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BURNER FOR GASEOUS AND LIQUID FUELS

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The present invention relates to a fuel burner and refractory assembly which directs a flame produced by a burner head for the gaseous fuel towards a wall to be heated and a flame produced by a burner head for liquid fuel is directed along the wall to be heated without contact therewith whereby the radiant factor of combustion of the liquid fuel serves to heat the wall.

An object of the invention is to provide burner heads and a refractory shroud of such construction that a liquid fuel burner which produces a thin fan-shaped flame has free movement within the refractory member and moves along without striking the wall to be heated and with the burner head for the gaseous fuel producing an elongated sheet-like flame which is guided by the refractory member transversely of the burner assembly into impingement with the wall to be heated.

Another object of the invention is to provide burner heads for liquid fuel and gaseous fuel with an adjustable air control mechanism in association with each fuel burner head wherein some of the air for supporting combustion of the liquid fuel is delivered through the control mechanism for supplying air to support combustion of the gaseous fuel.

Other objects and features of the invention will be appreciated by those skilled in the fuel burner art and as the present disclosure proceeds and upon consideration of the accompanying drawings and the following detailed description wherein several embodiments of the invention are disclosed.

In the drawings:

FIG. 1 is a sectional view of the burner assembly taken on the line 1-1 of FIG. 2.

FIG. 2 is a bottom view of a burner assembly.

FIG. 3 is a transverse sectional view taken on the line 3-3 of FIG. 1.

FIG. 4 is a sectional view taken on the line 4-4 of FIG. 3.

FIG. 5 is an enlarged fragmentary sectional view of the burner head for the gaseous fuel showing the relationship of the discharge ports to the surfaces of the refractory member.

FIG. 6 is a view similar to FIG. 5 showing a modification.

The invention is directed to a burner assembly which is useful for supplying heat to a wall which in turn radiates the heat to articles or items within the furnace chamber and facing the heated wall. Large quantities of heat must be delivered to the wall and a burner head for gaseous fuel and a burner head for liquid fuel are provided in combination with a refractory shroud member with the burner heads and the shroud so constructed as to direct the flame produced by the liquid along and substantially parallel but not impinging on the wall to be heated whereas the burning gaseous fuel as influenced

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by the refractory shroud is directed into impingement with the wall to be heated.

The structural features and characteristics providing such useful results are illustrated in the drawings wherein the refractory member indicated generally at 14 is mounted within an opening in a ceramic barrier 10 which may be the floor of a furnace chamber. The inner surface of the barrier 10 is indicated at 11 but the thickness thereof at one side of the burner assembly may be increased to present a furnace wall surface 12 within a chamber to be heated which is arranged substantially at right angles to the plane of the barrier 10.

The refractory shroud member 14 is of elongated shape and its exterior dimensions substantially fills the opening in the barrier 10. The refractory member 14 closes the opening but provides open areas for accommodating the burner heads and admitting air to support combustion and these features will be appreciated as the present disclosure proceeds. The refractory member 14 is provided with an elongated cavity 16 as shown in FIGS. 1, 3 and 4. One side wall 17 has an inner surface which slopes outwardly in proceeding downstream of the burner assembly. The wall 17 of the refractory member extends throughout the length thereof and may be formed integral with end walls 18 and 19 of the refractory shroud. Another wall 21 also extends throughout the length of the refractory member and may be formed integral with the end walls 18 and 19. The wall 21 has an inner face 22 on the downstream portion but the thickness of the upstream portion of the wall 21 is reduced and provided with an inner face 26 which is substantially parallel to the inner face 22. An angular disposed wall surface 27 joins the wall surface 26 with the wall surface 22 and the surface 27 merges with the wall surface 26 at an obtuse angle.

A lengthwise extending partition 28 is provided within the refractory member at the same side of the cavity 16. The partition 28 has an inner surface 29 arranged in a single plane which is parallel to and substantially in alignment with the wall surface 22. The partition 28 may be formed integral with the end walls 18 and 19 as shown in FIG. 4. The partition 28 is spaced from the wall surface 26 to provide an elongated unobstructed space 23 for accommodating a conduit shaped burner head 24 for gaseous fuel. An open elongated passage 31 is provided between the free end of the partition 28 and the angular wall surface 27. The shape and character of the passage 31 is shown in FIGS. 1 and 3.

