

Sept. 21, 1926.

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I. E. SMITH

OIL BURNER CONTROL SYSTEM

Filed Jan. 25, 1926

Fig. 1

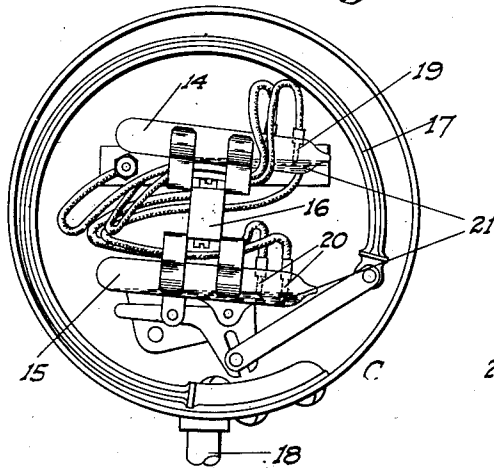


Fig. 2

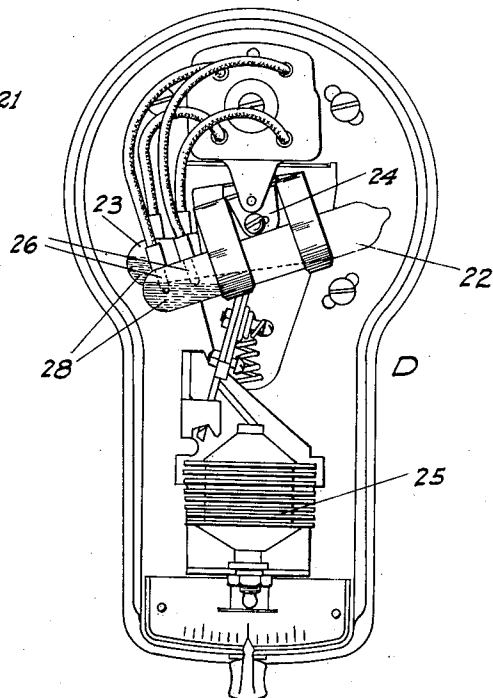


Fig. 3

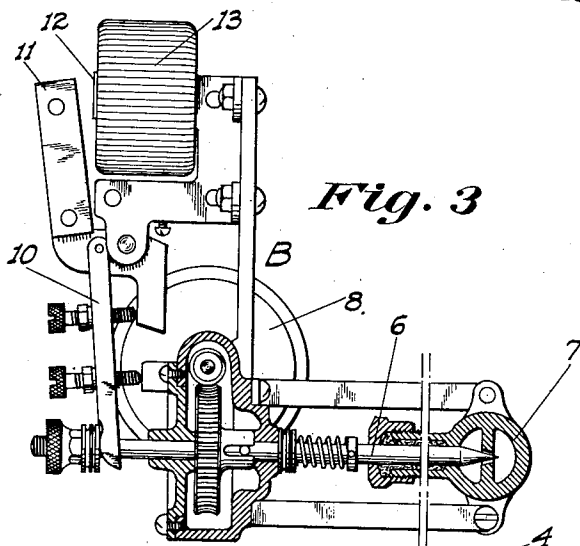
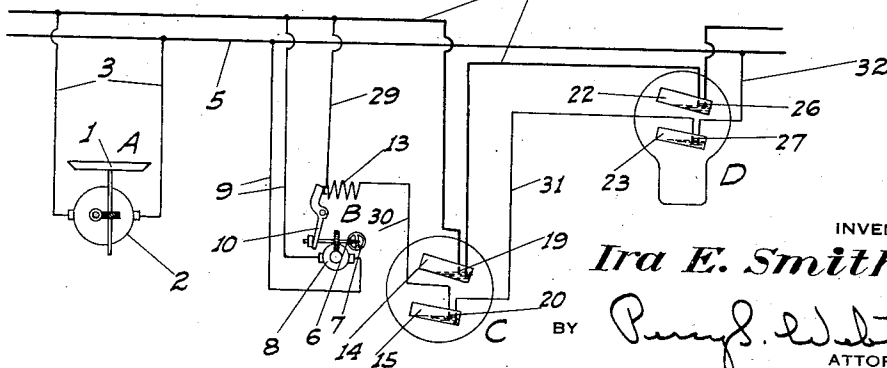


Fig. 4



INVENTOR

Ira E. Smith

BY

Paul Webster
ATTORNEY

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UNITED STATES PATENT OFFICE.

IRA E. SMITH, OF STOCKTON, CALIFORNIA.

OIL-BURNER-CONTROL SYSTEM.

Application filed January 25, 1926. Serial No. 83,684.

This invention relates to improvements in oil burning systems and particularly to such systems as employ electric motors for operating the burner and feeding oil thereto, of which systems there are now a number on the market.

