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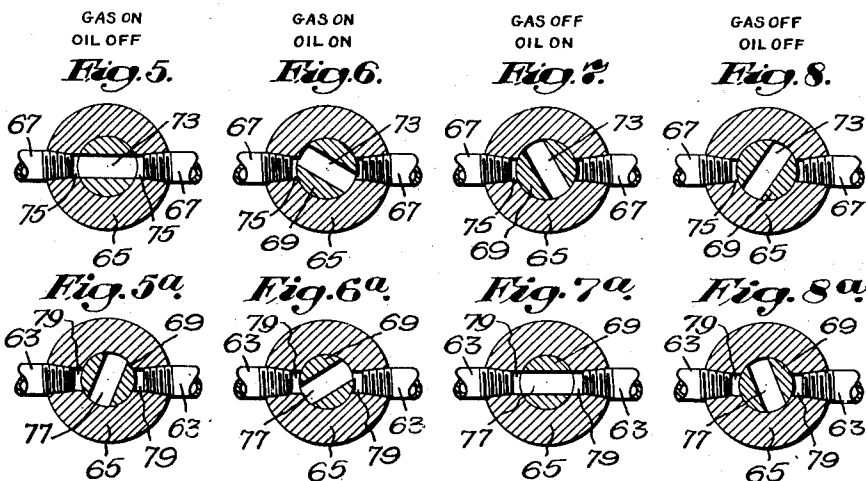
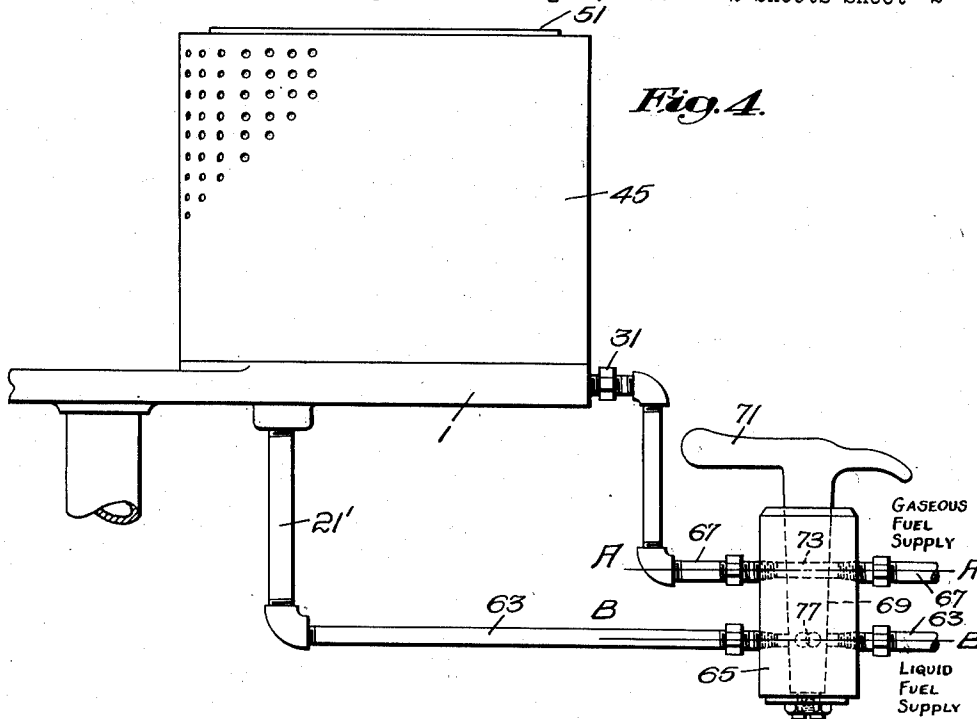
R. M. SHERMAN ET AL

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BURNER

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Inventors:
Rollston M. Sherman,
Frederick E. Neumann,
by **Emory Booth Varney & Townsend**
Attys

