July 1, 1958 G. H. MESSER 2,841,215

OIL BURNER ASSEMBLY INCLUDING AN OIL PREHEATER

Filed June 26, 1952 4 Sheets-Sheet 1

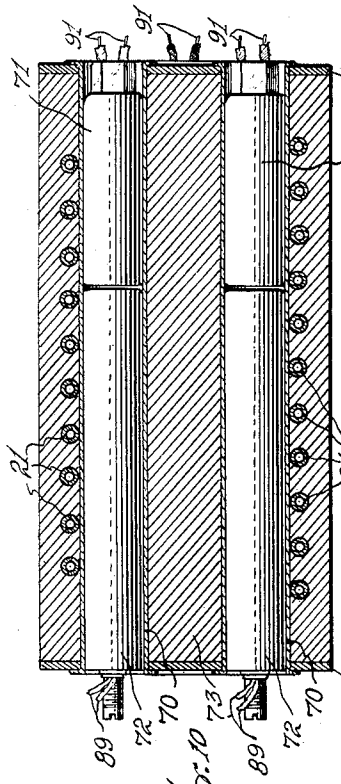


Fig. 10

Fig. 1

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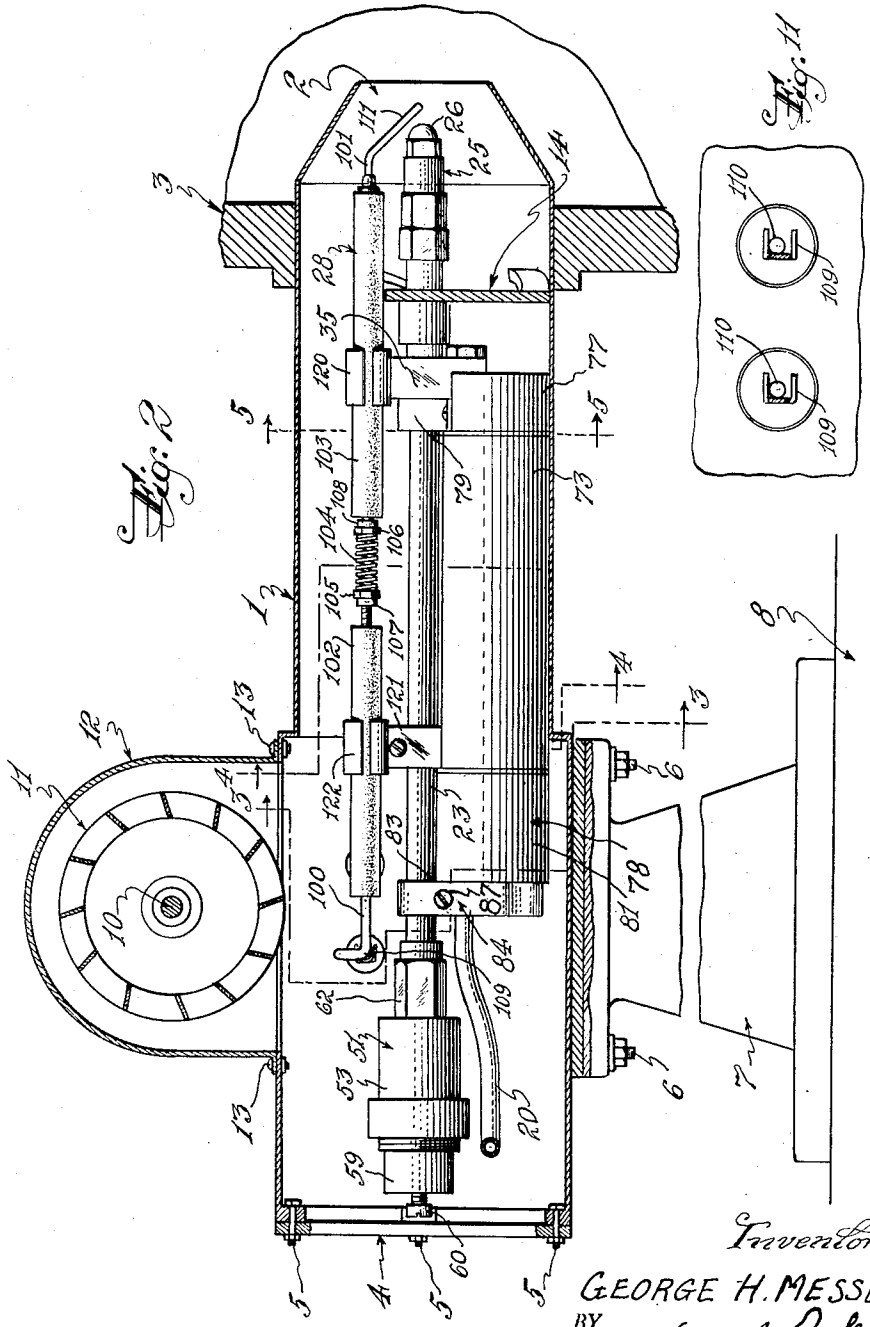


