Nov. 24, 1925. 1,562,799

I. E. SMITH

ELECTRICAL IGNITION MEANS FOR OIL BURNERS

Filed Jan. 14, 1925

Fig. 1

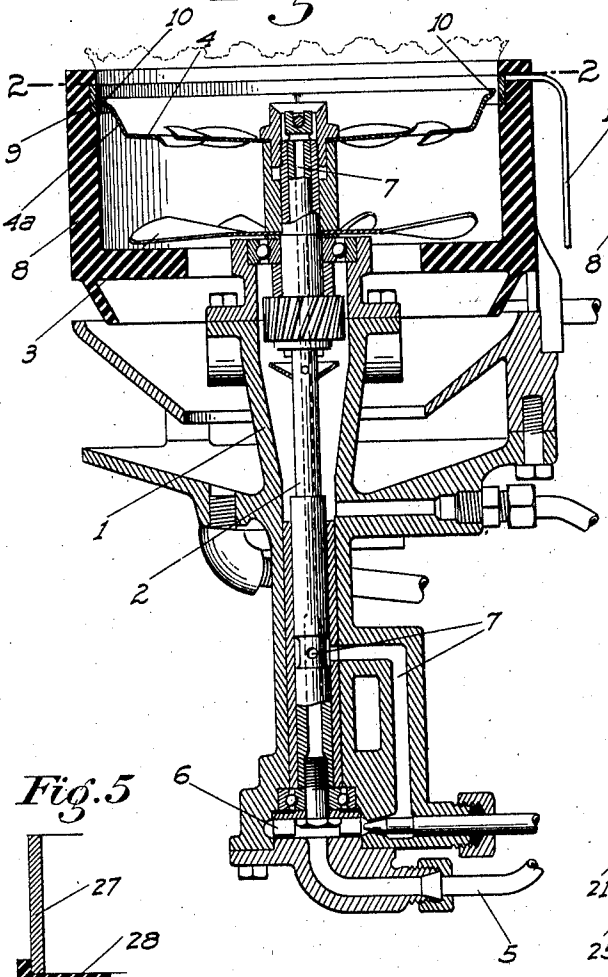


Fig. 2

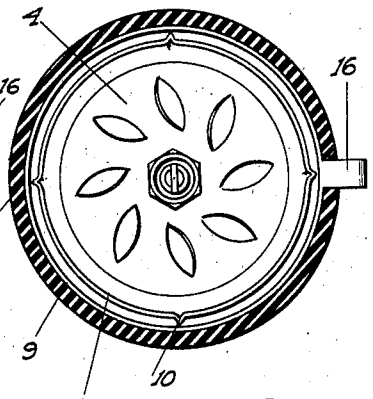


Fig. 3

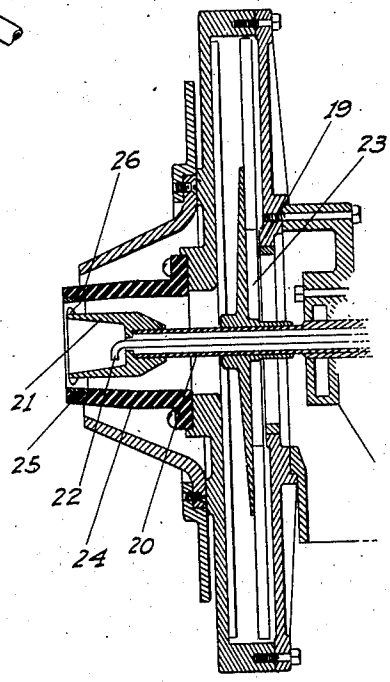
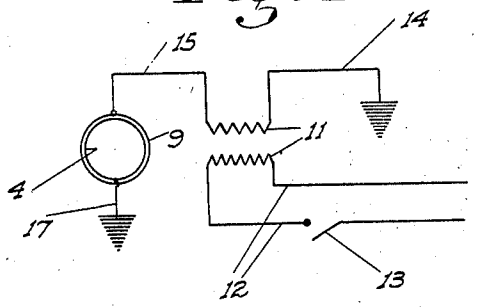


Fig. 5

Fig. 4



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UNITED STATES PATENT OFFICE.

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ELECTRICAL IGNITION MEANS FOR OIL BURNERS.

Application filed January 14, 1925. Serial No. 2,396.

To all whom it may concern:

Be it known that I, IRA E. SMITH, a citizen of the United States, residing at Stockton, county of San Joaquin, State of California, have invented certain new and useful Improvements in Electrical Ignition Means for Oil Burners; and I do declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the numerals of reference marked thereon, which form a part of this application.

