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RADIANT GAS BURNER

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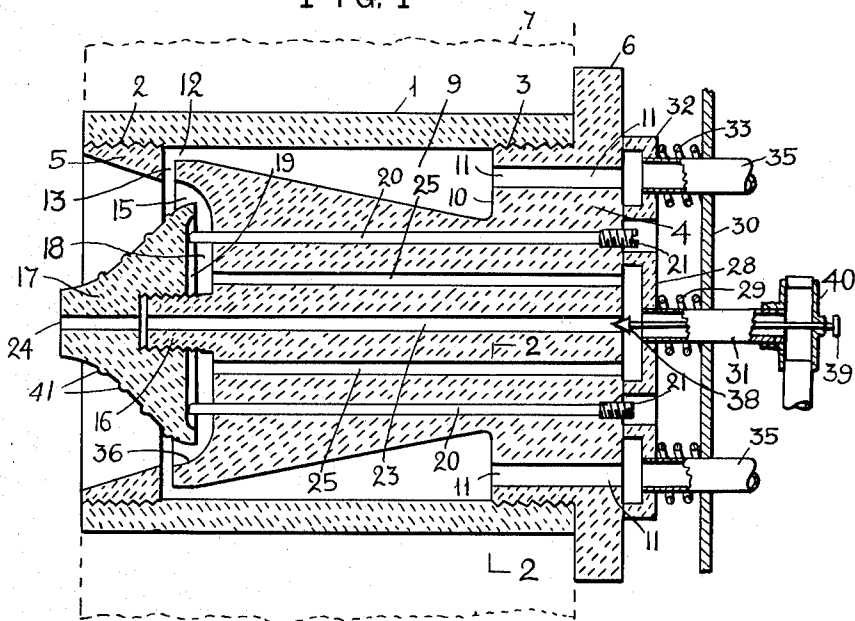
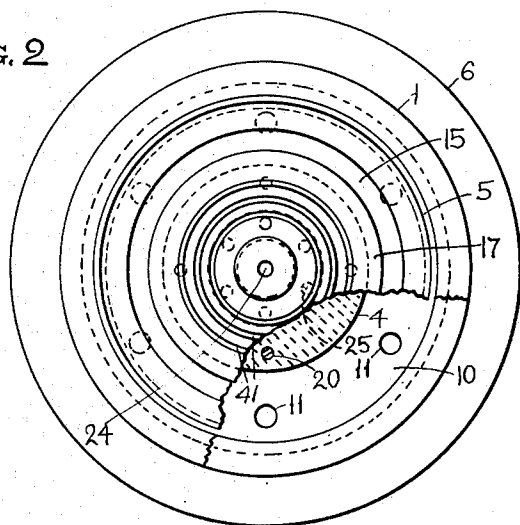
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FIG. 2



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RADIANT GAS BURNER

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7 Claims. (Cl. 158-113)

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My invention relates to gas burners and has particular reference to gas burners in which gas is mixed with air under pressure.

My invention has for its object to provide a gas burner in which gas is directed into a converging stream, partly being directed by the curvature of the ducts and passages in the burner, and partly by the pressure of the air which is directed in a converging stream over the outer portion of the gas stream. As a result, the burning gas is moved in a concentrated stream in which a very high temperature and perfect combustion are reached.

Another object of my invention is to provide means to guide the burning gases, this means constituting a conical member made of a refractory material which, when subjected to a very high temperature, is heated to a high degree of incandescence thereby radiating heat and helping to heat an object in front of the burner.

Still another object of my invention is to provide means for varying the cross-sectional area of the air and gas passages at the nozzle of the burner.

My invention is more fully described in the accompanying specification and drawings in which:

Fig. 1 is a sectional elevational view of my burner; and

Fig. 2 is an end view of the burner, partly in section taken on the line 2-2 of Fig. 1.

My gas burner comprises a tubular cylindrical body 1 made of a refractory material threaded at both ends at 2 and 3 for a rear plug 4 and a front plug 5, the plugs being also made of a refractory material. The rear plug may be provided with a flange 6 extending outside the body 1 and which may be used for retaining the burner in its place in a wall 7 of a furnace (shown in dotted lines in Fig. 1). The plug 4 has an annular recess 9 forming a shoulder 10 for several air ducts 11 spaced at equal distances around the plug. From the recess 9 the plug 4 gradually increases in diameter toward the front end where it forms an annular clearance 12 with the inner wall of the body 1. The front end of the plug 4 also forms an annular clearance 13 with the rear side of the front plug 5. The latter is of an annular shape diverging outwards. The inner rear edge of the plug 5 registers with the outer diameter of a recess 15 in the front side of the plug 4. The front end of the plug 4 is provided with a stem 16 threaded at the front end into a flame guiding and heat radiating cone 17 made of a refractory material. A clearance 18 is provided between the front side of the plug 4 and the rear side of the cone 17. The rear side of the cone 17 is pro-

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vided with a shallow recess 19. For gaging the correct distance of the cone 17 from the end of the plug 4, rods 20 are slidably fitted in the body of the plug 4 and threaded at their rear ends 21 into the corresponding tapped holes in the plug 4. The front ends of the rods 2 engage the rear side of the cone 17. The position of the rods can be adjusted by turning the rods to the right or to the left for which purpose the rear ends of the rods are provided with screw driver slots.

