July 25, 1950 M. RESEK ET AL 2,516,722

LIQUID FUEL BURNER OF THE RETORT CLASS

Filed Dec. 16, 1944 2 Sheets-Sheet 1

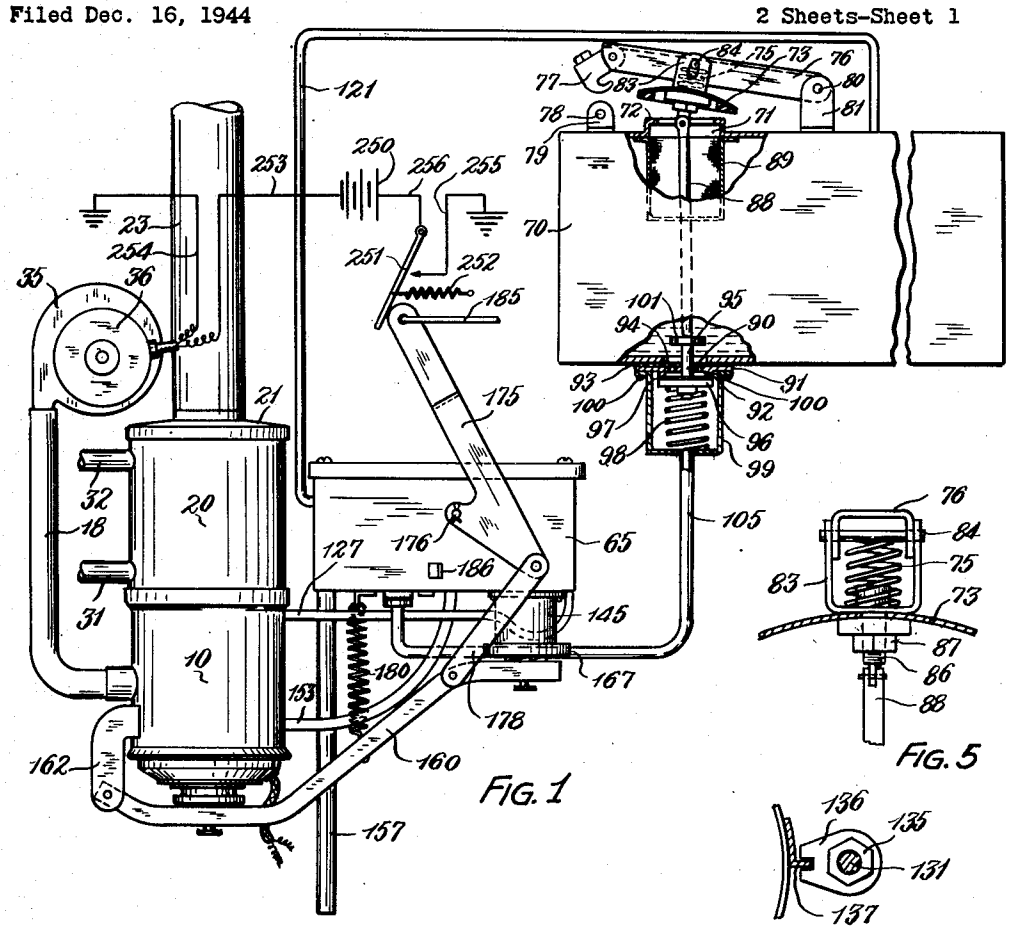


FIG. 1

FIG. 5

FIG. 6

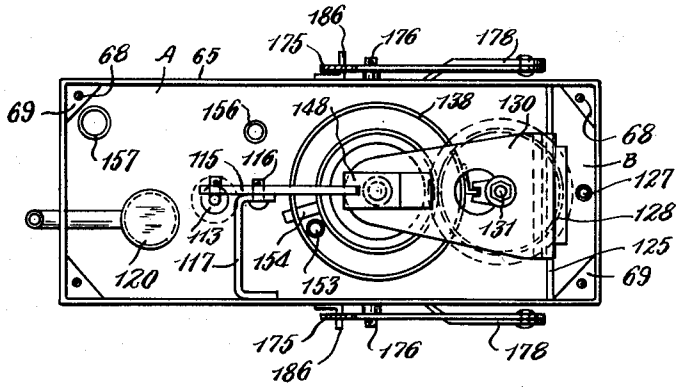


FIG. 4

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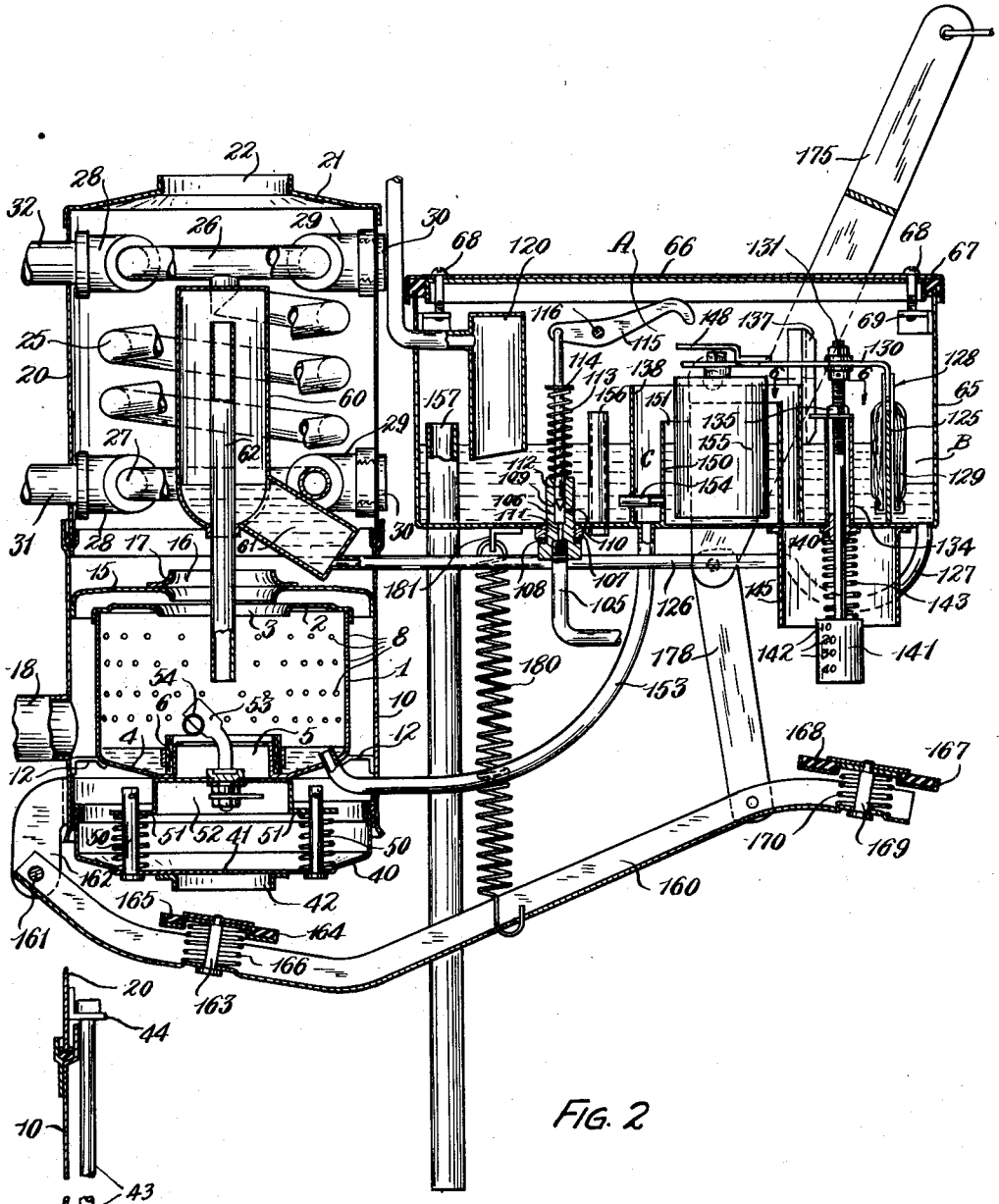


FIG. 2

FIG. 3

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UNITED STATES PATENT OFFICE

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LIQUID FUEL BURNER OF THE RETORT CLASS

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Application December 16, 1944, Serial No. 568,426

16 Claims. (Cl. 158—36)

1

This invention relates, generally, to liquid fuel burning apparatus, and more particularly, in one of its phases, to a liquid fuel burner of the retort class.

The invention was conceived and developed in connection with an engine heater characterized by a circulating element adapted to be placed in circuit with the cooling system of an internal combustion engine. Accordingly, the invention is illustrated as embodied in such an apparatus, although it will be understood that the invention is of more general application. Examples of engine heaters of the kind referred to will be found in the copending applications of Marc Resek, Serial No. 479,038, filed March 13, 1943, now Patent No. 2,393,411, dated January 22, 1946, and Marc Resek et al., Serial No. 514,468, filed December 16, 1943, and matured as Patent No. 2,438,823, issued March 30, 1948.

Among the objects of the present invention is the provision of liquid fuel burning apparatus that may be very conveniently placed in condition for operation and ignited from a remote location, as from the driver's compartment of a vehicle in which the heater is installed, and that may likewise be shut down with equal facility and placed in inactive and protected condition in which it remains until the next operation.

