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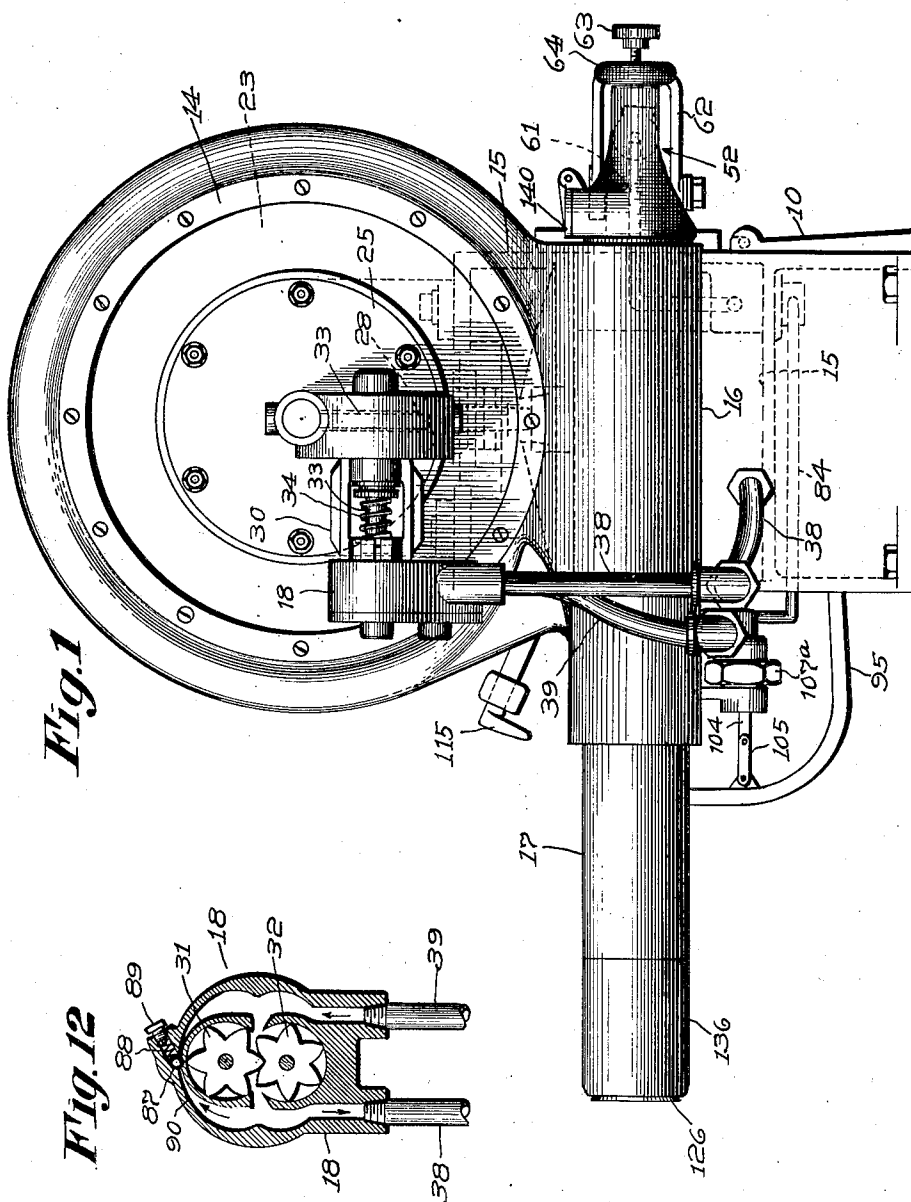
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M. A. FESLER

OIL BURNER

Filed May 19, 1924

6 Sheets-Sheet 1



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Aug. 10 , 1926.

