Oct. 4, 1927. 1,644,496

L. L. SCOTT

OIL BURNER

Filed Feb. 23, 1922 3 Sheets-Sheet 1

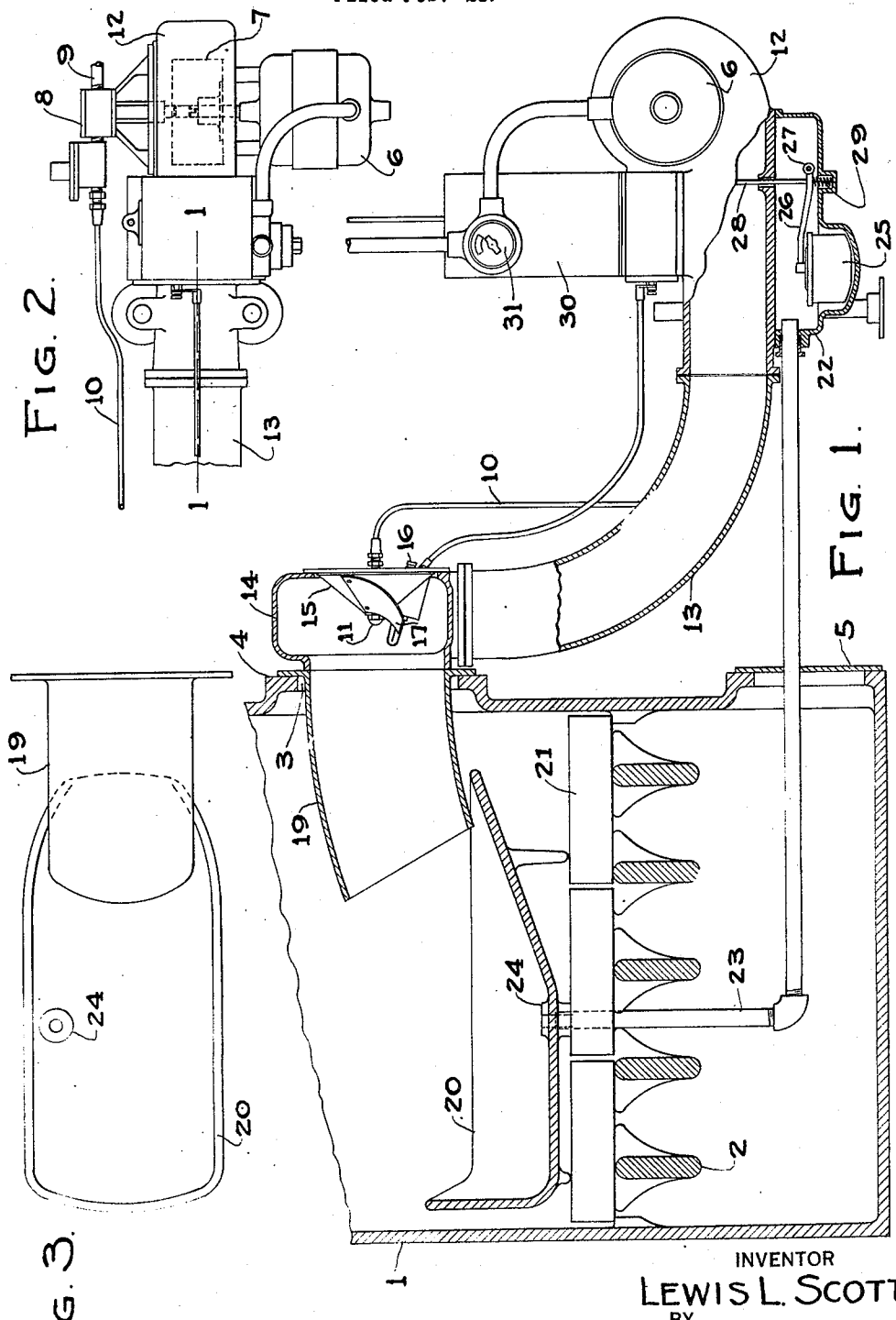


FIG. 2.

FIG. 1.