Another object is to provide, in apparatus of the above described character, means by which the oil supply to the burner is automatically shut off when the apparatus is placed in inactive condition, and by which a continual supply of fuel to the main burner is initiated and a measured quantity of liquid fuel is automatically delivered to the preheating burner of the retort, when the apparatus is placed in condition for operation.

Another object of the invention is to provide a highly efficient liquid fuel burner of the retort class that is thoroughly reliable and requires the minimum of attention, the same, in its preferred form, including an electrical igniter located inside the apparatus in operative relation to the preheating burner to the end that the apparatus may be set in operation without having to gain access to its interior.

Other objects and advantages will appear as we proceed to describe the invention by reference to the accompanying drawings wherein Fig. 1 is an elevational view of liquid fuel burning apparatus embodying the invention, this view showing the apparatus in its shut-down or inactive condition; Fig. 2 is an enlarged sectional side elevation of the apparatus, showing it conditioned for use; Fig. 3 is a detail of one of the tie bolts by

2

which the combustion chamber, housing and bottom casing member of the burner are clamped together; Fig. 4 is a plan view of the liquid fuel feeding and control chamber with the cover removed; Fig. 5 is an enlarged sectional detail of the reservoir cover and its clamping lever, and Fig. 6 is a similar detail, taken on the line 6—6 of Fig. 2.

