March 16, 1937. W. E. MILLER 2,073,847

FUEL OIL STRAINER AND PREHEATING DEVICE

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Fig. 1

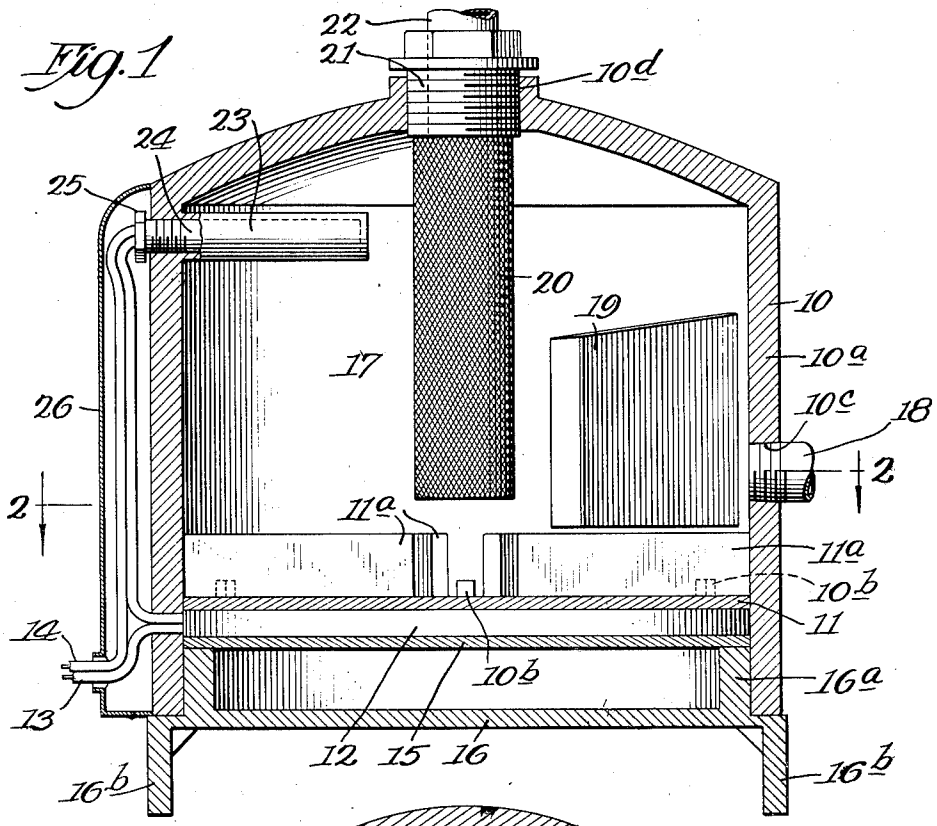

Fig. 2

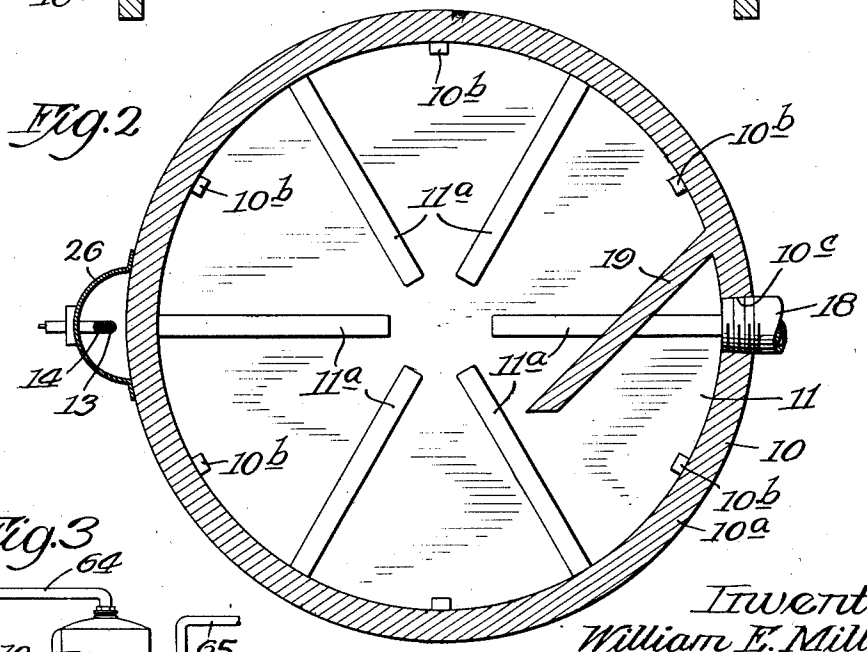

Fig. 3

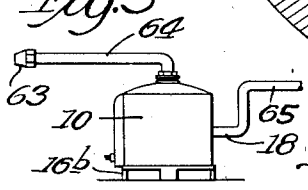

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Fig. 4

