Sept. 4, 1945. W. D. FULLER 2,384,022

GAS BURNER

Filed April 22, 1941

Fig. 1.

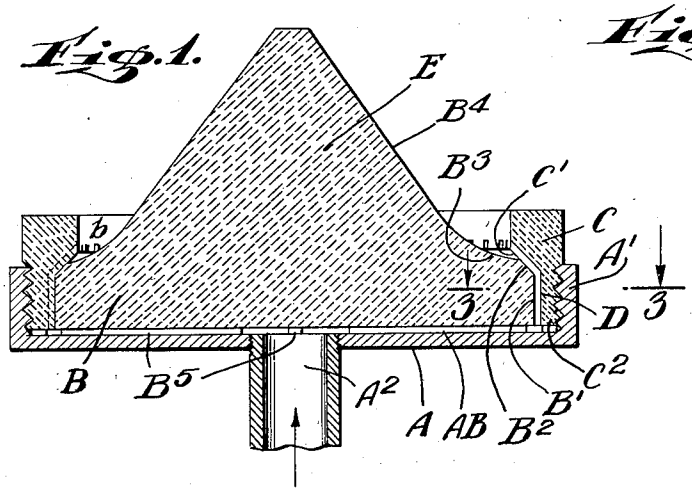


Fig. 3.

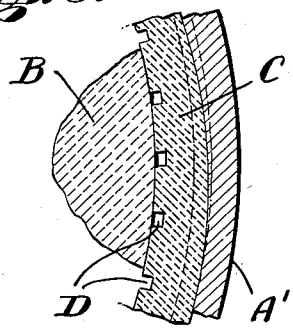


Fig. 4.

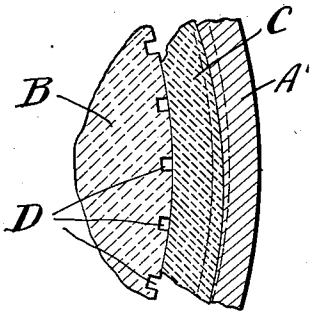


Fig. 2.

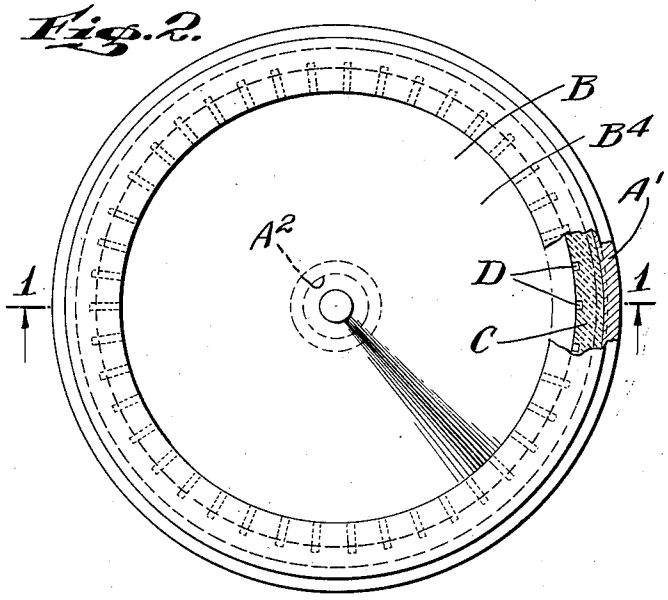
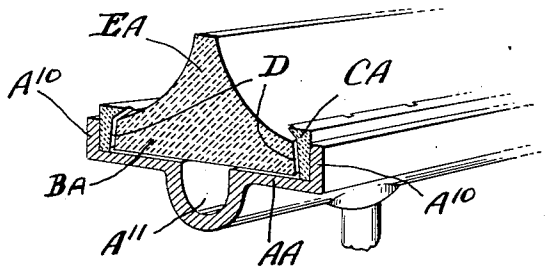


Fig. 5.