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BURNER

Rallston M. Sherman, Glastonbury, and Frederick F. Neumann, West Hartford, Conn., assignors to The Silent Glow Oil Burner Corporation, Hartford, Conn., a corporation of Connecticut

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10 Claims. (Cl. 158—11)

This invention relates to burners and more particularly though not exclusively to what are commonly termed combustion tube burners. The latter are usually provided with one or more combustion chambers having perforated tubular walls through which a fuel enters to mix with fuel vapor ascending from a fuel space at the bottom of the chamber, the mixture being burned in the combustion chamber and a blue flame issuing from the upper open end thereof. Such burners are commonly employed in connection with a single fuel-supply source such as oil or other liquid fuel which is supplied to or has connection with a fuel groove or trough immediately beneath the combustion chamber.

This application is a division of application, Serial No. 473,022, filed August 4, 1930.

The objects of the invention among other things are to improve the construction of burners of this type, increase their utility by making them adaptable to a wider range of service and to decrease the starting interval or period required for pre-heating when employed with liquid fuel.

These and other objects of the invention will be best understood by reference to the following description when taken in connection with the accompanying illustration showing one specific embodiment thereof, while its scope will be more particularly pointed out in the appended claims.

In the illustrated embodiment of the invention, the burner is so constructed that it will operate with complete effectiveness for either long or short intervals from a supply of either liquid fuel or gaseous fuel, and the connections are such that either liquid or gaseous fuel may be supplied at will so that the burner may be operated exclusively from a source of liquid fuel supply or from a source of gaseous fuel supply, or its operation at one time when supplied with gaseous fuel may be followed without interruption by its operation with liquid fuel, or vice versa.

The ordinary combustion tube burner, when supplied solely with liquid fuel, has certain disadvantages which limit its field of usefulness. In starting a burner of this type from a cold condition it is necessary to pre-heat the burner walls before finally turning on the full continuing supply of the liquid fuel so that some vaporization of the fuel will take place when it reaches the fuel space and the rising vapor ignites with the incoming air in the combustion chamber.

One common method of pre-heating is to provide the fuel groove with an asbestos or other wick, which is first saturated with oil or other

priming fluid and then lighted by a taper. After an interval of pre-heating sufficient to cause a vaporization of a portion of the liquid fuel reaching the fuel groove, the supply is then turned on. As the temperature rises, the walls of the groove and adjacent passages become more highly heated and an increasingly greater proportion of the fuel reaches the groove in vaporized form and finally, after the lapse of a substantial interval, the fuel reaching the fuel space or spaces is completely vaporized and an intensely hot blue flame results.

The prolonged interval required for the pre-heating before the burner can be brought to its full heating capacity, which may be termed the starting interval, is a serious drawback to the more general use of this type of burner. Due also to the fact that the oil or other fuel is delivered in liquid form and must be vaporized by the heated surrounding walls of the burner before it can be ignited in the combustion chamber, the heating effect of a burner of given size is limited and, while it may be ample for ordinary purposes, if an especial occasion arises calling for a more intense heat, the burner cannot be forced beyond a given point by merely increasing the rate with which liquid fuel is supplied.

In the described embodiment of the invention, if it is desired to operate the burner with liquid fuel, the starting interval may be cut down to a relatively short period by first turning on and igniting the gas from the source of gas supply which will immediately develop the full heating capacity of the burner and will quickly raise the temperature of the burner walls to a point sufficient to fully vaporize the oil. Accordingly, the latter, without the long delay heretofore necessary, may be quickly turned on and the gas shut off, almost immediately reaching the full oil-heating capacity of the burner under the supply of liquid fuel, thereby eliminating in large measure the disadvantage due to a prolonged starting interval.

On the other hand, where it is desired usually to operate the burner under liquid fuel but at times to operate it under conditions of more intense heat than could be obtained by liquid fuel, the latter may be shut off and the gas turned on to force the burner beyond its liquid-fuel heating capacity and to give whatever degree of flame may be called for.