Fig. 2

Fig. 11

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OIL BURNER ASSEMBLY INCLUDING AN OIL PREHEATER

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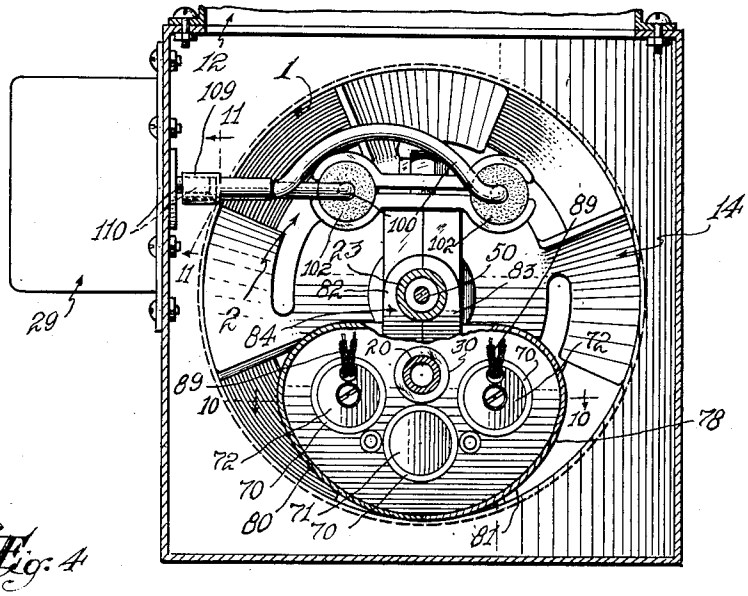


