Aug. 2, 1927. 1,637,368

A. C. BENNETT

APPARATUS FOR SUPPLYING FUEL OIL TO FURNACES

Filed June 25, 1923 3 Sheets-Sheet 1

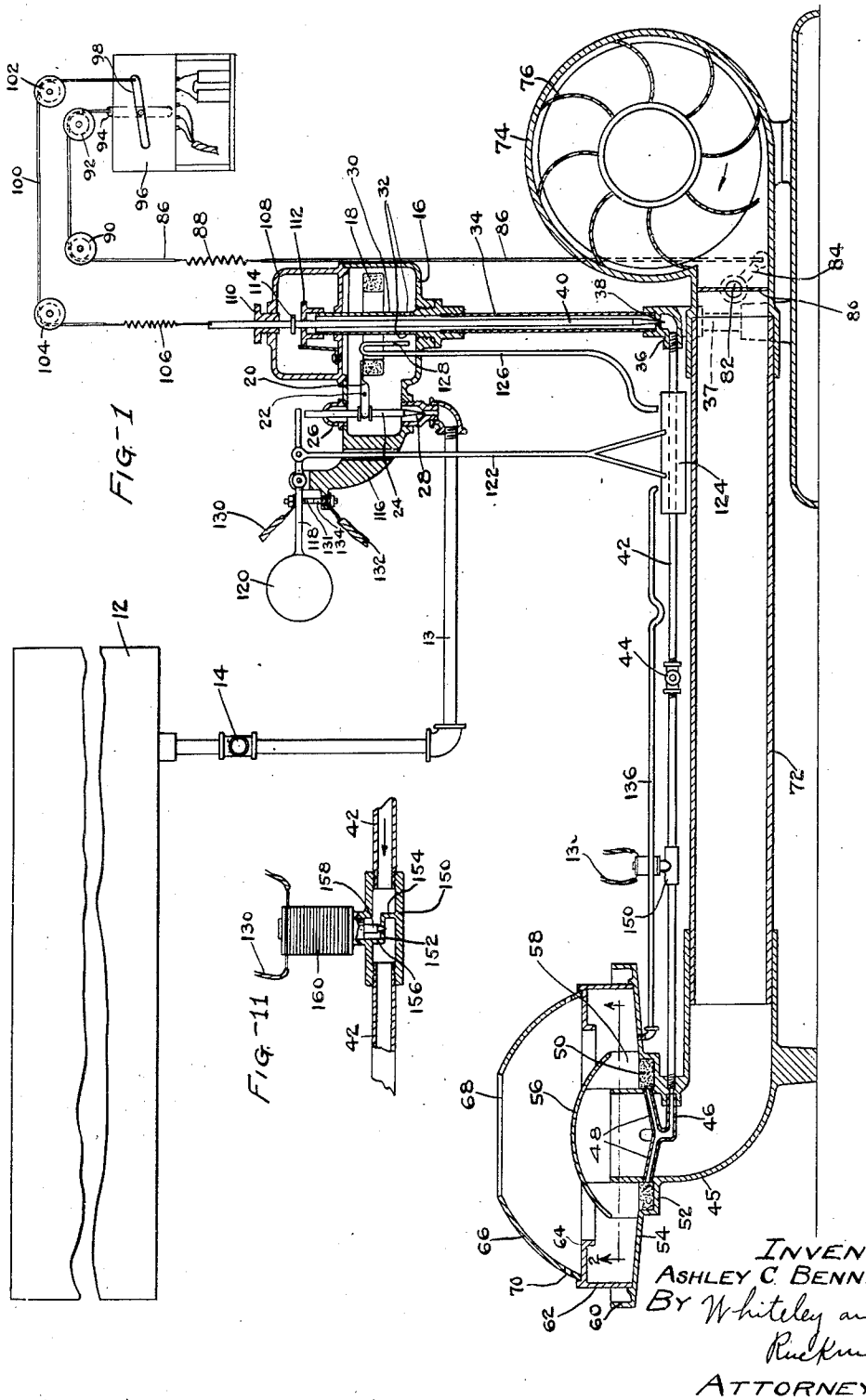


FIG. 1

FIG. 11

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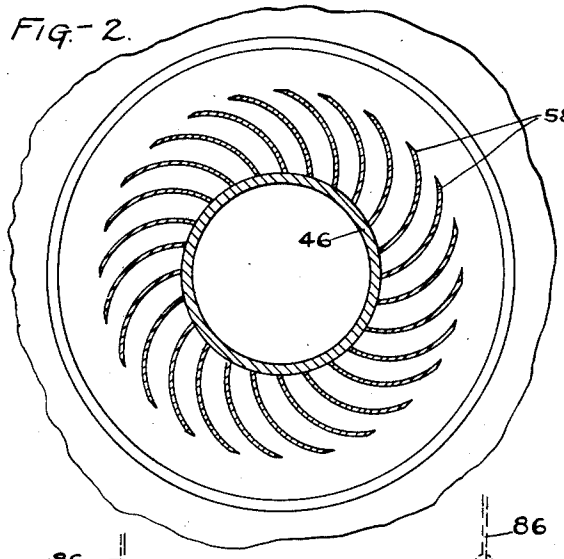