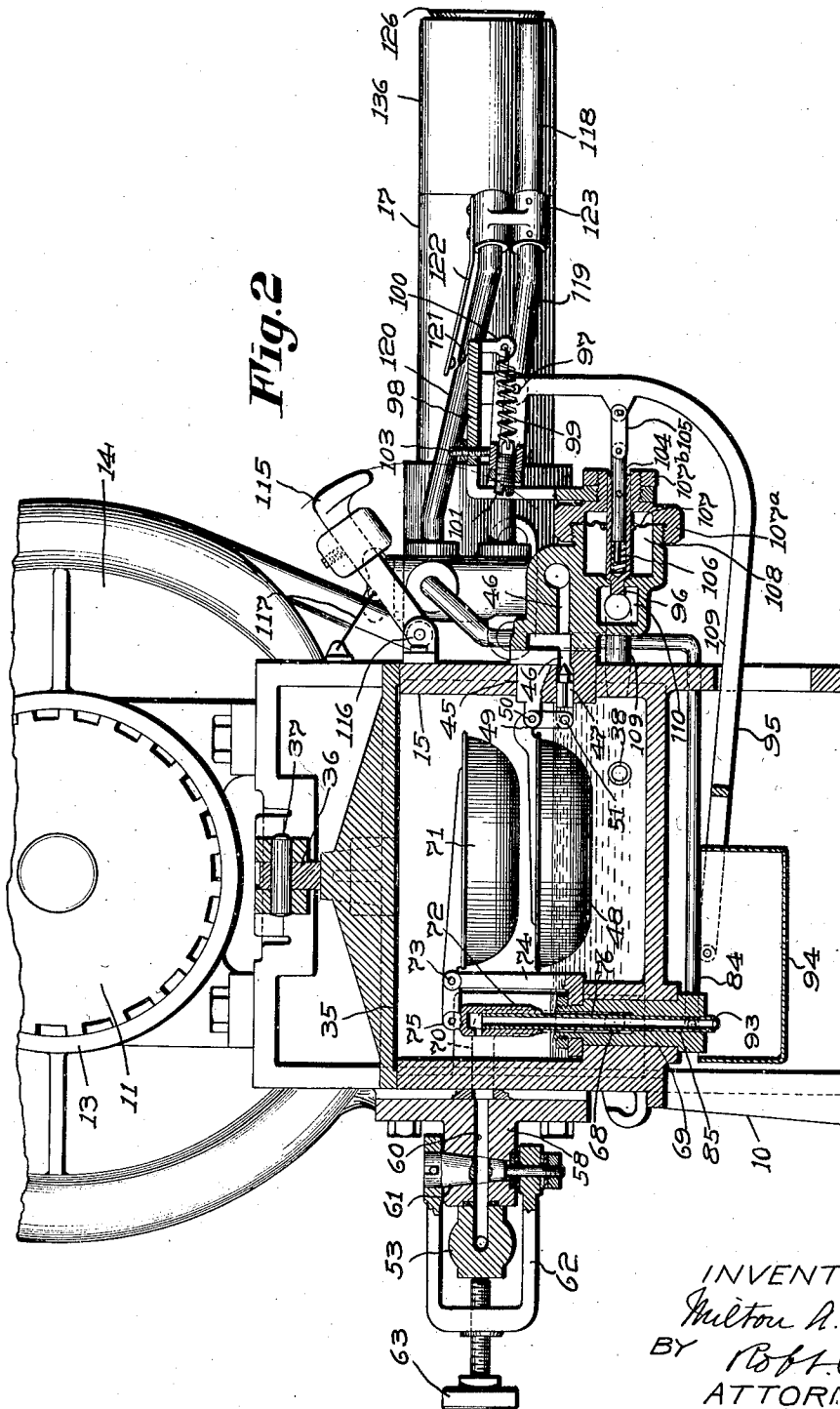
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6 Sheets-Sheet 2



