March 14, 1944. R. M. SHERMAN 2,344,177

BURNER

Filed April 18, 1940

Fig. 1.

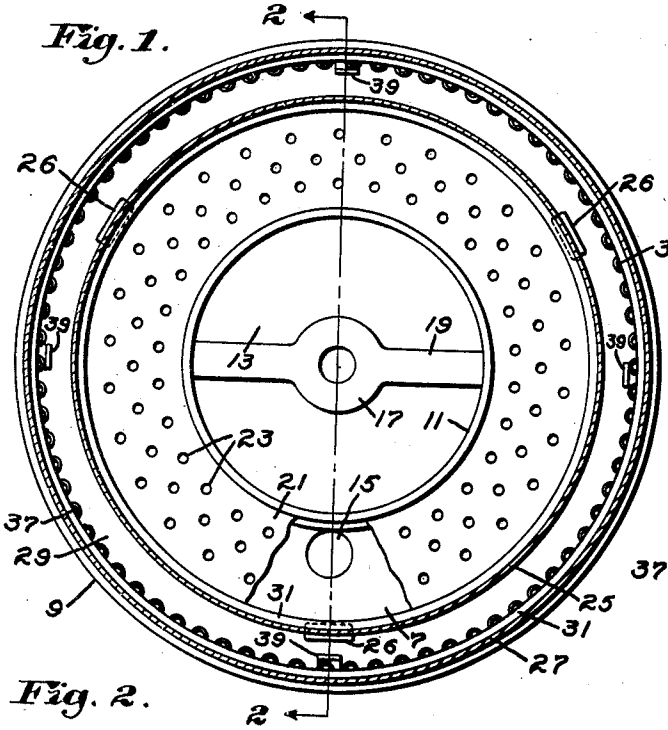


Fig. 3.

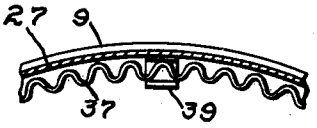


Fig. 4.

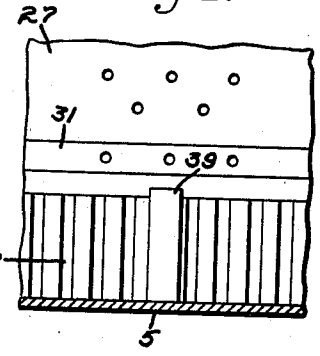
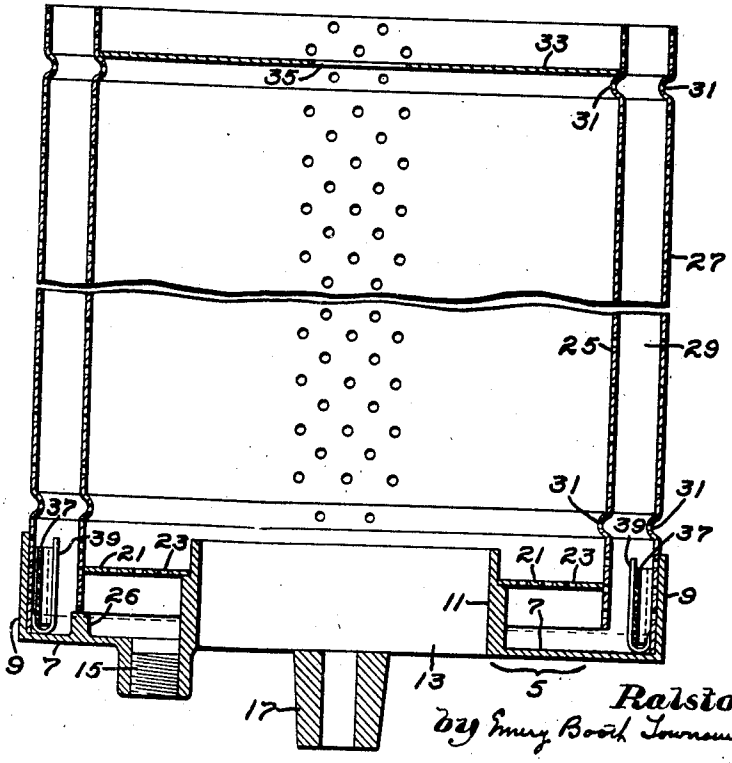


Fig. 2.



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BURNER

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3 Claims. (Cl. 158—87)

This invention relates to burners, and more particularly to what are termed combustion tube burners, in which liquid oil is admitted to the burner base and there vaporized, the fuel vapor being burned in an overhead combustion chamber to which air is supplied through combustion tubes, herein in the form of perforated tubular shells.

