

April 29, 1941.

R. M. SHERMAN

2,240,379

ELECTRIC IGNITION MEANS FOR COMBUSTION TUBE BURNERS

Filed Aug. 5, 1939

3 Sheets-Sheet 1

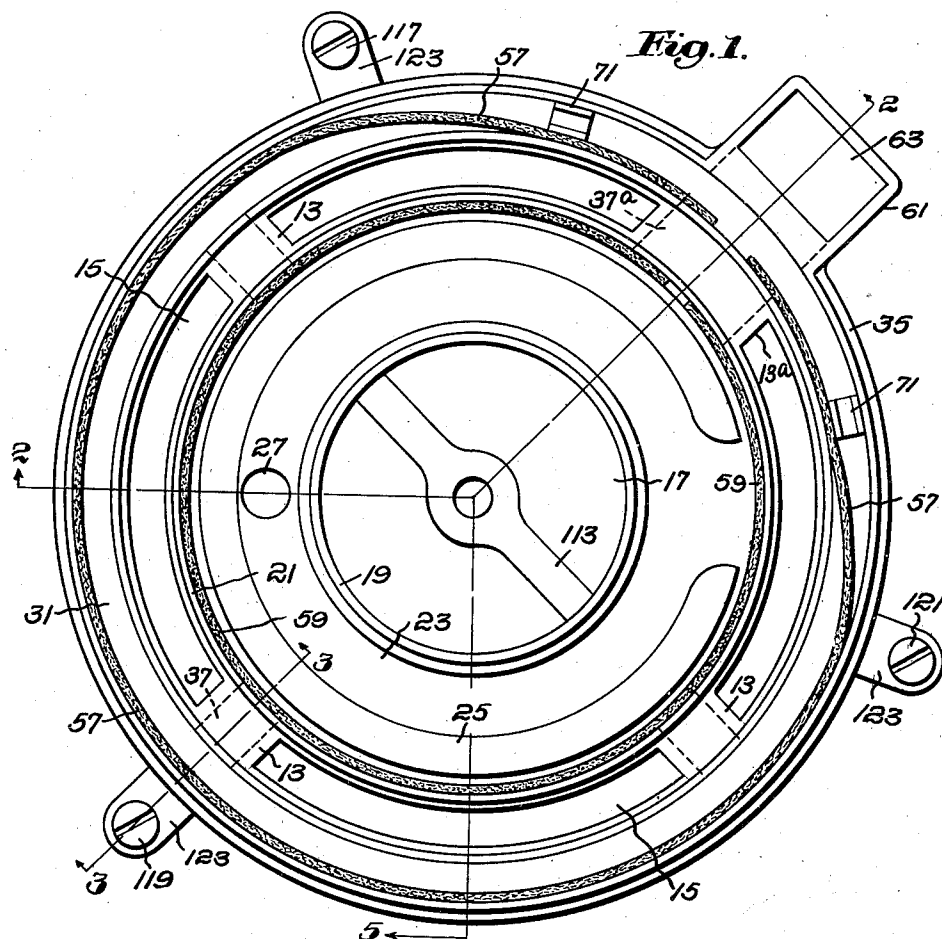


Fig. 2.

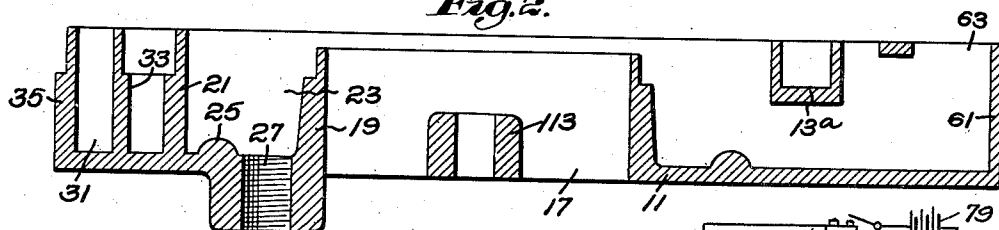
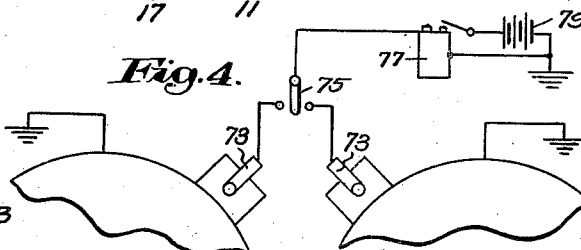
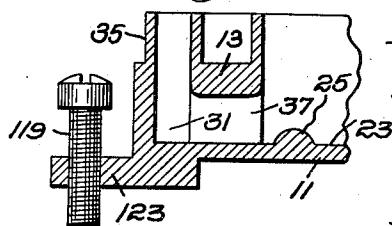