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APPARATUS FOR SUPPLYING FUEL OIL TO FURNACES

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FIG. 2.



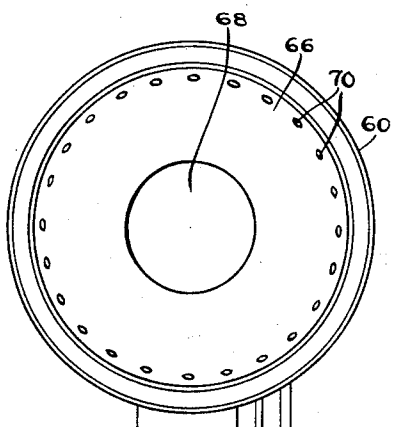
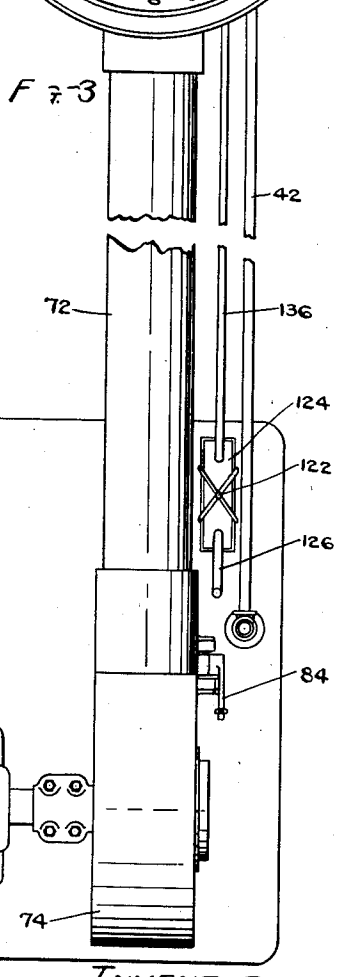


