July 13, 1937. R. M. SHERMAN 2,086,884

APPARATUS FOR CONTROLLING LIQUID FUEL BURNERS

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Fig. 1.

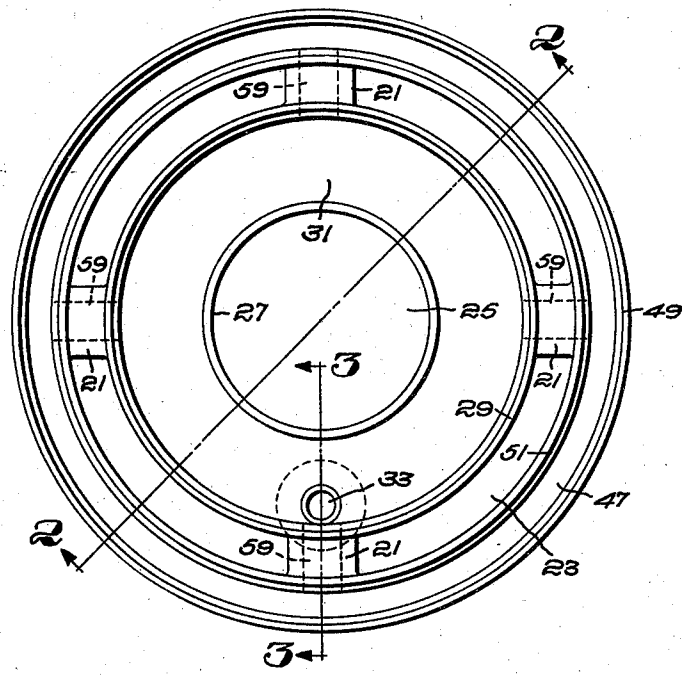
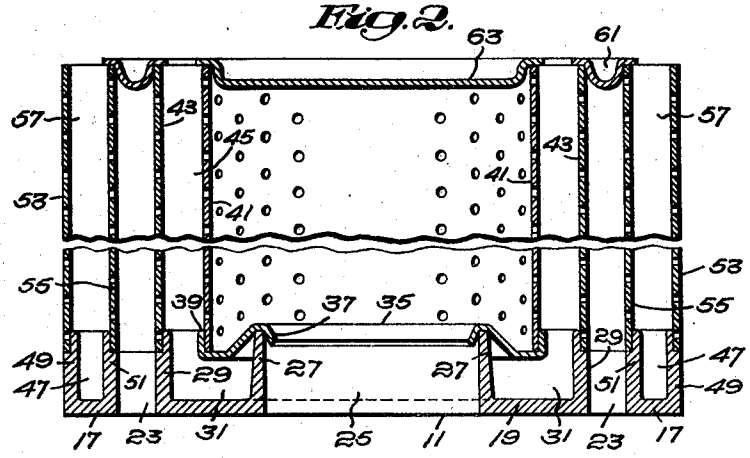


Fig. 2.



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Fig. 3.

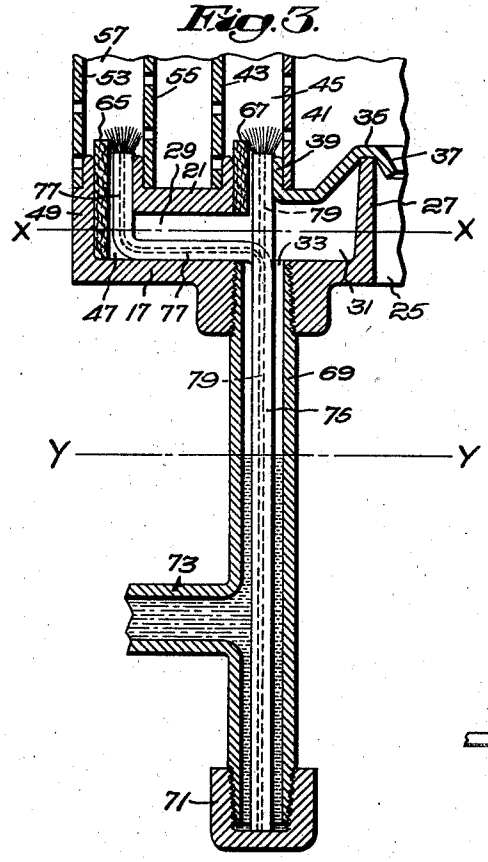


Fig. 4.