Fig. 3

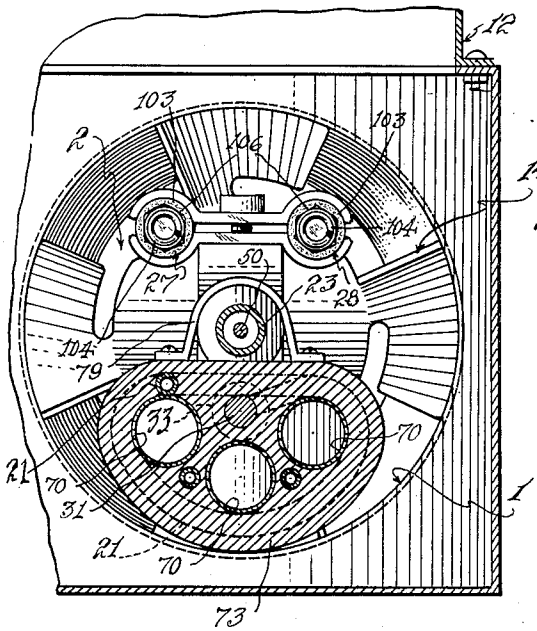


Fig. 4

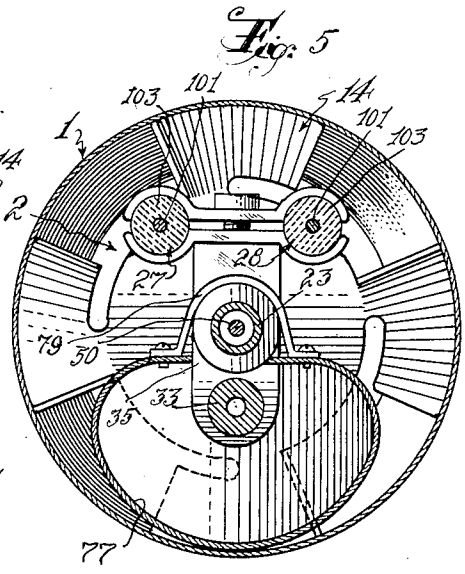


Fig. 5

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OIL BURNER ASSEMBLY INCLUDING AN OIL PREHEATER

Filed June 26, 1952 4 Sheets-Sheet 4

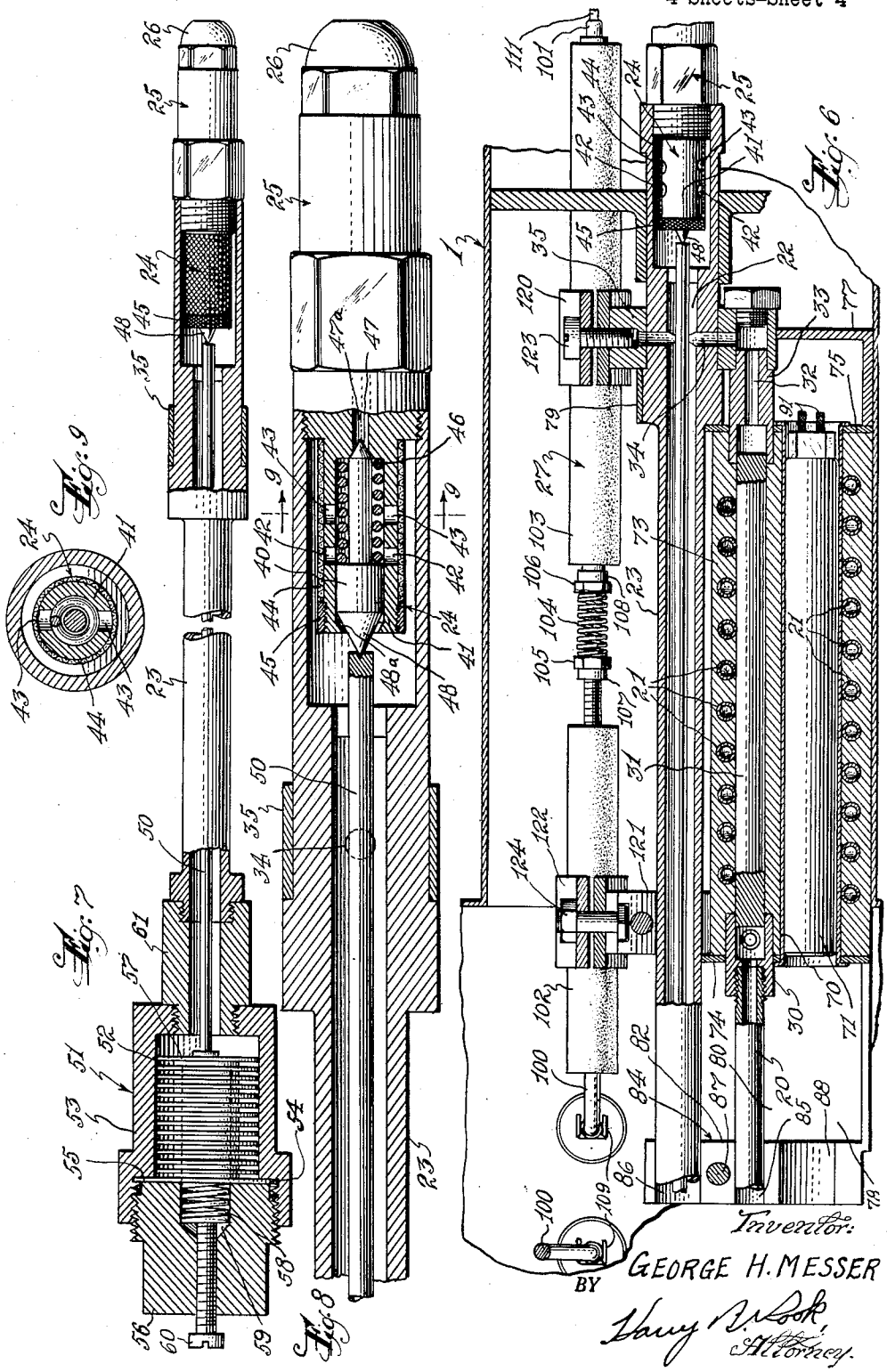


Fig. 6

Fig. 9

Fig. 7

Fig. 8

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United States Patent Office 2,841,215 Patented July 1, 1958

2,841,215

OIL BURNER ASSEMBLY INCLUDING AN OIL PREHEATER

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Application June 26, 1952, Serial No. 295,679

2 Claims. (Cl. 158—36)

My invention relates to oil burners and has particular reference to a novel and improved form of injector unit and to the oil preheater and electrode members included within such unit.

It is an object of my invention to provide in an oil-burner assembly a novel and improved form of injector unit which includes an oil preheater as a component part, and wherein the oil supply line for the preheater is included within such injector unit and comprises a tubular member having a valved nozzle at one end and a pressure responsive device in said tubular member for controlling the flow of oil through said nozzle and the preheater shall have its oil coils and heater elements imbedded in a heat conducting metal which is molded about these parts and mounted on the underside of said tubular member intermediate the length thereof and in close proximity to said pressure responsive means and said valved nozzle, and wherein is embedded an elongated thermostatic control switch for an electrical circuit for said heating element.

Other objects and advantages of my invention will appear as the course of the specification progresses.