FIG. 3.

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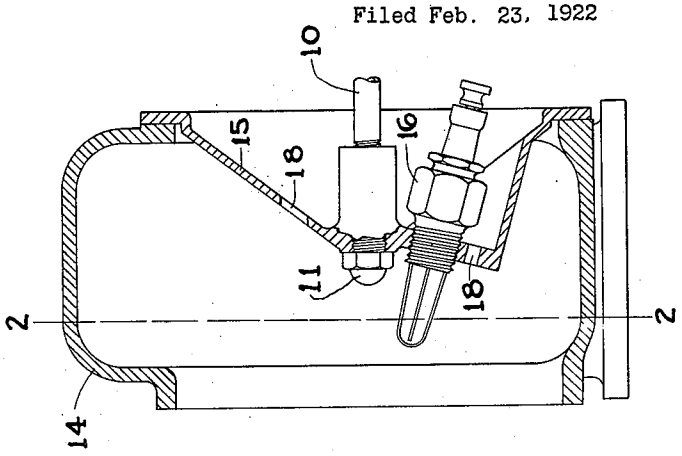


FIG. 4.

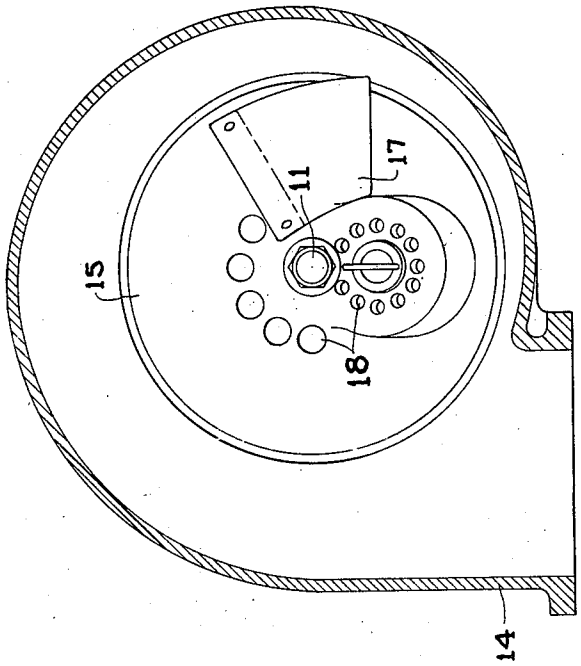


FIG. 5.

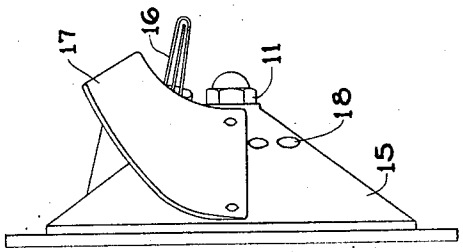


FIG. 6.