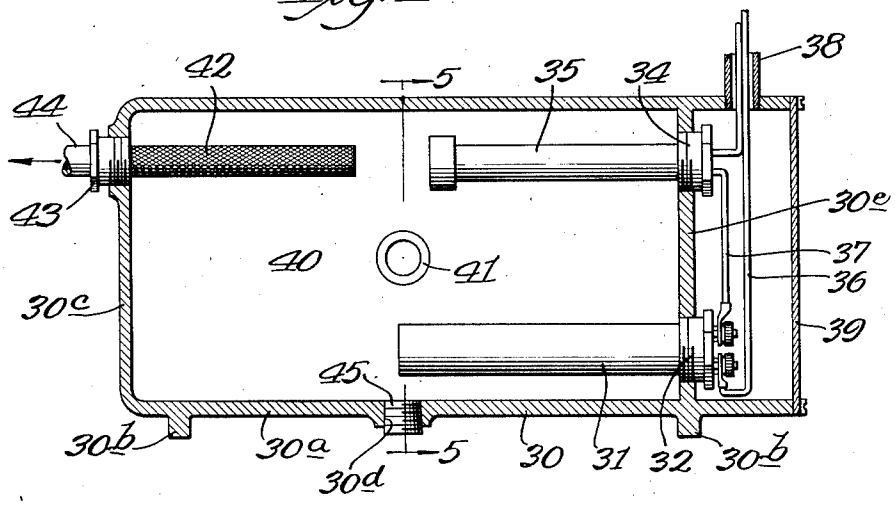


Fig. 6

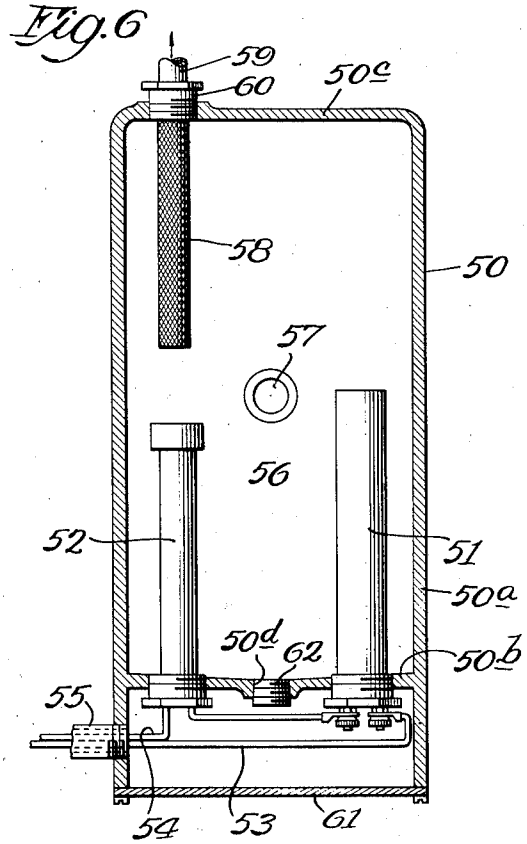
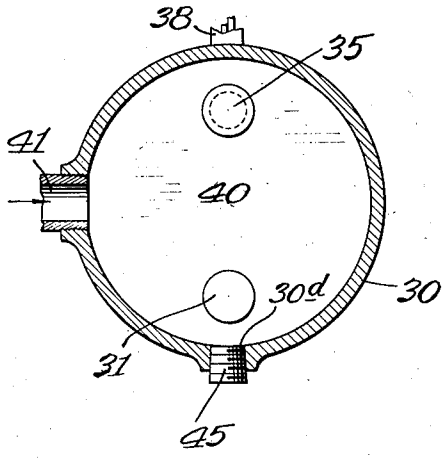


Fig. 5



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FUEL OIL STRAINER AND PREHEATING DEVICE

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6 Claims. (Cl. 210—43)