The objects of the invention are to materially increase the capacity of the burner when operating under normal conditions, to reduce the starting time or that required to bring the burner to such normal operating conditions, to increase the effectiveness of the burner in other respects, and at the same time to simplify its construction and the expense of manufacture.

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

In the drawing:

Fig. 1 is a plan view of a burner embodying one form of the invention, the shells or tubes being removed;

Fig. 2 is a sectional elevation on the line 2—2 in Fig. 1, a portion of the shells being broken away;

Fig. 3 is a detail showing in plan section the lower part of the outer shell resting within the base flange and illustrating the attachment of the wick thereto; and

Fig. 4 is an elevation showing a lower part of the outer shell with the wick attached.

Referring to the drawing and to the embodiment of the invention there submitted for illustrative purposes, the burner is provided with a metallic base 5 comprising a flat, annular bottom 7 which is bordered by the outer upright annular flange or lip 9 and the inner flange 11, the latter surrounding the air opening 13 in the base. This provides between the two flanges a broad annular compartment or fuel channel, near the inner portion of which is the oil admission opening 15 through which oil is supplied by a pipe connection, not shown. The base is supported by any suitable means, as by the boss 17 on the cross-web 19 extending across and beneath the air opening.

This provides a base of the utmost simplicity, inexpensive to manufacture, which may be formed of pressed metal if desired, or of cast iron and, if the latter, may be cast in green sand without core work. The base itself is entirely open from above, without cored passages, thus providing nothing but what may be easily and readily cleaned and examined.

Near the outside of its top, the flange 11 is provided with a shoulder on which rests an annular metallic plate 21 provided with a series of perforations 23 to constitute air admission openings.

The plate extends outwardly to partly overlie the broad fuel channel in the base, its outer edge serving to abut against the inner walls of the inner combustion tube or shell 25 and to center the latter. The shell 25 comprises a perforated sheet metal cylinder resting on suitable supports such as the three raised lugs or feet 26 presented by the flat bottom 7 of the fuel channel, and such that the lower edge of the shell is maintained above the normal starting level of the oil, which level is indicated by dotted lines in Fig. 2.

A similar but larger concentric cylinder 27 is removably seated on the flat bottom 7 of the fuel channel, with the outer walls of its lower end in loose contact with the inner walls of the flange 9. The two spaced shells 25 and 27 provide between them an elongated combustion chamber 29 which extends from the bottom wall 7 of the fuel channel to the tops of the shells.

At a point spaced a short distance above the top of the flange 9 the peripheral walls of the shells each have a similar beaded or rolled formation 31, the two beads extending in the same direction, the bead of the shell 27 extending into the combustion chamber. Near the tops of the shells a similar beaded formation is provided, and a disk-shaped plate 33, which may or may not have a small central opening 35, rests on the bead presented by the inner shell 25 so as to close or partly close the top of the central air chamber, leaving however an annular opening in the top of the combustion chamber for the escape of the products of combustion.

A burner of this general type is commonly started by igniting an oil saturated wick, comprising a fabricated strip of asbestos cut so as to rest on edge in the fuel compartment of the base. In the illustrative form of the invention, such a wick 37 having a vertically corrugated formation is provided, which wick is held in fixed position on the inner lower walls of one of the combustion tubes, herein the outer tube 27, by means of metallic U-shaped clips 39 which are spot-welded to the inner walls of the tube. By this means the wick may be removed from the burner with the tube for examination, cleaning, replacement or other purposes, can be conven-

iently removed from or placed in the clips, and, when installed in the burner by replacement of the tube, is there held against displacement.

When a burner of this type is to be started, oil is admitted by means of a suitable control valve to the inlet port 15 entering the wide channel and spreading over the latter for its full width both inside and outside of the bottom of the shell 25. It there penetrates and saturates the body of the wick. In starting the oil level is maintained in the channel at some given stage (such as is indicated by dotted lines in Fig. 2) by usual well-known extraneous constant level supply means. The wick being then lighted, the burner begins to heat, and, when the required vaporizing temperature is reached, combustion is carried on to a gradually increasing degree by vaporization of the oil more or less independently of the wick. When the burner is operating under normal conditions of full fire, the wick ceases to have any substantial vaporizing function. At that stage the liquid oil should become vaporized substantially on entering the channel and the level of the liquid oil in the channel under these conditions undergoes a corresponding drop.

