

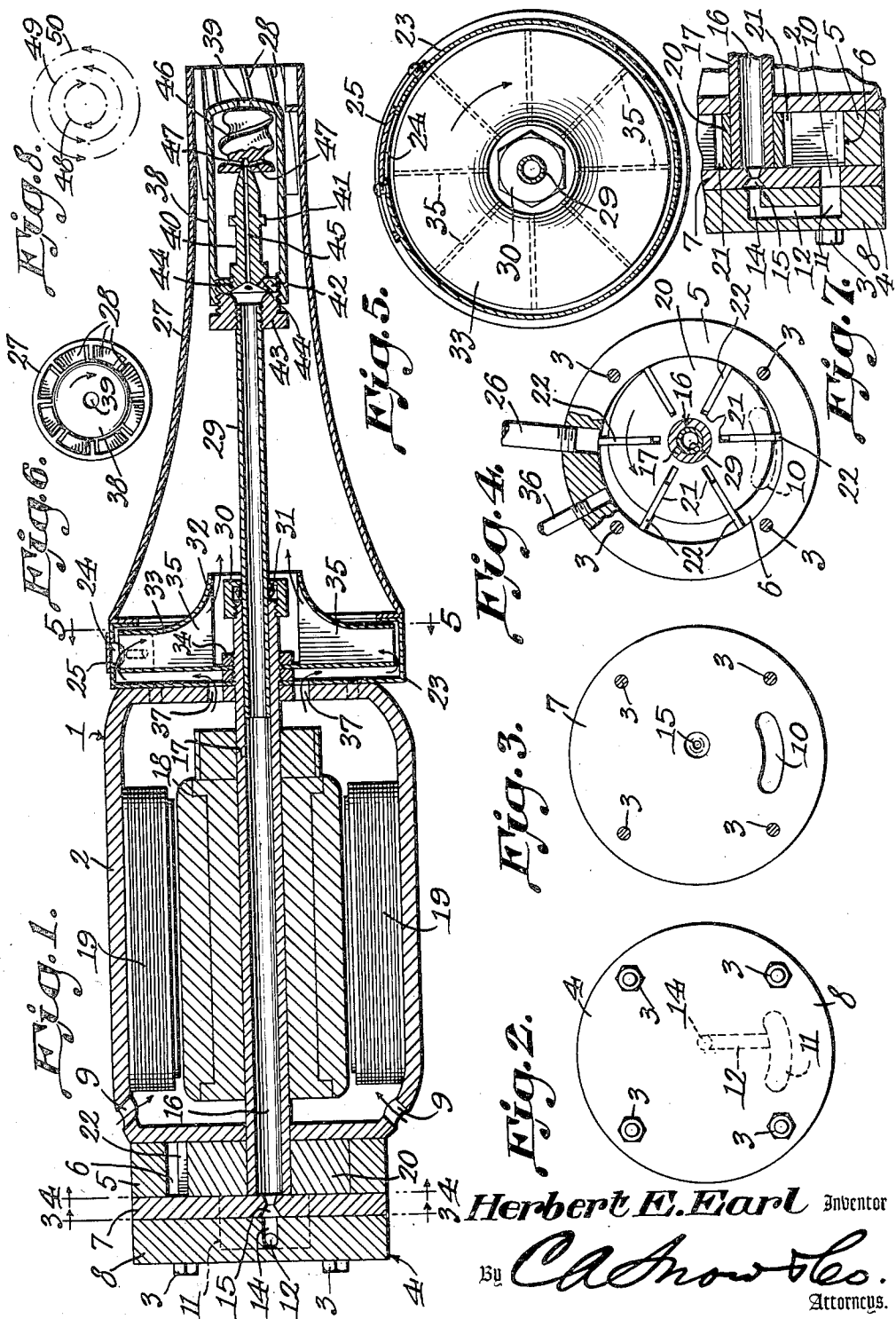
Jan. 28, 1936.

H. E. EARL

2,028,899

OIL BURNER

Filed Oct. 2, 1933



Herbert E. Earl Inventor
By *Chas. H. Snow* Attorneys.

UNITED STATES PATENT OFFICE

2,028,899

OIL BURNER

Herbert E. Earl, Roselle Park, N. J.

Application October 2, 1933, Serial No. 691,855

7 Claims. (Cl. 158-77)

The device forming the subject matter of this application is a burner, adapted to be used in connection with a fluid or gaseous fuel mixture, ordinarily composed of air and finely broken up oil, the structure being of use on furnaces of various kinds.

The invention aims to provide novel means for cooling the motor, to provide novel means whereby the device may be operated at low pressure, to provide novel means whereby the burning mixture, proceeding from the burner, will do its work in the fire space, and not be blown across the fire space into the chimney, and, generally, to improve and to enhance the utility of devices of that type to which the invention appertains.