The construction of the burner which qualifies it to burn either type of fuel adapts it to a wide range of conditions. If gas is readily available and relatively economical it may be employed

primarily with gas, and liquid fuel may be drawn from a source of liquid fuel supply only on those occasions when, as often happens, the gas supply may fail or be inadequate. If, as is usually the case, liquid fuel is more economical than gas, the burner may be primarily operated from the source of liquid fuel and operated with gas only for pre-heating or when the liquid fuel supply is depleted or not available, or when a special occasion arises for forcing the burner beyond a heating capacity which is obtainable from the liquid fuel. On the other hand, the burner may be operated at will exclusively by liquid fuel or exclusively with gas, as circumstances may demand.

Referring to the drawings:

Figure 1 is a plan view of a burner embodying one form of the invention, the cover plates for the air spaces or chambers being partly broken away to better show the construction of the base member;

Fig. 2 is a vertical sectional elevation on the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary view comprising a sectional elevation on the line 3—3 of Fig. 1;

Fig. 4 is an elevation of a burner similar to that illustrated in Fig. 2, showing its connection to the sources of liquid and gaseous fuel supply and the controlling valve therefor;

Figs. 5 and 5a show sectional plans on the lines A—A and B—B in Fig. 4 respectively representing the position of the valve when gas is supplied to the burner with the oil supply cut off;

Figs. 6 and 6a show similar sections with the valve in the position of supplying both liquid fuel and gaseous fuel;

Figs. 7 and 7a show similar sections with the valve in the position in which liquid fuel is supplied to the burner with the gas supply cut off; and

Figs. 8 and 8a show similar sections with the valve in the position in which both gas and liquid fuel are shut off from the burner.

Referring to the drawings (Figs. 1, 2 and 3) and to the embodiment of the invention which is submitted for illustrative purposes, the burner is provided with a base member 1 having an outer annular plate 3 and an inner annular concentric plate 5, connected one to the other by a series of webs 7, herein four in number, and providing for an annular air admission space 9 between the plates.

The inner plate 5 is provided with a central air admission opening 11 surrounded by an upturned ring-like flange 13, the outer edge of the inner plate 5 having also an upturned ring-like flange 15 spaced from but concentric with the flange 13. The flanges 13 and 15, together with the bottom plate 5, form a relatively wide annular compartment or channel, on the bottom of which there is provided a raised annular lip 17 separating the compartment into an outer fuel space defined by the groove 19 and an inner vaporizing space 21, to which latter liquid fuel, such as oil, may be delivered by the pipe connection 21' through the opening 23 in the bottom of the plate. The annular lip 17 constitutes a baffle which normally prevents the direct flow of the fuel in liquid form from the opening 23 to the fuel groove 19, the travel thereto of the vaporized liquid fuel taking place, however, without hindrance over the top of the raised lip. The bottom of the vaporizing space within the annular lip constitutes a flow plate over which any liquid fuel entering the burn-

er must flow, and by which, when the burner is heated, it is readily vaporized.

The outer annular plate 3 is also constructed to present an outer fuel groove 25 formed between upright spaced annular flanges 27 and 29 on said plate. Connected to one of the fuel grooves or spaces, and herein through the outside flange 27 to the outer fuel groove 25, is a pipe connection 31 for supplying gaseous fuel to the burner. The outer fuel groove 25 is connected to the inner fuel groove 19 by means of supply ducts 33 (Fig. 3) formed in the webs 7, so that free circulation takes place throughout both fuel grooves of either vaporized liquid fuel supplied through the pipe 21' or gaseous fuel supplied through the pipe 31.