The fire of such burners is sometimes controlled by thermostatically operated means but as far as I am aware, such means operates to either keep the fire at a single predetermined degree in intensity or else causes the fire to go out entirely. If for some reason the fire should not go out or the heat should continue to rise regardless of the operation of the single thermostat means there is nothing provided to insure the discontinuation of burner operation under such conditions.

The principal object of my invention therefore is to provide a control system which may be applied to any electrically operated oil burner by means of which when a predetermined heat caused either by the operation of the burner or by other causes is reached, the fire of the burner is automatically lessened in intensity, but the fire is not put out; when the heat is lowered by reason of the decreased fire said fire is again automatically increased in intensity to its original degree; and if for any reason the heat generated by the burner or present from other causes should fail to be decreased with the above first named automatic operation, the operation of the oil burner will be entirely discontinued and the fire caused to go out only when such increase in heat reaches a predetermined excessive and possibly a dangerous degree.

While this system may be used in connection with any electrically driven oil burners, such as used to generate steam for power purposes, I have particularly in mind to employ this system in connection with an oil burning building heating plant.

A further object of the invention is therefore to arrange the system in such a manner that the burner will be controlled as above described either by heat conditions at or adjacent the burner or in any room being heated, and relatively remote from the burner room.

In carrying out the present invention I preferably make use of thermostat switches, such as shown in my co-pending application for patent Serial No. 28,847, filed May 8th,

1925, and the oil valve controlling unit such as is shown in my co-pending application, Serial No. 34,065, filed June 1st, 1925, as will be hereinafter evident.

A further object of the invention is to produce a simple and inexpensive device and yet one which will be exceedingly effective for the purpose for which it is designed.

These objects I accomplish by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

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

Fig. 1 is a side elevation of a thermostat switch used in connection with my system to be operated by steam or hot water.

Fig. 2 is a side elevation of a thermostat switch to be operated by hot air.

Fig. 3 is a sectional elevation of an oil valve controlling unit.

Fig. 4 is an electric diagram of the system shown in connection with an oil burner.

Referring now more particularly to the characters of reference marked on the drawings, A represents the oil burner unit which includes a burner plate 1 driven by an electric motor 2 which as usual also controls the pumping of oil to the burner. Wires 3 to the motor are connected to the main current lines 4 and 5.

B represents the valve unit for controlling the flow of oil to the burner; C denotes the boiler or heating plant thermostat switch unit, operated by steam or hot water; and D represents the room thermostat switch unit operated by hot or warm air.

The valve controlling unit which is described and claimed in detail in my co-pending application, Serial No. 34,065 mentioned above, comprises essentially a needle valve stem 6 to cooperate with a valve 7 of suitable character interposed in the oil supply line to the burner line.

The stem 6 is never completely closed in the valve 7 and is continually rotated by a motor 8 which is connected to the main lines 4 and 5 by wires 9.

The operation of this motor or the rotation of the stem however does not affect the operation of the present system.

An arm 10 pivoted intermediate its ends in a fixed position relative to the valve is connected at one end to the outer end of the

stem 6. The opposite end of the arm is formed as an armature 11 arranged for movement to and from the core 12 of a coil magnet 13. These parts are so arranged 5 that when the magnet is energized and the armature is drawn toward the core the stem is moved to open the valve 7 wide. When the magnet is deenergized the armature drops away from the magnet causing the stem 6 to approach its closed position in the valve. 10

The thermostat switch unit C includes a pair of tubes 14 and 15 mounted in common at different but adjustable slants relative to a longitudinal horizontal plane on a 15 pivoted support 16. The slope of the tube 14 is greater than that of the tube 15.

The support 16 is operatively connected to the free end of a Bourdon tube 17 of common character whose opposite end is connected to a steam or hot water pipe 18 of the heating or power plant. Spaced contacts 19 and 20 depend into the tubes 14 and 15 respectively adjacent their lower ends, being 20 normally engaged by a quantity of mercury 21 in the tubes.

The parts of this structure which are fully set forth in my co-pending application, Serial No. 28,847 mentioned above are so 30 arranged that the mercury continually engages said contacts as long as the Bourdon tube 17 is slack or idle. When said tube expands under the influence of steam or hot water, the contact tube unit rotates to neutralizer and finally reverse the direction of 35 slant of said contact tubes. This causes the mercury in said tubes to flow toward the opposite end of the same, leaving the contacts 20 in the tube 15 first, and leaving the contacts 19 in the tube 14 only after a 40 further expansion of the Bourdon tube has taken place.

This, as will be evident, is because the slope of the tube 14 is initially greater than 45 that of the tube 15, necessitating a greater turning of the former before its slope is reversed.

The switch unit D also described in detail in said co-pending application, Serial No. 50 28,847 comprises two tubes 22 and 23, which are mounted at different but adjustable slopes relative to each other on a pivoted support 24. The slope of the tube 22 is greater than that of the tube 23. The support 24 is operatively connected to an ex- 55 pansible bellows 25, containing an expansible fluid influenced by heat. The parts of this structure are so arranged that the support 24 will be rotated by the expanding of the bellows in the manner to cause the slope 60 of the tubes 22 and 23 to be first neutralized and then reversed.