Curtailment of the time required to bring the burner from its initial starting stage to full fire is therefore dependent in large part on rapidly increasing the vaporizing temperature in the burner and particularly by rapidly raising the temperature of the parts of the base which form the fuel channel therein. In the described form of burner this is accomplished not only by the conduction of heat to the channel walls of the base through the walls of the shells, but also by lowering the initial zone of combustion and intensifying such combustion in close proximity to the bottom of the channel and to the liquid oil therein. It will be observed that the shell 27, which quickly becomes heated after the ignition of the wick, rests on the bottom of the wall 7 of the oil channel and has contact with the inner wall of the channel flange 9 and is closely adjacent the wick. This arrangement provides for an efficient transfer of the heat from the upper portions of the rapidly heating shell to the oil and to the channel walls of the base both by conduction and radiation.

The vaporizing effect in and about the base channel when the wick is ignited is greatly augmented, however, by the fact that initial combustion takes place in close proximity to the bottom of the channel. Thus, when the wick is lighted, air is being supplied to the combustion chamber, not merely through the air openings in the sides of the inner and outer shells above the level of the plate 21, but primary air is also being supplied to the fuel channel in the base and to the lowermost part of the combustion chamber, such air entering through the perforations or air inlets 23 in the plate 21 itself. Such primary air passes into the space beneath the plate and thence through and beneath the inner shell 25, where it fills the lowermost part of the combustion chamber and surrounds the wick.

The latter, accordingly, produces a starting flame which is not, as heretofore, confined to the region above the top edge of the wick and to the space above the top of the base flange 9, but spreads over the sides of the wick creating a starting flame in the fuel channel itself at the bottom of the combustion chamber and intensifying its starting action. Initial combustion instead of being confined to that part of the combustion chamber well above the wick, starts and spreads through the space at the side of and about the wick. Since primary air is being supplied to the space in which the wick rests, the latter, for purposes of lighting, is not required to project its upper edge into that part of the combustion chamber above the walls of the base, and which is supplied with air through perforations in the side walls of the shells, but the wick if desired may be relatively narrow in these respects.

With the burner started and the oil becoming vaporized by contact with the base independently of the wick, the primary air supply necessary to initiate combustion is being brought through the perforated plate directly into the oil channel. Initial combustion, therefore, not only takes place in the oil channel itself and at the very bottom of the combustion chamber instead of at a level of the combustion chamber substantially above the base, but the point of intense combustion is progressively lowered as the burner heats. This soon creates a zone of intense combustion at the very bottom of the combustion chamber where it is most effective to greatly increase the temperature of the walls of the base and all those portions of the shells which rest on or have contact with the base.

This materially hastens the rapid rise in the vaporizing temperature of the base parts which contact with the oil and materially decreases the time for bringing the burner up to a state of normal operation.

The supply of primary air to the fuel channel and the lowermost part of the combustion chamber not only materially reduces the time required for starting the burner, but has the more important result of greatly increasing the oil burning capacity and the general effectiveness of the burner when the starting stage has been completed and the burner has been brought to normal operation.

In operating at full fire conditions substantially the entire space constituting the oil channel becomes a vaporizing space filled with oil vapor. The primary air entering through the plate 21 commingling with the oil vapor forms a combustible mixture so that combustion begins in that space and continues to be maintained at the lowermost part of the combustion chamber.

This effects a marked lowering of the zone of intense combustion in the combustion chamber during full fire operation. In the burners of the prior art, where the primary air enters through the side walls of the shell above the walls of the base, intense combustion takes place at such an elevated point that the shells fail to reach a state of incandescence for some substantial distance above the base. In a burner constructed as described and operating under normal conditions, the walls of the outer shell 27 are incandescent down to the flange 9 and the walls of the shell 25 down to or below the plate 21.

The effectiveness of a burner of this class depends to a large extent on its radiating capacity. The spread of incandescence over the lower walls of the shell, which is gained in the present instance, greatly increases the area of incandescence which can be attained, and correspondingly augments the radiating capacity of the burner. The lowering of the area of incandescence is also of importance where these burners are used as range burners for oven heating. In burners of the prior art, due to the fact that incandescence is confined to the upper portions of the shells, it has been difficult to heat the lower part of the

adjacent oven which is located opposite the lower part of the burner. In the burner of the described construction the area of incandescence is extended to the lower part of the burner where it becomes more effective for oven heating.

