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APPARATUS FOR STARTING LIQUID FUEL BURNERS

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Fig. 1.

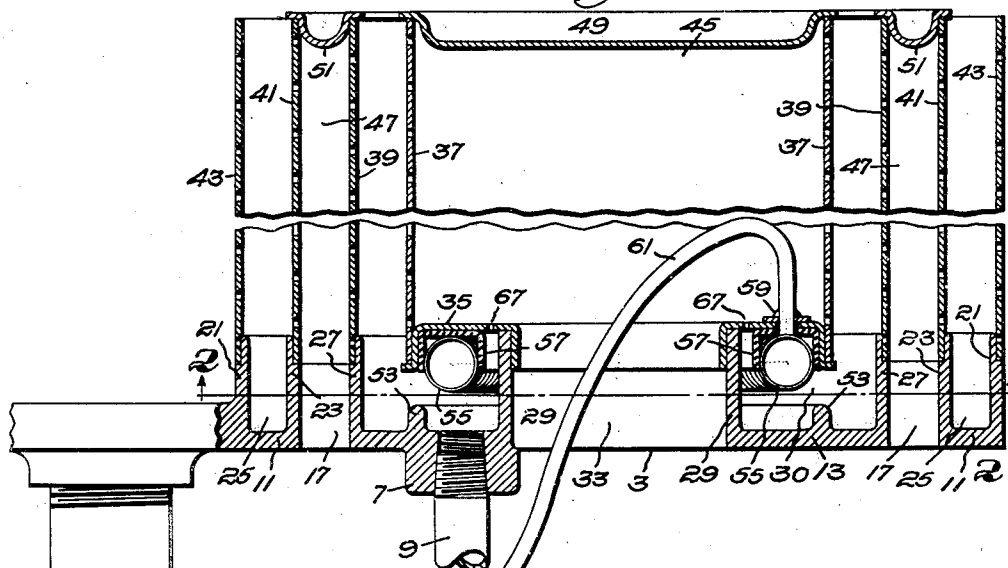
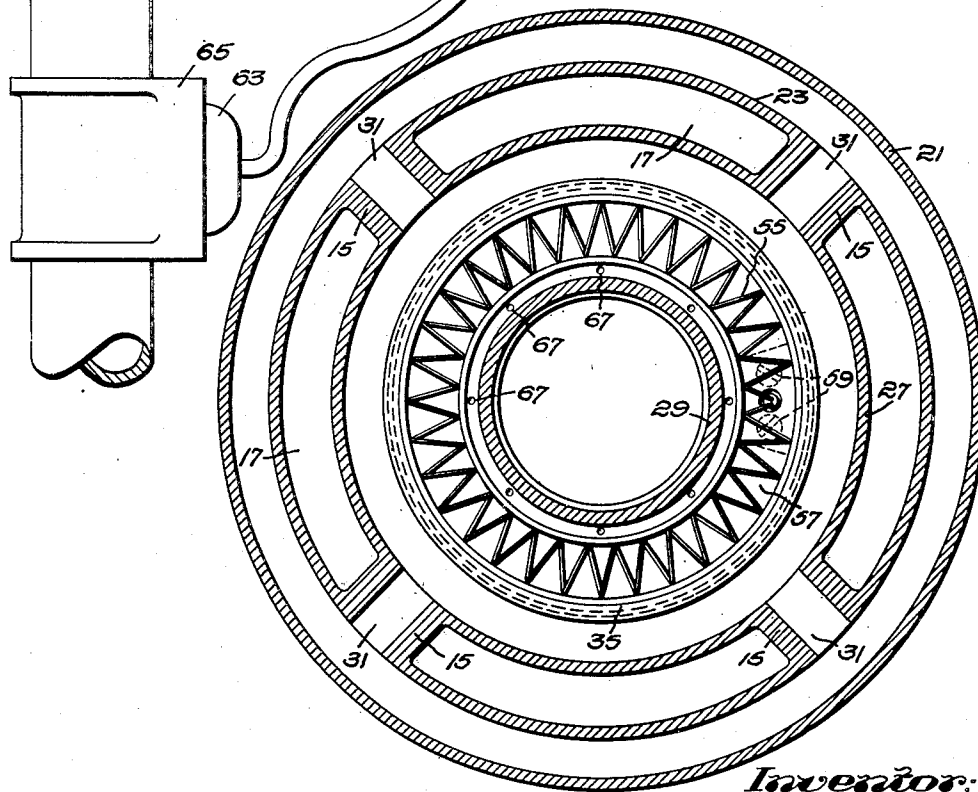


Fig. 2.