The top of the vaporizing chamber is closed except for the direct escape of vaporized fuel to the fuel space 19 by a removable annular cover plate 35, the under side of which is grooved to seat on the upper edge of the flange 13 with a preferably close fit. The walls of the cover plate extend outwardly, and herein also downwardly, over the vaporizing compartment and the annular lip, but are spaced vertically from the latter to provide an annular passage from the vaporizing compartment to the fuel space, so that any vaporized fuel may pass directly over the lip between the latter and the cover plate and into the fuel space 19.

Above the lip 17 the cover plate is provided with an upturned flange 37, within which there is supported a perforated sheet metal cylinder 39. A similar but larger concentric cylinder 41 is removably seated on the outer shouldered edge of the flange 15 so that there is provided between the two cylinders the elongated combustion chamber 43 aligned with and constituting an extension of the underlying fuel space 19. Concentric, spaced, perforated sheet metal cylinders 45 and 47 are likewise removably seated on the shouldered edges of the flanges 27 and 29 respectively, providing between them the combustion chamber 49 bearing a relation to the outer fuel space 25 similar to that of the combustion chamber 43 to the fuel space 19. It will be understood that the perforations in the sheet metal cylinders are distributed throughout substantially the entire surface thereof, a small perforated area only being shown in Fig. 2. It will also be understood that these perforations may be of any shape, size or arrangement to provide suitable air admission openings for the combustion chambers.

A removable cover plate 51 is provided with its edges resting upon the tops of the sheet metal cylinders 41 and 47 to close the top of the annular air space therebetween, and a disc-shaped closure plate 53 with its edges resting on the upper edges of the cylinder 39 is similarly provided to close the top of the central air chamber, leaving, however, annular openings in the tops of the two combustion chambers 43 and 49 for the escape of the products of combustion. The closure plates 51 and 53, if desired, may be provided with one or more apertures to permit the partial escape of air therethrough.

To render the burner effective for either liquid or gaseous fuel, the bottom of the combustion chamber 43 is separated from the top of the fuel space by a wall or partition in the form of a plate 55, and the combustion chamber 49 from the fuel space 25 by a plate 57, the plate 55 being provided with a series of restricted orifices 59 or their equivalent, and the plate 57 with a series of orifices 61. The size, number and arrangement of these

orifices may be varied but is preferably such that, while permitting the passage from the fuel space to the combustion chamber of either the gaseous fuel or of vaporized liquid fuel, the burning thereof is confined to the combustion space, and the flow of the gas or vapor is sufficiently restricted to cause a substantially even distribution thereof as it circulates throughout the fuel spaces and a substantially uniform combustion throughout both combustion chambers, whether supplied with gas through the pipe 31 or with liquid fuel through the pipe 21'.

The plate 55 is annular in shape and may be conveniently provided through a flanged extension of the cover plate 35, the outer edge of which is shouldered to fit closely to the inner walls of the upright flange 15, so as to prevent the passage of gas to the combustion chamber from the fuel space except through the orifices 59. The plate 57 is similarly annular in form, with its edges shouldered to fit upon the flanges 27 and 29 to close the combustion chamber 49 to the fuel space 25 except through the orifices 61.

Referring to Fig. 4, the pipe connection 21' communicates with the pipe line 63 which is connected through the casing of the control valve 65 to a source of liquid fuel supply, which for descriptive purposes will be referred to as oil. The source of oil supply may comprise an elevated tank or the like combined with any of the feeding devices customarily employed with burners of this type and which provide for the flow of the oil to the burner from some definite height or level, capable of being accurately regulated, so that the flow of the fuel may be maintained at a predetermined level over the flow plate or bottom of the vaporizing space 21 in the burner. Such tanks and regulating devices are of common construction and are not herein shown.

The pipe connection 31 communicates with the pipe line 67 which is connected through the control valve 65 with a source of gaseous fuel supply, which may be the ordinary service main, or a gas-containing storage tank where the gas is maintained under pressure, or any other suitable source.