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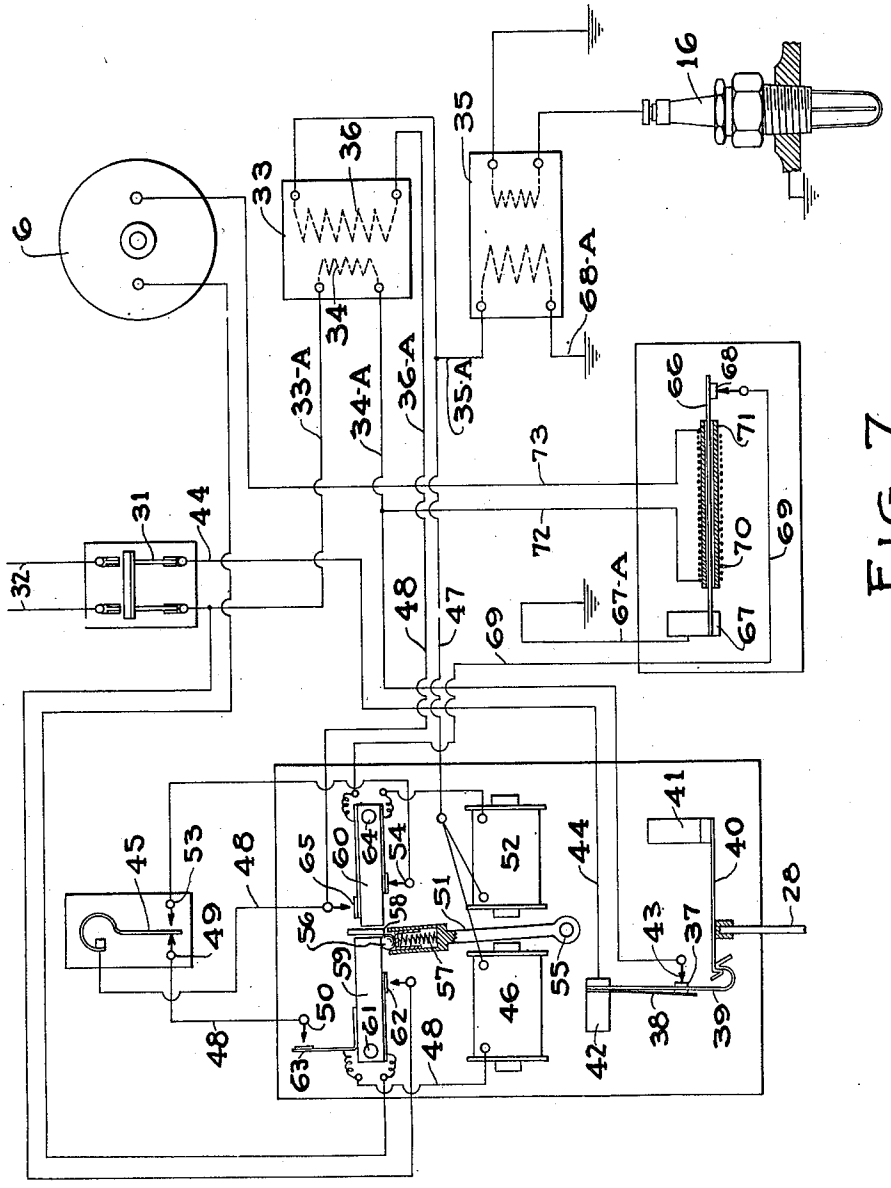


FIG. 7

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UNITED STATES PATENT OFFICE.

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OIL BURNER.

Application filed February 23, 1922. Serial No. 538,559.

This invention relates to novel apparatus for use in burning heavy oils which are practically non-volatile at normal temperature. While this invention can be used for many purposes, I have shown it as applied to a furnace such as is used for domestic heating.

One of the objects of this invention is to thoroughly mix the burning oil with air so that combustion will be complete. Another object is to provide means for automatically igniting the mixture of oil and air, by an electric spark and to provide means for cutting off the electric spark after ignition takes place. A further object is to so direct the incoming air that there will be no flame of burning fuel at the points of the spark plug or around the fuel nozzle; by this arrangement, sooting of the spark plug and nozzle is prevented. A further object is to create a flame of low velocity; by so doing, two very important things are accomplished; i. e. the fire is practically noiseless, and the chimney temperature is lowered because more of the heat is absorbed by the furnace. A further object is to so arrange the flame of burning oil in a domestic furnace, (which furnace has been designed for burning coal) so that heat will not be lost in the ash-pit part of said furnace, and so that heat will be stored up in fire brick which are placed on the grate bars of said furnace. A further object is to provide a means of catching unburned fuel, in case of failure of ignition, and returning said fuel to a safety device, which is designed to act under certain conditions to shut off the flow of fuel.

The invention is illustrated in the accompanying drawings, of which; Figure 1 is a vertical sectional view of the lower part of a domestic hot-air furnace showing my improved oil burner attached thereto; the air pipe and safety float of Figure 1 are shown partly in section, said section being taken on the line 1—1 of Figure 2. Figure 2 is a plan view of the air blower and connected parts as shown in Figure 1. Figure 3 is a plan view of the castings shown in section in Figure 1. Figure 4 is an enlarged sectional view of the air receiving housing shown in Figure 1 which receives the air and directs it around the fuel spray. Figure 5 is a section on the line 2—2 of Figure 4. Figure 6 is a side view of the casting which carries the spark plug and fuel nozzle, which casting is shown in section in Figure 4. Figure 7 is a diagrammatic drawing showing the complete wiring diagram and control switches.