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APPARATUS FOR STARTING LIQUID FUEL
BURNERS

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Connecticut

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10 Claims. (Cl. 158—81)

This invention relates to liquid fuel burners of the type supplied with oil or other hydrocarbon fuel in liquid form, the fuel being vaporized in the burner and burned with a suitable mixture
5 of air. The invention consists in improvements designed, among other things, to facilitate the initial vaporization of the fuel and to provide for the quick starting of the burner from a cold condition by electrical pre-heating of the liquid fuel.
10 For descriptive purposes the fuel herein referred to is oil, although other forms of liquid fuel may be employed.

The invention will be best understood by reference to the following description when taken in
15 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 drawing:—

20 Fig. 1 is a vertical, central, sectional elevation, partly broken away, showing one form of the invention as applied to one type of burner; and

Fig. 2 is a sectional plan looking from beneath and taken on the line 2—2 of Fig. 1.

25 Referring to the drawing and first to the type of burner which is therein shown to illustrate the application of the electric pre-heating device, the burner is of the so-called combustion tube type having a cast iron base plate 3 supported in any
30 suitable manner, as on the upright pipe 5, and having on its under side a boss 7 for the attachment of a fuel supply pipe 9. One-half only of the structure is herein shown, the latter being duplicated on the opposite side of the support 5.

35 The base plate comprises an outer annular plate 11 and an inner annular concentric plate 13 connected one to the other by a series of webs 15 (Fig. 2), herein four in number, and providing for an annular air admission space 17 between
40 the plates interrupted only by the webs 15.

The outer plate is provided with spaced, annular, upstanding walls 21 and 23 presenting between them a fuel space, herein in the form of a relatively narrow, annular channel or groove
45 25. The inner plate is provided with similar walls 27 and 29 forming between them a relatively broad fuel space 30 (which includes, as hereinafter described, a vaporizing chamber as well as a fuel or fuel distributing chamber) in
50 the form of an annular channel of greater radial width than the channel 25, there being provided fuel supply ducts 31 in the webs 15 connecting the inner and outer fuel spaces. A central air supply opening 33 is formed in the bottom of
55 the base within the inner, upstanding wall 29.

The top of the inner, broadened fuel space is closed in part by a removable sheet metal cover 35 seated on the top of the inner flange 29 and having a down-turned inner lip fitting within the flange and positioning the cover plate there-
60 on. The walls of the cover plate extend outwardly over the inner part of the fuel space 30, terminating in a down-turned flange and an out-turned peripheral lip which is spaced from the opposite wall 27 of the fuel space to provide an
65 annular exit slot for the passage of vaporized oil into the overhead combustion chamber.

An inner combustion chamber aligning with the annular exit slot is formed between combustion tubes 37 and 39, the latter being in the form
70 of perforated sheet metal cylinders, the tube 37 being seated on the out-turned lip of the removable cover and the tube 39 on the outer shouldered edge of the wall 27. Another combustion chamber aligning with the outer fuel groove 25 is
75 formed between similar combustion tubes 41 and 43 seated respectively on the flanged edges of the upstanding walls 23 and 21. There is thus formed an inner air chamber 45 enclosed within the combustion tube 37, to which air is supplied
80 through the central opening 33 in the base, and an intermediate air chamber 47 between the combustion tubes 39 and 41 to which air is supplied through the annular opening 17. The inner
85 air chamber is closed by a plate 49 resting on the top of the tube 37 and the intermediate air chamber 47 by a plate 51 resting on the tops of the tubes 39 and 41, these plates having annular exit passages for the products of combustion from the two combustion chambers.
90

It will be observed that liquid fuel is supplied through the pipe 9 to the bottom of the inner fuel chamber near the inner covered part there-
95 of, the covered portion functioning as a vaporizing space in which, during the normal established operation of the burner, the liquid fuel is vaporized and from which it passes in vaporized form into the uncovered portion of the fuel space and thence into the overhead combustion
100 chamber between the tubes 37 and 39, and also passes in vaporized form through the ducts 31 into the outer fuel groove 25 and outer combustion chamber between the tubes 41 and 43.