The valve 65 is arranged so that the burner may be connected at will with either source of fuel supply. Any suitable type of valve may be employed for that purpose, but herein (Figs. 4 to 8) it comprises a rotatable, tapered stem or body 69 seated in the casing 65 and provided with a handle 71. The stem is provided with a transverse gas port or passage 73 adapted in one position (Fig. 5) of the valve to align with and connect two opposite ports 75 in the casing, which are connected to the two branches of the gas line 67, between which the valve is interposed.

The valve stem is also provided with a similar transverse port or passage 77 for the oil, the latter port being vertically spaced from the port 73 and adapted in one position (Fig. 7a) to align with and connect two opposite ports 79 in the casing, which are connected to the two branches of the oil line 63, between which the valve is interposed. The two ports 73 and 77 intersect the axis of the valve stem at different angles so that in the fully open position of the gas line, as shown in Figs. 5 and 5a, the oil is cut off, and in the fully open position of the oil line (Figs. 7 and 7a) the gas is cut off. The valve may be further moved to the closed position shown in Figs. 8 and 8a, where both gas and oil are cut off from the burner.

Preferably the ports and passages are so re-

lated that in cutting off the gas from the burner and opening the oil supply thereto, as in passing from the position shown in Figs. 5 and 5a to that shown in Figs. 7 and 7a, or in cutting off the oil and opening the gas supply, as in passing from the position shown in Figs. 7 and 7a to that shown in Figs. 5 and 5a, an intermediate position (Figs. 6 and 6a) is passed through in which both gas and oil are temporarily supplied. This insures the persistence of the combustion in the burner during the time that change is being made from one type of fuel to the other so that the operation of the burner may proceed without interruption. It further facilitates the action of starting the burner with oil after pre-heating with gas, since the continuing pressure in the gas supply as the oil is turned on checks the too sudden delivery of oil to the vaporizing space, allowing it to flow more gradually over the bottom plate thereof and insuring its instant vaporization by the pre-heated walls.

The operation of the burner will be evident from the foregoing description. A common use for such a burner is to place it, when properly supported, in the fire pot of a kitchen range or the like, two burner units usually being combined in a single structure, of which one unit only is shown in Fig. 4. To operate the burner by oil, the gas is first turned on either partially or fully by moving the valve towards or to the position shown in Fig. 5. The gas enters the fuel space 25 and circulates through and fills that space as well as the fuel space 19. The gas issuing from the orifices 59 and 61 is then ignited by a taper or the like inserted through the top of the combustion chamber. The gas enters the combustion chamber from the fuel space unmixed with air and combustion is confined to the spaces 43 and 49, which receive a completely adequate supply of air through the perforated cylinder walls. The gas burns with a noiseless flame in the combustion chamber and immediately develops its full heating intensity, providing a hot blue flame, quickly raising the temperature of the burner parts to a point where the oil may be turned on with assurance of its being vaporized as soon as it enters the vaporizing space 21. As the valve is first turned to admit the oil, the gas continues to be supplied and the combustion maintained, the oil being delivered to the vaporizing space at first slowly, so that the oil first entering and traveling over the flow plate is completely vaporized, the resultant oil vapor arising in the combustion space through the orifices 59 and 61, to replace the diminishing supply of gas. When the valve is completely turned to the position shown in Figs. 7 and 7a, the gas is completely cut off and the burner works exclusively under the supply of oil.

If, during operation of the burner under oil, it is desired to force the burner beyond its oil-heating capacity, the valve may be turned back to its gas supplying position shown in Figs. 5 and 5a, and if turned to its full position will produce a flame of greater volume and heating intensity than can be had from the oil supply. Similarly, should any occasion arise for the switching from one type of fuel to the other, either because of the depletion or failure of the oil supply or the temporary or other failure of the necessary pressure in the gas main or other source, or for any other reason, such switch or change may be immediately made without alteration in the burner itself.

