

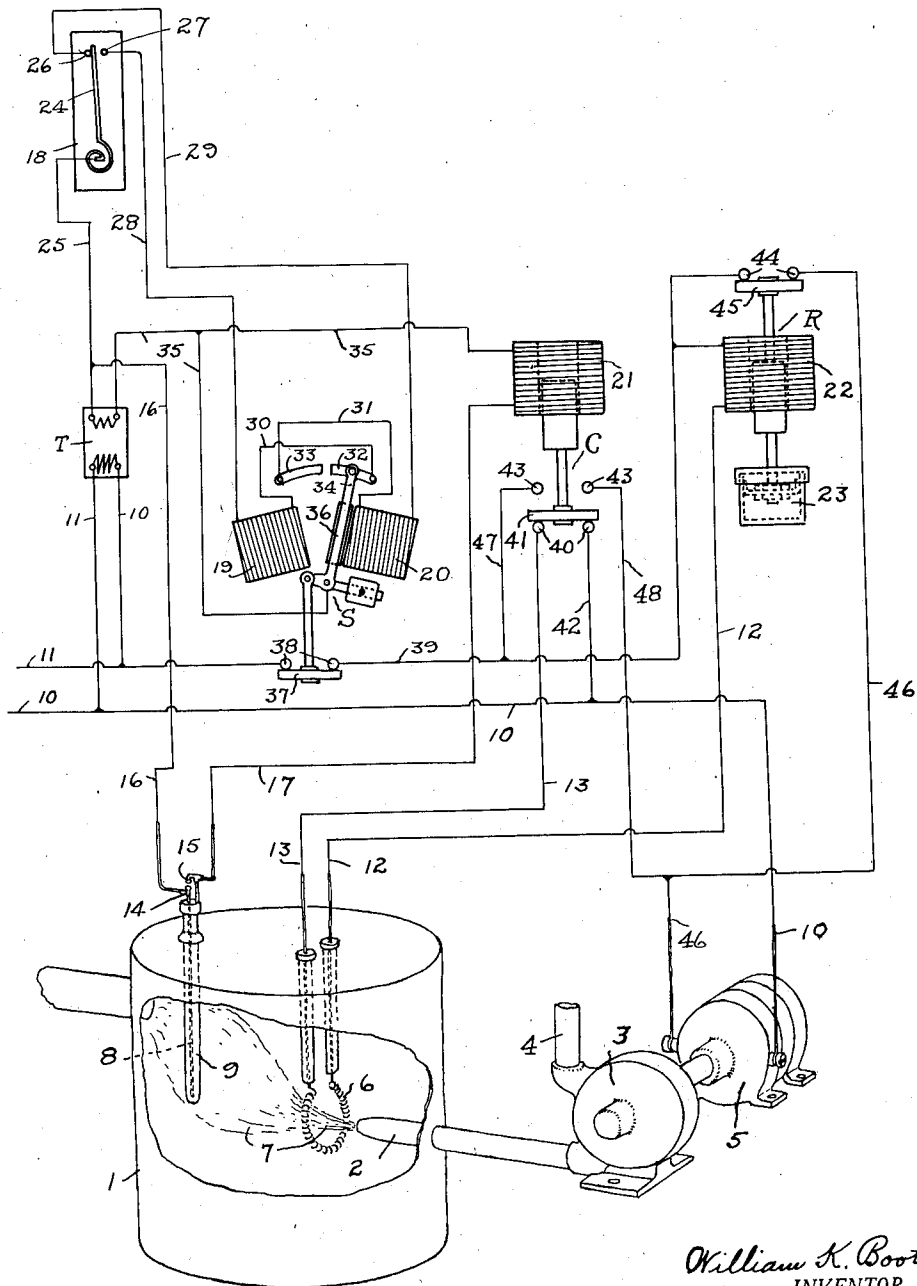
Dec. 4, 1928.

1,694,053

W. K. BOOTH

ELECTRIC FUEL IGNITING

Original Filed Sept. 18, 1922



William K. Booth
INVENTOR.

BY Kent W. Moynell
ATTORNEY

UNITED STATES PATENT OFFICE.