Fig. 3.



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April 29, 1941.

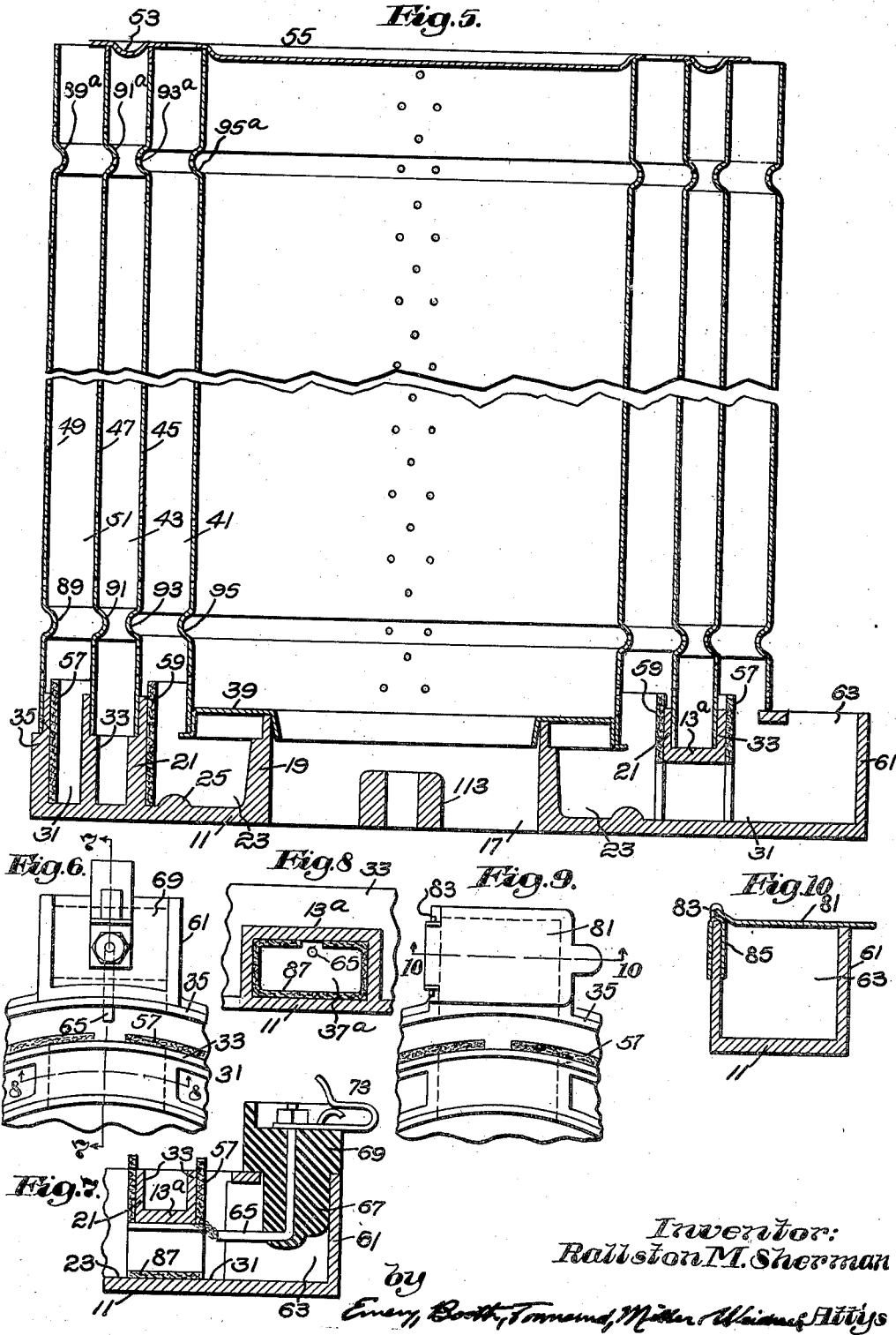
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3 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