This invention relates to an oil preheating device having incorporated therein a self-cleaning strainer for use in preheating and straining fuel oil at or before it reaches the place where it is atomized by an oil burner such as the burner commonly employed in connection with furnaces, boilers and the like. In the operation of oil burners, considerable difficulty has heretofore been caused by the clogging of the burning and atomizing apparatus by heavy viscous oils or oils containing waxes, gums and other impurities, including floating sediment, and the principal object of the present invention is to overcome these difficulties by providing a device which is adapted to strain the oil of impurities while at the same time heating the oil in advance of the burner to a temperature which reduces its viscosity and melts any waxes or gums contained therein. A further object of the invention is to provide an improved device for automatically heating the oil and maintaining it substantially constant at a predetermined temperature whether the connected burner is in operation or not so that when the burner is started, the combustion of the fuel occurs in the same manner as when the burner has been continued in operation for a long period of time. Another important object of the invention is to provide improved means for automatically cleaning the strainer embodied in the device by effecting a circulation over the surface of the strainer of the oil which passes through the device. Still another object of the invention is to provide an oil preheating device embodying improved means for heating the oil and for effecting the circulation of the oil through the device in combination with an improved form of strainer through which the oil passes from its outer side inwardly so that any sediment collecting on the strainer is washed off by the circulating oil and settles to the bottom of the device. Another object is to provide means for effecting a ready transfer to the oil of the heat which is generated in the preheating device, and in a manner that prevents the accumulation of residual heat that would otherwise cause an expansion of oil in the device sufficient to set up dripping at the burner nozzle when the current to the heater is interrupted. A further object is to provide a device that is capable of being associated with the burner nozzle for the purpose of maintaining the oil in the line leading to the nozzle at a temperature that will facilitate efficient starting. Other objects relate to various features of construction and arrangement which will appear more fully hereinafter.

The nature of the invention will be understood from the following specification taken with the accompanying drawings, in which certain embodiments are illustrated. In the drawings,

Fig. 1 shows a vertical axial section through the preferred embodiment of the present invention;

Fig. 2 shows a horizontal section taken on the line 2—2 of Fig. 1;

Fig. 3 is a diagrammatic view showing the preferred relationship of the burner nozzle and the device;

Fig. 4 shows a vertical section taken axially through a modified form of the invention;

Fig. 5 shows a section taken on the line 5—5 of Fig. 4; and

Fig. 6 is an axial section taken through a third form of the invention which is similar to that of Fig. 3, except that it is mounted in an upright position.

The form of the invention shown in Figs. 1 and 2 comprises a casing 10 which is preferably formed of cast aluminum or other suitable material and made, so far as possible, in one piece. This casing has an annular cylindrical wall 10a which is closed at the bottom by a bottom wall 11 located some distance above the lower edge of the annular wall 10a and having formed integrally therewith a series of radiating vanes 11a which extend inwardly from the annular wall 10a but terminate short of the center of the bottom wall 11. The bottom wall 11 is positioned against lugs 10b which are formed on the inner side of the annular wall 10a and it has positioned immediately beneath it an electrical heating device 12 comprising a suitable high resistance heating element embedded in suitable insulating material and connected in an electric circuit through insulated conductors 13 and 14 which extend through an aperture in the annular wall 10a. A plate 15 formed of material having electrical and heat insulating qualities is mounted immediately beneath the heat unit 12 and is supported by the annular flange 16a of a supporting plate 16 which has legs 16b adapted to rest upon a floor, table or other support. The oil heating chamber 17 is located above the bottom wall 11 and receives its oil through an inlet pipe 18 having a screw-threaded engagement with an aperture 10c formed in the annular wall of the casing. At one side of the outlet of the pipe 18 there is located a baffle 19 which is attached to the annular wall 10a and inclined in-

wardly at an angle of about forty-five degrees to the axis of the pipe 18 so that as the oil passes under pressure into the chamber 17, it strikes the baffle 19 and is deflected so that it is caused to assume a whirling circulating motion in the chamber 17 and is thoroughly heated by heat imparted thereto from the metallic bottom wall 11 and the heated metallic vanes 11a.

As the oil circulates in the chamber 17, its temperature is raised to the desired point and it then passes out through a fine mesh woven wire strainer 20 of cylindrical form which is closed at its lower end and which has its other end secured in a screw-threaded cap member 21 having a threaded engagement with an aperture 10d formed in the top wall of the casing. The tubular cap 21 has mounted therein an outlet pipe 22 through which the heated oil flows to the burner or other device by which it is atomized or consumed. Located at one side of the strainer and preferably adjacent the upper part of the chamber 17, there is located a thermostatic tube 23 which is formed integrally with the annular wall 10a of the casing or mounted in an aperture in this wall. This tube has mounted therein a thermostatic switch 24 which has a threaded engagement with the aperture at the mouth of the tube and which is held in adjusted position by a lock nut 25. One of the conductors 14 leading to the heating unit 12 has this thermostatic switch 24 connected therein so that the degree of heat applied to the oil in the chamber 17 is governed by the operation of the switch. The circuit of the switch 24 and of the heating unit 12 is independent of the circuit of the motor by which the burner is operated and independent of the circuit of the motor which drives the pump for feeding oil to the chamber 17 so that the preheating and straining device operates continuously and maintains the oil in the chamber 17 at the desired temperature. The electrode conductors leading to the heating unit 12 and the thermostatic switch 24 are preferably enclosed in a housing 26 which is attached to the side of the casing 10.