With the above and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed, may be made within the scope of what is claimed, without departing from the spirit of the invention.

In the accompanying drawing:

Fig. 1 shows in longitudinal section, a device constructed in accordance with the invention;

Fig. 2 is an end elevation of the outer disk of the base;

Fig. 3 is a transverse section on the line 3-3 of Fig. 1;

Fig. 4 is a transverse section on the line 4-4 of Fig. 1;

Fig. 5 is a transverse section on the line 5-5 of Fig. 1;

Fig. 6 is an end view of the spout and attendant parts;

Fig. 7 is a fragmental longitudinal section showing the passages in the base;

Fig. 8 is a diagram explaining the operation of certain parts of the structure.

In carrying out the invention, there is provided a casing, which, as a whole, is marked by the numeral 1. The casing 1 includes a cylindrical body 2. By means of securing elements 3, a butt or base 4 is secured to the rear end of the body 2.

The butt or base 4 is a composite structure. It embodies a ring 5, disposed in contact with the rear end of the body 2. The ring 5 has an internal chamber 6. Air is admitted to the chamber 6 through an inlet 26 carried by the periphery of the ring, as shown in Fig. 4. Oil, or similar fuel, is admitted to the chamber 6 through an inlet 36 carried by the periphery of the ring 5.

Disposed against the back of the ring 5 is an intermediate disk 7, and behind the disk 7 is an outer disk 8. The parts 5, 7, and 8 are held on the end of the body 2 by the securing elements 3. The primary supply of air is derived by way of the pipe 26. The body 2 of the casing 1, near its rear end, has openings or first ports 9 for the inlet of secondary air. The primary air passes through the pipe 26, into the chamber 6, and from the chamber 6, the air passes through an outlet 10 in the intermediate disk 7 into a correspondingly shaped recess 11 formed in the outer disk 8. From the recess 11, the primary air moves through a radial bore 12 in the outer disk 8 to a longitudinal bore 14 in the disk 8, and from the bore 14, the air passes through a doubled-tapered nozzle opening 15, formed in the intermediate disk 7, into the bore 16 of a hollow shaft 17.

The hollow shaft 17 is journaled for rotation in the ends of the body 2 of the casing 1, and is arranged eccentrically with respect to the chamber 6 in the ring 5 of the butt 4. The armature 18 of an electric motor of any desired kind is secured to the hollow shaft 17 and is located within the body 2 of the casing 1. The field 19 of the motor is carried by the body 2. The shaft 17 carries a pump for forcing forwardly a liquid fuel, preferably oil. This pump is located in the chamber 6 of the ring 5. The pump embodies a disk 20, secured to the shaft 17 and provided with radial slots 21, in which vanes 22 have radial sliding movement, under centrifugal action, the outer ends of the vanes being adapted to cooperate with the circumferential wall of the recess 6, as shown in Fig. 4.

The casing 1 includes, further, a fan housing 23, secured to the forward end of the body 2. On its periphery, the fan housing 23 has an opening 24, for the admission of an additional supply of secondary air, supplemental to the supply of air furnished through the openings 9 of the body 2. The opening 24 in the fan casing 23 may be closed wholly or in part, by a slidably mounted damper 25 mounted on the fan housing. The casing 1 includes further, a tapered spout 27 secured to the forward end of the fan housing 23. At its outer end, the spout 27 has longitudinally extended, internally arranged, spiral blades 28.

The shaft comprises a tubular extension 29, mounted for longitudinal adjustment in the forward end of the shaft 17. The extension 29 is held in any position to which it may have been adjusted longitudinally, through the instrumen-

5 tality of a nut 30, threaded on the forward end of the shaft member 17, and engaging a washer 31, which is V-shaped in cross section, the forward edge of the washer being engaged by the nut 30, and the rear edge of the washer bearing against the forward end of the shaft 17. The washer 31 has a double purpose, in that it holds the shaft sections 29 and 17 together for simultaneous rotation, and also forms a tight joint at the place specified.

10 The washer 31 and the nut 30 are located in the tapered end 32 or outlet of an air pump, including a fan body 33, secured at 34 to the shaft 17 and located in the fan housing 23. The fan body 33 carries radial blades 35. The inner edges of the blades 35 are spaced from the shaft 17, and the outer edges of the blades are spaced from the periphery of the fan housing 23. The secondary air entering the body 2 of the casing 1, through the ports 9, finds its way into the fan housing 23 through registering second ports 37 in the forward end of the body 2 and in the member 23.