FIG. 3



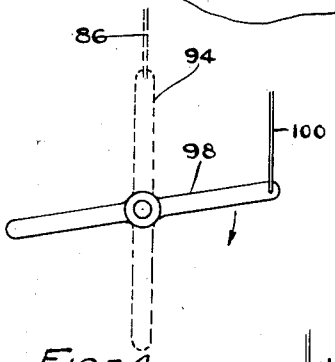


FIG. 4

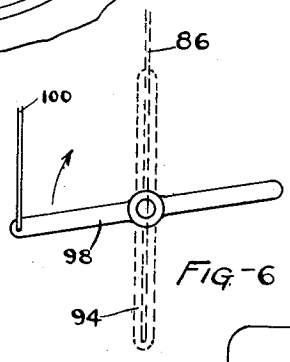


FIG. 6

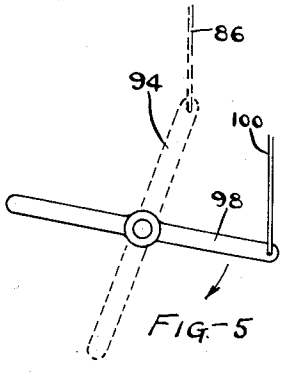


FIG. 5

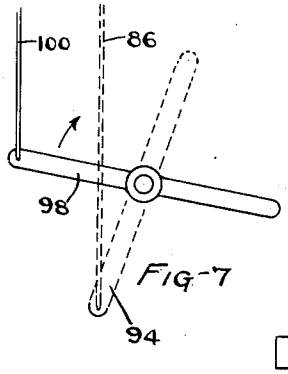


FIG. 7

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APPARATUS FOR SUPPLYING FUEL OIL TO FURNACES

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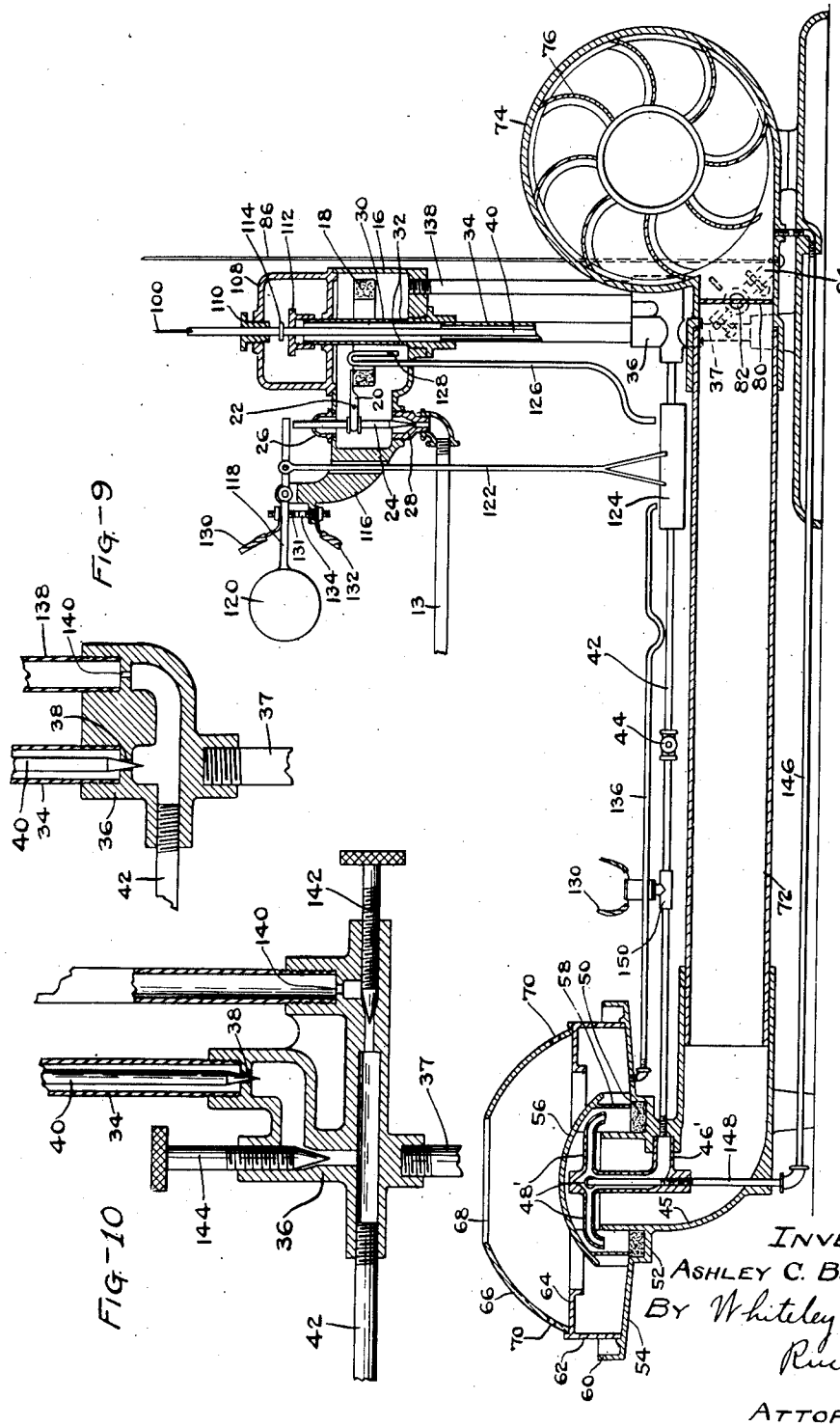