It will be observed that the gas supply pipe en-

ters the burner above the bottom of the outer fuel groove 25 so that, if during the starting of the burner liquid fuel is admitted to the vaporizing space and allowed to pass over the lip 17, liquid fuel may enter both fuel grooves and a shallow body of liquid fuel may gather in the bottom of said grooves and be retained therein until vaporized without interference with the free, concurrent admission of gaseous fuel to the fuel grooves and the combustion chambers from said fuel supply pipe.

The claims herein presented relate to a burner having provision for a supply of liquid fuel and a supply of gaseous fuel. Features relating to the construction of the burner per se, apart from the nature of the fuel supply, are claimed in our application, Serial No. 473,022, of which this is a division.

While we have herein described for purposes of illustration one specific embodiment of the invention and one particular application thereof, it is to be understood that extensive deviations from and changes in the illustrated form may be made and applications thereof other than herein illustrated may be utilized, all without departing from the spirit of the invention.

While the oil supply is herein shown as delivered to the inner fuel groove and the gas supply to the outer fuel groove, our invention as to the delivery of the liquid fuel and the gas contemplates the delivery of the two fuels at any point, or points, which may be suited to the construction of the particular burner to which the invention is applied.

We claim:

1. With a combustion tube burner having a base including a fuel groove and surmounted by a pair of perforated combustion tubes forming between them a combustion chamber communicating with said fuel groove, the combination of a source of gaseous fuel supply, a source of liquid fuel supply, and means including a common controlling valve for connecting said burner with either source of supply to the exclusion of the other, said valve in changing from one source of supply to the other providing for a continuance of the established supply from one source until the supply from the other source has been established, and said means connecting the source of liquid fuel supply to the burner by way of the fuel groove of its base.

2. With a combustion tube burner having a base including a fuel groove and surmounted by a pair of perforated combustion tubes forming between them a combustion chamber, the combination of a source of liquid fuel supply, a source of gaseous fuel supply, and connections including coordinately related valve means for controlling said sources to connect the burner for delivery thereto of either gaseous or liquid fuel to the exclusion of the other, said means, in changing from one source of supply to another, providing for a continuance of the established supply from one source until the supply from the other source has been established, and said means connecting the source of liquid fuel supply to the burner by way of the fuel groove of its base.

3. With a combustion tube burner having spaced perforated walls presenting between them a combustion chamber, a base having an endless vapor distributing chamber beneath and opening into said combustion chamber and a vaporizing chamber communicating with said vapor distributing chamber, the combination of a source of liquid fuel supply, a source of gaseous fuel

supply, connections for delivering liquid fuel from said liquid fuel source to the vaporizing chamber, connections for delivering gaseous fuel from said gaseous fuel source to be burned in said combustion chamber, and coordinately related valve means for controlling said sources to connect the burner for delivery thereto of either gaseous or liquid fuel to the exclusion of the other, said means, in changing from one source of supply to the other, providing for a continuance of the established supply from one source until the supply from the other source has been established.

4. A combustion tube burner having inner and outer, spaced, perforated, combustion tubes presenting between them a combustion chamber, a base having an endless vapor-distributing space beneath and opening into said combustion chamber, said base having also an inner vaporizing space and an open communicating passage connecting the same with said vapor-distributing space, said base being provided with a removable covering wall covering said vaporizing space and said passage whereby, when said cover is removed, the fuel spaces comprising the vaporizing space, fuel distributing space and all connecting passages are open and exposed, a source of liquid fuel supply, a source of gaseous fuel supply, means for delivering liquid fuel from said liquid fuel supply to the vaporizing space, means for delivering gaseous fuel from said gaseous fuel supply to be burned in the combustion chamber independently of said vaporizing space, and said base having means between the fuel delivery and the fuel-distributing space impeding the flow of liquid thereto while permitting the direct passage of vaporized fuel thereto.