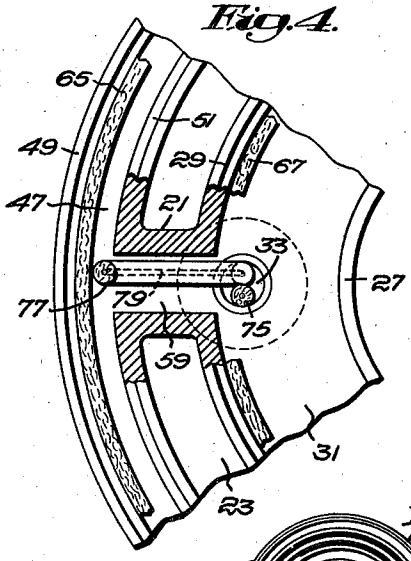


Fig. 6.

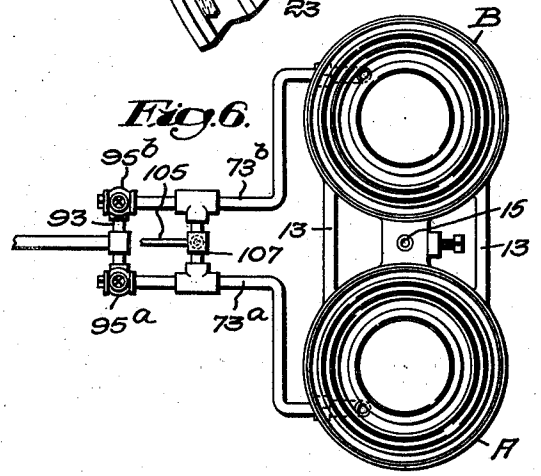
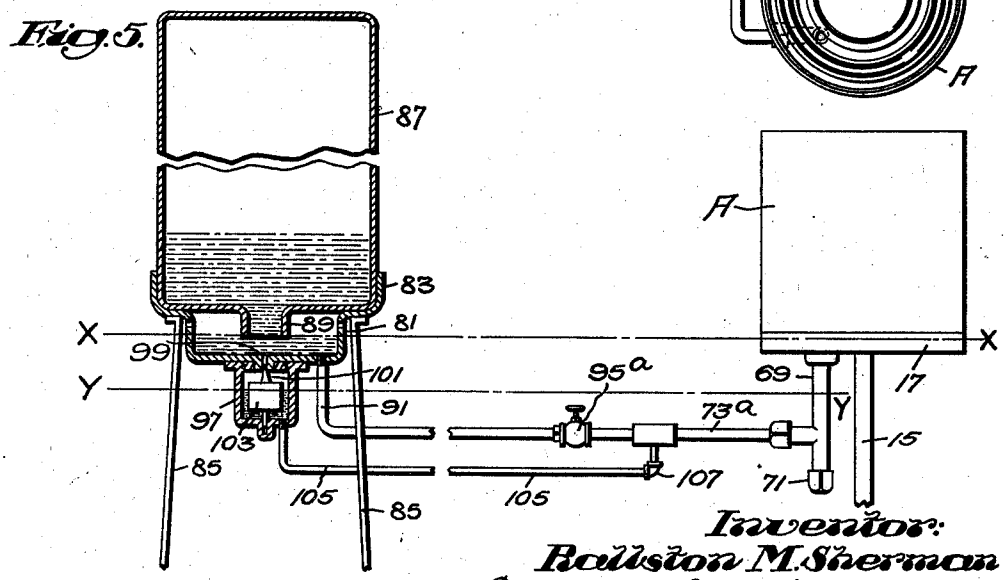


Fig. 5.



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Patented July 13, 1937

2,086,884

UNITED STATES PATENT OFFICE

2,086,884

APPARATUS FOR CONTROLLING LIQUID FUEL BURNERS

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Application May 24, 1932, Serial No. 613,302

6 Claims. (Cl. 158—37)

This invention relates to liquid fuel burners and to the control thereof, and more particularly to the provision of a simplified and effective control for establishing a relatively low flame or reduced rate of combustion when required. It furthermore relates to a simple arrangement of parts adapted to be so controlled that a number of burner units supplied from the same source of liquid fuel supply may be automatically lighted and brought to full fire operation either simultaneously or at different times.