FIG. 8

FIG. 9

FIG. 10

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Patented Aug. 2, 1927. 1,637,368

UNITED STATES PATENT OFFICE.

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APPARATUS FOR SUPPLYING FUEL OIL TO FURNACES.

Application filed June 25, 1923. Serial No. 647,680.

My invention relates to apparatus for supplying fuel oil to furnaces. Among the objects of the invention are to provide for effectively controlling the supply of fuel oil at all times, to prevent danger of overflow or flooding of the oil which is supplied, to provide for shutting off the motor and the supply of oil in case the burner goes out, to provide an arrangement for controlling the amount of oil and air so as to maintain a constant regulatable degree of temperature in the rooms heated by the furnace, and to provide for thoroughly mixing air with oil as it is being burned.

The full objects and advantages of my invention will appear in connection with the detailed description, and the novel features of my inventive idea will be particularly pointed out in the claims.

In the accompanying drawings which illustrate the application of my invention in slightly different forms,—

Fig. 1 is a view of the apparatus mostly in central vertical section. Fig. 2 is a view in horizontal section on the line 2—2 of Fig. 1. Fig. 3 is a top plan view. Figs. 4, 5, 6, and 7 are detail views of different positions of a portion of the regulating device. Fig. 8 is a view mostly in central vertical section showing a modified form of apparatus. Fig. 9 is a detail view in central vertical section of a feed control device. Fig. 10 is a view corresponding to Fig. 9 showing a modification. Fig. 11 is a detail view showing an electromagnetically operated valve.

Referring first to the construction shown in Figs. 1 to 7, the numeral 12 designates a gravity feed storage tank for fuel oil. A pipe 13 provided with a shut-off valve 14 connects the bottom of the tank with a casing 16 containing a ring float 18 to which is secured an arm 20 pivoted at 23 and attached at its outer end to a needle valve 24 whose upper end extends slidably through a cap 26 with which the casing 16 is provided. The lower end of this needle valve is adapted to engage a valve seat 28 formed at the place of discharge of the pipe 13 to the reservoir inside the casing 16. Extending up through this reservoir is a tube 30 which near the bottom of the reservoir is provided with perforations 32 which permit the oil to pass down a tube 34 which is screwed into the enlarged lower end of the tube 30. The lower end of the tube 34 is screwed into a hollow casting 36 secured to a support 37 and containing a valve seat 38 with which a needle valve 40 cooperates. This needle valve will be referred to later. Screwed into the casting 36 below the valve seat 38 is a horizontal pipe 42 which is provided with a valve 44. The farther end of the pipe 42 is screwed into a hollow casting 45 and communicates through a perforation in the wall of this casting with a tube 46 located within the casting and which turns upwardly and is provided with a number of branches 48 extending radially outward and the outer ends of which extend through perforations in the wall of the casting so as to discharge into absorbent material 50 such as asbestos placed in an annular pocket 52 formed in a flangelike member 54 surrounding the body portion of the casting 45. Spaced above the upper end of the casting 45 is a deflector dome 56 from which depends a multiplicity of wings 58 which extend down to the absorbent material 50 and which as shown in Fig. 2 are curved so as to give a centrifugal motion to the flame rising from the absorbent material and passing out between the wings whereby the flame is directed outwardly. The flange 54 is dished and at its periphery is turned upwardly to form a vertical annular flange 60. The casing is provided with a vertical cylindrical member 62 which rests upon the dished flange 54 and the upper end of this member 62 is provided with an annular flange 64 upon which rests a dome member 66 having a large open center 68, this dome member being provided near its lower end with a plurality of perforations 70. It will be understood that the parts just described and carried by the upper end of the casting 45 are placed inside the firebox of a furnace. The lower portion of the hollow casting 45 is curved into a horizontal position and is connected by a large pipe 72 with a fan casing 74 containing a centrifugal fan 76 which is driven by an electric motor 78. Current to the motor may be supplied from any source of electrical energy such as by connecting it to the electric lighting system. The entrance into the pipe 72 from the fan casing is controlled by a throttle valve 80 secured to a shaft 82 to which is fastened an arm 84 to the outer end of which is secured the lower end of