5. With a combustion tube burner having a pair of perforate combustion tubes forming between them a combustion chamber and a base member having a fuel receiving space beneath the combustion chamber, the combination of a source of liquid fuel supply, a source of gaseous fuel supply, and connections including coordinately related valve means for controlling said sources to connect the burner for delivery thereto of either gaseous or liquid fuel to the exclusion of the other, said means, in changing from either source of supply to the other, providing for a continuance of the established supply from one source until the supply from the other source has been established.

6. With a combustion tube burner having a pair of perforate combustion tubes forming between them a combustion chamber and a base member having a fuel receiving space beneath the combustion chamber, the combination of a source of liquid fuel supply, a source of gaseous fuel supply, and connections including coordinately related valve means for controlling said sources to connect the burner for delivery thereto of either gaseous or liquid fuel to the exclusion of the other, said means, in changing from either source of supply to the other, providing for a continuance of the established supply from one source until the supply from the other source has been established and said means further providing for variations from no delivery to full delivery of gaseous fuel alone, and for variation from full delivery to no delivery of liquid fuel alone.

7. A combustion tube burner having inner and outer, spaced, perforated combustion tubes presenting between them a combustion chamber, a base having an endless vapor distributing space beneath and opening into said combustion cham-

- ber, said base having also a vaporizing chamber and an open communicating passage connecting said chamber and opening into said vapor distributing space, said base being provided with a removable covering wall covering said vaporizing chamber and said passage, whereby when said cover is removed the fuel spaces, comprising the vaporizing chamber, fuel distributing space and said connecting passage, are open and exposed, a source of liquid fuel supply, a source of gaseous fuel supply, means for delivering liquid fuel from said liquid fuel supply to the vaporizing space, and means for delivering gaseous fuel from said gaseous fuel supply to be burned in the combustion chamber independently of said vaporizing space.
8. A burner of the class described comprising a pair of perforated, tubular members forming between them a combustion chamber, a base member having upstanding walls and having an endless vapor distributing chamber beneath and communicating with the combustion chamber and having a vaporizing chamber to which the liquid fuel supply is delivered, said vaporizing chamber communicating with the vapor distributing chamber permitting the direct flow of vaporized fuel to the latter, said base having means for impeding the flow of liquid fuel from the vaporizing chamber to the vapor distributing chamber comprising a wall raised above the bottom of the vaporizing chamber and extending entirely around said vaporizing chamber, the top of said wall being at a lesser height vertically than the walls of said base forming the vapor distributing chamber, a source of liquid fuel supply, a source of gaseous fuel supply, means for supplying liquid fuel to the vaporizing chamber, and means for supplying gaseous fuel to be burned in said combustion chamber.
9. A combustion tube burner having a pair of perforated, concentric, vertically arranged, combustion tubes forming between them a combustion chamber, a base having spaced, upstanding walls and a bottom wall forming an endless fuel groove beneath and communicating with the combustion chamber, said base having a vaporizing chamber provided with a lateral passage communicating with said fuel groove, a removable cover plate for said vaporizing chamber, a source of liquid fuel supply, a source of gaseous fuel supply, means for supplying liquid fuel to said covered vaporizing chamber, and gas supply means for delivering gaseous fuel from said source of gaseous fuel supply to said fuel groove comprising a gas supply conduit having a delivery orifice above the bottom wall of said fuel groove.
10. A combustion tube burner having a pair of perforated, concentric, vertically arranged, combustion tubes forming between them a combustion chamber, a base having spaced, upstanding walls and a bottom wall forming an endless fuel groove beneath and communicating with the combustion chamber, a source of liquid fuel supply, a source of gaseous fuel supply, means for supplying liquid fuel from said liquid fuel supply source to the base and said fuel groove to be vaporized and burned in said combustion chamber, and means for delivering gaseous fuel from said source of gaseous fuel supply to said fuel groove having a gas supply orifice above the bottom wall thereof also to be burned in said combustion chamber.
- RALLSTON M. SHERMAN.
FREDERICK F. NEUMANN.

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