2,240,379

ELECTRIC IGNITION MEANS FOR COMBUSTION TUBE BURNERS

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Application August 5, 1939, Serial No. 288,564

8 Claims. (Cl. 126—90)

This invention relates to burners employing liquid fuel (for descriptive purposes herein referred to as oil), and to methods of igniting such burners and more particularly those in which a wick or the like is employed for starting or other purposes.

The invention is herein illustrated in connection with a burner of the combustion tube type in which an oil-saturated, fire-resisting wick is lighted and used to preliminarily heat the burner.

One object, among others, of the invention is the provision of means for electrically igniting the wick by a direct and simple procedure under safe and practical conditions which insure dependability in operation.

Another object of the invention is the provision of such facilities for igniting the wick that they are adaptable either to electrical or manual ignition.

Where burners of this type are employed as range burners, the lighting of the wick is usually done with a lighted taper or the like, to apply which the lids of the stove must be removed and the taper applied through the tops of the combustion chamber between the elongated combustion tubes. This is not only an awkward operation where the burner is utilized as a range burner, but, when used as a space heater in an enclosed casing, access to the wick is usually impracticable.

To obviate this, for manual lighting, openings have been formed in the lower walls of the outer tube or shell provided with a door or closure, through which openings a lighted taper or match may be introduced above the edge of the wick. For electrical ignition, various expedients have been proposed, some of which contemplate resistor heating elements arranged in proximity to the wick and others provision for the passage of an igniting spark to the wick.

All the igniting devices of which I am aware have certain disadvantages. Many of them contemplate igniting the wick by a flame, spark or incandescent resistor applied to the space immediately above the wick to which there is a substantial access of air. If the burner parts are still hot from previous use, or, in the case of a range burner, if the range itself is hot, the feeding of oil to the burner which must precede such attempted ignition vaporizes a certain part of the oil which rises above the oil groove and with the air forms a combustible and explosive mixture, so that under certain conditions such attempted ignition at the region indicated is quite

apt to be accompanied by an explosion of considerable force.

The most practical and effective method of ignition is through the use of an ignition spark. The disadvantage of most of the ignition devices of this type which have been proposed is the fact that the spark electrode is positioned in the lower part of the combustion chamber and subject to the intense destructive heat there generated, which results in a short life or deterioration of the electrode as well as its insulating attachment. In such a location, furthermore, immediately above or adjacent the upper edge of the wick, these devices are particularly subject to the carbonizing action of the wick flame and require frequent cleaning or replacement to render them effective for producing a spark. Again, acting as most of them do on the upper edge of the wick, which soon becomes covered with an encrustation of carbon, they are subject to serious handicap in respect to efficiency and reliability of ignition.

Many of these prior ignition devices, furthermore, are complicated in respect to their attachment to the burner, requiring cutting of openings through the burner bases with attendant danger of oil leakage, or have a certain measure of permanency in respect to their attachment so that the removal of the electrode with its installation for cleaning or replacement becomes difficult.

In the following described embodiment of the invention, ignition means is provided which, if desired, may be employed for manual ignition without the use of any electrical attachment, or may have applied thereto a jump spark ignition device, the electrode of which directs its spark against the lower portions of the walls of the wick and preferably against the flat side thereof below the carbon-encrusted top thereof where it is positioned out of carbonizing relation to the wick flame, in a relatively cool spot, removed from the combustion chamber and the destructiveness of the heat therein, and away from the region to which any substantial amount of air is supplied. The spark electrode with its insulating support is so applied as to readily and manually removable and replaceable at will for cleaning or other purposes, the insulating support in the illustrated embodiment of the invention being inserted in the open top in a lateral peripheral extension of the burner base forming a chamber or well which opens through the outer wall of the groove.

