April 12, 1927. 1,624,681

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COMBINED BOILER AND INCINERATOR SYSTEM

Filed Dec. 5, 1925

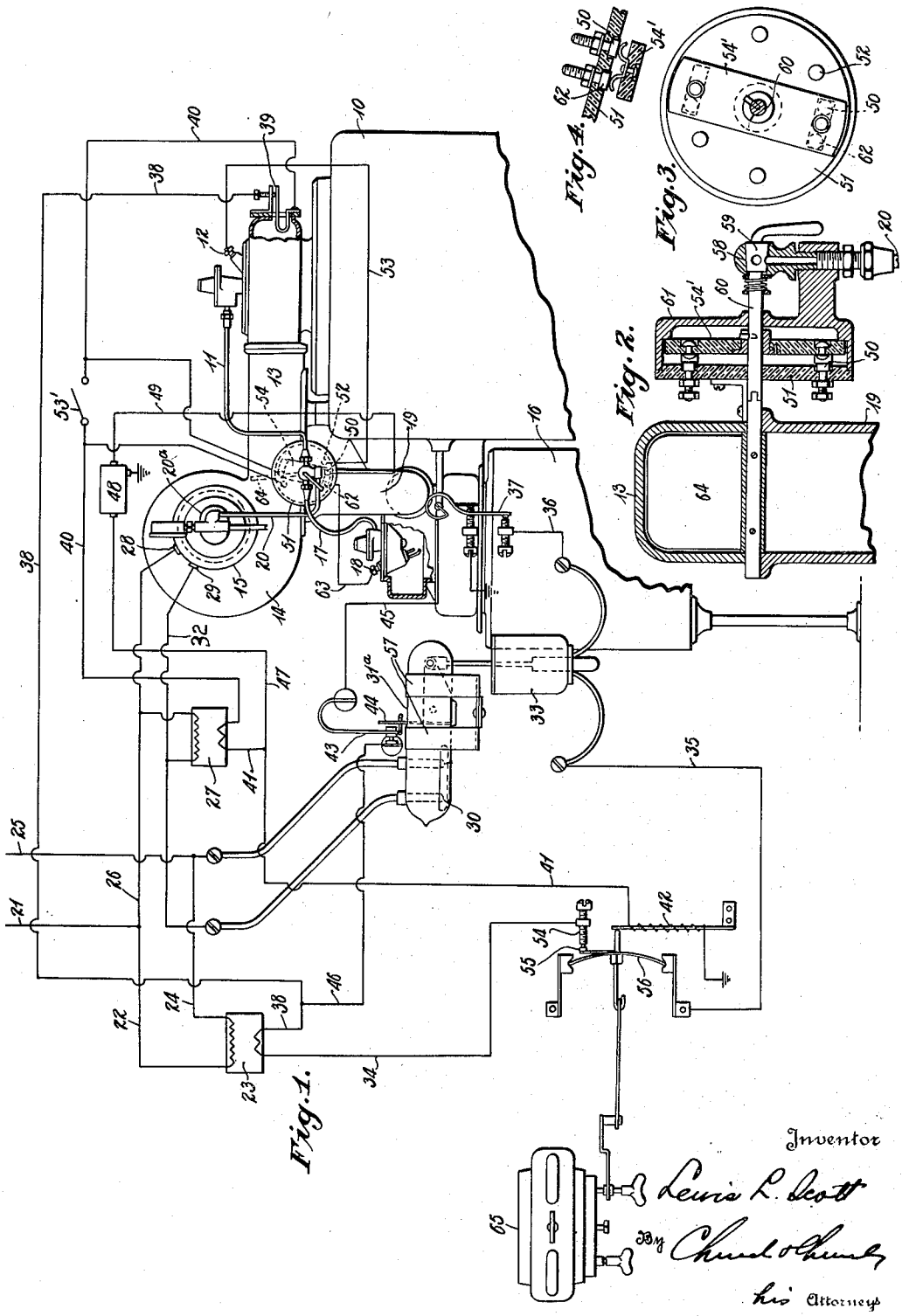


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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Patented Apr. 12, 1927. 1,624,681

UNITED STATES PATENT OFFICE.

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COMBINED BOILER AND INCINERATOR SYSTEM.

Application filed December 5, 1925. Serial No. 73,424.