The burner incorporated in the apparatus is of the bowl type, as will appear from Fig. 2. The burner bowl is designated 1 and has an annular top wall 2 flanged downwardly about its central opening 3. The bottom 4 of the bowl is dished and formed with a central cylindrical reentrant portion 5 that is open at the top. A wick 6 surrounds the portion 5. The peripheral wall of the bowl is provided with air admitting openings 8, the lowest of which are well above the maximum liquid level in the bowl; and in this connection it may be well to explain that liquid fuel is present in the bowl only when the burner is being primed for starting, as will more fully appear hereinafter.

The burner bowl 1 is supported centrally within a cylindrical housing 10, as by brackets 12, and fitting within the upper portion of said housing, in spaced relation to the top wall of the burner bowl, and with its flanged edge welded or otherwise secured to the housing, is an annular partition 15 that is flanged downwardly about its central opening 16. Said opening is somewhat smaller than, and is concentric with, the opening 3 of the top wall of the burner bowl. An upwardly curled ring-like condensate arrester 17 is applied to the partition 15 about said opening 16. An air supply conduit 18 opens into the housing 10 well below the partition 15, but preferably above the plane of the bottom 4 of the bowl.

Surmounting the housing 10, with its bottom edge sealed within the top of the housing, is a cylindrical combustion chamber 20 having a top wall 21 provided with a central flue connection 22. A flue 23 is shown in Fig. 1 as rising therefrom.

According to the present embodiment, a liquid circulating element or coil 25 is situated within the combustion chamber 20 and is communicatively connected at top and bottom to annular headers 26 and 27, respectively, each header including diametrically opposed fittings 28 and 29. The headers are shown as attached to the peripheral wall of the combustion chamber at one side by screw plugs 30, while an inlet pipe 31 communicates with the lower header through the fitting 28 thereof, and an outlet pipe 32 com-

municates with the upper header 26 through its corresponding fitting 28. It is through the pipes 31 and 32 that the liquid circulating element or coil is adapted to be placed in circuit with the cooling system of an internal combustion engine (not shown).

As illustrated more or less diagrammatically in Fig. 1, a centrifugal blower 35, driven by an electric motor 36, supplies air to the burner through the previously mentioned conduit 18. Closing the bottom of the housing 10, with its top sealed thereto is a dished casing member 40, having a relatively small central drain opening 41. Said opening is surrounded by a flanged collar 42, welded or otherwise secured to the bottom of said casing member. The combustion chamber 20, the housing 10, and the casing member 40 may be secured together by any suitable means, as by the expedient of two or more tie bolts, one of such being shown at 43, in Fig. 3. The bolt extends through lugs 44 and 45, on the combustion chamber and on the bottom casing member, respectively, so that when the bolts are tightened these two parts are drawn firmly against the top and bottom of the housing.

Rigidly secured to and rising from the bottom casing member 40 are posts 50 along which are guided apertured lugs 51 of a support 52 for an electrical igniter 53 that rises through the reentrant portion 5 of the bottom of the burner bowl and is disposed with its igniter wire or coil 54 in igniting relation to the top of the wick 6. It is deemed unnecessary to illustrate the igniter in detail, since the details constitute no part of the present invention, although we may explain briefly that it comprises two posts of conductive material that are insulated from each other and by the upper ends of which the igniter coil 54 is supported and to which its opposite ends are electrically connected. Such an igniter, in precisely the same environment, is disclosed in the above mentioned application Serial No. 514,468.

Located centrally within the combustion chamber 20, with its rounded lower end in rather closely spaced relation to the opening 16 of the partition 15, is a retort 60, shown as having adjacent the bottom thereof a lateral and downwardly inclined extension 61. A vapor delivery tube 62, having its upper end spaced only a short distance below the closed top of the retort 60, extends downwardly through a central, flanged opening in the bottom of the retort, and terminates at its lower end within the burner bowl, desirably centrally thereof and about half way between the top and bottom of the bowl.

Suitably supported adjacent the burner structure above described, and at a rather definite elevation with respect thereto, is a box-like container or chamber 65, to the top edge of which is sealed a cover 66. The cover is shown as constructed to provide a downwardly opening channel about the edge thereof, and said channel contains a packing gasket 67 that bears against the top of the peripheral wall of the chamber; and the cover is drawn down firmly upon the chamber by screws 68 that are threaded into ears 69 on the interior of the chamber.

Liquid fuel is supplied to the container or chamber 65 from a reservoir 70 having a filling opening 71. Said opening is surrounded by a flange 72 against which a cover 73, provided with a gasket for engagement with said flange, is adapted to be held tightly by a spring 75 when a lever 76, to which the cover 73 is loosely connected, is depressed and held down by the engagement of a hook 77 with a pin 78. The pin 78 is supported by ears 79 that are carried by the reservoir 70. The end of the lever 76 remote from the hook 77 is pivoted on a pin 80 that is supported by ears 81 that rise from the reservoir. A lost motion connection between the cover 73 and lever 76 is made by means of a U-shaped element 83 (see Fig. 5) that is secured in a manner presently to be described to the cover 73 and the side branches of which element extend up along the opposite sides of a channel member that constitutes the lever 76. Said side branches of the element 83 are slotted to receive the ends of a pin 84 that extends through the lever and between which and the base of the U-shaped element 83 the previously mentioned spring 75 is compressed. The element 83 is secured to the cover 73 by a bolt-like member 86 to which a nut 87 is applied. Pivoted to the lower end of the member 86 is a rod 88 that is guided through an aperture in the bottom of a cup-like screen 89 that is attached to the top wall of the reservoir 70 about the filling opening 71 thereof.