In the operation of the device, the oil entering the chamber 17 under pressure is deflected by the baffle 19 and caused to follow a circular path around the heating chamber and around the cylindrical strainer 20. During this motion, heat is imparted thereto by the bottom wall 11 and the radiating vanes 11a with the result that the viscosity of the oil is reduced and it is raised to the desired predetermined temperature fixed by the thermostatic switch 24. If the temperature of the oil rises above the predetermined degree, the switch 24 opens the circuit and thus arrests the operation of the heating unit 12. In this way, an intermittent operation of the heating unit is brought about and the oil in the chamber is maintained substantially constant, for example, at a temperature of about 148 to 150 degrees Fahrenheit in the case of fuel oil used with burners employed in conjunction with household heating furnaces. As the oil is thus circulated and heated, its viscosity is reduced so that it passes readily through the strainer 20 and gums and resins contained in the oil are melted and pass through the meshes of the strainer 20 without any clogging action. Any sediment that contacts the strainer is washed or scoured off by the gyratory motion of the oil while the customary oil pump is in operation and when the pump stops, all sediment in the oil tends to settle by gravity on the bottom wall 11 from which it may be removed at intervals. This settling action is facilitated by the decreased viscosity of the oil due to the preheating. From the interior of the strainer 20, the oil is drawn off through the pipe 22 to the atomizer or burner.

In Fig. 3 is illustrated the characteristic relation of my improved device to a burner nozzle 63 with which it is connected by a pipe 64. A pipe 65 connects the casing 10 to the usual oil pump (not shown). As shown, the device is located below the nozzle so that, when the pump is not operating, the oil in the pipe 64, as well as in the casing 10, is heated by the unit 12 owing to the local circulation set up by the latter. Accordingly, and regardless of the time that the burner may be out of operation, the oil immediately adjacent the nozzle is at a temperature that is satisfactory for starting purposes and there are not any cold masses of oil between the strainer and the nozzle.

Another important advantage of the construction shown in Fig. 1 resides in the fact that the bottom wall 11 and the vanes 11a are so related that the heat transmission to the oil is capable of close regulation. The vanes insure such a rapid transmission of heat while the heating unit is operating that when the burner shuts off and the thermostat interrupts the circuit to the heater, there is no possibility of a transmission of residual heat to the oil. Consequently, the oil is not subjected to an expansion that might cause dripping at the nozzle.

In Figs. 4 and 5 there is shown a modification of the invention in which a metal casing 30 is provided with a cylindrical wall 30a arranged horizontally and provided on one side with flanges or lugs 30b adapted to rest upon a suitable support. This casing has two end walls 30c and 30e, the former of which is spaced inwardly from one end of the annular wall 30a with a tubular heating unit 31 mounted in an aperture therein, where it is held in place by a threaded bushing 32. There is also mounted in another aperture in this end wall 30e a threaded bushing 34 in which is mounted a thermostatic tube 35 containing a thermostatic switch which is connected in series with the resistor of the heating unit 31 through insulated electrical conductors 36 and 37 which are brought in through a conduit 38. A cover plate 39 is secured to the adjacent end of the annular wall 30a, thus forming a chamber in which the conductors and the connections to the heating unit 31 and thermostatic switch are located. The oil flows in through the heating chamber 40 of the casing through an inlet pipe 41 which is connected to the pump or other device to which the oil is supplied under pressure. Upon entering the chamber 40, the oil circulates around the heating unit 31 and the thermostatic tube 35 with the result that the oil is thoroughly heated to a predetermined point determined by the action of the thermostatic switch. The heated oil flows out through a fine mesh tubular screen 42 which is carried by a cap member or bushing 43 having a threaded engagement with an aperture formed in the end wall 30c of the casing. This bushing has mounted therein an outlet pipe 44 through which the oil flows to the burner or other device by which it is consumed. In the operation of this form of the invention, the heated oil rises to the top of the chamber and circulates around the tubular screen 42 through which it passes from the outside inwardly so that sediment in the oil which tends to collect on the screen is washed off by the circulating oil

and ultimately settles at the bottom of the chamber for reasons noted above. For the purpose of cleaning out the chamber **40** when desired, the lowermost portion of the annular wall **30a** is provided with an opening **30d** which is normally closed by a threaded plug **45**.