This invention relates to improvements in electrical devices for initially igniting the combustible fuel produced by the operation of oil burners of what may be deemed the rotary type. That is, those which include a rotating burner plate, cup, or other revolving member, onto which the oil to be burned is fed and thrown centrifugally toward the edge of the revolving member by the rotation of the latter; and an airblast acting in conjunction with the rotation of the revolving member to provide a current of air blowing axially of said member to both mingle with the oil and deflect the combustible mixture thus formed away from the revolving member.

Heretofore, as far as I am aware, the only electrical ignition means used for such purposes has been a single spark producing device, similar to an ordinary gas engine spark plug, disposed usually at some distance away from the positive zone of movement of the oil and air mixture.

This, however, is very unsatisfactory, because in the first place a single spark has insufficient heat to readily ignite the relatively non-volatile oil commonly used in such burners; and in the second place, the location of the ignition device is usually such that while it is not in the direct zone of the flow of the combustible mixture and consequently cannot cause the desired instant igniting of such combustible mixture, it is in such a position that carbonizing of the points of the ignition device is very apt to occur. This necessitates the device being frequently cleaned to maintain it in a proper functioning condition.

Further, the spark at the plug is produced by an induction coil having vibrating contact points. Since these points frequently stick and fail to function, the resultant failure of a spark to be formed at the plug is a source both of annoyance and danger, as a quantity of unignited oil mixture may then accumulate in the furnace and cause possibly disastrous results when finally ignited.

The principal object of my invention, therefore, is to eliminate the above named inefficient structure by providing an ignition means which will cause a continuous electrical flame to be formed all around and a short distance outwardly of the rim of the revolving member of the burner when the said member rotates. This flame is so located that the oil as thrown centrifugally with the rotation of the revolving member will come into direct and immediate contact with the flame and will be instantly ignited.

The length of this flame being not less than the circumference of the revolving burner member, a large flame area is presented to the combustible fuel mixture, and the latter is ignited simultaneously all around the revolving member, and the otherwise slow spread of a smaller volume of burning oil to the bulk of the oil to ignite the same is avoided.

The efficiency of my improved ignition means is such that the combustible mixture, even in cold weather, readily ignites without preheating, and the spark or flame gap structure is such that it forms a unitary part of the burner structure itself, thus avoiding the need of additional mechanism.

My ignition device may also be easily applied to various oil burners of either the vertical or horizontal type now on the market with but very few changes.

Owing to the position of the electrodes being immediately adjacent the revolving member of the burner, they are removed from any possibility of being coated with carbon when the burner is in operation, especially as the electrodes are directly in the path of the air blast formed with the operation of the burner, as will be hereinafter seen.

The above objects I accomplished by means of such structure and relative arrangement of parts as will now be more fully described.

In the drawings similar characters of reference indicate corresponding parts in the several views, in which:

Fig. 1 is a sectional elevation of a certain

type of vertical oil burner showing the ignition means applied thereto.

Fig. 2 is a cross-section on the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary sectional elevation of a certain horizontal type of burner with the ignition means applied thereto.

Fig. 4 is a diagram of the circuit used in connection with the igniter.

Fig. 5 is a fragmentary section of a modified form of casing and stationary electrode construction.

Referring now in particular to the numerals of reference on the drawings and especially at this time to Figures 1 and 2, the burner represented in said figures is the vertical type shown in my co-pending application for patent, filed November 17th, 1924, Serial No. 750,248. This burner comprises essentially a rigid base or pedestal, in which is mounted a vertical shaft 2 adapted to be driven by an electric motor (not shown). This shaft supports a horizontal air fan 3, and a dish-shaped circular burner plate 4, a certain distance above the fan. The oil is fed to the center of the plate from a pipe 5, leading to the base 1, the oil being then acted on by a centrifugal pump runner 6 mounted on the shaft 2, and forced upwards to the plate through suitable passage means 7.

A cylindrical casing 8 surrounds the plate and fan in concentric but spaced relation thereto, being supported by the base and being made of a material having high insulating properties, such as porcelain.

Fixed in the casing and preferably lying flush with the inner face thereof, is a conducting ring 9, which is disposed in the horizontal plane of the upper edge of the rim 4^a of the plate 4. Said rim at its edge is formed with a plurality of small projections or points 10, extending equally toward but not contacting with the ring 9. When a high tension current is passed through the plate and ring, as many sparks will therefore jump simultaneously across the gap between the ring and the projections, as there are projections. It will also be seen that as the plate rotates the projections rotating therewith will cause continuous trains of sparks to pass across the gap between the ring and the plate at the various projections. As the speed of the plate is necessarily somewhat high, these various trains merge together to form a practically endless circular ring of sparks all around the plate space between the plate and ring.