WILLIAM K. BOOTH, OF CHICAGO, ILLINOIS, ASSIGNOR TO ELECTROIL SYNDICATE,
AN ASSOCIATION COMPOSED OF C. P. JAEGER, L. M. RUTLEDGE, WILLIAM L. MORRIS,
AND WILLIAM K. BOOTH.

ELECTRIC FUEL IGNITING.

Application filed September 18, 1922, Serial No 589,029. Renewed April 30, 1928.

This invention relates to an electrically controlled fuel feeding system for furnaces for burning oil, gas, finely divided fuel, and the like. Among the objects of the invention are: to provide means for stopping the delivery of fuel when the igniter is broken; to delay the flow of fuel until the igniter is in operation; to put the igniter out of service after combustion takes place; and to automatically maintain the fuel feeding device in operation. Other objects will appear hereinafter.

In the accompanying drawing the figure illustrates an electric igniting system embodying this invention.

In an igniting system of this kind it is desirable not only to delay the admission of fuel until the igniter is in condition for igniting, but also to cut out the igniter when it has performed its function. A variable resistance may be used to accomplish the latter result and a retarding device in connection with the igniter will perform the first mentioned function.

Referring now more particularly to the drawing, a furnace 1 is fed with fuel from a nozzle 2 in connection with a fan or blower 3 which receives fuel through an inlet 4. An electric motor 5 is connected to the fuel delivery device 3 and receives current from supply mains 10 and 11 as hereafter described. Within the furnace is an igniting coil 6 suitably supported out of the path 7 of the flowing fuel from the nozzle 2, and within the path of the burning fuel, and suitably located within the furnace 1 to be acted upon by the heat thereof is a variable resistance 8 preferably encased in a refractory material 9.

The igniting coil has conductors 12 and 13 connected at the ends thereof and extending without the furnace and the variable resistance 8 has relatively movable contacts 14 and 15 which are adapted to make connection when the resistance 8 becomes sufficiently heated, the terminals having conductors 16 and 17 respectively leading therefrom.

A thermostat device 18 is provided for automatically controlling the supply of current to magnet windings 19 and 20 of a main switch S and a cut out switch C has a magnet winding 21 in connection with the variable resistance 8 used for cutting out the current through the igniter coil 6. A retarding switch R has a magnet winding 22 inserted

with igniting coil 6 with a dash pot device 23 for preventing the rapid closing of this switch. If desired, the main and cut out switches and the current through the variable resistance 8 may be changed from the main circuit by means of a transformer T.

In the thermostat is a variable arm 24 connected by means of a conductor 25 to one side of the transformer T and adapted to make connection with a contact 26 or a contact 27. These contacts are connected by conductors 28 and 29 respectively with windings 19 and 20 and thence by conductors 30 and 31 with switch contacts 32 and 33. The main switch has a pivoted arm 34 engaging either one of the contacts 32 or 33 and is connected by a conductor 35 with the opposite terminal of the transformer T. If the arm 34 of the main switch is in connection with one of the contacts 32 or 33, a circuit can only be closed through the opposite winding 19 or 20 and when such a circuit is closed the arm is attracted by the reason of an armature 36 carried thereby, moving a switch bar 37 correspondingly with respect to the switch contacts 38. When the thermostatic arm 24 engages the contact 26 a circuit as traced above is closed through the winding 20 closing the switch bar 37 and when the winding 19 is energized the arm 34 is swung to separate the contact bar 37 from its contacts 38. As soon as this main switch S is closed by the action of the thermostat, a circuit is completed from the main 11, contacts 38, and contact bar 37, conductor 39, the winding 22, conductor 12, igniting coil 6, conductor 13, back contacts 40 and contact bar 41 of the cut out switch C and conductor 42 to the other main 10. This will energize and heat up the coil 6 so that it will ignite fuel.

A circuit is not immediately closed to the motor 5 because the main contacts 43 of the cut out switch C are not connected by the contact bar 41. As soon, however, as the retarding switch R is permitted to be closed by the retarding device 23, a circuit is made from the conductor 39 through contacts 44, contact bar 45 and conductors 46 and the motor 5 to the other main 10. As soon as the motor is in operation fuel is fed through the nozzle 2 which is ignited by the igniter 6, and as the igniter is out of the path of the flow of fuel it is not directly heated thereby.