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 base of a burner here employed to illustrate one embodiment of the invention, the parts above the base being removed;

Fig. 2 is a central, longitudinal section of the burner shown in Fig. 1, taken on the line 2—2 in Fig. 1, showing the combustion tubes or shells and cover plates in place but omitting the wicks;

Fig. 3 is a vertical section on an enlarged scale, taken on the line 3—3 of Fig. 1, showing that portion of the burner adjacent the point of liquid fuel delivery, such section showing the oil delivery conduit and pilot wick compartment together with the main starting and the igniting wicks;

Fig. 4 is a fragmentary plan view, also on an enlarged scale and partly in section, showing the parts illustrated in Fig. 3 but omitting the combustion tubes and cover plates;

Fig. 5 is an elevation on a reduced scale showing the burner and its supply tank, together with connections and controlling devices; and

Fig. 6 is a plan view of the burner units with their intermediate connections, as shown in Fig. 5.

Referring to the drawings and to the embodiment of the invention which is here submitted for illustrative purposes, while the invention has application to a wide variety of liquid fuel burners, it is here shown as applied to a burner of the so-called combustion tube type comprising (as will be seen from Fig. 6) two separate burner units A and B mounted on the same support, each of which units is of substantially the construction shown in Figs. 1 to 4 inclusive.

Referring first to Figs. 1 and 2, each unit comprises a cast-iron base member 11, the bases of the two units being embodied in one casting connected by webs 13 (Fig. 6) and supported on the floor in any suitable manner, as by the rod or pedestal 15. Each base (Figs. 1 and 2) comprises an outer annular plate 17 and an inner annular plate 19 connected one to the other by a series of webs 21 (Fig. 1), herein four in number, and providing for an air admission space 23 between the plates, the spaces being interrupted only by the webs 21. The inner plate is provided with a central air admission opening 25 surrounded by an up-turned ring-like flange 27, the outer edge of said inner plate having also an up-turned ring-like flange 29 spaced from but concentric with the flange 27. The flanges 27 and 29, together with the bottom plate 19, form a relatively wide annular trough 31 in the form of a channel presenting a fuel space or chamber to which liquid fuel (herein referred to as oil for purposes of description) is admitted through an opening 33 in the bottom of the channel. The top of the space defined by the channel is closed except for the direct escape of vaporized fuel to the combustion chamber by a removable annular cover plate 35 seated on the upper edge of the flange 27 and provided with a downwardly extending rim or sleeve 37 which fits within the flange and positions the cover plate thereon. The walls of the cover plate extend outwardly, and herein downwardly, over the channel 31, being spaced vertically from the bottom of the channel and peripherally from the inner walls of the flange 29 to provide an annular exit passage for the vaporized oil into the overhead combustion chamber.

The edge of the cover plate 35 is provided with an up-turned annular flange 39 within which there is removably secured a perforated sheet-metal cylinder or shell 41 constituting one of the combustion tubes of the burner. A similar but larger shell 43 is removably seated on an outer shouldered edge of the upright flange 29, the two shells forming between them the combustion chamber 45.

On the outer annular plate 17 there is also provided an annular fuel trough or channel 47 between the upright annular spaced concentric flanges 49 and 51, and concentric spaced perforated sheet-metal cylinders 53 and 55 are removably seated on the shouldered edges of such flanges to form between them the combustion chamber 57. The outer fuel channel 47 is connected with the inner, wider fuel channel 31 by means of supply ducts 59 (Figs. 1, 3, and 4) formed in the webs 21, one of such ducts being positioned directly opposite the oil opening 33 in the inner channel.

A removable cover plate 61 is provided with its edges resting on the top of the sheet-metal cylinders 43 and 55 to close the top of the annular air space therebetween, and a generally disk-shaped cover plate 63 rests on the upper edges of the cylinder 41 to close the top of the central air chamber, such plates leaving annular openings at the top of the two combustion chambers for the escape of the products of combustion.