Referring now to the drawings, the numeral 1 indicates the drum of a domestic furace; 2 indicates the grate bars commonly used with a coal fired furnace; 3 is the fire door opening; 4 is the fire door of said furnace; 5 is the ash door; 6 is an electric motor which drives the fan 7 and oil pump 8. The suction pipe 9 runs to an oil tank (not shown); oil is delivered under pressure through the pipe 10 to the fuel spray nozzle 11. The spray nozzle 11 can be any of the well known pressure spraying fuel nozzles. 12 is a blower housing which delivers low pressure air through the pipe 13 to the air receiver 14. The casting 15 is removably attached to the air receiver 14 and carries the spark plug 16 and fuel nozzle 11. The spark plug and nozzle are located entirely outside of the furnace proper, and the electric wires connected to the former will thus not be subjected to the heat within the furnace. In other words, the spark plug is inserted into the wall of the air receiving casting 14 from the outside, and the electrical connections to this spark plug project outward from the wall of the aid receiving casting. An air deflector plate 17 is attached to the casting 15, the purpose of which will be described later. The casting 15 is provided with the holes 18 (see Figures 4 and 5), the purpose of said holes will be described later. 19 is a pipe, preferably curved downward, which is attached to the air receiver 14 and to the furnace 1 and is for the purpose of conducting and directing the burning fuel mixture into the furnace. 20 is a box-like casting having an open top, said casting rests on the fire bricks 21 which fire bricks rest on the grate bars 2. The casting 20 serves the purpose of directing the burning fuel and air, and also serves the purpose of catching unburned fuel (in the event said fuel fails to ignite), and returning said fuel to the safety chamber 22 through the pipe 23. It will be noted that the casting 20 has a raised boss 24 where the pipe 23 connects to said casting. The object in using this raised boss 24 is to prevent fuel from running into the pipe 23 when the burner is started from cold and is operating in the normal way. I have found

that when the burner is started there is a small amount of wet fuel that will drip out into the casting 20, which fuel is burned as soon as the burner is operating for a few minutes. If I did not provide this raised boss, the fuel would run into the pipe 23 and would operate the safety device when there was no occasion for operating it. 25 is a metal float which is attached to the arm 26, which arm is pivoted at 27. 28 is a rod which is moved upward by the operation of the float 25 and which acts to break the circuit to the motor 6, thereby stopping the pump 8 (see Figure 7). The operation of the electric circuit breaker to the motor will be described later. 29 is a spring which is used for balancing the weight of the float 25. 30 is a metal box which is mounted on the housing 12 and which incloses the control switches, transformer and spark coil; these parts are shown diagrammatically in Figure 7. 31 is a hand switch for turning on the main line current. Referring now to Figure 7, the numeral 32 indicates the main line circuit, 33 indicates a transformer, the coil 34 of which is connected to the main line circuit through the wires 33-A and 34-A. 35 indicates a spark coil which is connected to the winding 36 of the transformer 33 through the wires 35-A and 48, said spark coil furnishes current to the spark plug 16. 37 indicates an electric contact which is mounted on the flat spring 38; 39 is a flat spring, the end of which is engaged in the end of the flat spring 40. The spring 40 is secured to the post 41 and bears against the rod 28. The springs 38 and 39 are secured to the post 42. The contact 37 bears against the contact 43 and forms a switch or circuit breaker in the main line wire 44 so that when said contacts 37 and 43 are separated, the main line circuits are broken. 45 indicates a thermostat which is usually placed in the living room of the house; said thermostat is adapted to move in one direction when the room is cold and in the opposite direction when the temperature in the room rises. The purpose of the thermostat 45 is to control the operation of the motor 6 (which motor controls the flow of oil to the furnace), thereby controlling the temperature in the room in which the thermostat is located. 46 is an electro-magnet which gets its current from the coil 36 of the transformer 33 through the wires 47 and 48, the switches 49 and 50 are located in the line 48. The magnet 46 when energized will move the armature 51 to the left as shown in the drawing. The magnet 52 gets its current from the same source as magnet 46, but the current to said magnet 52 is controlled by the switches 53 and 54. When the magnet 52 is energized it will move the armature to the right. The armature 51 is pivoted at 55 and the upper part of said armature contains the ball 56, which ball is pressed upward by the spring 57. 58 is a fixed piece of metal which is located between the arms 59 and 60. The arm 59 is pivoted at 61 and said arm carries the contact 62, which is the switch to the motor 6, and the contact 63, which is the switch for breaking the circuit to the magnet 46. The arm 60 is pivoted at 64 and said arm carries the contact 65, which is the switch to the spark coil 35, and the contact 54, which is the switch for breaking the circuit to the magnet 52. The numeral 66 indicates a piece of thermostatic metal which is fixed at one end to the post 67, and carries the contact 68 at the opposite end. The contact 68 is connected in series with the switch 65 through the wire 69 and thereby controls the operation of the spark coil 35. The post 67 is grounded through the wire 67-A as is the wire 68-A which is connected to one side of the primary winding of the spark coil 35. The thermostatic metal 66 is adapted to move upward when heated so as to break the contact between 68 and 69. 70 is a coil of wire which is wound around the insulating material 71, which insulating material fits loosely around the thermostatic metal 66. The coil 70 is connected in series with the motor 6 by the wires 72 and 73. When the motor 6 is started, the current flowing through the coil 70 will heat up the thermostatic metal 66 and cause same to move upward so as to open the switch 68 and thereby only allow the spark coil 35 to operate for a short period of time after the motor is started. When the motor is shut off the thermostatic metal will cool off and close the switch 68.