INVENTOR
WARREN D. FULLER
BY
John E. Hubbell
ATTORNEY

Patented Sept. 4, 1945 2,384,022

UNITED STATES PATENT OFFICE

2,384,022

GAS BURNER

Warren D. Fuller, West Hartford, Conn., assignor to Selas Corporation of America, a corporation of Pennsylvania

Application April 22, 1941, Serial No. 389,708

4 Claims. (Cl. 158—116)

The general object of the present invention is to provide improvements in gas burners and particularly in gas burners of the type in which the gas burned is supplied to the burner in admixture with a combustion supporting gas, such as air, for example, required for its combustion.

A specific object of the present invention is to provide a burner of the type specified which includes refractory material disposed in a novel manner alongside the burner combustion space which is highly heated to incandescence by the combustion process and serves as a high temperature source of radiant heat.

In the preferred form of the present invention the mixture of combustible gas and combustion supporting gas supplied to the burner is discharged through distributed burner orifices in an orifice wall portion of the burner thereby forming juxtaposed jets between which refractory material is interposed so as to provide a heat absorbing and radiating surface which is large relative to its volume and weight. The invention may be used in burners of various hexagonal forms and with especial advantage in circular burners in which the discharge ends of the burner orifices are distributed in a circle about a central tapered refractory body of circular cross section which diminishes as the distance from the orifice circle increases. The invention may also be used with especial advantage in a ribbon burner in which the burner orifices are arranged in horizontal rows at opposite sides of the central plane of the burner and in which refractory material in the form of a tapered bar is interposed between the orifice rows with its opposite side surfaces converging toward said central plane as the distance from the discharge end of said orifices increases. The described circular and ribbon burners possess common and distinctive advantages in that the refractory material alongside which combustion is effected is in heat conducting relation with the inlet portions of the burner, and in that much of the heat passing by conduction from the more highly heated portion of the refractory body into the cooler inlet portion of the burner is largely utilized in said inlet portion in preheating the combustible mixture passing through said orifices.

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

Of the drawing:

Fig. 1 is a section of a circular burner unit taken on the line 1—1 of Fig. 2;

Fig. 2 is an end view of the burner shown in Fig. 1;

Fig. 3 is a section taken on the line 3—3 of Fig. 1;

Fig. 4 is a partial section taken similarly to Fig. 3 and illustrating a modification; and

Fig. 5 is a perspective view of a portion of a ribbon burner unit.

In Figs. 1, 2 and 3 I have illustrated a circular burner unit form of the present invention comprising a metallic burner frame or holder which comprises a disc-like plate A provided with a marginal flange A′ extending away from the plate at one side and provided with a central supply pipe connection A^2 at its other side in register with a central opening through the plate. A central member B and a surrounding annular member C are mounted on the plate A with the members being enveloped and surrounded by the flange A′. Each of the members B and C may be formed of suitable refractory ceramic material. The member B adjacent the plate A is cylindrical and, together with the annular member C, forms the base of the burner. A tapered refractory body E is carried by the member B of the base portion. In the form of the burner illustrated and being described, the tapered body E and the member B are formed as an integral unit. The body E diminishes in cross section as the distance from the base portion increases. The peripheral surface of the element forming the member B and body E comprises a cylindrical portion B′, an adjacent conical portion B^2, a remote conical portion B^4 and a portion B^3 intermediate the two conical portions which is externally concave.

The annular member C comprises a relatively thin portion adjacent the plate A which surrounds and fits snugly against the surface B′ and a thicker portion which overlaps and extends away, both from the free edge of the rim flange A′ and the conical surface B^2 of the member B, the member C having a conical surface abutting against the surface B^2. As shown in Fig. 1, the member C is releasably secured to the metallic portion of the burner by means of an external thread C^2 formed on the member C and in engagement with a thread formed on the inner side of the rim A′. The member C may be secured

in position in other ways, however, as by cementing, for example.

The diverging space *b* between the peripheral wall portion B^3 of the body E and the adjacent portion of the member C serves as an ignition space and receives a combustible mixture through passages or channels D which extend along the joint between the members B and C away from the plate A and have their inlet ends adjacent the latter in communication with the supply inlet A^2 through a passage or passages AB between the plate A and the adjacent side of the member B. The member B may be formed with projections B^5 at its side adjacent the plate A to provide the passages AB. As shown in Figs. 1, 2 and 3, the channels D are in the form of grooves extending into the member C from its inner cylindrical surface surrounding the surface B'. In lieu of providing passages D in the form of grooves in the member C, they may be in the form of channels in the member B as shown in Fig. 4.