To attain the objects and advantages of my invention, I provide a removable and insertable unit for an oil burner comprising the usual injector nozzle, a long tubular member communicating with the nozzle and having a finned turbulator mounted thereon at one end, an oil preheater mounted on one side of the tubular member, an oil supply line for such preheater, a terminal box for the leads from the electrical elements of the preheater mounted on the supply line to plug connect with a stationary terminal box mounted on the oil burner cover, and a pair of electrode members for igniting the oil ejected from the nozzle mounted on the other side of such tubular member. The oil preheater includes a plurality of oil heating coils and suitably encased electrical heating elements, which coils and heating elements are imbedded in a heat conducting metal molded about these parts. The electrode members each include an aligned pair of elongated conducting elements which are mounted in a pair of non-conducting encasing members having a fixed spacial relationship to each other. One conducting element is fixedly mounted in one non-conducting encasing member while the other element is slidably mounted in the other non-conducting encasing member. The opposed ends of such conducting elements are connected by a conducting spring such that the slidable conducting element may be moved longitudinally in its non-conducting encasing member without breaking the electrical connection between the two conducting elements.

In the accompanying drawings:

Fig. 1 is a horizontal sectional view of an oil burner embodying the features of my invention;

Fig. 2 is a vertical longitudinal sectional view of the burner of Fig. 1;

Fig. 3 is a cross-sectional view taken on the plane of the line 3—3 of Fig. 2;

Fig. 4 is a cross-sectional view taken on the plane of the line 4—4 of Fig. 2;

Fig. 5 is a cross-sectional view taken on the plane of the line 5—5 of Fig. 2;

Fig. 6 is a vertical longitudinal view taken on the plane of the line 6—6 of Fig. 1;