This invention relates to combustion systems especially adapted for the use of oil burning apparatus.

One object contemplated by the invention is the provision of a boiler and an incinerator so arranged or combined with respect to the fuel feeding devices and the fuel igniting devices that either said boiler or said incinerator may be put into operation at the will of the operator from a remote point.

A further object is to provide the fuel feeding devices, and the air supply mechanism, with valves that operate to establish the flow of fuel to either the boiler or the incinerator and to simultaneously place the fuel igniting devices in operation and render operative the air supply for the element to be put in use.

With these and other objects in view the invention consists in certain novel details of construction and arrangements and combinations of parts all as will be hereinafter more fully described and the novel features thereof particularly pointed out in the appended claims.

In the accompanying drawings,—

Figure 1 illustrates the boiler, incinerator, fuel supply and air connections, more or less conventionally, while the electrical connections for operating the various parts are shown diametrically.

Fig. 2 is a detail sectional view of the combined switch and valve device controlling the electrical circuits and the flow of fuel and air.

Figs. 3 and 4 are detail sectional views further illustrating this control mechanism.

The boiler 10 is equipped with a suitable type of oil burner for generating heat to raise the temperature of the water circulating through the boiler. No particular form of oil burner need necessarily be used and in the present instance there is simply shown a fuel supply pipe 11 which communicates with the fuel spray nozzle within the boiler and so positioned therein with respect to the spark plug 12 that fuel discharged from said nozzle will be ignited in the event a spark is created at said plug. To aid the combustion of the fuel there is an air supply duct 13 communicating with the interior of the boiler and air is supplied through said duct by means of the blower 14 which is adapted to be operated by the motor 15.

The incinerator is shown outlined at 16 and this, like the boiler 10, is provided with an oil burner to which fuel is supplied through pipe 17, the fuel being ignited by the spark created at the spark plug 18, extending into the interior of the incinerator as in the case of the boiler 10. Likewise, air for aiding combustion within the incinerator is supplied thereto through a duct 19 to which air is supplied by the blower 14 before mentioned.

In combining the boiler 10 and incinerator 16 it is possible to use various wiring arrangements for operating motor 14 and for igniting the fuel supplied to the burners, but in the present case, the electrical connections are so arranged that electrical energy is supplied to either the burners from a common source and, in a like manner, the fuel supply connections 11 and 17 communicate with a common fuel connection 20 leading from a suitable source of supply to pump 20^a for forcing fuel through said connections. This pump is driven by motor 15. Also, as before mentioned, the one blower 14 functions to supply air to either the boiler or incinerator.

In the preferred arrangement of electrical connections the main circuit leading from the usual service line consists of wires 21 and 25. Wire 21 has a branch 22 leading to a transformer 23 from which extends wire 24 leading back to service wire 25. A second branch 26 of wire 21 extends to a transformer 27 and one binding post 28 of motor 15 and from the other post 29 of said motor there is a line 32 which runs to the transformer 27 and from said transformer to one terminal 30 of a mercury switch 31 whose other terminal 30 is connected to line 25 leading to service.

Upon closing the switch of the main feed lines 21—25 a circuit from the lower voltage side of transformer 23 energizes a solenoid 33 so arranged as to actuate mercury switch 31 and close the circuit comprising wires 32 and 25. This energizing circuit for the solenoid runs from transformer 23 by wire 34 to one post of a make and break device (to be later described), from the other post of said device to the solenoid 33 by wire 35 and from said solenoid by wire 36 to a thermostat 37 to ground. To complete this circuit, wire 38 from transformer 23 leads to a normally closed safety make and break

device 39; then by wire 40 to the low voltage side of transformer 27; then by wire 41 through a thermostatic member to ground. This latter thermostat may consist of a strip of thermostatic metal 42 which, upon a current flowing uninterruptedly through it for say about four minutes, will actuate the previously mentioned make and break device to which wires 34, 35 are connected. This last described circuit is utilized for initially energizing solenoid 33 but after this has been done and the pivoted tube 31ª of the murcery switch tilted to bridge the space between contacts 30, 32 a second pair of contacts 43, 44 are also brought into engagement, thereby establishing a circuit for maintaining the solenoid energized.

The circuit runs from the low side of transformer 23 by wires 34 and 35 to the solenoid; from said solenoid through wire 36, thermostat 37 and a wire 45 to the contacts 44, 43 of the mercury switch and from said contacts by wire 46 back to the transformer.