Spaced contacts 26 and 27 depend into the tubes 22 and 23 respectively adjacent 65 the lower ends thereof, said contacts being

normally engaged by a quantity of mercury 28 in said tubes. With this unit also as the bellows expands and the support 24 and the tubes mounted thereon rotate, the mercury in the tube 23 first leaves the con- 70 tacts 27 and then the mercury in the tube 22 leaves the contacts 26 only after a greater amount of expansion of the bellows has taken place.

The switches and unit B are wired in connection with each other and with the main lines 4 and 5 as follows: 75

A wire 29 from one end of the magnet 13 is connected to the line 4, the wire 30 from the other end of said magnet being connected to one of the contacts 20. A wire 31 from the other contact 20 is connected to one of the contacts 27 in the tube 23. 80

The wire 32 from the other contact 27 is connected to the main line 5. 85

It will therefore be seen that as long as the contacts 20 and 27 are closed the magnet will be energized and the valve 7 opened wide and held opened, allowing a great flow of oil to the burner and consequently causing 90 a fire of great but adjustable intensity to be had.

As soon as either tube 15 or 23 rotates sufficiently to cause the mercury to leave the respective contacts the circuit to the magnet 95 will be broken and the stem 6 will move toward a closed position in the valve, as previously described.

The flow of oil to the burner will be thus decreased, although not entirely cut off and the fire will consequently be automatically 100 lessened in intensity.

The operation of the motors 2 and 8 is not however interfered with so far, since these motors are wired direct to the main 105 line, the circuit of which is not affected by reason of the tubes 15 and 23.

The contacts 19 and 26 of the tubes 14 and 22 however are interposed in spaced relation in the main line 4 as shown in Fig. 4. Therefore should the lessened volume of fire (or the failure of this feature to function) fail for any reason to cause the heat generated by the burner or in a room heated by reason of the operation of the burner to 115 decrease but rather be increased, the Bourdon tube or bellows 25 will continue to expand. This will cause a continued rotation of either contact tube unit, causing the mercury to finally flow either from the contacts 19 or 26, depending upon whether 120 this greater heat is adjacent one unit or the other.

Either condition causes a break in the main line, as will be evident. The motor 2 125 will therefore stop, which will stop the burner and automatically cause the pumping of oil to the burner to cease. The fire will therefore go out and the motor cannot be again started until the heat has been de- 130

creased sufficiently adjacent both thermostat switch units to again cause the main line to be closed.

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 construction of the device, 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. A control system for an oil burner operated by an electric motor, there being main line wires to which the motor is connected; comprising an oil control valve structure, electrically actuated means for opening and holding the valve open, a circuit for said means connected to the main line, a normally closed thermostat switch in the circuit opened under the influence of a predetermined degree of heat, and a further normally closed thermostat switch interposed in the main line and mounted in connection with the first named switch; said last named switch being arranged to open only under the influence of heat a predetermined degree in excess of that necessary to open the first named switch.

2. A control system for an oil burner operated by an electric motor, including a normally open oil supply valve, means for normally holding the valve open, thermostatic means controlling the operation of said valve holding means to cause the valve to move toward a closed position when a predetermined heat is reached, a circuit for the motor, and thermostatic means for causing the motor circuit to be broken with a degree of heat a predetermined amount in excess of that necessary to actuate the first named thermostat means.

3. A control system for an oil burner

operated by an electric motor, including a normally open oil supply valve, means for normally holding the valve open, separated but interconnected thermostat means independently controlling the operation of said valve holding means to cause the valve to move toward a closed position when a predetermined degree of heat is present at either of the thermostatic means, a circuit for the motor, and further separated thermostatic means disposed adjacent said first named thermostat means for independently causing the opening of the motor circuit when a temperature adjacent either of said further thermostatic means is reached a predetermined degree in excess of that causing the first named thermostat means to function.

4. A control system for an oil burner operated by an electric motor, including a normally open oil supply valve, electrical means for opening and for holding the valve open, a circuit for said means, thermostatic means acting to open the circuit when a predetermined heat is reached, means then causing the valve to move toward a closed position, a circuit for the motor, and independent thermostatic means acting to open the motor circuit with a degree of heat in excess of that necessary to actuate the first named thermostat means.

5. A control system for an oil burner operated by an electric motor, comprising a normally open oil supply valve, an electro-magnet operating when energized to hold the valve open, means acting to close the valve when the electro-magnet is deenergized, a circuit for the electro-magnet, a normally closed thermostat switch interposed in said circuit and opened when a predetermined heat is reached, a circuit for the motor, and another thermostat switch in the motor circuit acting to open the same with a degree of heat a predetermined amount in excess of that necessary to cause the first named thermostat switch to open.

In testimony whereof I affix my signature.

IRA E. SMITH.