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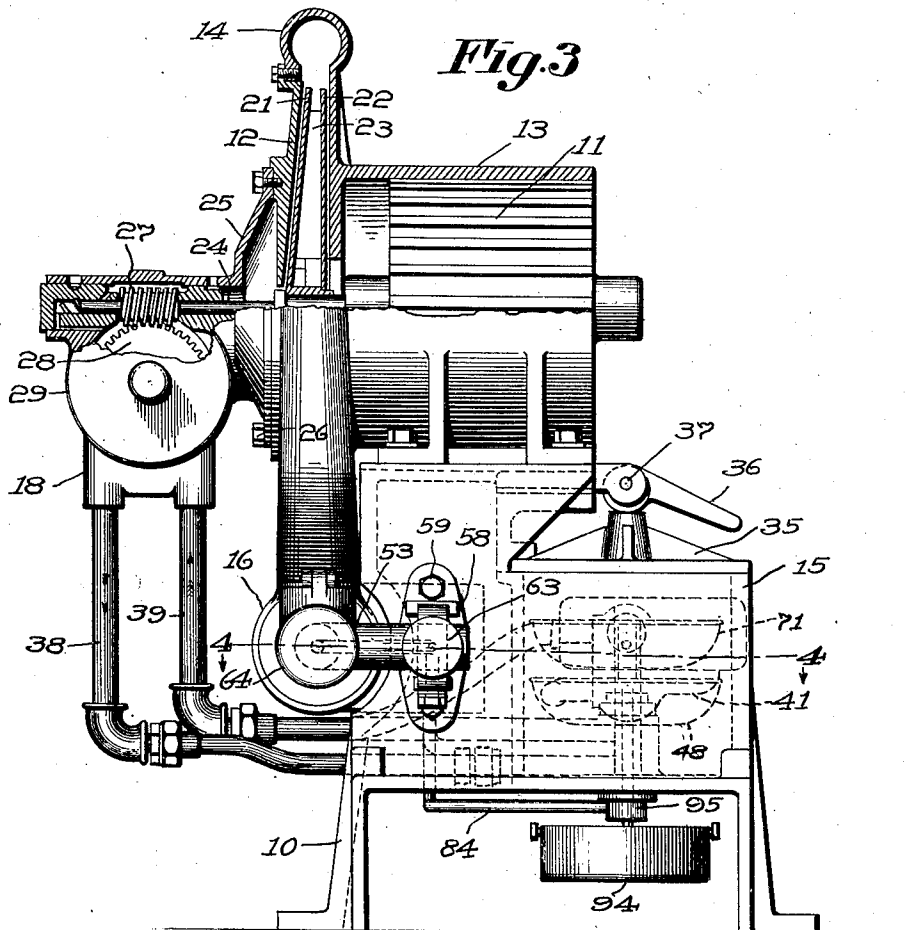
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