Fig. 7 is a side elevational view partially in section of the nozzle, the connecting tubular member and bellows;

Fig. 8 is an enlarged side elevational view partially in section of the nozzle and a portion of the connecting tubular member and showing the valve mechanism for controlling the flow of oil through the nozzle;

Fig. 9 is a cross-sectional view taken on the plane of the line 9—9 of Fig. 8;

Fig. 10 is a horizontal sectional view of the preheater taken on the plane of the line 10—10 of Fig. 3;

Fig. 11 is a view taken on the plane of the line 11—11 of Fig. 3 and showing the electrode terminals in their connected positions.

Referring to the drawings, reference character 1 designates the outer casing of the oil burner which casing has an opening 2 at one end to permit ignited oil to be ejected through such opening into a furnace 3, and has an end cover 4 removably secured to its other end as by bolts 5. Casing 1 is secured by bolts 6 to a pedestal 7, the pedestal being secured to the floor 8 for mounting the oil burner in a fixed position with respect to the furnace. Mounted on one side of casing 1 is a motor 9 which is connected by suitable shafting 10 to the usual blower fan 11 for supplying sufficient air to the combustion area. Blower fan 11 is provided with a housing 12 which is secured to casing 1 by screws 13. A finned air turbulator 14 is provided in the path of the air current generated by the blower fan. Such air turbulator is preferably formed to impart a swirling motion to the air and in this manner create a low pressure at the center of the swirl in the ignition area. Motor 9 is also connected by shafting 10 to an oil pump 15 so that the motor may be utilized to drive both the blower fan and the pump.

Oil pump 15 is utilized to deliver oil under pressure through a supply line 20 to the helical coil of heat conducting tubing 21 of a preheater and thence through an opening 22 in a tubular member which includes a tube 23, a fitting 61 and a bellows housing formed of fittings 53 and 56 and from opening 22 the oil flows past valve 24 to the ejection nozzle 25 which is integrally formed with valve 24. The oil is in this manner forced through nozzle 25 and out of nozzle tip 26, the oil being ignited a short distance beyond the nozzle tip by a spark between corresponding ends of electrode members 27 and 28. Electrode members 27 and 28 have their other ends connected to a transformer 29 which is included in the oil burner control circuit (Fig. 3).

As already noted supply line 20 is connected to the coil 21 of the preheater. Such connection is made through a suitable fitting 30, which is secured to supply line 20 and longitudinal member 31. It has also been noted that coils 21 connect with an opening 22 in tubular member 23. This connection is made through a longitudinal opening 32 in a fitting 33 and a vertical opening 34 extending through bracket 35 and said tube 23. Fitting 32 is secured at one end to longitudinal member 31 of the preheater hereinafter described in detail and is secured at its other end in bracket 35 which is secured upon tubular member 23.

Valve 24 controls the flow of oil through ejection nozzle 25. The valve includes a valve plunger 40 which functions in a cylindrical encasing wall 41 having vertical openings 42 and 43 therein and having a screen 44 positioned over the outside surface of wall 41 which screen is held in place by knurled nut 45. Plunger 40 is biased to the left as shown in the drawings by a compression spring 46. When the valve plunger occupies one extreme position in which one end 47 of the plunger is

seated in a longitudinal opening 47*a* in one end portion of the valve the flow of oil through the nozzle is stopped whereas a maximum flow occurs when the other end 48 of the plunger is seated in a longitudinal opening 48*a* in the other end portion of the valve. In the latter event oil flows freely through vertical openings 42 and 43 in wall 41 and thence through longitudinal opening 47*a* to nozzle tip 26. In intermediate positions of valve plunger 40 the flow of oil is restricted to a degree dependent upon the extent to which end 47 of plunger 40 projects within opening 47*a* which is determined by the position of the valve plunger.