A central hole 23 is provided in the plug 4, registering with a central hole 24 in the cone 17, also additional holes 25 arranged in a circle at equal distances apart. The rear ends of the holes 23 and 25 are enclosed by a cap 28 made of a refractory material and pressed against the rear side of the plug 4 by a spring 29, the rear end of the spring resting against a metal plate 30. A pipe 31 extends into the cap 28 for delivering combustible gas to the holes 23 and 25. The rear ends of the holes or ducts 11 are enclosed by an annular cap 32 made of a refractory material and held in place by springs 33, the rear ends of these springs resting against the plate 30. Pipes 35 admit air into the annular cap 32 from a suitable blower (not shown), preferably arranged to deliver a preheated air under suitable pressure, if desired.

In the operation of the burner, gas is delivered through the central holes 23, 25, the greater portion flowing through several holes 25 into the clearance 18. From this clearance the gas flows over the peripheral edge of the cone 17 and is deflected forward by the curved portions 36 of the plug 4. The gas is prevented, however, from flowing straight ahead by the flow of a compressed air from the clearances 12 and 13, which direct the air flow in a centripetal direction, compressing the cylindrical gas stream and causing the mixture of gas and air to flow over the central cone 17. The gas and air are thereby thoroughly mixed and burn with high efficiency, the central hole 23 helping to maintain a steady combustion. The burning gases are directed forward in a converging stream, impinging with great force against an object to be heated. The heating effect is also materially increased by the direct radiation from the heated surface of the conical member 17. The mixture of gas and air can be adjusted for a perfect combustion by screwing the plugs 4 or 5 in or out of the body 1, thereby varying the clearance 13, also by turning the cone 17 to the right or to the left and adjusting the positions of the regulating rods 20. Other means can be also employed such as throttle or regu-

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lating valves on the gas and air pipes (not shown) and the degree of preheating and compression for the air.

The duct 23 may be closed by a needle valve 38 operated by a handle 39 passing through the rear wall of a T-connector 40.

The conical member 17 may be provided with annular ridges 41 for causing a certain amount of turbulence and a more thorough mixing of gas and air.

It will be understood that various features and principles of each of the embodiments of the invention above described or referred to may be utilized or substituted in the other embodiments.

While the invention has been described in detail with respect to certain particular preferred examples, it will be understood by those skilled in the art after understanding the invention, that various changes and further modifications may be made without departing from the spirit and scope of the invention, and it is intended therefore in the appended claims to cover all such changes and modifications.

What is claimed as new and desired to be secured by Letters Patent is:

1. A gas burner comprising a tubular body; a plug having a rear portion fitted in the rear end of the body and having a main portion of a reduced diameter extending into the body towards its front end, forming an annular clearance with the inner surface of the body, the plug having longitudinal holes extending to its front portion; valve means to admit combustible gas into said holes; a conical member supported at the front end of the plug at a distance therefrom having its base nearest the plug for causing the gas to flow radially outwards from the front ends of the holes; means to admit air under pressure into the annular clearance between the plug and the body, the diameter of the plug gradually increasing towards its front end thereby gradually reducing the clearance with the body; and a ring-shaped plug fitted in the front portion of the body, the rear end of the front plug being spaced from the front end of the rear plug, the inner diameter of the front plug being smaller than the outer diameter of the front end portion of the rear plug, a conical wall portion of the conical member facing the clearance between the rear end of the front plug and the front end of the rear plug the air being thereby caused to flow over the front end of the rear plug for causing the gas stream to converge against the surface of the conical member.

2. A gas burner comprising a tubular body; a plug having a rear portion fitted in the rear end of the body and having a main portion of a reduced diameter extending into the body towards its front end, forming an annular clearance with the inner surface of the body, the plug having longitudinal holes extending to its front portion; valve means to admit combustible gas into said holes; a conical member supported at the front end of the plug at a distance therefrom having its base nearest the plug for causing the gas to flow radially outwards from the front ends of the holes; means to admit air under pressure into the annular clearance between the plug and the body, the diameter of the plug gradually increasing towards its front end thereby gradually reducing the clearance with the body; a ring-shaped plug fitted in the front portion of the body, the rear end of the front plug being spaced from the front end of the rear plug, the inner diameter of the front plug being smaller than the outer diameter of the front end portion of the

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rear plug, a conical wall portion of the conical member facing the clearance between the rear end of the front plug and the front end of the rear plug the air being thereby caused to flow over the front end of the rear plug for causing the gas stream to converge against the surface of the conical member; and means to adjust the width of the clearance between the rear end of the front plug and front end of the rear plug.