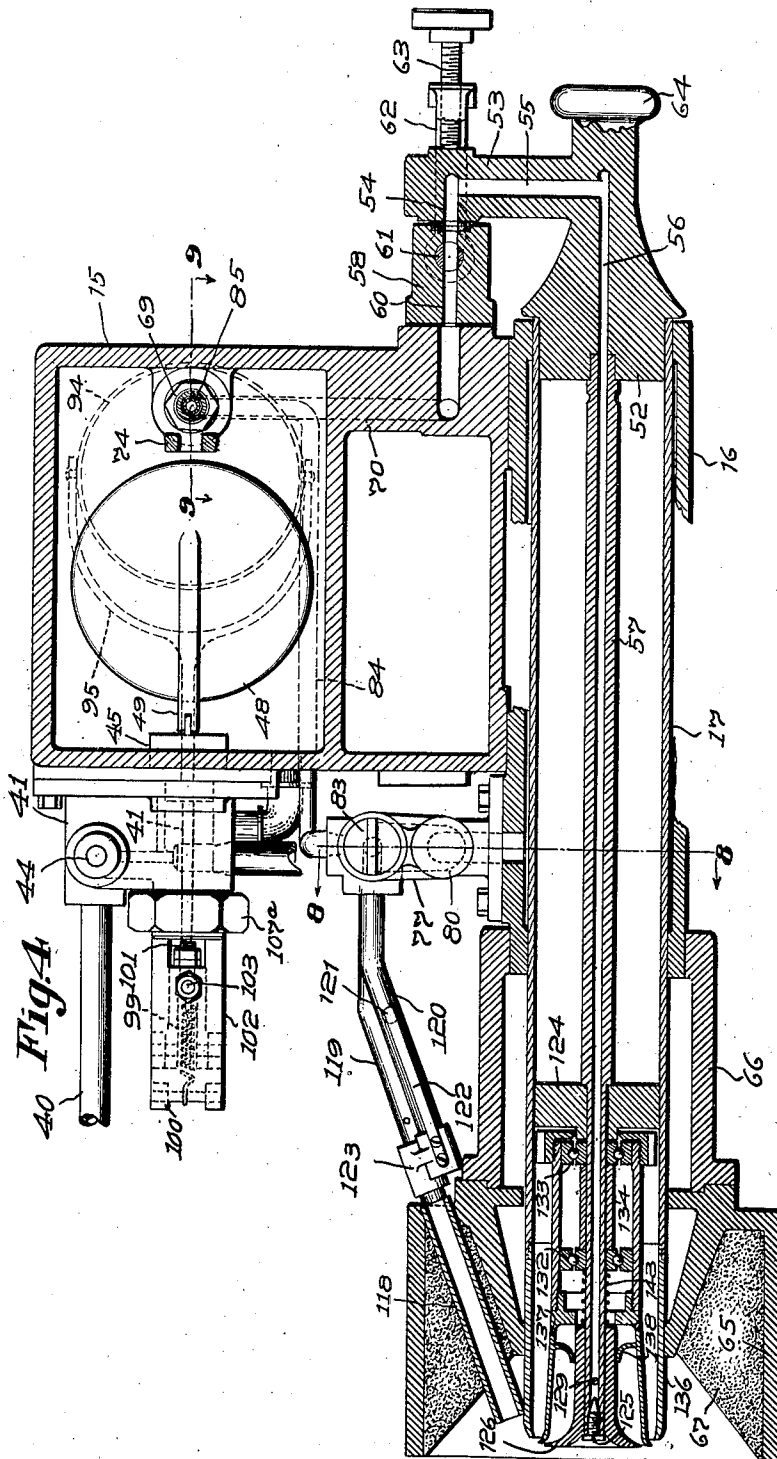
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6 Sheets-Sheet 4