The position of valve plunger 40 is controlled through rod 50 housed in said tubular member which rod is effective when moved to the right to project end 47 of plunger 40 into opening 47*a* and when moved to the left permits compression spring 46 to move plunger 40 to the left and withdraw end 47 from opening 47*a*. The position of rod 50 is controlled by a bellows 51 at a point remote from the valve. Bellows 51 includes an expansible diaphram 52 encased within fitting 53. Diaphram 52 has one end 54 positioned between a ridge 55 in fitting 53 and the end of a connecting fitting 56. The other end 57 of the diaphram forms a relatively oil tight connection with the inner wall of fitting 53. The bellows also includes a compression spring 58 which extends through diaphram 52 to abut at one end against end 57 of the diaphram. The other end of spring 58 abuts against the end of an opening 59 in fitting 56. An adjusting screw 60 having a threaded connection with fitting 56 and engaging spring 59 is provided to adjust the amount of compression on that spring. The effect of the bellows is to close valve 24 that is to seat end 47 of the valve plunger in opening 47*a* when the burner is not in operation, the bellows being effective to override compression spring 46. However, when the oil pump is set into operation and oil is admitted to the valve there is a backing up of oil in said tube 23 and pressure is exerted by the oil against end 57 of the diaphram to move rod 50 to the left against the action of spring 58, whereupon valve spring 46 becomes effective to move end 47 of the valve plunger out of opening 47*a* and open the valve. The extent to which adjusting screw 60 is turned into fitting 59 determines the compression force normally exerted by spring 58 and the extent to which valve 24 is opened in the foregoing manner during the operation of the burner. Fittings 53 and 56 have a threaded connection with each other and fitting 53 has a threaded connection with still another fitting 61 which connects with the tube 23.

Preheater coils 21 through which the oil must flow on its way to the nozzle, surround and directly contact a plurality of tubular members 70 suitable for encasing heater elements 71 and for encasing thermostatic elements 72 such as might be used in the oil burner control circuit (not shown). The heater elements may be of the type comprising wire wound on a porcelain spool and enclosed in a metal cartridge with magnesium oxide, for example, the "Chromolax" heater made by Edward L. Weigand of Pittsburgh, Pennsylvania; and the thermostatic elements 72 comprise a metal encased thermally-actuated electric switch, for example, a thermo-switch unit made by Fenwal Inc. of Ashland, Mass. under several patents including Patents Nos. 1,535,751, 2,090,407 and 2,257,990. One of the thermostatic switches 72 is connected in circuit with the oil burner operating mechanism in known manner, while the other thremostatic switch 72 is connected in circuit with the heaters 71 in known manner so that when the starting switch of the oil burner is closed, the heaters 71 first will be energized to heat the oil to a predetermined temperature, whereupon the heaters will be cut off and the oil burner will be started in operation according to the general practice of the art. In accordance with my invention the coils and tubular members are embedded in and directly contact a heat conducting metal 73 such as aluminum which is molded about these parts and longitudinal member 31 between end plates 74 and 75 to provide a highly efficient preheater unit. The preheater is provided with two end cover pieces 77 and 78. End cover 77 is secured to tubular member 23 by U-shaped piece 79. End cover 78 comprises two half sections 80 and 81 which are secured as by welding to half-sections 82 and 83 respectively of a bracket 84 having openings 85 and 86 through which oil supply line 20 and the tube 23 extend. The half sections of the bracket and cover are held in assembled relation by screw 87. Bracket 84 includes another opening 88 through which leads 89 are connected to electrical elements of the preheater and extending from one end thereof may pass. A terminal box 90 is provided for leads 89 and other similar leads 91 extending from the other end of the preheater which terminal box is mounted on supply line 20 in a position to plug connect with a stationary electrical box 92 mounted on casing 1. Casing 1 is provided with a slit 93 so that supply line 20 can be moved with box 90 out of the casing with the rest of the injector unit after removal of end cover 4 provided of course that the oil supply line has been disconnected from the pump as for example, at coupling 94. Preferably the oil preheater is mounted sufficiently close to the nozzle to heat the nozzle by conduction through the parts of the injector unit when the oil is not flowing, thereby to prevent thickening of oil at the nozzle tip.