In Fig. 6 of the drawings, there is shown a modification which is similar to that which is illustrated in Figs. 4 and 5 except that the casing **50** of the device is mounted in an upright position and is adapted to rest on the lower end of the annular wall **50a**. This casing has a lower wall **50b** spaced upwardly from the lower end of the annular wall and having mounted therein a heating unit **51** and a thermostatic tube **52** in the manner previously described. The heating unit and the thermostatic switch are connected in series and supplied with current through insulated conductors **53** and **54** which lead outwardly through a conduit **55** and are connected to a suitable electric current supply. The oil is supplied to the chamber **56** of the casing **50** through an inlet conduit **57** and it flows out through a fine mesh tubular screen **58** leading to the outlet conduit **59**, the screen and the conduit being carried by a bushing **60** which has a threaded engagement with the top wall **50c** of the casing. The chamber beneath the bottom wall **50b** is normally closed by removable cover plates **61** and this bottom wall is provided with a drain opening **50d** which is normally closed by a removable plug **62**. This plug may be removed when desired to clean out any sediment which collects in the bottom of the chamber.

Although certain forms of the invention have been shown and described by way of illustration, it will be understood that it may be constructed in various other embodiments coming within the scope of the appended claims.

I claim:

1. An oil treating device comprising a casing having an oil chamber, a tubular screen projecting into the upper part of said chamber, an oil outlet pipe leading from the inside of said screen, a heating device positioned at the bottom of said chamber, a series of metallic vanes adapted to be heated by said heating device and to contact with the oil in said chamber, an oil inlet pipe leading into the side of said chamber above said heating device, and a baffle mounted in an inclined position opposite said inlet pipe and adapted to cause the oil to circulate above said vanes and around said screen.

2. An oil preheating device adapted to be located in a pipe line leading to a burner nozzle comprising in combination, a casing having an oil chamber in communication with an oil supply and the burner nozzle, means for heating the oil in the chamber, a thermostat for controlling the operation of the heating means, and a separating wall between the heating means and the chamber having relatively thin vanes extending into the chamber for rapidly transmitting heat to the oil in the chamber, the vanes being so located and having such an extent of surface that they are free of any substantial amount of residual heat when the thermostat opens.

3. An oil treating device comprising a casing having an oil chamber, a screen in said chamber, means for introducing oil into said chamber and causing it to circulate over the surface of said screen, and a series of metal heating members positioned in the lower part of said chamber and including pockets for receiving sediments deposited from said oil.

4. An oil treating device comprising a casing having an oil chamber, a screen in said chamber, means for introducing oil into said chamber and causing it to circulate over the surface of said screen, and a series of metal heating vanes extending edgewise from the bottom of said chamber and radiating outwardly from the central part thereof to provide intervening spaces to receive sediment deposited from said oil without destroying the direct contact of said vanes with said oil.

5. An oil treating device comprising a cylindrical upwardly extending oil chamber having a centrally located outlet in its upper end, a tubular screen mounted in said outlet and extending downwardly in the center of said chamber with its lower end closed, an oil inlet pipe leading into said chamber at the side thereof opposite said screen, a deflecting baffle mounted on the wall of said chamber opposite the mouth of said inlet pipe to cause the oil flowing into said chamber to circulate in an annular path around the outside of said screen, a heater mounted in the bottom of said chamber, and a plurality of metallic heating vanes radiating outwardly from a point beneath said screen to transmit heat from said heating device to the oil in said chamber, said radiating vanes forming between them spaces adapted to receive the sediment washed off of said screen and to retain said sediment without agitation by the circulating oil.

6. An oil strainer comprising in combination, an oil chamber, a tubular screen projecting into the upper part of the chamber, an outlet pipe connected to the interior of the screen, a plurality of spaced vanes extending upwardly from the bottom of the chamber and terminating short of the inner end of the screen, an inlet pipe connected to the chamber interior above the vanes, and a baffle positioned adjacent the delivery end of the inlet pipe and adapted to direct the oil around the screen and above the vanes, the vanes defining open top pockets for holding relatively quiescent masses of oil for the collection of sediment.

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