The invention will be best understood by reference to the following description when taken in connection with the accompanying illustration of

one specific embodiment thereof, while its scope will be more particularly pointed out in the appended claims.

In the drawings—

Fig. 1 is a plan view of the burner base with the combustion tubes removed, showing one embodiment of the invention;

Fig. 2 is a section in elevation on the line 2—2 in Fig. 1;

Fig. 3 is a detail section in elevation on the line 3—3 in Fig. 1;

Fig. 4 is a diagram illustrating electrical connections;

Fig. 5 is a central, sectional elevation of the burner base on the line 2—5 in Fig. 1, with the tubes and wicks in position and showing the lateral extension of the base through which ignition is effected;

Fig. 6 is a detail in plan, showing the electrical ignition attachment in position as applied to the base;

Fig. 7 is a section in elevation on the line 7—7 in Fig. 6;

Fig. 8 is a section on the line 8—8 in Fig. 6, looking toward the ignition electrode;

Fig. 9 is a plan view, showing the extension or well equipped with a hinged cover for manual ignition;

Fig. 10 is a sectional elevation on the line 10—10 in Fig. 9;

Fig. 11 is a plan view of the burner utilizing two units and illustrating the adjustable mounting therefor; and

Fig. 12 is a front elevation of the parts shown in Fig. 11.

Referring to the drawings and the illustrative embodiment of the invention there shown, each burner unit (Figs. 1, 2 and 5) is provided with a base 11 in the form of a casting having an outer generally annular portion and an inner concentric annular portion spaced from each other but connected by a series of webs 13 and providing an annular air admission opening 15 between the two annular portions of the base, interrupted only by the webs 13. The inner annular portion is provided with a central air admission opening 17 surrounded by an upstanding ring-like flange 19, the outer edge of the inner portion also having an upstanding ring-like flange 21 spaced from but concentric with the flange 19. The flanges 19 and 21 together with the connecting bottom wall of the base form a relatively wide annular compartment or channel 23 on the bottom of which is a raised wall or rib 25 extending around the channel but interrupted at a point substantially diametrically opposite the oil admission opening 27, located in the bottom wall of the channel between the rib 25 and the flange 19. Oil is supplied to the channel through the oil opening 27 by a pipe connection, not shown.

The outer annular portion of the base casting presents an outer fuel compartment in the form of a channel 31 formed between the upright spaced flanges 33 and 35, the outer channel being of lesser radial width than the channel 23. The outer channel 31 is connected to the inner fuel channel by means of ducts 37 formed in the webs 13, so that a free circulation of liquid and vaporized oil takes place in both fuel channels. The top of the wide channel 23 is partly covered and closed (Fig. 5) by a removable annular cover plate 39 formed preferably of thin sheet-metal such as chromium steel, the inside edge of the plate having a down-turned flange to seat upon and within the top of the base flange 19 with a pref-

erably close fit. The walls of the cover plate extend outwardly and herein also downwardly but are spaced vertically from the bottom of the channel 23 and the raised rib 25 to provide an annular space through which vaporized oil may pass directly into the space between the flange 21 and the edge of the cover plate 39.

The edge of the cover plate has an out-turned lip on which there is supported a perforated sheet-metal cylinder 41 constituting the inner one of a pair of combustion tubes. A similar but larger concentric cylinder 43 is removably seated on the outer shouldered edge of the flange 21 so that there is provided between the two cylinders an elongated combustion chamber 45 aligned with and constituting an extension of the outer uncovered edge of the wider channel 23. Two concentrically spaced perforated sheet-metal cylinders 47 and 49, likewise removable, are seated on the inner and outer shoulders, respectively, of the flanges 33 and 35, providing between them a combustion chamber 51 having a relation to the outer fuel channel 31 similar to that of the combustion chamber 45 to the outer portion of the channel 23.

A removable annular top plate 53 is provided with its edges resting on the tops of the sheet-metal cylinders 43 and 47 to close the top of the annular air space therebetween, and a disc-shaped closure 55 with its edges resting on the upper edges of the cylinder 41 is similarly provided to close the top of the central air chamber, leaving, however, annular openings in the tops of the two combustion chambers 45 and 51 for the escape of the products of combustion.