The bottom of the reservoir 70 has an opening 90 in axial alignment with the aforesaid filling opening 71, and secured to the bottom of the reservoir about the opening 90 is a plate 91 on the under side of which is an annular valve seat 92. A gasket 93 is compressed between the plate 91 and the bottom of the reservoir, and within the radius of the valve seat 92, the plate 91 is provided with a series of ports 94 that communicate with the interior of the reservoir through the opening 90. Reciprocable within a central aperture of the plate 91 is the stem 95 of a disk-like valve 96 which has a gasket 97 applied to its upper side that is arranged to engage the annular valve seat 92 when the valve disk 96 is elevated by a spring 98 that is compressed between the valve disk and the bottom of a cup-like receptacle 99 whose flanged top engages the peripheral portion of the plate 91 and is secured with said plate to the bottom of the reservoir by screws 100. The valve stem 95 has, at its upper end, a wide flat head 101 for engagement by the previously mentioned rod 88.

In the drawing, the hook 77 by which the lever 76 is normally held down is shown as released from the pin 78, thus permitting the spring 98 to seat the valve disk 96 and thus close the ports 94. The lever 76 may now be swung upwardly to further elevate the cover 73 and permit the reservoir to be filled with liquid fuel. After the reservoir has been filled the lever 76 is depressed so as to force the cover 73 against the flange 72 under the tension of the spring 75 and the hook 77 is engaged beneath the pin 78. The depression of the cover, and consequently the rod 88, unseats the valve 96 and opens communication through the ports 94 between the reservoir and the receptacle 99.

A pipe 105, connected to the bottom of the receptacle 99, extends downwardly and laterally beneath the chamber 65 where it has connection with the lower end of a valve casing 106 (Fig. 2) that is threaded into a boss 107 on the bottom of the chamber, the joint being rendered leakproof by a gasket 108. The central cylindrical chamber 109 of the valve casing 106 communicates with the interior of the chamber through a lateral port 110, and with the previously mentioned pipe 105 through a port 111, the latter being surrounded at its upper end by a valve seat wherewith a needle valve 112 engages when the latter is depressed against the tension of a spring

113. Said spring surrounds the stem of the valve and bears at its lower end against the top of the valve casing and at its upper end against a collar 114 on the stem of the valve. At its upper end said stem is pivoted to a lever 115 that is fulcrumed on a pin 116, shown in Fig. 4 as supported by a bracket 117 that extends from one of the side walls of the chamber 65.

It is evident from the foregoing that when the filling opening of the reservoir 70 is closed by the cover 73, the reservoir is in open communication with the chamber 65. In order to maintain a substantially constant liquid level in the compartment of the chamber 65 to which the liquid fuel is delivered through the pipe 105 we employ a so-called air lock for the reservoir 70, or, in other words, a barometrically controlled liquid feed from the reservoir to the chamber 65, the mechanics of which will now be described. Supported in inverted position within the chamber 65 is a relatively deep cup 120 that communicates near its upper end with the top portion of the reservoir 70 through a pipe 121. When the liquid fuel rises within the chamber 65 sufficiently to seal the open bottom of the cup 120 it will prevent the entrance of air to said cup and consequently to the top of the reservoir 70 thereby to prevent further flow of liquid by gravity from the reservoir 70 to the chamber 65 until the liquid level in the chamber drops below the bottom of the cup 120. The plane of the perimeter of the cup 120 is slightly inclined to the horizontal to insure instant release of the air lock when the liquid level drops below the high side of the cup, as otherwise—that is, if the open end of the cup were horizontal—there would be a tendency for the liquid to cling to the cup.

The interior of the container or chamber 65 is divided by a partition 125 into a receiving compartment A, to which the liquid fuel is delivered through the before-mentioned pipe 105, and a delivery compartment B that communicates, through a pipe 126, with the lateral extension 61 of the retort 60, said pipe including a trap 127 that has the effect of increasing the head of liquid adjacent the compartment B, and this prevents any slight vapor pressure that may be built up within the retort from backing the liquid fuel into said compartment. Supported astride the partition 125, by a wick carrier 128, is a U-shaped wick 129 of suitable absorbent material. To a lateral extension 130 of the wick carrier 128 is swiveled the top end of a wick adjusting stem 131 that descends through a tube 134 rising from the bottom of the chamber 65 a suitable distance above the maximum liquid level in the compartment A. The stem 131 is threaded through a nut 135 having a lateral bifurcated extension 136 (Fig. 6) that cooperates with a guide rail 137. This guide rail is supported by a cylindrical wall 138 that rises from the bottom of the chamber a considerable distance above the maximum liquid level in the compartment A, and the purpose of which will presently appear. The stem 131 is rotatable and reciprocable in a flanged guide bearing 140 whose upper end fits within the bottom of the tube 134, and fastened to the lower end of the stem is a head 141, shown as having graduations 142 thereon. A spring 143 surrounds the stem and is compressed between the head 141 and the flange of the guide bearing 140. The spring 143 holds the stem down with the nut 135 engaging the tube 134. By turning the stem by means of the head 141 it may be adjusted vertically with respect to the nut 135 thereby to raise or lower the wick, through the medium of the wick carrier 128. The elevation of the wick may be ascertained by reading the graduations 142 with respect to the lower edge of a cylindrical housing 145 that depends from the bottom of the chamber 65 in substantially concentric relation to the head 141. By lifting the stem 131 by means of the head 141 against the action of the spring 143, the wick may be bodily raised sufficiently to arrest the oil feed, as will be more fully explained hereinafter. During reciprocation of the wick adjusting stem 131 the bifurcated extension 136 of the nut 135 traverses the guide rail 137.