Herein the bottom of the channel which defines the fuel space 30 is substantially flat except
105 for a raised annular lip 53. This lip 53 may be said to separate the fuel space 30 into the vaporizing space or chamber under the cover plate 35 and the fuel distributing space or chamber underlying the exit slot to the combustion
110

space between the tubes 37 and 39, and in the form shown extends entirely around the bottom of the channel outside of the liquid fuel supply opening, and approximately in vertical alignment with but vertically spaced from the peripheral edges of the cover plate 35.

The specific form of burner so far described is merely shown to illustrate one application of the electrical preheating device, the latter being adapted for use in connection with widely different constructions and types of burners.

Referring now to the means for electrically preheating and vaporizing the liquid oil, there is provided for this purpose an electric heating element in the form of a resistor or heating coil 55 which is supported by and beneath the cover plate 35, being located in the vaporizing space and extending entirely around the latter. This heating coil is positioned immediately above the liquid oil admission opening and extends over and in close effective heat-radiating relation to liquid oil which may flow over or accumulate on the bottom of the channel.

The heating coil 55 is seated in an insulating support 57 comprising an annular ring of U-shaped cross section fixedly secured to the bottom of the cover plate by any suitable fastening means, such as the screws 59, which enter through the top of the cover. The insulating seat 57 is of heat resisting material, such, for example, as porcelain, capable not only of insulating the coil from the cover but of withstanding the high temperatures reached in the operation of the burner.

The terminals of the heating coil are connected to a source of electric current by insulated conductors which pass through a flexible cable connection 61, the latter passing up into the central air chamber 45 and thence down through the opening 33 in the base and carrying at its end a plug 63 adapted to removably seat in a socket 65 connected to the supply circuit. The cable 61 preferably has a protective covering of asbestos or other heat resisting material. This provides a detachable connection permitting the removal of the cover plate for inspection or cleaning by merely withdrawing the plug 63 from its socket.

In the operation of the burner, oil is admitted through the supply pipe 9 under the regulation of any of the usual feeding devices. These commonly provide for the flow of the oil from a supply source at some definite level which may be accurately regulated so that the flow of the oil may be maintained at an approximately predetermined level over the bottom of the inner fuel channel. Such regulating devices are of the usual or common construction and are not herein shown. By this means a flow of fuel is maintained on the bottom of the channel and within the lip 53 immediately beneath the heating coil 55. The latter, while in close heat radiating relation to the liquid oil beneath, is preferably positioned at a height where it at no time contacts with the liquid oil.

At the time the oil is admitted to the burner, or immediately preceding the admission of the oil, the current is turned onto the heating element by means of a conveniently located switch (not herein shown) and the oil is thereupon very quickly vaporized by the intense heat radiated from the coil, the vaporized oil passing over into the uncovered part of the fuel space into the inner combustion chamber, and also through the ducts 31 into the outer fuel space and outer combustion chamber, where it may be ignited, if

desired, by means of a lighted taper inserted through or held at the open top of either combustion chamber.

Due to the position of the heating element with relation to the oil, whereby it acts through directly radiated heat, the vaporization starts almost instantly and without the relatively long delay necessitated where it is attempted to vaporize the oil by first electrically heating the underlying walls of the base casting and waiting for the mass of metal of which the base is formed slowly to acquire a sufficiently high temperature to act on the liquid oil by heat conducted through the walls of the base to the oil.

The circuit through the heating coil remaining closed, an ample supply of vaporized oil continues to be delivered to the combustion chambers, so that the normal heating effect of the burner incidental to its full combustion capacity, which effect is ordinarily reached only by a slow building up process where preheating by means of a lighted wick is employed, is very quickly had by the described process of electrical preheating.

After a short starting interval, relatively negligible as compared with that heretofore required, which interval includes the initial rapid vaporization of the liquid oil by the heat radiated from the heating coil and also the rapid heating up of the walls of the combustion chambers and the base plate following ignition of the oil vapor and consequent on the ample supply of oil vapor by the continued effect of the heating coil, the combustion tubes become red hot, the burner reaches its full heating capacity and the walls of the base become so highly heated that the oil is vaporized as quickly as it reaches the fuel space 30 and without the need of further assistance from the electrical heating element. The heating current is then turned off and the burner continues its operation in the usual manner.

It will be seen that due to its position in the vaporizing space, where it is housed in and protected by the walls of the cover plate, the resistor 55 is outside of the zone or region of normal combustion and out of the direct path of the burner flame when the burner reaches its condition of normal operation, thereby avoiding carbonizing or other deleterious effects which might arise from continued and direct exposure to the burner flame.