a cable 86 having portions connected by a spring 88. The upper portion of the cable 86 runs over pulleys 90 and 92 whereby the cable is deflected through 180°. The end of the cable is secured to an arm 94 rotatably mounted on a thermostat casing 96. The thermostat may be of any suitable or well known construction, and the details thereof form no part of my present invention, and, therefore, need not be described. An arm 98 is secured for rotation with the arm 94 and as shown is inclined a little from right angular relation thereto. Secured to the arm 98 is a cable 100 which after being deflected by passing over pulleys 102 and 104 is secured to a spring 106 which in turn is secured to the extended upper end portion of the needle valve 40 previously referred to. Carried by the casing 16 is an auxiliary casing 108, the top of which is provided with a screw-threaded plug 110 through which the upper portion of the needle valve 40 extends slidably. Within the auxiliary casing 108 and screwed upon the upper end of the tube 30 is a cap 112. This cap and the plug 110 constitute the adjustable stops for an enlargement 114 secured to the needle valve between the cap and the plug, and by adjusting the cap and the plug, the limit of travel of the needle valve in both directions may be varied. Pivoted to an extension 116 extending from the casing 16 is a lever 118 on one end of which is a weight 120. The other end of this lever is arranged to overlie the upper end of the needle valve 24. Connected to the lever between the end thereof just referred to and its pivot is a cable 122 to the lower end of which is attached a pan 124. A pipe 126 has its lower end arranged to discharge into this pan and the upper portion of the pipe casing extending up into the reservoir in the casing 16 is bent to form a siphon 128. If the needle valve 24 fails to function for controlling the supply of oil, as for instance on account of dirt settling on the valve seat, flooding of the reservoir is prevented by the siphon which after the oil has reached the desired level in the reservoir carries the overflow to the pan 124. After a sufficient amount of oil has accumulated in the pan to overcome the weight 120, the weight of this oil causes the lever 118 to force down the needle valve 24 and close it. At the same time, the circuit through which electric current is delivered to the motor 78 is broken by the following arrangement. A wire 130 forming part of the circuit is attached to a contact member 131 insulatively secured to the lever 118 and a wire 132 also forming part of the circuit is attached to a contact member 134 insulatively mounted on the projection 116. These two contact members are normally in engagement with each other to complete the circuit to the motor but when the weight 120 is lifted, the contact members are separated and the motor stops. In case the burner goes out, and starts to flood the overflowing oil enters a pipe 136 tapped into the flange 54 and having its outer end arranged to deliver into the pan 124. When the amount of oil thus delivered through the pipe 136 becomes sufficient it will cause the valve 24 to close and the motor to stop in the same manner as previously described. In the form of invention shown in Figs. 8 and 9, the reservoir in the casing 16 is connected by a pipe 138 to the space in the hollow casting 36 below the valve seat 38. The delivery of oil into this space through the pipe 138 is through a restricted opening 140 shown in Fig. 9. By this construction, an auxiliary supply of oil is provided from the reservoir in addition to the supply through the pipe 34. In the modification shown in Fig. 10, a needle valve 142 is provided for manually regulating the supply of oil delivered by the pipe 138 while a needle valve 144 is provided for manually regulating the amount of oil delivered by the pipe 34. In the form shown in Fig. 8, the tube 46′ extends farther up into the burner than does the pipe 46 shown in Fig. 1 and the branches 48′ of this pipe instead of delivering directly into the absorbent material 50 have downwardly directed ends which discharge the oil upon the top of the absorbent material. A small bypass pipe 146 leads from the fan casing 74 and the outer end of this pipe is connected to a vertical pipe 148 extending up centrally inside the vertical portion of the tube 46′ to deliver a small amount of air for mixing with the oil which passes through the branches 48′. Otherwise the construction of the burner is the same as shown in Fig. 1, a large volume of air being forced through the pipe 72 against the deflector dome 56 and being caused to mix with the ignited oil as it is forced out between the curved wings 58.