The mixture of fuel and combustion supporting gas, such as air, for example, supplied through the inlet A^2 and flowing through the passages D leaves the upper ends or discharge orifices of said passages in the form of small jets. In the preferred form of the present invention, the axis of each of said jets is parallel, or approximately parallel, to the adjacent element of the conical surface portion B^4, and so disposed with respect to the surface portions B^3 and B^4 that the unignited inner cone or core portion of each flame does not come into contact with and chill the adjacent portion of the member E, but will be sufficiently close to the peripheral surface of the member E to insure the attainment of a relatively high temperature by said surface. The latter is thus adapted to radiate a relatively large amount of heat to work, not shown, and to maintain high combustion temperatures and efficient combustion conditions.

With the tapered body E surrounded by the burning jets or flames of the fuel-air mixture discharged from the passages or grooves D, the only heat passing away from the member B by conduction to an adjacent solid body must pass either into the plate A or into the member C, and much of the heat coming to the surfaces of the member B adjacent the plate A and annular member C will be absorbed by the combustible mixture passing through the manifold or space AB and passages or grooves D and hence utilized in preheating the combustible mixture, thereby contributing to the maintenance of high combustion temperatures.

The maintenance of such temperatures contributes to the emission of an amount of radiant heat from the burner which is unusually large relative to the amount of heat carried away from the burner by the products of combustion. The relatively intense radiation from the body E in a direction normal to its surface portions B^3 and B^4 is especially desirable in some uses of the burner, such as, for example, in heating the inner wall of a combustion chamber or a hollow body into which the burner body E is inserted.

In Fig. 5 I have illustrated the use of the present invention in a so-called ribbon burner comprising a metal frame AA in the form of an elongated trough with parallel sides A^{10} and with a gas and air mixture manifold or supply passage A'' formed centrally in the frame AA and open at its side adjacent the trough space midway between the opposing trough sides A^{10}. Mounted on the frame AA is a member BA which may be formed of refractory ceramic material in the shape of a bar. The central bar BA and two side bars CA, which may also be formed of refractory ceramic material, constitute the base of the burner and are mounted on the metal frame AA. The frame AA and the bars BA and CA may be so shaped that a transverse cross section through the ribbon burner, as shown in Fig. 5, is substantially identical with the diametral cross section of the circular burner shown in Fig. 1, except in respect to the fuel mixture supply provisions.

Formed as described, the ribbon burner shown in Fig. 5 operates in a manner generally similar to that of the burner shown in Figs. 1–3. It is to be noted, however, that with the opposing passages D in the embodiment of Fig. 5 arranged in two parallel rows, one at each side of the central refractory body EA formed integrally with and carried by the bar BA, the axes of the jets or flames discharged from the side by side grooves or passages in each row are parallel whereas all of the jets or flames discharged by the burner of Figs. 1–3 are convergent.

It will now be understood that in each of the embodiments described above the refractory bodies E and EA at their larger ends terminate at the immediate vicinity of the base portions B and BA and merge into the latter at the discharge orifices of the passages D. In the embodiment of Figs. 1 to 3 the portion of the base surrounded by the passages D is impervious to flow of air so that the only combustion supporting gas passing through the base will be that passing through the passages D. Likewise, in the embodiment of Fig. 5, the base portion formed by the bar BA and between the two rows of passages D is impervious to flow of air, so that the only combustion supporting gas passing through the base will be that passing through the passages D.

In each of the embodiments described, the passages D are so disposed that a number of jets are discharged inwardly toward the smaller ends of the bodies E and EA from the discharge orifices of the passages. The jets of combustible mixture are produced and formed at regions alongside of and overlying the outer surfaces of the tapered refractory bodies E and EA, and these jets are ignited to produce a series of flames from which heat is radiated to the closely adjacent surfaces to heat them to incandescence. The surfaces heated to high incandescent temperatures promote efficient combustion of the jets whereby the outer refractory surfaces of the tapered bodies E and EA will be highly heated and provide high temperature sources of radiant heat.

While in accordance with the provisions of the statutes, I have illustrated and described the best forms 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 my invention, as set forth in the following claims.