A burner of this type is commonly started by igniting the oil-saturated wick, usually comprising a fabricated strip of asbestos, the strip being cut so as to rest on edge in the fuel compartment or channel with its upper edge entered into the bottom of the overhead combustion chamber, as indicated in Fig. 5. In the illustrative device, two such starting wicks 57 and 59 are shown, the first located in the outer fuel channel and the other in the inner fuel channel. The wick 59 may have portions coinciding with the ports 37 cut away to leave such ports unobstructed.

When the burner is to be started, oil is admitted through the inlet port 27 and enters the wide channel, flowing thereover within the raised rib 25, through the opening therein to the outer portion of the channel, and through the ducts 37 to the outer fuel channel 31, penetrating the bottom edges of both wicks and saturating the bodies thereof. The wicks being then lighted, the burner begins to heat, and when the required vaporizing temperature is reached the liquid oil becomes vaporized on entering the channel 23 beneath the cover plate 39, the covered portion of said channel constituting the vaporizing space. Combustion is then carried on to an increasing degree independently of the wick and finally completed through the oil vapor passing from the vaporizing chamber beneath the edge of the cover plate into the inner combustion chamber and into the outer combustion chamber through the ducts 37, the wicks ceasing to have any substantial function when the burner operates under full fire.

For ignition purposes the base 11 of the burner is provided with a formation defining a lateral extension 61 projecting radially from the walls of the outer flange 35 forming a well or pocket 63 of rectangular cross-section which is open at its top and may extend down to a level corre-

sponding to that of the bottom of the oil channels. The lower part of this well opens into and forms a lateral extension of the outer chamber 31 through an opening formed in the outer wall or flange 35 of the outer fuel groove.

For electrical ignition, the burner is provided (Figs. 6, 7 and 8) with a sparking electrode 65 supported by a block of porcelain or other suitable insulating material, this block having a lower projecting portion 67 which fits into the well and an upper flanged portion 69 which laps over the mouth of the well and closes the same. The electrode, where it emerges from the lower downwardly projecting insulating support 67, is turned at right-angles and projects through the opening in the flange so that its tip faces but is spaced from the side of the wick 57. It is there positioned well above any normal oil level in the channel but well below the bottom extremity of the combustion chamber. The spacing of the wick from the electrode may be assured by the provision of U-shaped spacing clips 71 (Fig. 1) which hold that part of the wick opposite the electrode against the walls of the flange 33. The bottom edge of the tube 49 is recessed to fit over the side walls of the well 61 and the inner walls of the insulating block 69 are curved to correspond to the curvature of the tube so that they fit snugly thereagainst when the ignition attachment is in place.

The entire attachment, which fits loosely in the inner walls of the chamber 63, is quickly and readily removable for cleaning, replacement or any other required purpose by raising the tube 69 and lifting the block out of the well while tilting it slightly inward, and may be replaced with equal facility.

The electrode has connection to the external connecting clip 73 at the top of the block 69, to which clip one terminal of the sparking circuit is connected, while the other terminal is connected to the base 11 of the burner either by direct connection or through ground. The connections to a burner consisting of two units, for example, may be as conventionally indicated in Fig. 4, where the electrode terminal to each unit is connected to contacts which are controlled by a switch 75 controlling the high tension circuit from a spark coil 77 and battery 79, both the spark circuit and the base of each unit being grounded as indicated. By the closure of the circuit through either of the sparking electrodes, a series of ignition sparks in that particular unit is caused to jump across the gap to the flange 33 against which the wick backs, thereby igniting the wick. The path of the spark is direct from the electrode 65 through the wick to the inner wall or flange 33 and thence through the base of the burner, and ignition takes place irrespective of whether the wick is or is not provided with the usual reinforcing wires.

It will be observed that the insulating support is located outside the heated portions of the burner in a relatively cool space, where it remains unaffected by the heat of combustion, and that the electrode itself is positioned at the side of the channel 31 out of the combustion chamber and in a region which is itself relatively cool. It is unaffected by the destructive heat of the combustion chamber or by the carbonizing action of the wick or wick flame and its spark is directed against a part of the wick which remains free from the deposit of carbon. The electrode with its support is not only readily removable and replaceable but the provision for its assemblage

in the open well leaves the base intact, with no impairment of its oil feeding or burning function.