The end of the previously mentioned lever 115 remote from that to which the stem of the needle valve 112 is pivoted, overhangs a yielding abutment 148 that is supported by the extension 130 of the wick carrier 128, shown in the form of a leaf spring; and when the wick is lifted bodily in the manner previously described for the purpose of shutting off the oil feed, the abutment 148 engages and lifts the overhanging end of the lever 115, depressing its opposite end to seat the valve 112 so as to positively shut off flow of liquid fuel from the reservoir 70 to the chamber 65.

Located within and spaced from the cylindrical wall 138 is a similarly shaped displacer chamber 150 which is notched at its upper edge to provide an overflow lip 151. An annular trough C that is thus provided between the chamber 150 and the wall 138 communicates through a pipe 153 with the bottom of the burner bowl 1. Constant communication is established between the compartment A and the interior of the displacer chamber 150 through a tube 154 of relatively small diameter. A displacer 155, in the form of a cylindrical body that is only slightly less in diameter than the displacer chamber, is attached at its upper end to the extension 130 of the wick carrier 128. Consequently, when the wick carrier is lifted by means of the stem 131 to elevate the wick, and, at the same time, to close the needle valve 112, as just described, it will also lift the displacer 155 and allow liquid corresponding in volume to the formerly submerged end of the displacer to flow from the compartment A through the tube 154 into the displacer chamber attaining therein the level prevailing in said compartment.

The chamber 65 is vented above the maximum liquid level through a vent tube 156 that opens through and rises from the bottom wall of the chamber, and excess liquid fuel inadvertently delivered to the compartment A of the chamber 65 escapes through an overflow pipe 157 that is shown as sealed within an aperture in the bottom wall of the chamber and as extending a substantial distance below the apparatus so as to avoid possibility of the excess fuel being ignited from the burner.

As brought out in the above identified applications, it is desirable to close the bottom of the apparatus against the ingress of water when the apparatus is shut down between operations. This is accomplished by what we shall term a bottom clamp which, when in closing position, sustains the wick 129 and the displacer 155 elevated and the needle valve 112 closed.

The bottom clamp includes an arm 160, desirably of channel formation, that is pivoted at one end on a cross pin 161 supported from the burner housing 10 by brackets 162. Loosely connected to the arm 160, by a pin 163, is a closure 164, equipped with a gasket 165 which is arranged to

seat against the beforementioned flanged collar 42. The closure is yieldingly held with said gasket compressed against the collar by a spring 166 that surrounds the pin 163 and is compressed between the web of the channel that constitutes the arm 160 and the underside of the closure 164. For similar cooperation with the bottom of the housing 145 is a closure 167, fitted with a gasket 168, and loosely connected to the free end of the arm 160 by a pin 169. A spring 170 surounds said pin and is compressed between the arm and cover 167.

Side branches of a forked lever 175 depend on opposite sides of the chamber 65 and are journaled on pins 176 that extend from the side walls of the chamber. Pivotally connected to the lower ends of the branches of said lever 175 are links 178 which have their opposite ends similarly connected to the arm 160. A relatively heavy spring 180 has its upper end anchored to an ear 181 on the bottom of the chamber 65 and its opposite end attached to the arm 160, the spring tending to lift the arm and hold the closures 164 and 167 firmly against the flanged collar 42 and the housing 145, respectively, thereby to seal the bottom of the apparatus and, incidentally, hold the stem 131 elevated, along with the wick 129 and the displacer 155, as previously explained. The parts are illustrated in this condition in Fig. 1. By swinging the lever 175 from the position shown in Fig. 1 to that illustrated in Fig. 2, and which may be done from a remote location by means consisting of or including a rod 185 that is pivotally connected to the upper end of the lever, the arm 160 may be swung in opposition to the spring 180 to the position shown in Fig. 2, wherein the closures 164 and 167 are lowered away from the parts wherewith they cooperate. When thrown to this position, a toggle joint constituted of the links 178 and the lower parts of the side branches of the lever 175 pass through dead center, so to speak, as illustrated in Fig. 2, under which conditions the branches of the lever 175 engage stops 186 on the sides of the chamber 65.