The operation and advantages of my invention will be readily understood in connection with the foregoing description. The fuel oil contained in the tank 12 flows past the needle valve 24 and when the space in the casing 16 is nearly full, the float 18 causes the needle valve to close. When the float lowers, more oil is again admitted to the reservoir. The manner in which the supply of oil is cut off and the motor stopped, in case the burner goes out or the valve 24 fails to close at the proper time has already been described. The manner in which the heat is regulated by the action of the arms 94 and 98 in connection with the thermostat will now be explained. In the position shown in Figs. 1 and 4, the throttle 82 for the draft and the needle valve 40 for con-

trolling the supply of oil are nearly closed. This is the position for a moderate fire. In the position shown in Fig. 5, the valve 40 is fully opened and the throttle 82 is partly opened. This position gives an increased heat. It will be noted that as the arm 94 moves from the position shown in Fig. 4 to that shown in Fig. 5, the end of this arm moves nearly in a horizontal direction so that only a small movement of the throttle is produced and at the same time the arm 98 moves nearly in a vertical direction, thus causing complete lifting of the valve 40. In the position shown in Fig. 6, the valve 40 is still held wide open, the elasticity of the spring 106 providing for this condition and the throttle 82 is also wide open so that a roaring fire is produced. In the position shown in Fig. 7, the valve 40 has moved into the closed position while the throttle 82 is nearly wide open so that sufficient draft is provided to burn up the surplus oil. It will be understood that the thermostat operates in customary manner, and is connected to the arms 94 and 98 so as to control their position according to the temperature of the room in which the thermostat is installed.

In order to shut off the supply of oil to the burner immediately in case of failure from any cause of the current which operates the motor and fan, the following arrangement may be provided as shown in detail in Fig. 11. At a point adjacent the burner, the supply pipe 42 is provided with a coupling 150 within which is a horizontal partition 152 connected at one end by an angular member 154 with the lower half of the pipe, and connected at the other end by an angular member 156 with the upper half of the pipe whereby the passageway through the pipe is closed except through an opening in the horizontal portion of the dividing member just referred to. This opening is controlled by a valve 158 having a pointed end fitting the opening and a stem portion which constitutes the core of a solenoid having a coil 160 which is included in the circuit connected with the electric motor which drives the fan. This coil may be conveniently connected in with the wire 130. This construction provides an electromagnetically operated valve which is held up when current is passing through the coil and which drops immediately to shut off the supply of oil to the burner in case the current is cut off for any reason so that the fan stops. This prevents the burner from smoking which result would occur if it continued to burn without an adequate supply of air.