25 A tip is attached to the forward end of the extension 29 of the shaft 17 and rotates therewith. This tip may be variously constructed. Preferably, it comprises a thimble 38, having an opening 39 at its forward end. Within the thimble 38 is disposed a nozzle 40, provided intermediate its ends with a circumferential outstanding rib 41. The nozzle 40 has a foot 42 which is threaded into the thimble 38. The rear end of the thimble 38 is threaded upon a head 43 carried by the forward end of the shaft member 29, and the foot 42 is in contact with the head 43. The foot 42 is supplied with outwardly inclined ports 44 which discharge into the space between the nozzle 40 and the thimble 38. The nozzle 40 has a longitudinal bore 45. A spiral member 46 is held against the forward end of the thimble 38 by the nozzle 40, but the engagement between the forward end of the spiral member 46 and the forward end wall of the thimble 38 is not air tight, the result being that the mixture of air and oil can find its way outwardly through the outlet 39 in the end of the thimble 38. Near its base, the spiral member 46 has lateral, forwardly inclined ports 47 which communicate with the longitudinal bore 45 of the nozzle 40.

50 In practical operation, the shaft 17—29 is rotated by the motor 18—19, and rotation is imparted to the fuel pump 20—21 shown in Fig. 7. The primary supply of air, entering through the pipe 26, and the oil, entering through the pipe 36, are acted upon by the fuel pump and are thoroughly mixed. They are forced, by the fuel pump, through the outlet 10 in the disk 7, into the recess 11 in the disk 8. The mixture passes through the radial bore 12 of Fig. 7, into the longitudinal bore 14, and by way of the nozzle 15, into the bore 16 of the shaft section 17. The mixture traverses the shaft section 29 and moves through the ports 44 in the head 43 of the nozzle 40, into the space between the nozzle and the thimble 38. The mixture is also discharged through the ports 47 of the spiral member 46, into the field of operation of the spiral member, and from the spiral member, the mixture passes outwardly through the outlet 39 in the end of the thimble 38.

70 The secondary supply of air enters the body 2 of the casing 1 through the ports 9 and cools the motor 18—19. The secondary air is drawn through the ports 9, and through the ports 37, by the action of the air pump 33—35, which is rotated by the shaft 17—29. The air, proceeding

from the ports 37, moves upwardly behind the fan body 33, downwardly through the fan body, and outwardly through the tapered end 32 of the fan body, as indicated by the arrows in Fig. 1. If an additional supply of secondary air is required, that supply may be furnished through the opening 24 in the fan housing 23, under the control of the damper 25. The secondary air passes forwardly in the spout 27, impinges against the spiral blades 28 in the spout 27, and mingles with the mixture delivered through the outlet 39 of the thimble 38 of the tip on the forward end of the shaft section 29. Because the shaft section 29 is longitudinally adjustable in the shaft section 17, the position of the tip may be charged with respect to the spiral blades 28 of the spout 27, and with respect to the outlet end of the spout.

An important feature of the invention remains to be discussed. In this connection, note Fig. 8 of the drawing. In that figure, there are shown three concentric circles 48, 49 and 50. The inner circle (48) may be taken to represent the direction in which the shaft section 29 and the tip, including the thimble 38, turn, and a clockwise direction is indicated, looking toward the discharge end. The mixture, therefore, is delivered in a clockwise direction through the ports 44 and 47. The twist of the spiral member 46, however, is such that, after the mixture has left the ports 44 and 47, and is moving forwardly, under sufficient pressure, in the thimble 38, the mixture will follow the thread of the spiral member 46 in a counter-clockwise direction, as indicated by the circle 49 in Fig. 8. The result is that the mixture, proceeding outwardly through the outlet 39 of the thimble 38 is not blown clear across the furnace into the stack (not shown) but is subjected to thorough combustion in the fire space, fuel being saved accordingly. This result is further enhanced by reason of the fact that the spiral blades 28 in the spout 27 are so inclined that, as indicated by the circle 50 in Fig. 8, the secondary supply of air also receives a counter-clockwise whirl viewed from in front of the discharge end.

The general construction at the outlet end of the device is such that the entire mixture receives a thorough breaking up or atomization. The length of the flame, or zone of combustion may be so regulated with respect to the end of the structure that there will be no direct impingement of the flames on the refractory structure of the furnace. The building up of back pressure is avoided, and the device may be operated at low pressure.

Having thus described the invention, what is claimed is:

1. In a device of the class described, a casing, a hollow shaft journaled in the casing and having an intake end and a discharge end, means for rotating the shaft in one direction, a pump for fluid fuel operatively connected to the intake end and driven by the shaft, said pump constituting means for driving fluid fuel through the shaft, from the intake end to the discharge end, a tip on the discharge end and including a thimble having an outlet in its forward end, and a nozzle in the thimble and communicating with the discharge end, the nozzle having a transverse port through which the fluid fuel is discharged and caused to move forwardly, and circumferentially in the thimble in said one direction, when the shaft is rotated, and means interposed between the nozzle and the outlet of the thimble for caus-

ing the fluid fuel to move forwardly, and circumferentially in the thimble, in a direction opposite to that mentioned, while the shaft continues to rotate, and before the fluid fuel reaches the outlet of the thimble.