3. A gas burner comprising a tubular body; a plug having a rear portion fitted in the rear end of the body, the other portion of the plug being of a reduced diameter and forming an annular clearance with the tubular body, the rear portion of the plug having ducts for admitting air under pressure into the annular clearance, the diameter of the plug increasing toward the front end thereby reducing the annular clearance; a stem at the front of the rear plug; a conical member supported on the stem at a distance from the front end of the rear plug, the base of said member facing the plug, the front surface of the rear plug curving forward near its peripheral portion; a plurality of holes extending through the rear plug from the rear to the clearance between the conical member and the plug; means to admit combustible gas into the holes, the curved front portion of the plug forming with the rear end of the conical member a curved duct for directing the gas stream forwards from the plug; and an annular shoulder at the front end of the body inwardly extending therefrom and having an inner diameter less than the outside diameter of the plug, said shoulder being axially spaced from the front end of the plug to form a duct for directing the air from the annular clearance centripetally against the gas stream emerging from the clearance between the rear plug and the conical member.

4. A gas burner comprising a tubular body; a plug having a rear portion fitted in the rear end of the body, the other portion of the plug being of a reduced diameter and forming an annular clearance with the tubular body, the rear portion of the plug having ducts for admitting air under pressure into the annular clearance, the diameter of the plug increasing toward the front end thereby reducing the annular clearance; a stem at the front of the rear plug; a conical member supported on the stem at a distance from the front end of the rear plug, the base of said member facing the plug, the front surface of the rear plug curving forward near its peripheral portion; a plurality of holes extending through the rear plug from the rear to the clearance between the conical member and the plug; means to admit combustible gas into the holes, the curved front portion of the plug forming with the rear end of the conical member a curved duct for directing the gas stream forwards from the plug; and an annular shoulder at the front end of the body inwardly extending therefrom and having an inner diameter less than the outside diameter of the plug, said shoulder being axially spaced from the front end of the plug to form a duct for directing the air from the annular clearance centripetally against the gas stream emerging from the clearance between the rear plug and the conical member, the plug having an additional central hole for the gas in register with a corresponding central hole in the conical member.

5. A gas burner comprising a tubular body; a plug having a rear portion fitted in the rear end of the body, the other portion of the plug being of a reduced diameter and forming an annular clear-

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ance with the tubular body, the rear portion of the plug having ducts for admitting air under pressure into the annular clearance, the diameter of the plug increasing toward the front end thereby reducing the annular clearance; a stem at the front of the rear plug; a conical member supported on the stem at a distance from the front end of the rear plug having its base nearest the plug, the front surface of the rear plug curving forward near its peripheral portion; a plurality of holes extending through the rear plug from the rear to the clearance between the conical member and the plug; means to admit combustible gas into the holes, the curved front portion of the plug forming with the rear end of the conical member a curved duct for directing the gas stream forwards from the plug; the front end of the body being of a reduced diameter inside, forming a shoulder spaced from the front end of the rear plug to form a duct for directing the air from the annular clearance centripetally against the gas stream emerging from the clearance between the rear plug and the conical member; rods extending through the rear plug and abutting the rear end of the conical body; and means to adjust the longitudinal position of the rods for controlling the clearance between the plug and the conical member.

6. A gas burner comprising a tubular body; a plug having a rear portion fitted in the rear portion of the body, the other portion of the plug being of a reduced diameter forming a clearance with the body, the diameter of the plug increasing towards its front end thereby reducing the annular clearance, the plug having ducts for admitting air into the clearance; a stem at the front end of the plug; a conical member mounted on the stem at a distance from the front end of the plug having its base nearest the plug, the plug at the front end having a recess for the conical member, the plug having holes for gas around the stem, the holes extending from the rear end of the plug to the front end; an annular plug fitted in the front portion of the body spaced from the front end of the rear plug to provide a duct for directing the air centripetally against the gas emerging from the clearance between the conical member and the plug; a cap held against the rear end of the rear plug enclosing the rear ends of the gas holes; a pipe extending from the cap for admitting gas into the cap; an annular cap held against

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the rear ends of the air ducts at the rear end of the rear plug; and pipes extending from the annular cap for delivering air into the annular cap.

7. A gas burner comprising a tubular body; a plug having a rear portion fitted in the rear portion of the body, the other portion of the plug being of a reduced diameter forming a clearance with the body, the diameter of the plug increasing towards its front end thereby reducing the annular clearance, the plug having ducts for admitting air into the clearance; a stem at the front end of the plug; a conical member mounted on the stem at a distance from the front end of the plug having its base nearest the plug, the plug at the front end having a recess for the conical member, the plug having holes for gas around the stem, the holes extending from the rear end of the plug to the front end; an annular plug fitted in the front portion of the body forming a shoulder spaced from the front end of the rear plug to provide a duct for directing the air centripetally against the gas emerging from the clearance between the conical member and the plug; a cap held against the rear end of the rear plug enclosing the rear ends of the gas holes; a pipe extending from the cap for admitting gas into the cap; an annular cap held against the rear ends of the air ducts at the rear end of the rear plug; pipes extending from the annular cap for delivering air into the annular cap; means to yieldably press the central cap against the rear end of the rear plug; and means to yieldably press the annular cap against the rear end of the rear plug.

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