a shank formed integrally with and projecting upwardly from the center of the bottom piece, and a laterally projecting flange at the upper end of the shank and in the central portion of the combustion chamber spaced from the side wall of the cup-shaped member so as to form a fuel passageway therebetween and operating to baffle and deflect outwardly against the side wall the jets of fuel emanating from the holes so as to reduce the velocity thereof prior to passage of the fuel into the upper portion of the combustion chamber through the passageway.

Signed at Rockford, Illinois, this 21st day of September, 1931.

GARNET W. McKEE.