2. In a device of the class described, a casing, a hollow shaft journaled in the casing and having an intake end and a discharge end, means for rotating the shaft in one direction, a pump for fluid fuel operatively connected to the intake end and driven by the shaft, the said pump constituting means for driving fluid fuel through the shaft, from the intake end to the discharge end, a tip on the discharge end and including a thimble having an outlet in its forward end, and a nozzle in the thimble and communicating with the discharge end, a spiral member in the thimble and located between the outlet of the thimble and the nozzle, the spiral member having a transverse port through which the fluid fuel is discharged and caused to move forwardly, and circumferentially in the thimble in said one direction, when the shaft is rotated, the twist of the spiral member being such as to cause the fluid fuel to move forwardly, and circumferentially in the thimble, in a direction opposite to that mentioned, while the shaft continues to rotate, and before the fluid fuel reaches the outlet of the thimble.

3. In a device of the class described, a casing, a hollow shaft journaled in the casing and having an intake end and a discharge end, means for rotating the shaft in one direction, a pump for fluid fuel operatively connected to the intake end of the shaft and driven by the shaft, the said pump constituting means for driving fluid fuel through the shaft, from the intake end to the discharge end, a tip on the discharge end and including a thimble having an outlet in its forward end, the tip including, as constituent parts, a nozzle in the thimble and communicating with the discharge end, and a spiral member interposed between the nozzle and the outlet of the thimble, one of said constituent parts being provided with a transverse port, through which the fluid fuel is discharged and caused to move forwardly, and circumferentially in the thimble, when the shaft is rotated, the twist of the spiral member being such as to cause the fluid fuel to move forwardly, and circumferentially in the thimble, in a direction opposite to that mentioned, while the shaft continues to rotate, and before the fluid fuel reaches the outlet of the thimble.

4. In a device of the class described, a casing, a hollow shaft journaled in the casing and having an intake end and a discharge end, means for rotating the shaft in one direction, means operated by the shaft for driving a fluid fuel through the shaft from the intake end to the discharge end, a tip on the discharge end and having an outlet, the tip embodying means discharging fluid fuel forwardly, and circumferentially with respect to the shaft in said one direction, when the shaft is rotated in said one direction, and the tip also embodying means causing the fluid fuel to move forwardly, and circum-

ferentially with respect to the shaft, in a direction opposite to that mentioned, while the shaft continues to rotate in said one direction, and before the fluid fuel reaches the outlet of the tip.

5. In a device of the class described, a casing, means for admitting air to the casing, a hollow shaft journaled in the casing and having an intake end and a discharge end, means for rotating the shaft in one direction, a pump for liquid fuel operatively connected to the intake end and driven by the shaft, said pump constituting means for driving fluid fuel through the shaft, from the intake end to the discharge end, a tip on the discharge end and having an outlet, the tip having a forwardly and outwardly inclined port through which the fluid fuel is discharged and caused to move forwardly, and circumferentially with respect to the shaft in said one direction, when the shaft is rotated in said one direction, the tip including means causing the fluid fuel to move forwardly, and circumferentially with respect to the shaft, in a direction opposite to that mentioned, while the shaft continues to rotate in said one direction and before the fluid fuel reaches the outlet of the tip, a portion of the casing surrounding the tip, and said portion of the casing embodying means imparting to the air, a forward movement circumferentially of the shaft, and in said opposite direction, while the shaft continues to rotate in the first-mentioned direction.

6. A device of the class described, constructed as set forth in claim 5, in combination with means operable to allow change of the position of the tip in the discharge end of the casing longitudinally thereof.

7. In an oil burner, a casing, a motor within the casing, a housing on the forward end of the casing, a spout on the forward end of the housing, the housing having an outlet discharging into the spout, the casing being provided with a first port admitting air to the casing, the casing being provided with a second port admitting air from the casing to the housing, damper controlled means admitting air from the atmosphere to the housing, a hollow shaft journaled in the casing and driven by the motor, a tip on the forward end of the shaft and discharging into the spout, a fuel and primary air pump on the rear end of the casing, the fuel and primary air pump embodying means receiving fuel and means receiving primary air, the pump embodying means discharging fuel and primary air into the shaft, and an air pump driven by the shaft and located in the housing, said air pump drawing air from the atmosphere into the housing, through said damper controlled means, and also drawing air into the housing from the casing, by way of the first port and the second port, thereby to cool the motor, the air pump discharging air from the housing through the outlet into the spout.

HERBERT E. EARL.