The burner so far specifically described is shown merely as illustrative of a wide variety of burners to which the present invention may be usefully applied.

In the operation of a burner of this type, the burner is started by a preliminary heating operation in the course of which the burner parts are raised to such a temperature that oil admitted to the base is vaporized through the heat generated by the burner so that subsequently, in the normal or established operation of the burner, the oil vapor circulates through the channels and interconnecting passages and enters the combustion chambers, where it commingles and is burned with the air admitted thereto.

In its normal operation oil is fed to the burner, usually by gravity, from some source, such as a barometric feed device or a constant level float chamber, providing for a definite running or normal feed level which can be accurately fixed and maintained. Such level provides for the admission of oil to the bottom of the fuel channel in the base but limits the height to which liquid oil may rise in the base to some fixed point therein, such, by way of example, as is represented by the dotted line X—X in Figs. 3 and 5.

Preliminary heating of the burner may be accomplished by various means, but resort is commonly had to asbestos wicks permanently positioned in the fuel channels, these being first saturated by admitting oil to the burner base, and then ignited manually by means of a lighted taper inserted from without through the tops of the combustion chambers. The oil supply is then checked until the wicks burn freely, after which the oil supply is increased until the burner develops its full heating capacity, when it burns through vaporization of the oil independently of the wick and may be regulated as desired by controlling the rate of oil supply.

This method of starting the burner from a cold state requires more or less careful manipulation and attention and a substantial time elapses before the burner is in established normal operation.

One object, among others, of the present invention is to provide an automatic igniting device. In the illustrative embodiment of the invention, this comprises a constantly burning pilot light provided by a pilot wick device, the latter supplied with liquid fuel from a level below the normal running fuel level of the burner, so that it remains lighted during such period as the burner is out of operation. Such pilot light is so positioned that, as soon as oil is supplied to the base at the normal operating level, it will create a pre-heating flame in each separate combustion chamber of the burner, but, on the interruption of the oil supply at its normal running level and the extinguishment of the main flame in each combustion chamber, the pilot light will continue to burn.

The automatic igniting device is herein such that a plurality of burner units may be employed, each deriving its oil supply from the same constant level feeding device, each unit capable of being started up either together with or independently of the other, and each capable of being operated at its full or partial capacity while the other unit or units are either in or out of operation, the starting of any unit being effected by merely providing its normal supply of oil at the normal running level. The provision of such an igniting device considerably simplifies the starting of each burner unit and also reduces the time required for preliminary heating since the burner is never started from an entirely cold state.

Referring to Figs. 3 and 4, where one form of the igniting device is illustrated as applied to each burner unit, the base is there shown as supplied with the usual main or starting asbestos wicks 65 and 67 of annular form, the first of which is positioned in the outer part of the narrow channel 47 and the second in the outer part of the wide channel 31. In the normal operation of the burner oil is admitted to the base through the opening 33 from the tubular conduit or pipe length 69 threaded into the bottom of the base and depending vertically from the base, the bottom of the pipe being closed by the threaded cap 71 and the main oil supply pipe 73 being connected to the pipe 69 at a point preferably somewhat above the lower closed end thereof. The depending pipe length 69 provides a fuel compartment or well in which are positioned two elongated pilot wicks 75 and 77 extending preferably to the bottom of the well, and in any event below the pilot oil level represented by the line Y—Y, which level is maintained by means later described.

The pilot wick 75 is in igniting relation to oil when entered into the channel and, for the purpose, extends upwardly into the fuel channel 31, and herein into the annular space connecting the fuel channel with the combustion chamber 45, being spaced separate from the wick 67 but positioned closely adjacent thereto so that its flame is adapted to vaporize and ignite the oil when the latter is conducted into the wick 67 by saturation or capillary attraction. The pilot wick 77 extends upwardly through the opening 33, whence it is projected through the adjacent duct 59 and terminates in an extension which extends upwardly into the outer fuel channel 47, occupying substantially the same relation to the wick 65 as the already described relation of the pilot wick 75 to the main wick 67.

Some measure of stiffness and capacity to retain its assigned position may be imparted, if desired, to each pilot wick by an internal wire reinforcement, as indicated in Figs. 3 and 4.