The closed and covered chamber 63 provides a vapor chamber in which, as well as in other passages of the base, vaporization of the oil takes place on the lighting and heating of the burner. This chamber, being below the combustion chamber and deprived of any access of air, becomes filled with the oil vapor promptly after the starting wick becomes lighted, with the result that the spark therefrom automatically ceases, even though the sparking circuit remains closed, this being due doubtless to the profusion of oil vapor in the sparking gap and the exclusion of air therefrom.

The same lateral extension on the burner base may be employed for manual ignition without the use of the electrode and its support or the other electrical connection. In that event the open mouth of the well is closed by an overlying hinged cover 81 (Figs. 9 and 10) which is hinged at 83 to the clip 85, the latter frictionally clasping one of the side walls of the well. By lifting the cover about its hinge an opening is exposed in the base communicating with the channel 31 through which a lighted match or taper may be inserted and placed in direct contact with the adjacent oil-saturated wick 57. The cover may be removed at any time by withdrawing the clip from the walls of the well should it be desired to install the electrode with its connections for electrical ignition.

The ignition of the wick 57, which takes place in a few seconds under the action of the spark, will be followed shortly by the lighting of the inner wick 59. The lighting of the wick 59 will follow in any event by the effect of the flame from the wick 57 acting through the duct 37a in the web 13a which is made somewhat wider than the ducts 37 in the webs 13, respectively, so that the duct 37a provides a passage forming a substantial extension of the opening through the flange 35 in which the electrode 65 is to be positioned. If it is desired to hasten the lighting of the inner wick, an intermediate piece of wicking 87 may be placed in the duct 37a which abuts against or is in close proximity to both wicks 57 and 59 so that the flame from the outer wick 57 is promptly communicated to the inner wick 59. Such intermediate piece of wicking, which is omitted in Fig. 5, is illustrated in Figs. 7 and 8, the wicks 57 and 59 being cut away at that point to leave the ends of the duct 37a uncovered as well as to permit the exposure of the edges of the intermediate wicking to the respective channels.

The wicking 87 which extends through the communicating duct 37a and serves as a pilot wick for lighting the inner wick 59, is also adapted to serve the same function for the outer wick 57. The wicking 87, as will be seen from Fig. 8, presents its oil saturated edges in closely adjacent igniting relation to the path of the spark so that should the spark generated fail to light the wick 57, due to some maladjustment or misplacement in its position with relation to the spark gap, the pilot wick is in such igniting relation to both the inner and outer wicks that the flame flaring up over its entire breadth and length will assure the prompt lighting not only of the inner wick 59 but the outer wick 57 as well.

Another feature of the invention consists in means to improve the efficiency and the action of the burner when run at low rates of oil con-

sumption. With the burner operated at full capacity and with the base brought to a high temperature, the vaporized oil rises, fills the combustion chamber and mingles with the air entering through the perforations of the tubes so that the entire chamber becomes filled with a blue flame. When the burner is turned down to run at a lower rate of flame intensity, a less complete vaporization of the oil appears to result due to the lower temperature of the base, accompanied by a less efficient and usually an unsatisfactory operation of the burner. It has been found that by providing means which tends to concentrate, or in a measure confine, the flame to the lower part of the combustion chamber when the burner runs at this lower rate of oil consumption, a much higher base temperature is reached and a much more satisfactory and efficient operation of the burner results.

Accordingly, for this purpose, at a point spaced a short but appreciable distance above the top of the wick, the peripheral walls of each of the two adjoining shells forming each of the combustion chambers are given a beaded or rolled formation to provide flame deflecting means. The bead or roll 89 on the tube 49 provides a well rounded indentation which projects into the combustion chamber 51 and is opposite to a similar bead or roll 91 in the tube 47. Since both beads extend laterally in the same direction, no diminution in the spacial capacity of the combustion chamber results, but the flame from the lower part of the burner in and above the region of the wick is subject to a slight deflection from its straight vertical path. When the burner is turned down there is enforced a slight tortuous path on the flame, tending to concentrate this lesser flame in the lower part of the combustion chamber. Similar formations 93 and 95, at about the same level and for the same purpose, are formed in the chimneys 43 and 41 respectively. Other sets of similar formations may be provided in the combustion tubes at successively higher levels to furnish flame deflecting means when the burner is operated at a somewhat higher but less than full capacity. As illustrative of these there are shown higher up in the tubes correspondingly similar beads 89a, 91a, 93a and 95a.