I claim:

1. Apparatus for supplying fuel oil to furnaces comprising a storage tank, a casing enclosing a reservoir, a pipe connecting said tank and reservoir, a valve controlling the passageway into said reservoir, a float in said reservoir, connections between said float and valve which normally cause said valve to close when the oil reaches a predetermined level in said reservoir, a tube leading from said reservoir which carries off surplus oil when said valve fails to function, a pan into which said tube discharges, a member positioned to force said valve into closed position when weight is applied to the member, means for suspending said pan from said member, a burner, and a pipe connecting said reservoir with said burner.

2. Apparatus for supplying fuel oil to furnaces comprising a storage tank, a casing enclosing a reservoir, a pipe connecting said tank and reservoir, a valve seat at the entrance from said pipe into said reservoir, a needle valve for cooperation with said valve seat, a float in said reservoir, connections between said float and valve which normally cause said valve to close when the fuel oil reaches a predetermined level in said reservoir, a tube leading from said reservoir which carries off surplus oil when said valve fails to function, a pan into which said tube discharges, an intermediately pivoted lever having one end over-lying the upper end of said needle valve, a weight on the other end of said lever, means for suspending said pan from said lever at a point between said first mentioned end and the pivot of said lever, a burner, and a pipe connecting said reservoir with said burner.

3. Apparatus for supplying fuel oil to furnaces comprising a storage tank, a casing enclosing a reservoir, a pipe connecting said tank and reservoir, a burner, a pipe connecting said reservoir with said burner, a fan, a motor for driving said fan, a pipe connecting the casing of the fan with said burner, a tube leading from said reservoir which carries off surplus oil, a pan into which said tube leads, a movable member, means for suspending said pan from said movable member, and means associated with said movable member which causes said motor to stop when said pan is depressed.

4. Apparatus for supplying fuel oil to furnaces comprising a storage tank, a casing enclosing a reservoir, a pipe connecting said tank and reservoir, a burner, a pipe connecting said reservoir and burner, a fan, an electric motor for driving said fan, a pipe connecting the casing of the fan with said burner, a tube leading from said reservoir which carries off surplus oil, a pan into which said tube leads, a movable member, means for suspending said pan from said movable member, an electric circuit for said motor, and a movable contact member in said circuit and carried by said movable member whereby said circuit is broken when said pan is depressed.

5. Apparatus for supplying fuel oil to furnaces comprising a storage tank, a casing

enclosing a reservoir, a pipe connecting said tank and reservoir, a valve controlling the passageway into said reservoir, a float in said reservoir, connections between said float and valve which normally cause said valve to close when the oil reaches a predetermined level in said reservoir, a tube leading from said reservoir which carries off said surplus oil when said valve fails to function, a pan into which said tube discharges, a movable member positioned to force said valve into closed position when weight is applied to said member, means for suspending said pan from said movable member, a burner, a pipe connecting said reservoir with said burner, a fan, an electric motor for driving said fan, a pipe connecting the casing of the fan with the burner, an electric circuit for said motor and a movable contact member in said circuit and carried by said movable member whereby said circuit is broken when said pan is depressed.

6. Apparatus for supplying fuel oil to furnaces comprising a storage tank, a casing enclosing a reservoir, a pipe connecting said tank and reservoir, a valve controlling the passageway into said reservoir, a float in said reservoir, connections between said float and valve which normally cause said valve to close when the oil reaches a predetermined level in said reservoir, a tube leading from said reservoir which carries off surplus oil when said valve fails to function, a pan into which said tube discharges, a movable member positioned to force said valve into closed position when weight is applied to said member, means for suspending said pan from said movable member, a burner, a pipe connecting said reservoir with said burner, a fan, an electric motor for driving said fan, a pipe connecting the casing of the fan with said burner, an electric circuit for said motor, a movable contact member in said circuit and carried by said movable member whereby said circuit is broken when said pan is depressed, and a pipe leading from said burner for carrying away oil in case the burner goes out, said pipe discharging into said pan whereby said valve will be closed and said motor will be stopped by the weight of oil which passes said burner acting upon the aforesaid movable member.

In testimony whereof I hereunto affix my signature.

ASHLEY C. BENNETT.