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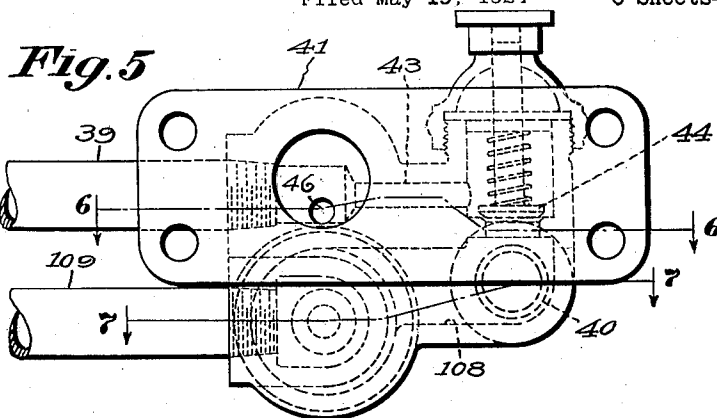
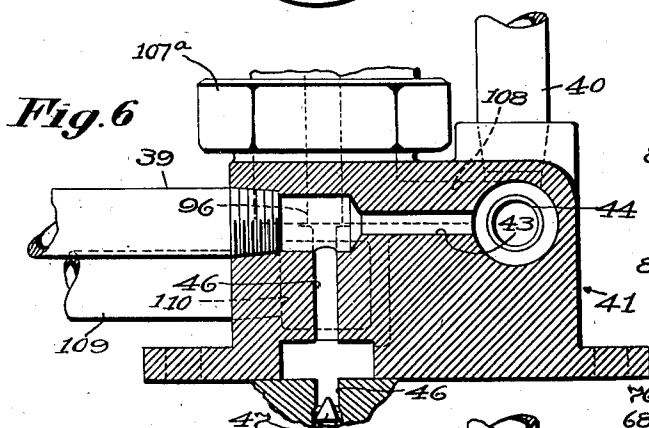
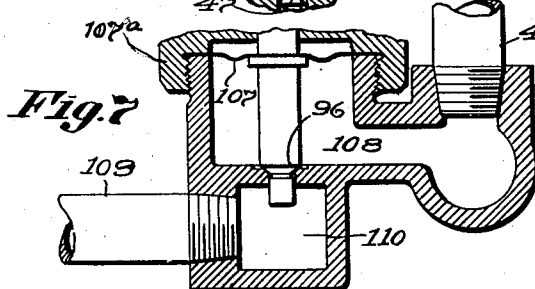
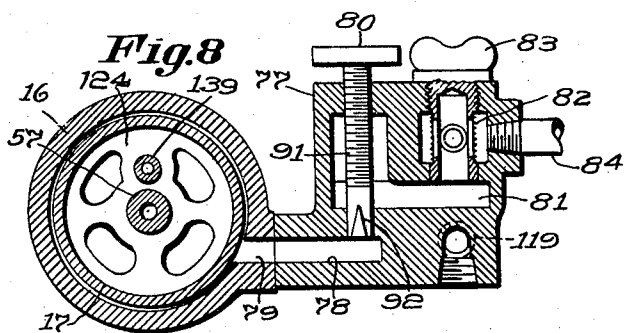
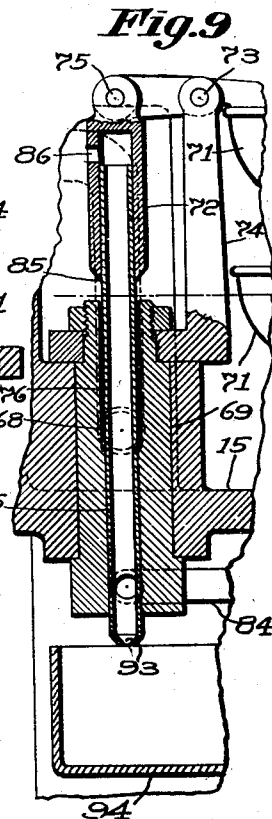
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OIL BURNER