When the contacts 43, 44 of the mercury switch are closed, as just described, another circuit for the spark is also established. This circuit runs from the low side of transformer 27 in one direction through wire 40 to the normally closed safety device 39, then through wires 38 and 46 to the contacts 43, 44 of the mercury switch and from said contacts by wire 45 to the thermostat 37 and ground. In the other direction, the circuit extends by wires 41, 47 to spark coil 48, which is grounded, then by wire 49 to the contact 50; and from the cooperating contact 52 of said switch by wire 53 to the spark plug 12.

With the circuits as described, it will be seen that if the main switch (not shown) on the service lines is closed and the switch 51 is also closed, motor 15 will be started and the circuit for initially energizing the solenoid will be established, thereby tilting the mercury tube and closing contacts 43, 44 of the second solenoid circuit and the sparking circuit, it being understood that the plate 54 of the manually operable switch 51, has also been moved to a position to bridge the contacts 50, 52 of said switch. As will later be described, at the time this switch was actuated, suitable valves in the air duct and the fuel supply connection will also have been set to supply air and fuel to the burner—of the boiler so that the boiler will begin to operate and heat the water flowing therethrough immediately upon the spark plug circuit having been established. If the burner functions properly upon these initial operations, the contacts of the safety device 39 will be caused to separate, being affected by the heat developed in the boiler—separation of these contacts will usually occur in about two minutes with the result that the spark plug circuit and the original solenoid circuit will be broken. It is for this reason that the second circuit for maintaining the solenoid energized is provided but the circuit for the spark plug need not be maintained as the heat with the boiler will be sufficient to effect combustion of fuel subsequently applied thereto. In the event combustion does not take place properly when the apparatus is initially placed in operation, the contacts of the safety device 39 will not separate, whereupon the circuit through the make and break device with which the thermostatic member 42 cooperates will be maintained and cause said thermostatic member to heat up and flex the thermostatic strip in such wise as to actuate the make and break device and interrupt the circuit. The second circuit for maintaining the solenoid energized will also be broken and, consequently, the solenoid will be de-energized and the mercury tube tilted, thereby rendering the entire apparatus, except the blower, inoperative. By having the safety device 39 timed to separate in say two minutes and having the thermostatic member 42 so arranged as to require the passage of current therethrough for say four minutes before being flexed the thermostatic member cannot put the apparatus out of operation so long as the first mentioned contacts of safety device 39 are held separated by heat within the boiler.

The make and break device which is adapted to be actuated by thermostatic member 42 is fully described in my copending application Serial No. 6,909. For present purposes it is only necessary to describe it as being composed of a fixed contact 54 and a movable contact 55 carried by a flexible resilient member 56 which can be forced away from the fixed contact by the thermostatic member to separate the two contacts. Likewise, the mercury switch is shown and described in a copending application of mine. This need only be described as consisting of the tube 31ª carried in suitably pivoted clips 57 adapted to be rocked by the solenoid. The tube 31ª contains a body of mercury which will be caused to move toward one end and bridge contacts 30, 32 when the solenoid is energized but which will be moved to the opposite end to break the circuit when the solenoid is de-energized.

To regulate the temperature to which water in boiler 10 may be heated, thermostat 37 is arranged so as to be affected by the heat of the water. Said thermostat can readily be set for any desired temperature which, when reached, will affect the former and break the solenoid energizing circuit thereby rendering the system inoperative. When the temperature of the water drops sufficiently the thermostat will reestablish the circuits (the manually operable switches

not having been opened) and the boiler will again be placed in operation.

As before pointed out, a combined system for operating the boiler 10 and incinerator 16 is contemplated in the present instance, wherefore, means are provided for supplying the burner of the incinerator with fuel from pipe 20 and air from blower 14 and providing a circuit including spark plug 18 of the incinerator. Various valve and switch arrangements for accomplishing this could, of course, be developed, but the arrangement which has been found most practicable up to the present time and which is, therefore, preferred consists of the following:

The air conduit 19 for the incinerator is substantially a branch of duct 13 of the boiler and fuel pipes 11 and 17 are branches of main supply pipe 20 both being connected to pipe 20 by a fitting 58 embodying a three-way valve 59. The stem 60 of this valve extends through the casing 61 to switch 51 and has mounted thereon the plate 54 which serves to bridge the gaps between the various contact members of said switch. The plate is mounted on the valve stem 60 so that when valve 59 is turned to supply fuel to the boiler, the contacts 50, 52 will be connected to supply current to the boiler burner. On the other hand, when valve 59 is turned to supply fuel to the incinerator burner, plate 54 will also be moved to connect contact 50 with a contact 62 of switch 51, said contact being connected by wire 63 to the spark plug of the incinerator burner. For convenience in operation it is also prefered that the stem 60 of valve 59 carry a valve 64 controlling the flow of air through ducts 13 and 19, this valve 64 being mounted on said stem in such manner that when fuel is flowing through pipe 11 duct 13 will be connected to the blower while if valve 59 is turned to supply fuel to pipe 17, duct 19 will be connected to the blower. In this way the supply of air, fuel and electricity can be simultaneously, and, therefore, conveniently and quickly, supplied either to the boiler burner or to the incinerator burner.

As has been before pointed out, the thermostat 37 controls the burner for the boiler but in the case of the incinerator, a timing mechanism is provided for rendering the burner inoperative. Any form of mechanism of this character may be employed, a clock 65 in the present instance being shown connected to the flexible strip 56 for effecting a separation of contacts 54, 55 to interrupt the solenoid energizing circuit.

When it is desired to start the incinerator, the plate 54 of switch 51 is moved as before explained and snap switch 53 in parallel with switch 51 in line 40 is also closed. This will complete the spark circuit but as soon as the snap switch is reversed, the spark circuit will be broken, combustion continuing due to the heat generated in the burner.

What I claim is:

1. In a system such as described, a boiler, an incinerator, a burner for each of said elements, fuel supply connections for delivering fuel to each of said burners, a spark plug in each burner, normally inoperative electrical connections for said spark plugs, air supply connections for each burner, a valve controlling flow of fuel through said connections to direct it to either of said burners, a switch for closing the circuit of either of said spark plugs, a valve for controlling the flow of air though the air supply connections, and common operating connections for the switch, air valve and fuel valve for rendering the spark plug circuit operative and for establishing a flow of fuel and air to either of said burners.

2. In a system such as described, a boiler, an incinerator, a burner for each of said elements, fuel supply connections for delivering fuel to each of said burners, a spark plug in each burner, normally inoperative electrical connections for said spark plugs, air supply connections for each burner, a valve for controlling the flow of fuel to either of the burners, a valve stem, a switch for closing the spark plug circuit of either burner, said switch comprising a circuit making and breaking element carried on said valve stem, and a valve on said valve stem for controlling the supply of air to either of said burners.

3. In a system such as described, a boiler, an incinerator, a liquid fuel burner in each of said elements, supply connections for supplying fuel to each of said burners, normally inoperative means in each burner for igniting fuel supplied thereto, control means for simultaneously directing the fuel to one of said burners and rendering the ignition means therein operative and, at the same time, rendering the ignition means of the other burner inoperative and cutting off the supply of fuel to the latter, automatic means for rendering the burner for the boiler inoperative upon failure of initial combustion of the fuel therein and means for rendering said burner inoperative when the water in the boiler has reached a predetermined temperature.

4. In a system such as described, a boiler, an incinerator, a liquid fuel burner in each of said elements, supply connections for supplying fuel to each of said burners, normally inoperative means in each burner for igniting fuel supplied thereto, control means for simultaneously directing the fuel to one of said burners and rendering the ignition means therein operative and, at the same time, rendering the ignition means of the other burner inoperative and cutting off the

supply of fuel to the latter, means for rendering the boiler burner temporarily inoperative when the temperature of water in the boiler reaches a predetermined degree, and time controlled means for rendering the incinerator burner inoperative after the same has been in operation for a predetermined length of time.

5. In a system such as described, a boiler, an incinerator, a liquid fuel burner in each of said elements, supply connections for supplying fuel to each of said burners, normally inoperative means in each burner for igniting fuel supplied thereto, control means for simultaneously directing the fuel to one of said burners and rendering the ignition means therein operative and, at the same time, rendering the ignition means of the other burner inoperative and cutting off the supply of fuel to the latter, and time controlled means for rendering the incinerator burner inoperative after said burner has been in operation a predetermined length of time.

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