These beads or rolls not only improve the function of the burner under the conditions stated, but also tend to improve the structure of the chimneys since in each case they impart a rigidity to the cylindrical formation which, without such stiffening means, tends to undergo deformation, interfering with their ready application to the base.

Another feature of the invention consists in an adjustable mounting or support for the burner which is illustrated more particularly in Fig. 11, where such a support is shown for a burner consisting of two similar units. The two burner bases 11 are supported at opposite ends of an arm 97 which is pivoted on a central tubular pedestal 99 carried by the base 101. The arm with the two burners may be swung to different positions of adjustment or raised or lowered to different positions on the pedestal and there held fixed by the clamping screw 103. The individual burners are each supported by substantially the same means of adjustment, and that for one unit only needs to be described.

The end of each opposite branch of the arm has a slot 105 in which is positioned the upright threaded clamping bolt 107. The latter passes

up through a two-arm leveling support 109 which is held fixed by the lock-nut 111, and thence through the middle of a bar 113 which forms a part of the burner base and extends across the bottom of the central air chamber 17. The base is thus clamped centrally in fixed, adjustable position on the bolt 107 between the bar 113 and nut 111 by the clamping nut 115. The result of this construction is that both burners together may be adjusted vertically on the pedestal 99 or may be turned and secured in different angular positions about the same. Each burner separately may be adjusted to different positions with relation to the pedestal support by loosening the clamping bolt 107 and moving the base to different positions lengthwise the slot 105. Each burner separately may be brought to different positions of angular adjustment by loosening the nut 115 and turning the base about the bolt 107.

In addition to this, a leveling and vertical adjustment is provided for each burner separately and independently of the other by means of three vertical adjusting screws 117, 119 and 121. Each screw is threaded through a lug 123 projecting (Fig. 3) radially outward from the periphery of the bottom wall of the base, there being provided three such lugs substantially 120° apart. The bottoms of the adjusting screws 117 and 119 rest in cup-shaped depressions in the respective arms of the leveling support 109, while that of the screw 121 rests on the broad, flat surface of the arm 97. By this means each burner base separately may be raised or lowered by a similar adjustment of its three screws or may have its level adjusted to provide the proper relation between the oil and the grooves by a differential adjustment of the screws. When either individual base is turned to different angular positions about its central support by the loosening of the nut 115, the lock-nut 111 is also loosened and a similar turning adjustment is made with respect to the leveling support 109.

Accordingly, it will be seen that this support provides a substantially universal adjustment for the burner. It provides for the separate and independent adjustment of each burner base for height and level as well as a rotative or turning adjustment. It provides for a lateral adjustment of the burner as a whole with relation to its support and a lateral spacial adjustment between the two burner units and between each unit and its common support. It further provides a simultaneous adjustment of both units together for height as well as a simultaneous turning adjustment of both units about the central pedestal.

While there is herein shown and described for the purpose of illustration one specific embodiment of the invention, it will be understood that this is submitted for illustrative purposes only and that extensive deviations may be made from the form and relative arrangement of parts herein shown, all without departing from the spirit of the invention.

I claim:

1. A combustion tube burner having a base provided with walls defining a fuel groove, a flat igniting wick set on edge in said groove, perforated inner and outer combustion tubes surmounting said base and providing between them a combustion chamber above the groove, a formation on the outer wall of the base defining a peripheral extension of said wall and providing a lateral chamber outside the fuel groove and be-

yond the peripheral limits of the outer combustion tube and opening into the fuel groove, said chamber having a covering top, and an electrode entered into said chamber through said covering top and without cutting through the oil retaining walls of the fuel groove, said electrode being positioned in said lateral chamber and surrounded by adequate insulating space to create a wick igniting spark within the base and below the top edges of the wick.