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6 Sheets-Sheet 5



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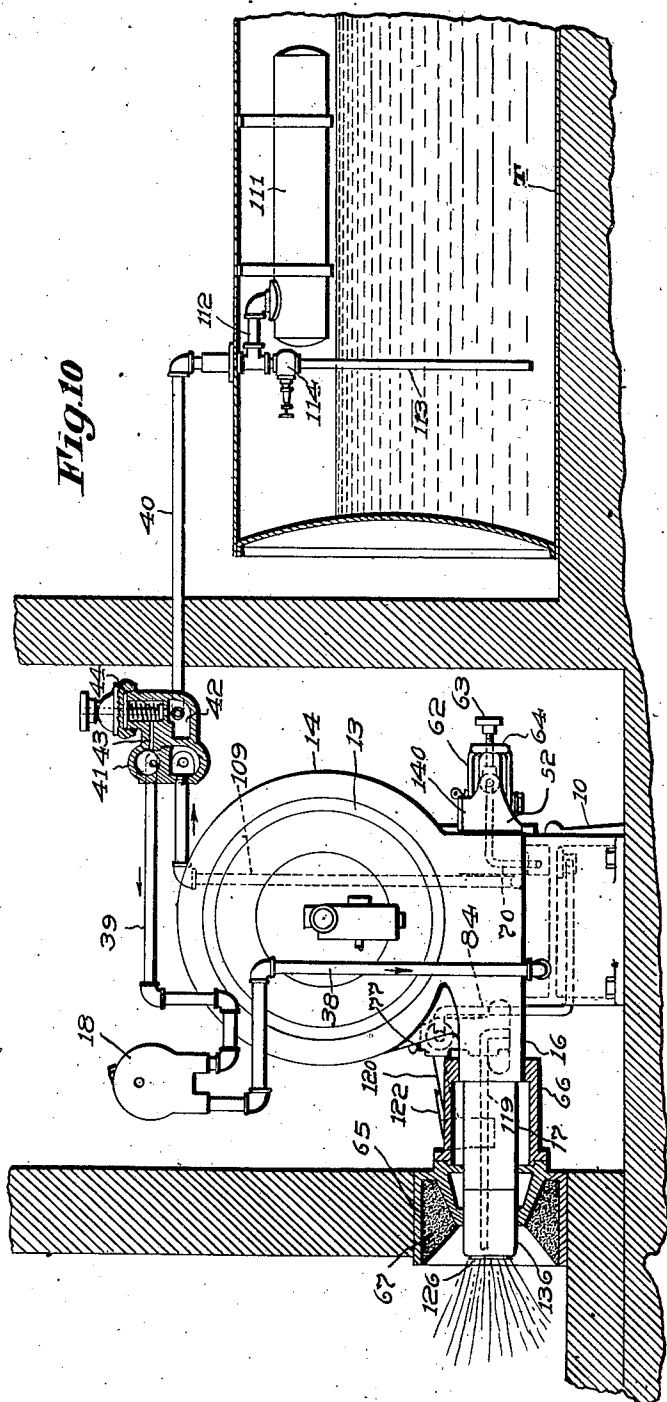
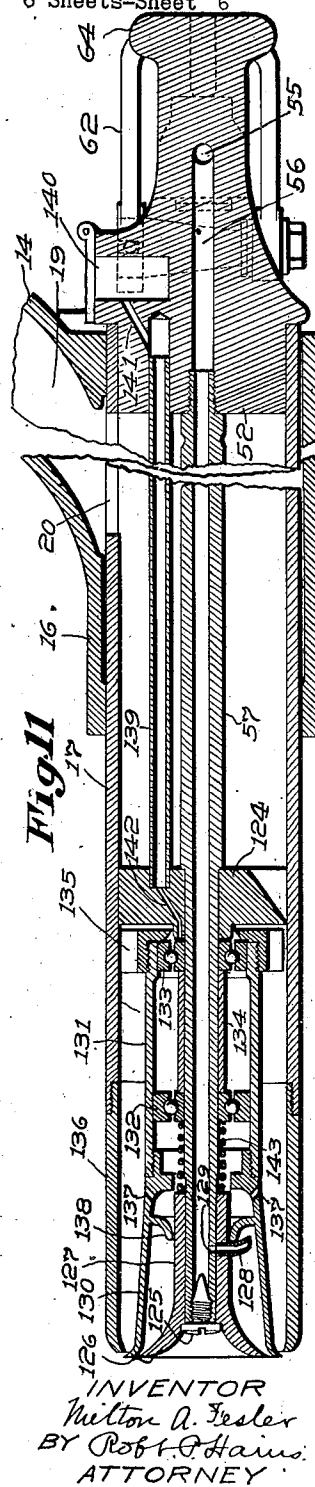
M. A. FESLER

OIL BURNER

Filed May 19, 1924

1,595,931

6 Sheets-Sheet 6



UNITED STATES PATENT OFFICE.

MILTON A. FESLER, OF STAMFORD, CONNECTICUT, ASSIGNOR TO PETROLEUM HEAT & POWER COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF DELAWARE.

OIL BURNER.

Application filed May 19, 1924. Serial No. 714,198.

This invention relates to oil burners for burning oil in furnaces, and the present burner, due to its simplicity of control and quiet operation, is particularly well adapted for use in domestic furnaces, although it may also be used in large commercial furnaces.

The use of oil as a fuel for furnaces is necessarily accompanied by more or less danger of fire, because oil burners are provided with mechanism for delivering to them a continuous supply of fuel and if through any cause the fuel is not consumed as it is delivered by the burner, it will accumulate in or near the furnace in a highly inflammable condition.