While the electrical heating element may be advantageously employed with highly useful results solely as a preheating element, and ignition of the vaporized oil be effected by other means, such as the lighted taper or the like heretofore referred to, the coil, if brought to a suitable state of incandescence, may also be utilized initially to ignite the oil, thereby electrically effecting both the preheating and ignition.

In the described embodiment of the invention, to assist in the ignition of the oil vapor rising from the bottom of the fuel space under the action of the heating coil, the cover plate may be provided with a number of small ventilating openings 67 which provide for the admission of sufficient air from the air chamber 45 to insure that a combustible mixture of air and oil vapor is had at and about the incandescent helices of the heating coil. The rising oil vapor will tend to travel outwardly over the lip 53 and up into the inner combustion chamber. If there is insufficient air initially to provide a combustible mixture, this flow of the vapor will tend to draw additional air through the openings 67 so that ignition, if it does not take place at once, will

shortly follow. As combustion gets under way, however, and the natural draft of the burner is developed, an upward flow of air will be developed through the central air chamber which will be effective to suppress the further entrance of air through the air admission openings 67, so that the combustion will thereafter be confined to the combustion chambers.

While I have herein shown and described for the purposes of illustration one specific embodiment of the invention and one specific application thereof, it is to be understood that the same may be embodied in widely different forms and applied to burners of widely varying constructions, all without departing from the spirit of the invention.

I claim:

1. A combustion tube burner having a base with a vaporizing chamber in the base to which liquid fuel is supplied, a removable cover for said chamber, and an electric heating element positioned to heat said chamber and supported by said cover.

2. A combustion tube burner having a base with a vaporizing chamber in said base to which liquid fuel is supplied, a covering wall for said chamber having its edges spaced from the walls of the base to leave an exit slot, a combustion chamber with which said slot communicates, and an electric heating element in said vaporizing chamber beneath said covering wall.

3. A combustion tube burner having a chamber to which liquid fuel is supplied, an electric heating element in said chamber above and in heat radiating relation to the liquid fuel, and means for confining the flow of liquid fuel to the area beneath said heating element.

4. A combustion tube burner having a combustion chamber, liquid fuel supply means, a vaporizing chamber between the supply means and the combustion chamber, and an electric heating element in the vaporizing chamber above the liquid fuel admitted thereto.

5. A combustion tube burner having a combustion chamber, liquid fuel supply means, a fuel chamber between the supply means and the combustion chamber, an electric heating element in the fuel chamber above the liquid fuel admitted thereto, and raised wall means to retard the flow of liquid fuel beyond the direct heat radiating influence of the heating element.

6. A combustion tube burner having a base provided with a central air opening, an annular fuel chamber to which liquid fuel is supplied, an elec-

tric heating element in said chamber, and a removable cover plate for said chamber above said heating element but leaving a narrow exit slot and an overhead combustion chamber with which said slot communicates.

7. A combustion tube burner having a base provided with a central air opening, an annular fuel chamber to which liquid fuel is supplied, an electric heating element in said chamber, a removable cover plate for said chamber above said heating element but leaving a narrow exit slot, an overhead combustion chamber with which said slot communicates, and means tending to confine the liquid fuel to the portion of said fuel chamber beneath the heating element.

8. A combustion tube burner having a base provided with a fuel chamber, means to supply liquid fuel over the bottom of said chamber, an electric heating element in said chamber, and means for supplying air to said chamber to form an ignitable mixture with the fuel vaporized by said heating element.

9. A combustion tube burner having a base provided with walls forming a fuel chamber, a vaporizing chamber communicating with said fuel chamber, means for supplying liquid fuel to said vaporizing chamber, combustion tubes in upstanding relation to and above said fuel chamber and forming a combustion chamber communicating therewith, an electric heating element in said vaporizing chamber above the normal level of the fuel and in effective heat radiating relation to the liquid fuel supplied to said chamber, and means for supplying current to bring said heating element to a state of incandescence.

10. A combustion tube burner having a base provided with walls forming a fuel chamber, a vaporizing chamber communicating with said fuel chamber, means for supplying liquid fuel to said vaporizing chamber, combustion tubes in upstanding relation to and above said fuel chamber and forming a combustion chamber communicating therewith, an electric heating element in said vaporizing chamber above the normal level of the fuel and in effective heat radiating relation to the liquid fuel supplied to said chamber, means in immediate proximity to said heating element for admitting air to said vaporizing chamber, and means for supplying current to bring said heating element to a state of incandescence.

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