When the bottom clamp is lowered in the manner just described in order to set the apparatus in condition for use, the stem 131 is released and allowed to drop to the position shown in Fig. 2, such action being insured by the spring 143. The descent of the stem is arrested by engagement of the nut 135 with the top of the tube 134. When the stem descends it lowers the wick sufficiently to start a siphoning of the liquid fuel over the partition 125 from compartment A to compartment B, from which latter compartment the fuel flows through the pipe 126 to the retort 60. Simultaneously with the lowering of the wick, the displacer 155 is depressed within the chamber 150, causing instantaneous displacement of liquid fuel from said chamber over the lip 151 into the trough C from which it flows by gravity through the pipe 153 to the bottom of the burner bowl 1. The fuel flowing into the bowl will immediately saturate the wick 6 and, now, by closing a circuit (not shown) that includes the electrical igniter 53, the igniting coil 54 thereof may be heated to generate vapors from the wick and ignite them and, through them, the liquid fuel in the bottom of the bowl 1. During initial stage of combustion, primary air is admitted through the lower perforations 8, and secondary air through the perforations thereabove and through the annular slot between the top 2 of the burner bowl and the partition 15. The products of combustion rising through the openings 3 and 16 into the combustion chamber 20 will heat the retort 60 and vaporize the fuel supplied thereto through the pipe 126. Vapors generated within the retort will descend through the tube 62 and will be discharged therefrom centrally within the burner bowl 1, where they will mix with primary air admitted, under the present demands, through all the perforations 8. Secondary air will be supplied through the annular slot between the wall 2 and partition 15, and the resultant voluminous flame will rise within the combustion chamber about the retort, maintaining the same at a high degree of temperature and at the same time heating the contents of the circulating element or coil 25. About the same time the igniter 53 is energized, current is supplied to the motor 36 which operates the blower 35 to supply air through the conduit 18 to the burner housing 10.

It is apparent from the foregoing that the bottom of the burner bowl 1 constitutes a preheating means of the liquid fuel combustion type for initially heating the retort 60; and that a main burner is constituted of the vapor tube 62 and the surrounding portion of the burner bowl. As explained earlier herein, liquid fuel is present in the bowl only when the burner is being primed for starting.

When it is desired to shut down the apparatus, the current to the motor 36 is turned off and the lever 175 is swung toward the left, as the parts are viewed in the drawings, thereby to allow the spring 180 to lift the arm 160 and apply the closures 164 and 167 to the parts against which they seat, the closure 167 engaging the head 141 of the wick stem 131 and lifting it and consequently the wick 129 and the displacer 155. By the same action, the needle valve 112 is moved to closed position.

In order to render automatic the starting and stopping of the fan 35 when the apparatus is placed in condition for operation and when it is shut down, respectively, we provide the circuit shown diagrammatically in Fig. 1. It includes a battery 250, a switch 251 and the motor 36 of the aforesaid fan. The switch 251, as here illustrated, comprises an arm that tends to swing into engagement with a contact point under the influence of a spring 252, and said arm is in the path of the lever 175 and is held out of engagement with said contact point when the lever is in the position it occupies when the apparatus is shut down, as shown in Fig. 1.

Now, when the lever 175 is pulled by the rod 185 to its other position in order to condition the apparatus for operation, the arm of the switch 251 is released and swings into engagement with the contact point, thereby to close the circuit and energize the fan motor 36, the current flowing from the battery 250, through conductor 253, motor 36, conductor 254, the "ground," conductor 255, switch 251 and conductor 256 to the battery.

Having thus described our invention, what we claim is:

1. In liquid fuel burning apparatus, a vaporizing burner including a retort and a preheating means of the liquid-fuel combustion type for preheating the retort, a liquid fuel supply in communication with the retort, shutoff means that is adapted to be shifted between a first position in which it shuts off the supply of fuel to the retort and a second position wherein flow of fuel to the retort is permitted, a displacement chamber having an overflow passage, means for supplying fuel to said chamber to an elevation below said passage, a displacer movable up and

down in said chamber, operative connections between the shutoff means and said displacer whereby when said means is moved to first position it elevates the displacer and when moved to second position it depresses the displacer thereby to displace liquid from said chamber through said overflow passage, and means for conveying liquid displaced from the chamber to the preheating means.

2. In liquid fuel burning apparatus, a vaporizing burner including a retort and a preheating means of the liquid-fuel combustion type for preheating the retort, a liquid fuel supply communicating with said retort, a displacer chamber having an overflow passage and communicating with said supply to receive fuel therefrom to an elevation below said passage, means operable to cause fuel to be fed from said supply to the retort, and a displacer movable up and down in the displacer chamber and having operative connection with said means and depressed thereby when said means is actuated so as to displace fuel from said chamber through said passage, and means for conveying the displaced fuel to the preheating means.

3. In liquid fuel burning apparatus, a vaporizing burner including a retort, a preheating means of the liquid-fuel combustion type for preheating the retort, a reservoir, means supplying liquid fuel thereto, means maintaining a substantially constant liquid level in the reservoir, means conveying fuel from the reservoir to the retort of the main burner, a displacer chamber communicating with the reservoir to receive fuel therefrom by gravity, said chamber having an overflow passage above said liquid level, means operable to cause fuel to be fed from the reservoir to the retort, and a displacer movable up and down in said chamber and having operative connection with the last mentioned means and depressed thereby when said last mentioned means is actuated so as to displace fuel from said chamber through said passage, and means conveying the displaced fuel to the preheating means.

4. In liquid fuel burning apparatus, a vaporizing burner including a retort and a preheating means of the liquid-fuel combustion type for preheating said retort, a fuel container, conduit means through which fuel is conveyed from said container to the retort, a liquid fuel supply communicating with the container, a liquid level control means maintaining a substantially constant liquid level in the container, a flow control means shiftable between a first position wherein it arrests flow of fuel from the container to the retort and a second position wherein it establishes such flow, a displacement chamber communicating with the container in such manner that fuel will flow from the container to said chamber to the height of the aforesaid liquid level but will not readily return to the container, said chamber having an overflow passage above said liquid level, a displacer movable up and down in said chamber and operatively connected to the aforesaid flow control means so that when said flow control means is moved to first position it will elevate the displacer and when moved to second position it will depress the displacer thereby to displace liquid from the chamber through said passage, and conduit means by which the displaced fuel is conveyed to the preheating means.