While there are shown two individual pilot wicks, any pilot wick device may be employed which is in igniting relation to the main wicks or to the oil entered into the channel, so that the oil may be simultaneously ignited and burned in the two separate combustion chambers, such relationship being established, for example, by the use of a single pilot wick operatively related to other wick bodies connected to or forming a part of the main wicks, or either of them.

Referring to Figs. 5 and 6, the lighting attachment is there shown as applied to a burner having two separate burner units designated as A and B, the main oil supply for each of which is derived from the same constant level feeding device. While the latter may be of any desired type, herein for illustrative purposes it comprises the constant-level bowl-shaped receptacle 81 having an enlarged upturned mouth formed by the sides 83 through which it is supported on the floor by the legs 85 at a height so related to the burner

units as to provide the required normal oil level feed X—X. Within the receptacle 81 there is supported the inverted tank or reservoir 87, the open mouth 89 of which projects down into the oil carrying part of the bowl where the oil at its normal level provides a liquid seal for the mouth, the liquid in the bowl being subject to atmospheric pressure through any suitably provided orifices. The tank is capable of maintaining a sub-atmospheric pressure in its upper part so that, assuming the tank filled or partially filled, the oil supply in the bowl is maintained at a constant level by conditions well understood in the art. The valve closure, which is commonly provided for the mouth of the tank merely to facilitate the installation of the tank in the bowl in its inverted position, is herein omitted for the sake of simplicity.

The oil is fed by gravity to the burner units through a supply pipe 91 communicating with the bottom of the constant level receptacle 81 and extending to a branch 93 (Fig. 6), one end of which branch is connected to the main oil supply pipe 73*a* for the burner unit A and the other end of which is connected to the main oil supply pipe 73*b* for the burner unit B. A controlling valve 95*a* is provided in the supply pipe 73*a* and a separate controlling valve 95*b* in the supply pipe 73*b*, so that the supply of oil at the feed level X—X may be established in respect to or withdrawn from both units simultaneously or independently each of the other.

To maintain a constant and uninterrupted oil supply for both burner units at the pilot light oil level Y—Y, there is provided a second constant level oil receptacle adapted to establish a lower oil level, together with an oil supply conduit which is connected to the burner units independently of the controlling valves 95*a* and 95*b*.

In the illustrative embodiment of the invention, such second constant level oil receptacle comprises a relatively small tank 97 secured to and depending from the bottom of the bowl 81 and communicating with the interior thereof through a small orifice 99, the latter being controlled by a valve 101 carried by the float 103. The action of the float-controlled valve establishes and maintains in the receptacle 97, through the gravitation of oil from the receptacle 81, a level conforming to the desired level Y—Y. Communicating with the bottom of the receptacle 97 is a pilot wick supply pipe 105 which extends to a branch 107, the latter having connection with each of the main feed pipes 73*a* and 73*b* at points between the controlling valves 95*a* and 95*b* and the burner units.

With the described arrangement the pilot wick compartment in the depending pipe 69 remains constantly filled with oil supplied from the receptacle 97 up to the level Y—Y and the pilot wicks for both burners continue to be wet or saturated with oil, so that, after being initially lighted, such wicks continue to burn indefinitely. When it is desired to start into operation either one of the burner units, as, for example, the unit A, its control valve 95*a* is opened, admitting oil from the bowl 81, the oil entering the base of the channels of the burner and rising to the level X—X, thereby wetting or saturating both the starting wicks. The admission of oil to the channels is followed immediately by the lighting of the main wicks from the pilot wicks, the burner then reaching its full normal operation in the usual manner, the starting time, however, being substantially expedited through such preheating effect as is afforded by the pilot wicks. The controlling valve may be employed to cut down the heating effect of the burner by reducing the rate of oil supply, but if the main oil supply is cut off to cut the burner out of operation the pilot wick continues to burn. The companion unit may be started and controlled in a similar manner through its control valve 95*b*, and since both pilot lights are each burning continuously while its burner unit is out of operation, and both the units are separately controlled as to the main oil supply, they may be started together or separately and each may be operated at full or partial capacity independently of the other.