The highly heated or incandescent condition of the shells down to the point where they enter the base contributes to lowering the zone of combustion and raises the vaporizing and oil burning capacity of the burner, apart from the contributory effect of the greater heat conducted through them to the walls of the base. The plate 21 itself becomes highly heated due to the heat radiated and conducted from the closely adjacent incandescent walls of the shells and functions as a vaporizing plate in its action on the oil beneath the same. The primary air supplied through the heated plate to the oil channel is in turn highly heated, bringing the mixture of air and oil vapor in the oil channel to a point where intense combustion is readily initiated at the bottom of the combustion chamber. The secondary air, which is supplied to the combustion chamber through the side walls of the shell immediately above the base, also passes through the lowermost highly incandescent areas of the shell, so that no cool spot or checking of combustion can there take place which tends to occur with the admission of air thereto through sections of the shell which have not been brought to incandescence.

The lowering of the zone of intense combustion and its initiation in the lowermost part of the combustion chamber have an important advantage in overcoming what is known as "fading." This is a difficulty encountered when it is attempted, as for example during the night, to maintain the burner in operation but at such a low rate as to little more than keep it lighted. Under these conditions the supply valve is very nearly closed. As the base cools, its vaporizing capacity decreases, and the oil level tends to rise. This has the effect of choking or retarding the feed of oil. The rise in oil level, however, has intensified the action of the burner with the result that, with the partly closed valve, a condition is built up under which insufficient oil is fed through the nearly closed valve to maintain further combustion and the burner goes out.

With the described construction, under similar conditions, the temperature of the lower walls of the shells and of the base parts is maintained at a higher point, preventing, under the low feed of oil, the initial rise in oil level due to low vaporization, and the extinguishment of the burner is prevented.

Besides increasing the oil burning and heat radiating capacity of the burner and reducing the starting time, the creation of intense combustion in the lowermost part of the combustion chamber and closely approximate the base, materially assists in avoiding carbonization of the oil in the fuel channel. The fact that the inner shell, which becomes more intensely heated during full fire operation (though not at the first stage of starting), while entering the oil groove is maintained above the normal oil level, prevents the formation of coke or carbon on and below the shell itself, which carbon, due to the high temperature of the shell, would otherwise tend to form rapidly, with the obstruction of the free passage of the oil and oil vapor from the vaporizing chamber to the combustion chamber. Due to this and to the large unbroken vaporizing space in the base, the burner may be operated for long periods without the necessity of cleaning. It is also possible to operate the burner with heavier grades of oil than is usual, due to the fact that its vaporizing capacity is sufficient to burn off not only the lighter but the heavier oil ends as well, the latter of which tend to carbonize without vaporization when it is attempted to use such heavier oil in burners of the prior art where the vaporizing capacity is insufficient.

While there is herein shown and described for purposes of exemplification 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, construction and relative arrangement of parts as herein shown, all without departing from the principles and spirit of the invention herein described.

I claim:

1. A combustion tube oil burner having, in combination, a base formed to provide on its upper side a broad endless fuel channel and an air admission opening surrounded by said channel, an inner vertical perforated combustion tube enclosing an air chamber supplied with air through said air admission opening, an outer vertical perforated combustion tube surrounding said inner combustion tube in spaced relation thereto to form a combustion chamber between them, the lower end portions of both of said combustion tubes entering said fuel channel and extending into proximity with the bottom thereof, the inner combustion tube being materially spaced from the inner wall of said fuel channel and having its lower edge slightly spaced from the bottom of said channel, means providing an oil vaporizing and carbureting chamber within said fuel channel comprising a metal plate overlying the bottom of said fuel channel between the inner wall of the latter and said inner combustion tube, which plate and the portion of said inner tube below the plane of said plate are in substantially unobstructed heat conducting relation to the vapor space of said oil vaporizing and carbureting chamber for freely transferring heat thereto for vaporizing oil therein, said plate being formed with openings for passage of air from said air chamber to said oil vaporizing and carbureting chamber for admixture with the oil vapors in the latter to form a combustible mixture, whereby during normal operation of the burner such combustible mixture will be conducted beneath the lower edge of said inner combustion tube from the last mentioned chamber to the bottom of the combustion chamber so that combustion may be maintained at the bottom of said combustion chamber within said fuel channel.

2. A combustion tube oil burner according to claim 1 in which the lower edge of the inner combustion tube is spaced from the bottom of the fuel channel by spaced lugs projecting upwardly from said bottom, upon which lugs said edge rests.

3. A combustion tube oil burner according to claim 1 in which the fuel channel is formed by an upstanding vertical inner flange and a surrounding upstanding vertical outer flange both on the base, the plate being supported by said inner flange and acting laterally to position the inner combustion tube, the outer combustion tube fitting within said outer flange and being laterally positioned thereby.

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