5. In liquid fuel burning apparatus, a vaporizing burner including a retort and a preheating burner means of the liquid-fuel combustion type for preheating said retort, a fuel container, conduit means through which fuel is conveyed from said container to the retort, a liquid fuel supply communicating with the container, a valve for shutting off the supply of fuel to the container, means biasing said valve toward open position, a liquid level control means maintaining a substantially constant liquid level in the container, a flow control means shiftable between a first position wherein it arrests flow of fuel from the container to the retort and a second position wherein it establishes such flow, a displacement chamber communicating with the container in such manner that fuel will flow from the container to said chamber to the height of the aforesaid liquid level but will not readily return to the container, said chamber having an overflow passage above said liquid level, a displacer movable up and down in said chamber and operatively connected to the aforesaid flow control means so that when said flow control means is moved to first position it will elevate the displacer and when moved to second position it will depress the displacer thereby to displace liquid from the chamber through said passage, conduit means by which the displaced fuel is conveyed to the preheating means, and means through which the flow control means maintains the aforesaid valve closed when said flow control means is in first position.

6. In liquid fuel burning apparatus, a vaporizing burner including a retort and a combustion device therebelow and a casing enclosing the retort and combustion device, said casing having an opening that opens to the atmosphere in the region of said combustion device and being otherwise closed from the bottom thereof to an elevation above said device, a container for liquid fuel, conduit means for conducting fuel from said container to the retort and to the combustion device, flow control means in the container that is shiftable between a first position wherein it arrests flow of fuel to the retort and a second position wherein it establishes such flow, means actuated by said flow control means when shifted to first position for causing a measured amount of fuel to be fed from the container to the combustion device for preheating the retort, the flow control means having an operating part outside the container for shifting the flow control means between first and second positions, the container including a part surrounding said operating means and defining an opening through which access is had to said operating means, and a structure including closures for the opening of the aforesaid casing and for the last mentioned opening and which is shiftable in one direction to remove the closures from said openings and in another direction to apply said closures to the openings, the closure for the second mentioned opening engaging said operating means when moved to closed position thereby to shift the flow control means to second position.

7. In liquid fuel burning apparatus, a vaporizing burner including a retort and a combustion device therebelow and a casing enclosing the retort and combustion device, said casing having an opening that opens to the atmosphere in the region of said combustion device and being otherwise closed from the bottom thereof to an elevation above said device, a container for liquid fuel, conduit means for conducting fuel from said container to the retort and to the combustion device, flow control means in the container

that is shiftable between a high position wherein it arrests flow of fuel to the retort and a low position wherein it establishes such flow, means actuated by said flow control means when shifted to low position for causing a measured amount of fuel to be fed from the container to the combustion device for preheating the retort, the flow control means having an operating part outside the container for shifting the flow control means between low and high positions, the container including a housing surrounding said operating means and provided with an opening through which access is had to said operating means, and a structure including closures for the opening of the aforesaid casing and for the opening of said housing shiftable in one direction to remove the closures from said openings and in another direction to apply said closures to the openings, the closure for the opening of said housing engaging said operating means when moved to closed position thereby to shift the flow control means to high position.

8. A liquid fuel burner comprising a casing, a substantially horizontal partition disposed across said casing for separating the same into a combustion chamber above the partition and an air chamber below said partition, the partition having an opening, a retort located in the combustion chamber, a receptacle within the air chamber having a perforated peripheral wall and the interior of which communicates with the combustion space through the aforesaid opening, the lowest of the perforations of said peripheral wall being spaced a substantial distance above the bottom of the receptacle, a vapor delivery tube that opens at its upper end into the retort above the maximum fuel level therein and at its lower end into said receptacle, a liquid fuel supply, fuel conveying means leading from the supply to the retort and to said receptacle, and control means incorporated in said fuel conveying means and operable to cause fuel to be conveyed from said liquid fuel supply to the retort continuously for prolonged periods of time and for a limited initial period of time only to said receptacle.

9. A liquid fuel burner comprising a casing, a partition disposed horizontally across the casing and dividing it into a combustion chamber above said partition and an air chamber below the partition, said partition having an opening through which said chambers communicate, a burner bowl in the air chamber, said bowl having an annular top wall spaced from said partition with its opening substantially in alignment with the opening in the partition, the peripheral wall of the bowl having perforations sufficiently above the bottom of the bowl to provide a liquid fuel sump below said perforations, a retort supported within the combustion chamber above the opening in said partition, a vapor delivery tube extending from above the maximum liquid level in, and downwardly through the bottom of, the retort and terminating within said bowl, and means for supplying liquid fuel to the retort and to the burner bowl.

10. A liquid fuel burner comprising a casing, a partition disposed horizontally across the casing and dividing it into a combustion chamber above said partition and an air chamber below the partition, said partition having an opening through which said chambers communicate, a burner bowl in the air chamber, said bowl having an annular top wall spaced from said partition with its opening substantially in alignment with the opening in the partition, the peripheral wall of the bowl having perforations sufficiently above the bottom of the bowl to provide a liquid fuel sump below said perforations, a retort supported within the combustion chamber above the opening in said partition, a vapor delivery tube extending from above the maximum liquid level in, and downwardly through the bottom of, the retort and terminating within said bowl, means for supplying liquid fuel to the retort and to said sump, and an electrical igniter situated in the burner bowl adjacent the sump.