The wick supply pipe may be provided with a valve (not shown) to regulate the rate of oil supply to the pilot wicks and to cut down any substantial excess over what is required for the pilot wick consumption. Such pilot wick oil supply, if desired, may be cut off during the normal operation of the burner when the main control valve 95*a* or 95*b* is opened and oil is being delivered through the main supply pipe 91. Or, if desired, the main controlling valve for each burner might be so related to the branch of the wick supply pipe for that burner as to act to cut off the wick supply when the main supply is opened, and conversely to open the wick supply when the main supply is cut off.

It is obvious that in place of the arrangement shown in Figs. 3 and 4, there might be provided separate conduits or wells for each of the two pilot wicks 75 and 77 similar to the well 69, each receiving oil from the receptacle 97, and that the main oil supply might be entered into the base of the burner through a conduit independent of the wick receiving conduit or conduits 69, the latter being connected directly to the wick supply pipe 105, the arrangement illustrated, however, materially simplifying the construction and pipe connections.

The wick supply conduit is preferably so restricted, either at the orifice 99 or in the pipe 105 or by the use of a valve in the pipe or otherwise, that the maximum rate of oil supplied to the pilot wick may not exceed that required for the full operation of the burner, so that, in case the float 103 for any reason becomes ineffective to close the orifice 99, the burner cannot by accidental disarrangement be forced beyond its normal maximum operation by an excess of oil supplied thereto.

While I have herein shown and described for the purpose of illustration one specific embodiment of the invention and one specific application thereof, it is to be understood that extensive changes may be made in the details, form, relative arrangement of parts and connections and that various applications of the invention may be made other than that to the specific form of burner herein shown, all without departing from the spirit of the invention.

I claim:

1. The combination with a plurality of liquid fuel burners, of high and low flame fuel feeding means comprising a first constant level fuel chamber communicating with a source of liquid fuel and with each of said burners, a relatively lower second constant level fuel chamber communicating with said source and with each of said burners, and means intermediate said first chamber and each of said burners for independently controlling the delivery of fuel from said first chamber to said burners while uninterrupt-

edly continuing to supply liquid fuel thereto from said second source.

2. The combination with a plurality of liquid fuel burners, of high and low flame fuel feeding means comprising a first source of liquid fuel supply with means for maintaining it under a constant head, said source communicating with each of said burners, means for supplying each of said burners from a source of liquid fuel supply maintained under a relatively lower head, and means intermediate said first source and each of said burners for independently controlling the delivery of liquid fuel from said first source to said burners.

3. The combination with a liquid fuel burner having a pilot light device, of high and low flame fuel feeding means therefor comprising a first constant level fuel chamber communicating with a source of liquid fuel and at least with said burner and establishing a head under which fuel is supplied thereto during the normal operation thereof, means intermediate said chamber and said burner for controlling the delivery of fuel from said chamber to said burner, and a relatively lower constant level fuel chamber communicating with said source and with said pilot light device and maintaining a lower head under which said pilot light device operates when the burner supply is cut off.

4. The combination with a liquid fuel burner having a pilot light device, of high and low flame fuel feeding means comprising a first source of liquid fuel supply with means for maintaining it under a constant head, said source communicating at least with said burner and establishing the head under which fuel is supplied thereto during the normal operation thereof, means intermediate said first source and said burner for controlling the delivery of fuel from said first source to said burner, and a second source of low liquid fuel supply with means for maintaining it under a relatively lower head, said second source communicating with said pilot device and establishing the head under which said pilot device operates when the burner supply is cut off.

5. In combination with a liquid fuel burner, a high and low flame fuel feeding means comprising a first constant level fuel chamber communicating with a source of liquid fuel and said burner, a relatively lower second constant level fuel chamber communicating with the source and said burner, and means intermediate said first chamber and burner controlling the delivery of fuel from said first chamber to said burner.

6. In combination with a liquid fuel burner, a high and low pressure feeding means therefor comprising a main first source of liquid fuel supply with means for maintaining it under a constant head, said source communicating with said burner, a second source of low flame supply with means for maintaining it under a relatively lower head, said source also communicating with said burner, and means intermediate said first source and said burner for controlling the delivery of fuel from said first source to said burner.

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