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

1. A burner comprising means including a central part and an annular structure cooperating with the peripheral surface of the central part to provide a series of discharge orifices in the form of an annulus, the annular structure having a portion extending radially inward from the peripheral surface of and overlying a region

of the central part, an imperforate refractory body joined to the central part and having a generally conical outer wall surface which, at the larger end of the body, terminates at the immediate vicinity of and merges into the central part at the outlet ends of the discharge orifices, means for passing to the discharge orifices a combustible mixture of fuel and combustion supporting gas, the central part and annular structure being substantially impervious to flow of combustion supporting gas except through the discharge orifices and said part and inwardly extending portion of said annular structure being formed and disposed to discharge radially inward from the outlet ends of the discharge orifices at regions alongside of and overlying the outer wall surface a number of jets of the mixture which may be ignited to produce a series of flames from which heat is radiated to the closely adjacent outer wall surface to heat the latter to incandescence.

2. A burner comprising a base formed with a series of passages having inlets at one side thereof and discharge orifices at the opposite side thereof disposed in the form of an annulus, a refractory body carried by said base, said body having a generally conical-shaped outer wall surface which, at the larger end of the body, terminates at the immediate vicinity of said base and merges into the latter at the discharge orifices of said passages, means for passing to the inlets of the passages a combustible mixture of fuel and combustion supporting gas, the portion of said base surrounded by said passages being impervious to flow of combustion supporting gas so that the only combustion supporting gas passing through said base will be that passing through the passages, said passages being disposed in said base in a manner to discharge radially inward from the discharge orifices, at regions alongside of and overlying the outer wall surface, a number of jets of the combustible mixture which may be ignited to produce a series of flames from which heat is radiated to the closely adjacent outer wall surface to heat the latter to incandescence, the incandescent wall surface being effective to permit efficient combustion of the jets to maintain high flame temperatures, so that the outer wall surface will be highly heated and provide a high temperature source of radiant heat.

3. A burner comprising a base portion and structure cooperating with the peripheral surface of the base portion to form a number of opposed distributed passages, said passages having inlets at one side of said base portion and discharge orifices at the opposite side thereof, a refractory body carried by said base portion, said body in section having converging opposing outer surfaces which, at the larger end of the body, terminate at the immediate vicinity of said base portion and merge into the latter at the discharge orifices of said passages, means including a plate to hold said base portion and said structure cooperating therewith in assembled relation, said plate being formed to provide a manifold at the side of said base portion having the inlets for passing to the latter a combustible mixture of fuel and combustion supporting gas, the portion of said base between said passages being impervious to flow of combustion supporting gas so that the only combustion supporting gas passing through the base will be that passing through the passages, said passages being disposed in a manner to discharge inwardly toward the smaller end of the body from the discharge orifices, at regions alongside of and overlying the outer surfaces, a number of jets of the combustible mixture which may be ignited to produce a series of flames from which heat is radiated to the closely adjacent outer surfaces to heat the latter to incandescence, the incandescent surfaces being effective to promote efficient combustion of the jets to maintain high flame temperatures, so that the outer surfaces will be highly heated and provide a high temperature source of radiant heat.

4. A burner comprising a base formed with two spaced apart rows of passages having inlets at one side thereof and discharge orifices at the opposite side thereof, an elongated refractory body carried by said base, said body in transverse section having converging outer surfaces which, at the larger end of the body, terminate at the immediate vicinity of said base and merge into the latter at the discharge orifices of said passages, means including a frame to hold said base and body, said frame cooperating with said base to provide a manifold communicating with the inlets for passing to the passages a combustible mixture of fuel and combustion supporting gas, the portion of said base between said passages being impervious to flow of combustion supporting gas so that the only combustion supporting gas passing through the base will be that passing through the passages, said passages being disposed in a manner to discharge inwardly toward the smaller end of the body from the discharge orifices, at regions alongside of and overlying the outer surfaces, two rows of jets of the combustible mixture which may be ignited to produce a series of flames from which heat is radiated to the closely adjacent outer surfaces to heat the latter to incandescence, the incandescent wall surfaces being effective to promote efficient combustion of the jets to maintain high flame temperatures, so that the outer wall surfaces will be highly heated and provide a high temperature source of radiant heat.

WARREN D. FULLER.