Aug. 27, 1963 J. S. ZINK ETAL 3,101,769

BURNER FOR GASEOUS AND LIQUID FUELS

Filed Sept. 25, 1961 2 Sheets-Sheet 1

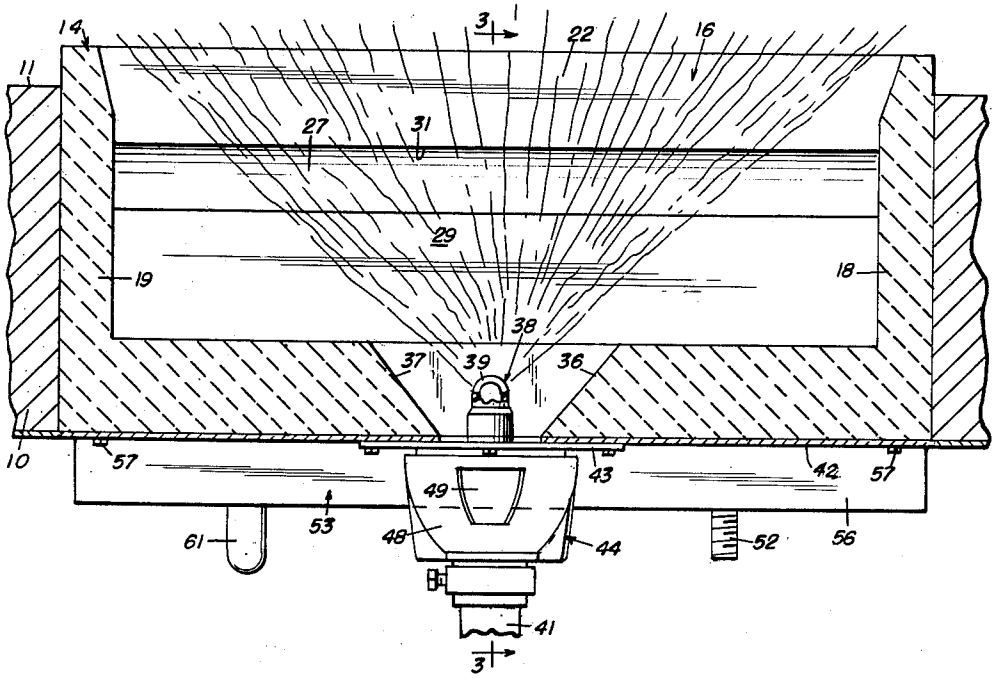
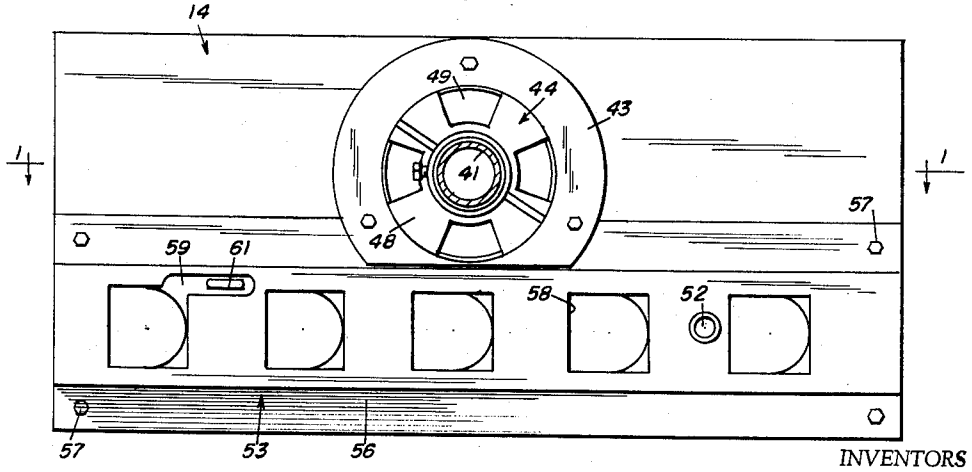


FIG. 1

FIG. 2



INVENTORS

JOHN SMITH ZINK

ROBERT D. REED

HERSHELL GOODNIGHT

BY

ATTORNEY

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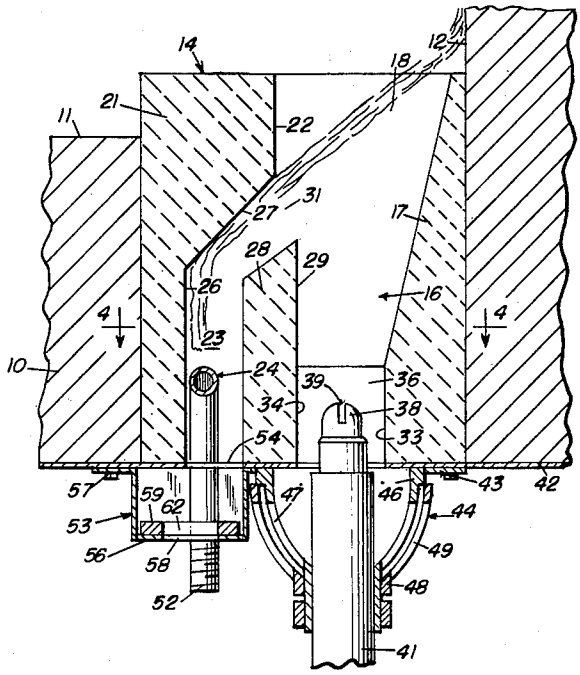


FIG. 3

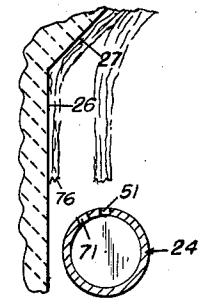


FIG. 5

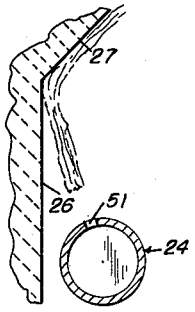
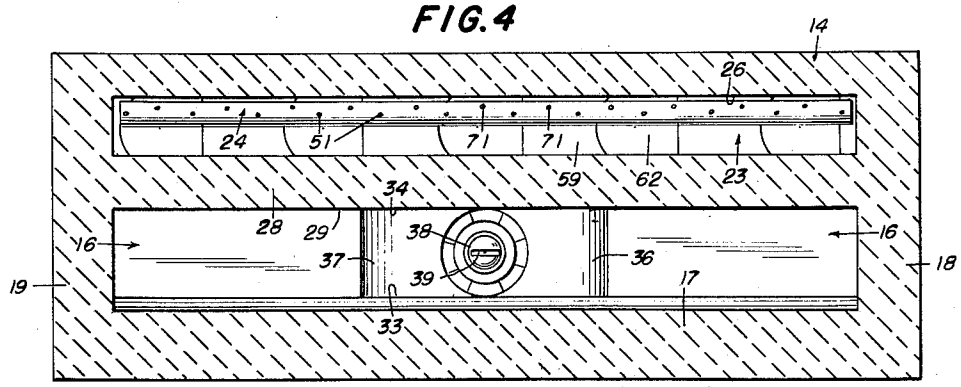


FIG. 6

FIG. 4



INVENTORS
JOHN SMITH ZINK
ROBERT D. REED
HERSHELL GOODNIGHT

BY

ATTORNEY

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BURNER FOR GASEOUS AND LIQUID FUELS

John Smith Zink, Robert D. Reed, and Hershel Goodnight, Tulsa, Okla., assignors to John Zink Company, Tulsa, Okla., a corporation of Delaware

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3 Claims. (Cl. 158—11)

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

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 therethrough, 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.

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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