The preheater is supported on one side of tubular member 23, 61, 53, 56 by means of brackets 35 and 84 with the body of heat conducting material in close heat conducting and radiating relation to the tubular member, and electrode members 27 and 28 are mounted on the other side of the tubular member. Each electrode member includes a pair of conducting elements 100 and 101, and a pair of non-conducting encasements 102 and 103 for these elements. Conducting element 101 is fixedly mounted in encasement 103 but conducting element 100 is slidably mounted in encasement 102. Elements 100 and 101 project from opposing ends of encasements 102 and 103 and such projecting ends are connected by a conducting spring 104, spring 104 being soldered to nuts 105 and 106 which engage threaded portions of elements 100 and 101 respectively. Nuts 105 and 106 are held in position on conducting elements 100 and 101 by lock nuts 107 and 108. Because of the spring connection between conducting elements 100 and 101, element 100 may be moved relative to element 101 without breaking an electrical connection between the two and its one end which is provided with a terminal lug 109 may be adjusted to the position of terminal elements 110 on transformer 29. Conducting elements 101 of electrode members 27 and 28 have corresponding ends 111 projecting from encasements 103 and extending in front of nozzle tip 26 where they are separated by a small spark gap in which the oil ejected from the nozzle is ignited. As shown in the drawings conducting element 100 of electrode member 27 and its non-conducting encasement 102 are made somewhat shorter in length than the corresponding portions of electrode member 28 because of the respective positions of each of terminal elements 110 on transformer 29.

With respect to the manner of mounting electrode members 27 and 28 on the side of said tubular member opposite from the preheater, such electrode members are mounted between suitably formed portions of bracket 35 and clamp 120, and between a bracket 121 secured on the tube 23 and clamp 122. Clamps 120 and 122 are secured to brackets 35 and 121 respectively in their holding positions as by screw 123 and nut 124.

Although I have herein shown and described only one form of apparatus embodying the features of my invention, it is to be understood that various changes and modifications may be made therein without departing from the spirit and scope of my invention.

What I claim is:

1. In an oil burner assembly of the type including an injection nozzle, a fuel oil supply pump and an electric motor therefor, the combination therewith of a horizontal tubular member having said nozzle mounted at one end thereof and communicating therewith, control means including a valve in said member closely adjacent said nozzle and a pressure responsive device in said tubular member in spaced relation to said valve longitudinally of said tubular member for controlling the flow of oil from said tubular member through said nozzle, an oil preheater comprising a helical coil of heat-conducting tubing communicating at one end with said tubular member closely adjacent said valve and communicating at its other end with said fuel supply pump whereby fuel oil is pumped through said coil and thence through said tubular member to said valve and said nozzle, an elongate solid body of heat-conducting metal cast around and embedding said helical coil with the walls of said tubing in direct contact with said heat-conducting metal, at least one elongate electrical heating element embedded in said heat-conducting body in heat-conducting relation to said heat-conducting metal inside and close to the convolutions of said helical coil and extending throughout the length of said coil, means mounting said heat-conducting body on the underside of said tubular member exteriorly and intermediate the length thereof and parallel thereto in heat-conducting and close heat-radiating relation thereto and in close proximity to said pressure responsive means and

to said valve and nozzle such as to heat said pressure responsive means, said valve and the nozzle by conduction of heat through said tubular member and by radiation of heat from said heat-conducting body, and an elongate thermostatic control switch embedded in said heat-conducting body in heat-conducting relation to said heat conducting metal and inside and close to the convolutions of said helical coil to control an electrical circuit for said heating element.

2. In an oil burner assembly as defined in claim 1, a second elongate thermostatic switch disposed within and extending longitudinally of said heat-conducting body in direct heat-conducting relation to said heat-conducting metal and inside the convolutions of said helical coil of tubing to control an electrical operating circuit for the oil burner including said electric motor for the pump.

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