This continuous spark train however causes an actual and practically endless electrical flame to be formed in addition to the sparks themselves.

With the rotation of the fan, an upwardly directed air blast is created, some of which blast passes between the plate and ring, and is then deflected horizontally and outwardly by the centrifugal force set up by the rotation of the plate.

The result of this blast action is that while the actual spark-current itself jumps straight across between the electrodes, the flame formed thereby is caused to cling to and be deflected outwardly and upwardly mainly from the upper circular edge of the ring and casing. At the same time the flame, which has a varying height of between 1/4 to 3/4 inch, hovers to a certain extent directly above the spark gap. This, of course, increases the already large surface area of flame exposed to the oil thrown centrifugally from the center of the plate with the rotation thereof, and makes a very quick and efficient ignition. This also eliminates the necessity of preheating the oil under all external temperature conditions which are liable to be encountered.

The fact that one electrode is moving all the time the burner is in operation and that both electrodes are in the direct line of the air blast prevents a deposit of any foreign matter thereon, which would cause a resistance to the passage of current to be had, or any burning of the electrode points due to excessive electrical heat, as is the case with stationary electrodes situated out of the zone of an air blast.

Further, the electrode ring being positioned immediately adjacent the burner plate itself, there is no tendency for the ring to become carbonized with the operation of the burner, after the ignition means is discontinued. This is owing to the fact that with the air blast operating continuously with the feeding of the oil to the plate, the oil flame is never actually in contact with the plate, but is maintained some little distance above the same.

The circuit for the ignition means as shown in Fig. 4 comprises a straight step-up transformer 11, the primary circuit of which is connected to the ordinary 110 or other lighting circuit wires 12, with a switch 13 in the latter. One of the secondary circuit leads 14 from the transformer is grounded, while the remaining lead 15 is connected to the ring 9 by means of a member 16 extending outwardly on the outside of the casing to a point below any great heat.

The purpose of the transformer is to convert the low primary current voltage, to a high secondary voltage having suitable amperage, without the use of vibrating contacts or coils, so that the high voltage current may be handled without switches, to provide a strong, continuous, large and hot electrical flame across the spark gap, for ignition purposes.

The amperage of the current may be varied according to the length of the electrodes, which of course is governed by the

diameter of the burner plate; the width of spark gap, and other conditions. Suitable amperage in connection with a high voltage is of course very desirable, since it is amperage which gives heat to the spark.

In an ordinary spark plug, with its small current carrying points, no appreciable amperage can be used for any length of time, owing to the excessive heating and consequent rapid burning away of the points.

I am enabled to make use of a current having any desired amperage owing to the very large area of the current carrying surface provided by the rim of the burner plate and the surrounding ring, and which form the electrodes. These large surfaces eliminate concentration of the heat at any two points, heating being further prevented by reason of the air blast, as previously stated.

The plate 4, in conjunction with the base 1 is grounded, as shown at 17, in Fig. 4, so that when the switch 13 is closed, a secondary high tension circuit is closed through the transformer, causing a current to jump the gap between the ring 9 and projections 10 of the plate 4, with the consequent formation of the electrical flame as above described, when the plate is rotated. This gap, as will be noted, is the only break in the line of travel of the secondary circuit, and the projections from the shortest jump-point between the burner plate and casing ring. The transformer is of any suitable type capable of stepping up the current from the normal low voltage to whatever voltage and amperage may be deemed desirable, depending on different conditions, as above outlined.

In the type of burner shown in Fig. 3, while the mechanical shape and arrangement of parts is somewhat different from the type above described, the operation is substantially the same, and my ignition means may be applied thereto with equal facility.

This burner includes a base 19; a driven horizontal shaft 20 mounted therein; an oil cup 21 fixed on the outer end of the shaft and into which the oil is fed by a pipe 22; a fan 23 on the shaft inwardly of the cup; and a nozzle 24 mounted on the casing and surrounding the cup in spaced relation thereto. The fan is arranged to direct a blast of air horizontally around the cup and between the same and the nozzle. Ordinarily this nozzle is of metal, but I replaced this member by one of the same form but made of porcelain or other material of good insulating qualities. This member is then the equivalent of the casing 8 on the burner first described. A ring 25, corresponding in function to the ring 9, is mounted in the nozzle 24, and lugs or points 26 projecting outwardly toward the ring 25 from the sides of the cup correspond to the projections 10 on the plate 4.

