Jan. 11, 1938. H. E. WOOLERY 2,104,940

OIL BURNER

Filed Sept. 12, 1936

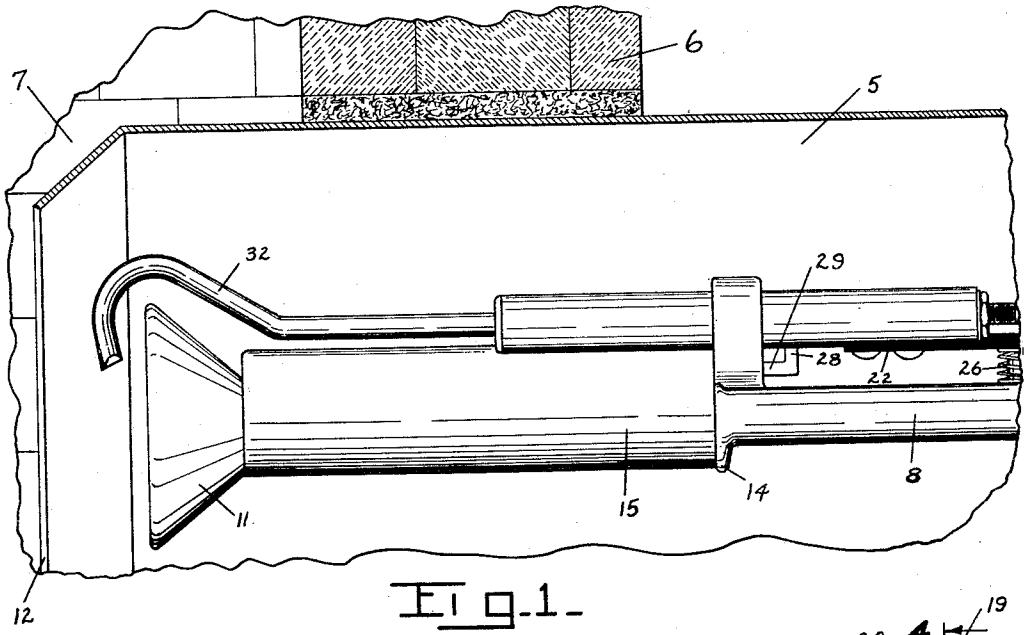

Fig. 1.

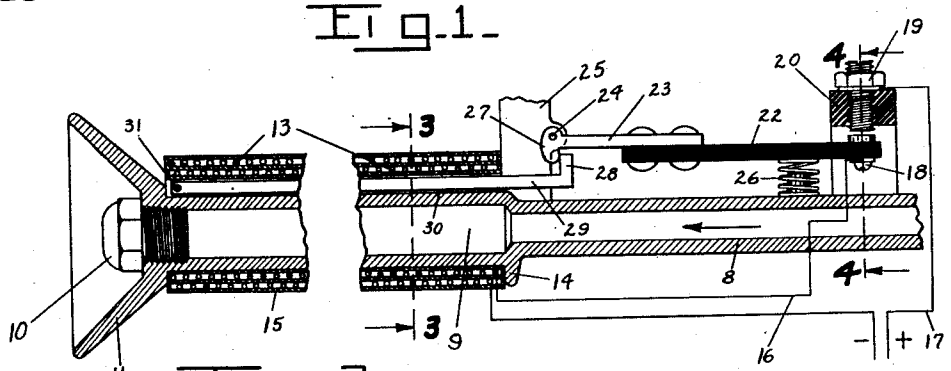

Fig. 2.

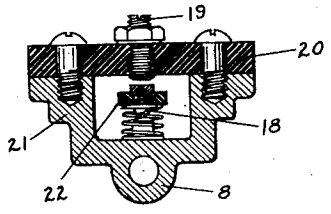

Fig. 4.

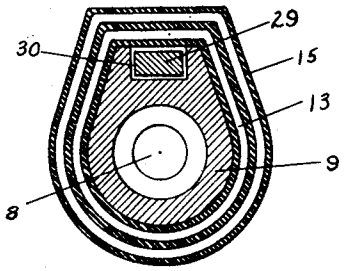

Fig. 3.

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OIL BURNER

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12 Claims. (Cl. 219—38)

This invention relates to oil burners, and the main object is to provide means of a novel, efficient, and practical nature for preheating and maintaining at a predetermined temperature the fuel spray nozzle of the burner whereby the fuel oil passing through the nozzle may be heated to a degree that will facilitate flowage, vaporization, ignition, and combustion, and thereby permit the use of relatively cruder and cheaper grades of commercial hydrocarbon fuel, which grades of fuel are known to possess high B. t. u. heat factors but which present difficulties to proper atomization and vaporization due to their dense and relatively heavy consistency. A further object is to design the preheating nozzle with a heat conductive element at its forward end, which element will serve to protect the electric heater from heat radiated from the combustion chamber, and will also serve to absorb such heat and conduct it into the nozzle proper whereby the oil preheating action may be continued under the influence of radiant heat from the fire box after the burner has been functioning for a predetermined period and at which time the preheater may be de-energized. The preheater as herein disclosed comprises an electric heating element intimately associated with the nozzle so as to directly heat the same, and the electric circuit to the element is automatically opened and closed by a thermostatically operated switch, which is also intimately associated with the nozzle so as to be responsive to the temperature condition thereof. More specifically the automatic switch is designed to open or break the circuit to the heating element when conditions are such as to insure sufficient nozzle heating by radiant heat without assistance from the electric heating unit, and also to close the circuit to again energize the heating unit either when the burner is again initially started or when the radiant heat is insufficiently intense to maintain the desired nozzle temperature during normal functioning of the burner.