I will now describe the general operation of my oil burner. Let us assume that the fire has been burning and the room temperature has been brought up to the desired point and that the motor 6 has just been shut off. As the room temperature drops, the thermostat 45 will move to the right and close the switch 53 thereby sending current through the magnet 52, whereupon the armature 51 will move to the right, thereby allowing the arm 59 to drop downward and moving the arm 60 upward. As the arm 59 drops downward, the switches 62 and 63 close and the motor 6 starts. As the arm 60 moves upward the switch 54 opens, breaking the circuit to the magnet 52, and the switch 65 closes, thereby sending current to the spark coil 35. The switch 68 will open in a short period of time as before described. When the motor 6 starts, fuel is pumped by the pump 8 and is forced under pressure through the spray nozzle 11. The fan 7 forces air through the pipe 13 into the air receiver 14, which air receiver is so formed as to make the air take the path of an involute curve and to rapidly rotate said air.

The funnel-like casting 15 forces the air toward the outlet pipe 19. The plate 17 acts to direct the air around the points of the spark plug 16 and fuel nozzle 11 so that the air velocity at these points is high enough to prevent flame propagation around the spark plug points and fuel nozzle. The mixture of air and fuel is ignited by the spark plug 16 and the flame of said mixture is directed into the furnace by the outlet pipe 19. I have found that by bringing the air around the fuel spray in the form of an involute curve and that by forcing said air toward the outlet before said air reaches the fuel spray and that by making an enlarged outlet, I can produce combustion that is complete and that burns with practically no noise. It is very desirable to have an oil fire that is noiseless, as the noise of the common oil fire is very annoying when used in domestic heating and also when used in a steam automobile. The vortex formed by the air in the receiver 14 will cause air from the outside to be sucked in around the fuel nozzle and spark plug through the holes 18. This additional air helps to get better mixing of air and fuel and better combustion.

I am fully aware of the fact that it is not new to ignite a spray of oil by an electric spark and that it is not new to bring in air around said fuel spray tangential to an air receiver which is located around said fuel spray. These features are clearly shown in Patent Number 1,207,897, to John Good dated December 12, 1916.