2. A combustion tube burner having a base provided with inner and outer annular walls defining an annular fuel channel, a starting wick in said channel, concentric combustion tubes surmounting said base and forming a combustion chamber above said channel, a formation on an annular wall of said base defining a lateral enlargement thereof and providing a lateral chamber at one side of and opening into said fuel channel and providing an adequate insulation space for an electrode, said chamber having a covering top, an electric sparking electrode entered into said chamber through said covering top and positioned in said lateral chamber below the top edges of the wick, and means for igniting the wick through the effect of a spark created thereby.

3. A liquid fuel burner having combustion tubes forming a combustion chamber, a base supporting said tubes and having a fuel channel beneath and registering with said combustion chamber, a starting wick positioned in said channel to project its flame into the combustion chamber, said base having a chamber at a side of and communicating with said fuel channel, forming a lateral enlargement of the fuel channel and providing an adequate insulation space for an electrode, a cover for the top of said chamber, a sparking electrode supported by and removable with said cover and positioned in said lateral chamber to create a spark below the top edges of the wick and below the combustion space in said combustion chamber, and means for igniting the wick through the effect of a spark created thereby.

4. A liquid fuel burner having combustion tubes forming a combustion chamber, a base supporting said tubes having a fuel channel beneath and registering with said combustion chamber, a liquid fuel absorbent starting wick positioned in said channel to project its flame into said combustion chamber, said base having a covered space at a side of but opening into said fuel channel and forming a lateral enlargement thereof below the top edges of said wick and below the combustion space of said combustion chamber, a sparking electrode in said space, and means for igniting the wick through the effect of a spark created thereby.

5. A combustion tube burner having a base presenting a fuel channel, perforated combustion tubes surmounting said base and defining a combustion chamber above said channel, a starting wick positioned in said channel to project its flame into said combustion chamber, said base presenting a covered vaporizing chamber at a side of but opening into said fuel channel and

constituting a lateral enlargement of the fuel channel at the side of the base, a sparking electrode entered through the walls of said vaporizing chamber and positioned in said lateral enlargement to create a spark below the upper edges of the wick, and means for igniting the wick from a spark created thereby.

6. A liquid fuel burner having spaced annular upstanding walls defining between them an outer annular fuel channel and a laterally spaced inner annular fuel channel, pairs of spaced concentric combustion tubes forming combustion chambers in upstanding relation to and opening each from one of said fuel channels, a duct connecting said fuel channels, means for supplying liquid fuel to said base, a liquid fuel absorbent fire-resisting starting wick in each of said channels, said base having a covered space at a side of but opening into said fuel channel, an electric spark electrode in said covered space, and means for igniting the wicks through the effect of a spark created by said electrode, the same comprising a liquid fuel absorbent fire-resisting pilot wick member in said base in igniting relation to the spark created by said electrode, said pilot wick member extending into the communicating duct between the channels and in such relation to said starting wicks as to light the latter from its flame.

7. A liquid fuel burner having annular concentric combustion tubes forming a combustion chamber between the same, a base supporting said tubes and having a fuel channel beneath and registering with said combustion chamber, a liquid fuel absorbent fire-resisting starting wick in said fuel channel, a covered space in said base at a side of but opening into said fuel channel and forming a lateral enlargement thereof, an electric spark electrode entered through the walls of said covered space, and means for igniting the wick through the effect of a spark created by said electrode, the same comprising a pilot wick member in said base in igniting relation to the spark created by said electrode and in such relation to the starting wick as to light the latter from its flame, and means for supplying liquid fuel to said base to saturate said starting wick and said pilot wick member.

8. A combustion tube burner having a base provided with inner and outer annular fuel grooves, concentric combustion tubes surmounting said base and providing combustion chambers above said grooves, means for supplying liquid fuel to said fuel grooves, a starting wick in each of said grooves, said base having a duct interconnecting said fuel grooves and having a formation extending laterally and outwardly beyond the limits of one of said grooves to present a covered chamber at a region substantially opposite said interconnecting duct and opening into and constituting a lateral enlargement of said outer fuel groove, a pilot wick in said interconnecting duct, an electric spark electrode entered through the walls of said lateral enlargement, and means for igniting the wicks through the effect of a spark created thereby.

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