The circuit employed for this latter type of igniter is identical with that above described, and with the operation of the burner identical results will be obtained.

The casing 8 or nozzle 24 are specifically designated as the insulated members carrying the electrode to which the lead from the transformer is directly connected. This is because while it is very easy to insulate the casing or nozzle from the remainder of the apparatus, it would be hard to insulate the plate 4 or cup 21 from the other metal parts, which are necessarily connected thereto, in a manner to prevent a short circuit, in the event that the transformer were connected direct to said plate or cup instead of as above described.

While I have shown the casing 8 in the main views as being of insulation material throughout, the outer portion may be made entirely of metal, as shown at 27 in Fig. 5, this portion forming the stationary electrode, with only an insulation pad 28 of desired thickness between the same and the metal member supporting it.

The same construction may be employed in connection with the nozzle 24.

From the foregoing description it will be readily seen that I have produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred arrangement of the parts, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention as defined by the appended claims.

Having thus described my invention, what I claim as new and useful and desire to secure by Letters Patent is:

1. An electrical ignition means for an oil burner, which includes a rotary burner member onto which the oil is fed, comprising an electrical circuit in which the member is interposed, and means whereby, when the member is rotating and a current is flowing through the circuit, a substantially continuous electrical discharge in the form of a flame will be formed around the outer rim of said member.

2. An electrical ignition means for an oil burner, which includes a rotary burner member onto which the oil is fed, comprising an electric circuit having an annular spark gap adjacent and around the member, and means whereby with the rotation of the member and the passage of a current through the circuit, sparks of such quantity will pass across the gap as to form a substantially continuous electrical discharge in the form of a flame around the plate.

3. An electrical ignition means for an oil burner, which includes a rotary burner member onto which the oil is fed, comprising an electric circuit in which the mem-

ber is interposed, the latter forming a revolving electrode, and a stationary electrode in the circuit surrounding the member in spaced relation thereto, and insulated therefrom.

4. An electric ignition means for an oil burner, which includes a rotary burner member onto which the oil is fed, and a casing surrounding the plate in spaced relation thereto; comprising a circular electrode mounted in connection with the casing, concentric with and spaced from the member, and located in a transverse plane with the rim of the latter, means insulating the electrode from the member, an electric circuit in which the electrode and member are interposed, and means whereby with the rotation of the member and the passage of a current through the circuit, a substantially continuous electrical discharge will pass between the electrode and member all around the same.

5. An electric ignition means for an oil burner, which includes a rotary burner member onto which the oil is fed, and a casing surrounding the plate in spaced relation thereto; comprising a circular electrode mounted in connection with the casing, concentric with and spaced from the member, and located in a transverse plane with the rim of the latter, means insulating the electrode from the member, an electric circuit in which the electrode and member are interposed, and projections extending at circumferentially spaced intervals from the rim of the plate toward but not touching the ring.

6. An electric ignition means for an oil burner, which includes a rotary burner member onto which the oil is fed, comprising a conducting ring surrounding the member in concentric and spaced relation thereto, a plurality of electrodes extending evenly toward the ring from the inner face thereof and arranged to rotate with the member, the ring and electrode being insulated from each other, and a circuit in which the ring and electrodes are interposed.

7. An electric ignition means for an oil burner, which includes a rotary burner plate onto which the oil is fed, and a casing surrounding the plate in spaced relation thereto, comprising a conducting ring mounted in connection with the casing, concentric with and spaced from the member, and located in a transverse plane with the rim of the latter, the casing being made of insulation material, circumferentially spaced projections on the plate extending evenly toward the ring, but spaced therefrom, and an electric circuit; said circuit having a step-up transformer interposed therein, one lead from the transformer being connected to the ring, and the other lead therefrom being grounded, and the member being also grounded.

8. An electric ignition means for an oil burner which includes a rotary member onto which the oil to be burned is fed whereby with the rotation of said member the oil will be thrown centrifugally therefrom; comprising a circular element surrounding said rotating member in transverse and concentric but spaced relation thereto, a high voltage electric circuit in which said member and element are interposed and across the gap between which the current jumps to form a substantially continuous train of sparks with the rotation of the member, thereby inducing the formation of an electrical flame in addition to the sparks.

In testimony whereof I affix my signature.

IRA EDWARD SMITH.