The refractory member 14 in the central part of the cavity 16 is provided with a recess which has side wall surfaces 33 and 34. This recess has angular end wall surfaces 36 and 37 which diverge from each other in proceeding downstream of the burner assembly as best shown in FIG. 1. The recess accommodates a liquid fuel burner tip 38 which is provided with a narrow discharge slot 39 which extends circumferentially over the free end portion. The liquid fuel is supplied to the burner tip 38 along with an atomizing agent through a guide tube 41 so that the atomized liquid fuel is discharged as a thin fan-shaped pattern as diagrammatically represented in FIG. 1 which moves in an unhampered manner through the cavity 16 and substantially parallel to the wall surface 12.

The outer face of the barrier 10 and the refractory shroud member 14 may be covered with sheet-metal as indicated at 42 and the burner assembly 38 extends through an opening therein. The burner head for the liquid fuel may be supported in any suitable manner by means which includes a plate 43 forming part of an air register mechanism 44. This air register assembly is of hemi-spherical shape and includes a stationary member 46 having circumferentially spaced openings 47 therein. An outer member 48 having apertures 49 therein may be rotated to adjust the registration of the circumferentially spaced apertures 49 with the openings 47 to control the volume of the air admitted into the presence of the liquid burner tip and the atomized fuel issuing therefrom.

The gas burner head 24 is of elongated construction as best shown in FIG. 4 and comprises a tubular member supported in the space 23 and extends from one end wall 18 to the other end wall 19. The tubular member is provided with discharge orifices 51 spaced therealong for the escape of a major portion of the gaseous fuel which is supplied into the gas burner head 24 under pressure through a conduit connection 52. An air register assembly 53 is provided for controlling the volume of air admitted to the space 23 through an elongated opening 54. The air register assembly 53 includes an elongated stationary member 56 having a trough shape in cross section and which may be secured to the barrier 10 and the sheet-metal covering 42 in any suitable manner such as by means of bolts 57. The member 56 is provided with a plurality of openings 58 which are spaced from each other throughout the length of the burner assembly. A plate shaped member 59 is provided within the stationary member 56 which is adapted to be moved longitudinally relative thereto by means of a handle 61. The plate member 59 is provided with openings 62 at spaced intervals along the length thereof so that they may be brought into registration or partial registration with the openings 58. The elongated character of the air register mechanism 53 and the openings therein are such as to supply air in volume sufficient for complete combustion of the gaseous fuel issuing through the discharge ports 51 and for supplying additional air which moves through the passage 31 into the presence of the burning liquid fuel.

In operation and when the liquid fuel issues through the slot 39 and upon ignition a flame is produced from the liquid fuel which has a thin fan-shape approximating the diagrammatic representation shown in FIG. 1. Air for supporting combustion is admitted through the air register mechanism 44 and additional air moves through the air register assembly 53 and the space 23 and the passage 31 to provide adequate air for combustion of the liquid fuel. The flame produced by the burning liquid fuel does not engage the wall surface 12. Accordingly there is no deposit of unburned liquid fuel particles on the wall 12 as a result of the operation of the burner for liquid fuel. The flame developed from the combustion of the liquid fuel is unimpeded in movement downstream from the burner tip 38. The radiant factor of the flame produced by the liquid fuel is high and heat is transferred to the wall surface 12.