The present structure embodies various features which are illustrated and described in my co-pending application Ser. No. 66,552, filed March 2nd, 1936, for Oil burner, and to that extent the present application is a continuation, in part, of said earlier application.

In the accompanying drawing, which illustrates a preferred embodiment of the invention:

Fig. 1 is a side elevation of my improved nozzle construction, with adjacent burner and furnace parts in section.

Fig. 2 is a sectional elevation taken diametrically and longitudinally through the nozzle unit, with a portion broken away.

Fig. 3 is an enlarged sectional elevation on the line 3—3 in Fig. 2.

Fig. 4 is a sectional detail elevation on line 4—4 in Fig. 2.

Referring to the drawing more particularly and by reference characters, 5 designates the tubular front end portion of the burner unit housing, which housing extends through the fire box wall 6 of the furnace or boiler and opens at its front end into the combustion chamber 7 formed by such wall.

Disposed axially within the burner tube or housing 5 is a fuel supply pipe 8 which terminates in an enlarged portion forming the nozzle body proper 9, to which the fuel is fed from the pipe 8. A spray control head 10 is threaded into the front end of the nozzle and may be of any conventional or suitable type capable of projecting the fuel in spray form for combustion in the chamber 7. The nozzle 9 is provided at its forward end and about the head 10, with an integral, forwardly flared annular flange 11, which has for its primary purpose to absorb heat radiated from the combustion chamber 7 back through the front opening 12 of the tube 5, and to conduct such heat into the material of nozzle 9 so as to in turn increase or raise the temperature of oil in the nozzle chamber before such oil is projected through the control head 10 and into spray form within the combustion chamber 7. Another function of the flange 11 is to prevent the aforesaid radiant heat from directly impinging upon and destructively effecting the high resistance electric heating element 13 which annularly encloses the nozzle 9. This element may be of any suitable type, and extends from the flange 11 rearwardly to a second flange or shoulder 14, and is preferably provided with an insulating cover 15.

The electric heating element 13 is connected by circuit wires 16 and 17, to terminals 18 and 19 of the thermostatically operated switch, and this circuit will also include a suitable current, source, and other thermostat and control devices which may be found desirable to connect with the burner apparatus.

The terminal point 19 is adjustably secured in an insulate cross bar 20 mounted on a yoke 21 extending upwardly from tube 8, and the terminal 18 is secured in the insulate extension 22 of a lever 23 which fulcrums at 24 to a stationary lug 25. A spring 26 tends to hold the long end of the lever 23 up with the terminals 18 and 19 in

contact with each other, in which event the circuit to the heating element 13 is closed.

At its forward end the lever 23 has a short depending arm 27 for engagement with an upstanding finger 28 of a bar 29. This bar is disposed in a channel 30 formed longitudinally in the nozzle material and the front end of the bar is secured as at 31, to the front portion of the nozzle. The bar 29 is made of invar metal or some other material having a very low coefficient of expansion while the nozzle is formed of metal having a relatively high coefficient of expansion, with a result that appreciable changes in nozzle temperature will be effective to cause a longitudinal movement of the bar finger 28, and when this occurs the mechanism will be operative in association with the spring 26 to open and close the circuit to the electric heating element.

The numeral 32 designates an electrode device for igniting the fuel spray discharged from the nozzle head 10, and this device is connected up with the ignition control mechanism so as to create an ignition spark at the proper moment. The electrode design and its control mechanism, however, form not part of the present invention, and are therefore not here disclosed or described in detail.

From the foregoing it will be understood that when energized the heating unit 13 will be operative not merely to heat the nozzle and fuel oil therein to facilitate flowage, but will do so immediately before such fuel is to be projected from the spray head 10. This is an important consideration because when the burner is cold preheating of the fuel at a point spaced back of the point of discharge will not assist to clear the oil of thicker consistency which has or may have previously accumulated in the spray head. It is of course desirable to provide a control mechanism which, for instance when a room thermostat calls for heat, will close the heating element circuit for a brief period before the fuel pressure and ignition mechanism is brought into play. This will insure and facilitate initial flowage, vaporzation, ignition and combustion. When the nozzle body or tube is heated to a predetermined high degree of temperature, either by the electric heating element or by the radiant heat of the combustion chamber acting on flange 11, then the thermostatic bar 29 will actuate the lever 23 to break the circuit through terminals 18 and 19 to deenergize the heater 13. Under ordinary circumstances the absorbed radiant heat will thereafter be sufficient to maintain the desired minimum nozzle temperature. Where, however, such a condition does not prevail, then the resulting cooling of the nozzle will automatically effect reclosing of the heating circuit to again electrically heat the nozzle to the desired temperature, thus restoring the oil preheating condition essential when using the cruder and heavier bodied hydrocarbon fuel.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described my invention, what I claim to be new and desire to protect by Letters Patent is:

1. The combination with the fuel spray nozzle of an oil burner, of an electric heating element for heating said nozzle and the fuel therein to facilitate atomization of the oil as it is projected in a spray from the nozzle, and thermally actuated means closely associated with so as to be responsive to the temperature of the nozzle, for controlling a circuit to the electric heating element.

2. The combination with the fuel spray nozzle of an oil burner, of an electric heating element for heating said nozzle and the fuel therein to facilitate atomization of the oil as it is projected in a spray from the nozzle, a circuit for supplying the electric heating element, and means, responsive to the temperature of the nozzle, for automatically opening and closing the circuit when the temperature of the nozzle cools below or is heated above an approximate predetermined degree.

3. The combination with the fuel spray nozzle of an oil burner, of an electric heating element for heating said nozzle and the fuel therein to facilitate atomization of the oil as it is projected in a spray from the nozzle, a circuit for supplying the electric heating element, a switch in the circuit, and thermostatically actuated means, arranged in a position to be sensitive to the temperature of the nozzle, for opening the switch to break said circuit.

4. The combination with the fuel spray nozzle of an oil burner, of an electric heating element for heating said nozzle and the fuel therein to facilitate atomization of the oil as it is projected in a spray from the nozzle, a circuit for supplying the electric heating element, a switch in the circuit, and thermostatically actuated means, arranged in a position to be sensitive to the temperature of the nozzle, for automatically opening and closing the switch to thereby maintain a predetermined uniform nozzle temperature while the burner is being operated.

5. The combination with a burner nozzle, of means for heating the nozzle to facilitate vaporization of the fuel to be projected therefrom, a bar disposed longitudinally of the nozzle and attached at one end to the nozzle with its other end free to move longitudinally, said bar having a different coefficient of expansion than the nozzle, and means associated with said other end of the bar for controlling said heating means.

6. The combination with a burner nozzle, of means for heating the nozzle to facilitate vaporization of the fuel to be projected therefrom, a bar disposed longitudinally of the nozzle and attached at one end to the nozzle with its other end free to move longitudinally, said bar having a different coefficient of expansion than the nozzle, and means associated with said other end of the bar for controlling said heating means, said heating means annularly enclosing the nozzle and bar.

7. The combination with a burner nozzle of an electric heating element extending annularly about the nozzle to heat the same, a circuit for supplying the heating element, a switch in the circuit, and a thermostatically responsive strip disposed between the nozzle and said heating element, said strip being associated with the switch to open the latter when the strip is heated to a predetermined temperature.

8. A fuel spray nozzle for an oil burner comprising a tubular member terminating in an ejector head, said tubular member having a longitudinal extending recess, an electric heating element disposed about the nozzle and annularly enclosing said recess, a thermostatic bar disposed in said recess, so as to be responsive to the temperature of said nozzle member, and extending at one end beyond the heating element, a circuit for supplying the heating element, and a

switch in said circuit operatively connected with said bar end for actuation thereby.

9. An oil burner having a nozzle for projecting fuel into a combustion chamber, and disposed with respect to the chamber in such manner as to receive and absorb radiant heat therefrom, means other than said radiant heat for heating the nozzle, and thermally responsive means arranged to be influenced by the temperature of the nozzle, for rendering inactive said nozzle heating means.

10. An oil burner having a nozzle for projecting fuel into a combustion chamber and disposed with respect to the chamber in such manner as to receive and absorb radiant heat therefrom, means other than said radiant heat for heating the nozzle, and thermally responsive means arranged to be influenced by the temperature of the nozzle, for rendering inactive said nozzle heating means, said nozzle being provided at its forward end with a flared flange facing the combustion chamber so as to facilitate the absorbtion and conduction of such radiant heat to the nozzle.

11. The combination with an oil burner having a nozzle for projecting a fuel spray into a combustion chamber, of an electric heating element surrounding the nozzle to heat the same and the fuel passing therethrough, a flange member projecting integrally and outwardly from the nozzle and forwardly of the heating element, to absorb heat radiating from the combustion chamber and for transmitting such heat to the body of the nozzle, a thermostat circuitously connected with the electric heating element and arranged so as to be responsive to the temperature of the nozzle, said thermostat being operative to control the circuit to said heating element.

12. The combination with a nozzle for directing a fuel spray into a combustion chamber, of a heating element disposed annularly about the body of the nozzle, an annular flange extending in flared form forwardly from the front end of the nozzle to absorb radiant heat from the combustion chamber and conduit it to said nozzle body, said flange extending radially outwardly of the heating element to protect the latter from direct action of such radiant heat.

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