In the event that the fuel should fail to ignite it will run into the casting 20 and out through the pipe 23 to the casting 22, whereupon the float 25 will move upward thereby moving the rod 28 and spring 40 upward (see Figure 7), as spring 40 moves upward it will move out of engagement with the spring 39 and said spring 39 will move to the left thereby moving spring 38 and contact 37 to the left so that the main line circuit to the motor will be broken and the motor will stop pumping oil.

I claim:

1. In an oil burning system, means for spraying oil comprising a spray nozzle, means for furnishing air to the oil spray to promote combustion, means for igniting the sprayed oil, a casting for receiving the air, an outlet pipe leading from said casting in a direction at right angles to the path of the air entering said casting, and an air deflector plate located in proximity to said spray nozzle and igniting means and arranged to direct the air around the same and toward the outlet of the air receiving casting, said spray nozzle and ignition device being set into said air receiving casting in the path of the incoming air, and the former being arranged to spray fuel in the direction of the outlet of said air receiving casting.

2. In an oil burning system, means for spraying oil comprising a spray nozzle, an air blower for furnishing air to the oil spray to promote combustion, means for igniting the sprayed oil, a casting for receiving air from the air blower, and an outlet pipe leading from said casting in a direction at right angles to the path of the air entering said casting, said spray nozzle being located within the air receiving casting and arranged to spray the fuel in the direction of the outlet of said air receiving casting, the wall of said casting being provided with openings arranged around said spray nozzle, and said casting being shaped to cause the air to form a vortex and thereby induce a flow of air through said openings into said air receiving casting.

3. In a heating furnace designed for burning coal and having a fire door and an ash door and coal grate bars, an oil burner arranged to project a flame of burning oil through the fire door opening of said furnace, means for storing heat located on said grate bars, and means for catching unburned fuel and returning said fuel to the outside of the furnace, supported by said heat storing means.

4. In an oil burning system, means for spraying oil comprising a spray nozzle, means for furnishing air to said oil spray to promote combustion, means for igniting the sprayed oil, a casting providing a chamber for receiving the air, said chamber having an outlet, said spray nozzle being located within the said chamber and arranged to spray fuel in the direction of the outlet of said chamber, and an air deflector plate located in proximity to said spray nozzle and igniting means and arranged to direct the air around the same and toward the outlet of the said chamber at such velocity as to cause the flame from ignition to burn at a point removed from said spray nozzle and ignition means.

5. In an oil burning apparatus, a spray nozzle for finely dividing the oil, an electric ignition device for igniting the sprayed fuel, means for furnishing air to the fuel spray to promote combustion, and means for causing the air so furnished to follow the path of the involute of a circle, and thereby be rotated about the spray nozzle to form a vortex in the zone of the ignition device so that ignition of the oil will readily take place.

6. In an oil burning apparatus, a spray nozzle for finely dividing the oil, means for forcing fuel through said spray nozzle under pressure and thereby mechanically spraying it, an electric ignition device for igniting the sprayed fuel, means for furnishing a rotating body of air to the fuel spray to promote combustion, said electric ignition device and spray nozzle being located in the

vortex of said rotating body of air, so that by so locating the ignition device, said fuel will be readily ignited.

7. In an oil burning apparatus, a spray nozzle for finely dividing the oil, an electric ignition device for igniting the sprayed fuel, means for furnishing a rotating body of air to the fuel spray to permit combustion, said electric ignition device and spray nozzle being located in the vortex of the rotating body of air so that said body of air rotates around the spray nozzle and ignition device, and so that by so locating the ignition device and spray nozzle the fuel spray will be readily ignited.

8. In an oil burning system, means for spraying oil comprising a spray nozzle, an air blower for furnishing air to said oil spray to promote combustion, means for igniting the sprayed oil, a casting providing a chamber for receiving air from the air blower, said chamber having an outlet, said spray nozzle being located within said chamber and arranged to spray fuel in the direction of the outlet thereof, and the wall of said chamber having openings arranged around the ignition device, and being shaped to cause the incoming air to form a vortex, whereby to cause additional air to be drawn through said openings into said chamber.

In testimony whereof I have hereunto set my hand.

LEWIS L. SCOTT.