The gaseous fuel supplied to the burner 24 moves lengthwise within the tubular member. A major portion of the gaseous fuel escapes through the discharge ports 51 which are arranged at spaced intervals along the length of the burner head 24. The axis of each discharge port 51 and the direction of the discharge of the gaseous fuel through the ports 51 is substantially parallel to the face 26 of the wall 21. The streams of gaseous fuel escaping through the discharge ports 51 strike the wall surface 27 as depicted in FIGS. 3 and 5 and the burning gaseous fuel is diverted at a direction which is substantially parallel to the face 27 of the wall 21. The flame developed by the burning gaseous fuel is thus directed

towards the wall 12 as diagrammatically illustrated in FIG. 3. The flame developed from the gaseous fuel is purposely directed towards the wall surface 12 to extract the heat from the burning gaseous fuel because the radiant factor of the burning gaseous fuel is low. The air register assembly 53 permits a sufficient quantity of air to enter into the space 23 to support combustion of the gaseous fuel with additional air for the operation of the liquid fuel burner. The volume of air that is admitted through the air register 53 is materially greater than the volume that may pass through the air register 44. The isolation of the two air supplies facilitates operation of the liquid fuel burner.

The gas burner head 24 is provided with kindling ports 71 as shown in FIGS. 4 and 5 at spaced intervals along the length thereof. The axis of each kindling discharge port 71 is disposed so that a minor portion of the gaseous fuel escaping through the ports 71 engages the wall surface 26 immediately downstream from the burner head 24 and this characteristic is depicted in FIG. 5. The volume of the gaseous fuel escaping through the ports 71 may be as little as five percent of the volume of the gaseous fuel and as much as forty-five percent of the total volume of the gaseous fuel released from the burner head 24. Combustion of the gaseous fuel issuing through the kindling ports 71 begins approximately at the zone represented at 76 in FIG. 5 and heat is produced along the wall face 26 and at its juncture with the wall surface 27 to provide heat for kindling and continued rekindling of the major portion of the gaseous fuel issuing through the discharge ports 51. The kindling ports may be eliminated by arranging the discharge ports 51 with their axes in a direction to discharge all of the gaseous fuel towards the juncture of the wall surface 26 with the wall surface 27 as shown in FIG. 6.

While the invention has been described with reference to particular structural characteristics of the fuel burners and the refractory member it will be appreciated that changes may be made in the details of the various elements together with alterations in the overall assembly. Such changes and other modifications may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

What we claim and desire to secure by Letters Patent is:

1. A burner and furnace wall assembly comprising, a barrier, said barrier having an elongated opening there-through, a furnace wall adjacent said opening for absorbing heat radiating from burning fuel, an elongated refractory shroud member filling said opening, end walls on said shroud member, a first longitudinally extending side wall joining said end walls, a second longitudinally extending side wall joining said end walls and having a face confronting the first side wall, said second side wall having a second face spaced a greater distance from the first side wall than said first face, an angularly disposed surface on said second side wall joining the first face with the second face, a partition extending lengthwise within said shroud member joining said end walls and spaced from said second face, said partition having a surface confronting the first side wall, a free edge on said partition spaced from said angular surface, said first face and said surface on said partition and the first side wall forming an elongated cavity within said shroud member, a burner head for discharging liquid fuel in a fan shaped pattern downstream within said cavity and substantially parallel to said furnace wall, an elongated burner head for gaseous fuel mounted between said partition and said second face, said angular surface and the edge on said partition providing a passage extending generally transversely of said shroud member through which burning gaseous fuel is deflected by said angular surface, means controlling the volume of air admitted to the presence of the first burner head, and means controlling the volume of air admitted to the presence of said elongated burner head.

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2. A burner and furnace wall assembly according to claim 1 wherein the means controlling the volume of air admitted to the presence of the elongated burner head is adjustable to admit excess air for movement through said passage into said cavity.

3. A burner and furnace wall assembly according to claim 1 wherein the elongated burner head is arranged adjacent said second face and the burning gaseous fuel heats said second side wall to kindle and rekindle the gaseous fuel escaping from said elongated burner head.

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References Cited in the file of this patent

UNITED STATES PATENTS

251,052	Jackson et al. -----	Dec. 20, 1881
492,653	Archer -----	Feb. 28, 1893
2,149,980	Paret -----	Mar. 7, 1939
2,512,319	Ferguson -----	June 20, 1950
2,659,424	Ferguson -----	Nov. 17, 1953
2,847,063	Reed et al. -----	Aug. 12, 1958
2,851,093	Zink et al. -----	Sept. 9, 1958