11. A liquid fuel burner comprising a casing, a partition disposed horizontally across the casing and dividing it into a combustion chamber above said partition and an air chamber below the partition, said partition having an opening through which said chambers communicate, a burner bowl in the chamber, said bowl having an annular top wall spaced from said partition with its opening substantially in alignment with the opening in the partition, the peripheral wall of the bowl having perforations sufficiently above the bottom of the bowl to provide a liquid fuel sump below said perforations, a retort supported within the combustion chamber above the opening in the aforesaid partition, a vapor delivery tube extending from above the maximum liquid level in, and downwardly through the bottom of, the retort and terminating within said bowl, the retort having a laterally extending sump adjacent its lower end, a liquid fuel supply pipe extending inwardly through the adjacent wall of the casing and communicatively connected with said sump, and a second liquid fuel supply pipe extending through the casing wall and communicatively connected to the bottom portion of the burner bowl.

12. A liquid fuel burner comprising a casing, a partition disposed horizontally across the casing and dividing it into a combustion chamber above said partition and an air chamber below the partition, said partition having an opening through which said chambers communicate, a burner bowl in the air chamber having an annular top wall spaced from said partition with its opening substantially in alignment with the opening in the partition, the peripheral wall of the bowl having perforations sufficiently above the bottom of the bowl to provide a liquid fuel sump below said perforations, a retort supported within the combustion chamber above the opening in the aforesaid partition, a vapor delivery tube extending from above the maximum liquid level in, and downwardly through the bottom of the retort and terminating within said bowl, means for supplying liquid fuel to the retort and to said sump, and means for supplying air to the air chamber.

13. A liquid fuel burner comprising a casing, a partition disposed horizontally across the casing and dividing it into a combustion chamber above said partition and an air chamber below the partition, said partition having an opening through which said chambers communicate, a burner bowl in the air chamber having an annular top wall spaced from said partition with its opening substantially in alignment with the opening in the partition, the peripheral wall of the bowl having perforations sufficiently above the bottom of the bowl to provide a liquid fuel sump below said perforations, a retort supported within the combustion chamber above the opening in the aforesaid partition, a vapor delivery tube extending from above the maximum liquid

level in, and downwardly through the bottom of, the retort and terminating within said bowl, means for supplying liquid fuel to the retort and to said sump, means for supplying air to the air chamber, the bottom of the burner bowl being formed with a central reentrant portion that is open at the top, a wick surrounding said reentrant portion, and an electrical igniter supported within said reentrant portion in proximity to the upper end of the wick.

14. A liquid fuel burner comprising a casing, a substantially horizontal partition disposed across said casing for separating the same into a combustion chamber above the partition and an air chamber below said partition, the partition having an opening, a relatively slender vertically disposed retort located in and substantially centrally of the combustion chamber, a receptacle within the air chamber having a perforated peripheral wall and the interior of which communicates with the combustion space through the aforesaid opening, the lowest of the perforations of said peripheral wall being spaced a substantial distance above the bottom of the receptacle, a vapor delivery tube that opens at its upper end into the retort above the maximum fuel level therein and at its lower end into said receptacle, a liquid fuel supply, fuel conveying means leading from said supply to the retort and to said receptacle, and control means incorporated in said fuel conveying means and operable to cause fuel to be conveyed from said liquid fuel supply to the retort continuously for prolonged periods of time and for a limited initial period of time to said receptacle only, the space surrounding the retort providing accommodations for an annular liquid circulating element in the combustion chamber.

15. In liquid fuel burning apparatus, a vaporizing burner including a retort, a receptacle having a top opening and so related to the retort that combustion of liquid fuel in the receptacle will preheat the retort, a liquid fuel supply, fuel conveying and control means for continuously delivering fuel from said supply to the vaporizing burner during each period of operation of the

apparatus, and further means included in said fuel conveying and control means by which a given quantity of fuel from said supply is segregated in said receptacle at the beginning of each such period, the liquid fuel supply and said conveying means being so related to the burner and to said receptacle that fuel is fed by gravity from the supply to the burner and receptacle.

16. The combination of elements defined in claim 15, combined with means providing a passage through which combustion air is supplied to the burner, a shutter for said passage, mechanism for opening and closing the shutter, and a shut-off device for the fuel conveying means including a movable part that occupies a given position when the shut-off device is in condition to prevent conveyance of fuel to the burner and receptacle, the aforesaid mechanism incorporating a member that moves in unison with the shutter and that is so located as to block movement of said part of the shut-off device from said given position when the mechanism is in shutter closing condition.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
Re. 22,332	Sabins	June 8, 1943
511,694	Grant	Dec. 26, 1893
1,234,326	Fuller	July 24, 1917
1,236,416	Fink	Aug. 14, 1917
1,283,109	Doble	Oct. 29, 1918
1,329,052	Lukaszewski	Jan. 27, 1920
1,337,498	Alsberg	Apr. 20, 1920
1,412,325	Widerwax	Apr. 11, 1922
1,505,745	Stromquist	Aug. 19, 1924
1,640,240	Kirchen	Aug. 23, 1927
2,053,236	Conant	Sept. 1, 1936
2,355,418	Breese et al.	Aug. 8, 1944
2,393,411	Resek	Jan. 22, 1946