The resistance 8 is in series with the wind-

ing 21 of the cut out switch in a circuit traced from the secondary side of the transformer as follows: from conductor 25, conductor 16, resistance 8, conductor 17, winding 21 and conductor 35, back to the transformer. The variation of the resistance is such as to cause the connection of contacts 14 and 15 when the resistance 8 becomes heated, and the resistance 8 prevents the flow of enough current through the winding 21 to raise the cut out switch bars 41. As soon, however, as the contacts 14 and 15 are connected by the movement of the resistance, the latter is cut out and an increased current will flow through the winding 21 which will draw up the contact bar 41 making connection with the upper contacts 43 and breaking connection with the lower contacts 40. This will break the circuit including the igniter and the winding 22 of the retarding switch R. It closes a permanent connection for the motor from the conductor 39 which is connected by the switch S to the main 11 through conductor 47, contacts 43, contact bar 41, conductors 48 and 46, motor 5, back to the other main 10. The system will continue to furnish fuel in this manner until the thermostatic arm 24 moves in the opposite direction to engage the contact 27. This will close a circuit from the secondary side of the transformer T by way of conductor 25, conductor arm 24, contact 27, conductor 28, winding 19, conductor 30, contact 32, arm 34 and conductor 35, back to the other side of the transformer secondary. This will draw the arm 34 from its engagement with the contact 32 to engage the contact 33, and it will drop the contact bar 37 from its connection with the contacts 38, breaking the circuit for the motor 5. This will stop the feeding of fuel and place the whole system in the condition assumed for the start.

The resistance 8 cools rapidly and separates the contacts 14 and 15 and the motor cannot be started immediately, first because the contact bar 41 will drop to engage the lower contacts 40 as soon as the contacts 14 and 15 are separated, and because the other switch cannot be closed rapidly on account of the retarding device 23. It is apparent therefore, that fuel cannot be delivered until after the igniter is in operation and after the igniter has successfully performed its function it will be put out of service until it is again required. The system is entirely automatic, requiring no manual attention. If the igniter is broken, the motor cannot be started in the first place as the winding 22, in series with the igniting coil 6, cannot be energized. In start-

ing the motor it is connected in parallel with the winding 22 and the coil 6 in series, but after the operation of the cut out switch C, the motor is connected directly between the supply mains.

I claim:

1. In an electrical fuel igniting system, a fuel feeding motor, an electrical igniter, a switch relay in series with the igniter operative to close a starting circuit to the motor, and electrical means for open circuiting the igniter, and the relay and closing a new running circuit to the motor.

2. In an electrical fuel igniting system, a fuel feeding motor, an electrical igniter, a retarding switch relay in series with the igniter, means to supply current to the igniter circuit and to the motor, a switch operated by the relay to close a starting circuit to the motor after the igniter receives current, and electrical means for thereafter open circuiting the igniter circuit and closing a new running circuit for the motor.

3. In an electrical fuel igniting system, fuel feeding means including an electric motor, an electrical igniter, means for delaying the starting of the motor until after the igniter is in operation, and electrical means controlled by the heat of combustion for open circuiting the igniter and for closing a new running circuit for the motor.

4. In an electric fuel igniting system, the combination with fuel feeding means including an electric motor, of means for closing a starting circuit to the motor, a fuel igniter, and an electro-responsive means controlled by the ignited fuel for opening the starting circuit for the motor and for closing a running circuit therefor.

5. In an electric fuel igniting system, the combination with fuel feeding means including an electric motor, of an igniter, a temperature controlled electro-responsive main switch, means for closing a starting circuit for the motor after the igniter is in service, and electro-responsive means for thereafter opening the starting circuit and closing a running circuit for the motor.

6. In an electric fuel igniting system, fuel feeding means including an electric motor, means for igniting the fuel, different starting and running circuits for the motor, a resistance controlled by heat for short circuiting contacts for said resistance, and electro-responsive means in series with said resistance operative to connect either the starting or the running circuit for the motor depending upon the condition of the resistance.

WILLIAM K. BOOTH.