It is therefore extremely important that oil burners, and particularly those used in domestic furnaces where they are operated by inexperienced persons, be so constructed that the fire hazard accompanying their use will be as small as possible.

A very important feature of the present invention, therefore, resides in the construction by which it is impossible for the present burner to deliver fuel to the furnace in an unignited condition.

Many of the oil burners now in use are provided with a pilot light for igniting the fuel as it issues from the oil burner, but it sometimes happens that the pilot light becomes extinguished, in which case a large amount of fuel may issue from the burner without being consumed. The present invention contemplates means for preventing this, and an important feature of the invention resides in means controlled by the pilot and which renders the fuel feeding mechanism inoperative when the pilot light is out.

Another feature of the invention resides in a construction by which the supply of fuel adjacent the burner is maintained at a lower level than the burner so that the fuel will not flow to the burner by gravity, and in means for utilizing a slight air pressure to feed the fuel to the burner.

The slight air pressure exerted upon the fuel, in accordance with the present invention, serves to feed the fuel to the burner in an uniform stream that is free from pulsations or other variations that would affect the flame, and the amount of fuel fed to the burner may be readily controlled by oper-

ating a valve that regulates the supply of oil delivered to the fuel feeding chamber.

When the present fuel feeding means is used on connection with a burner employing air under pressure to atomize the oil, the fan which delivers the air to the burner will serve also to supply the air that feeds the oil to the burner. This arrangement has the advantage that fuel will not be delivered to the burner unless the fan for supplying the atomizing air is operating. The employment of an air blast for atomizing oil has the further advantage in that it produces very little noise, and the type of fan to be described is given a special construction that avoids the humming noise which accompanies the operation of the ordinary fans.

In the present construction, as stated, means is provided for maintaining the level of the fuel in the adjacent feed tank at a level below the burner, and another feature of the present invention resides in mechanism for automatically cutting off the supply of fuel to the burner when for any reason the fuel rises in the feed tank to an abnormal height.

Another feature of the invention resides in an emergency valve and means for operating the same in case the abnormal rise of fuel in the feed tank should fail to operate the automatic cut-off to the burner. This emergency valve serves to cut off the supply of fuel to the feed tank and causes a vacuum tank to drain the fuel from the feed tank and the associated conduits.

Still another feature of the invention resides in improvements in the construction of the atomizing mechanism of the burner.

Other features of the invention and novel combination of parts in addition to the above will be hereinafter described in connection with the accompanying drawings which illustrate one good practical form thereof.

In the drawings:—

Fig. 1 is a side view of an oil burner and associated parts constructed in accordance with the present invention.

Fig. 2 is a view of the opposite side of the burner shown in Fig. 1 with parts in section.

Fig. 3 is a rear view of Fig. 1 with parts in section.

Fig. 4 is an enlarged sectional view taken on the line 4—4 of Fig. 3.

Fig. 5 is a plan view of a manifold to be described.

Fig. 6 is a sectional view taken on line 6—6 of Fig. 5.

Fig. 7 is a sectional view taken on line 7—7 of Fig. 5.

Fig. 8 is a sectional view taken on the line 8—8 of Fig. 4.

Fig. 9 is an enlarged vertical sectional view taken on the line 9—9 of Fig. 4.

Fig. 10 is a view of the complete burner and main storage tank with parts shown diagrammatically, and with the pump and manifold shown above their proper position.

Fig. 11 is a vertical sectional view through the burner proper and taken at right angles to the plane of the section of Fig. 4; and

Fig. 12 is a vertical sectional view through the fuel pump.

In the embodiment of the invention illustrated, the various parts of the burner unit are supported by a base 10 which may be bolted or otherwise secured to the floor of a building in front of the furnace, in which the burner is to be used. Upon the base 10 is mounted a combined casing for an electric motor 11 and a fan 12, the motor being mounted in the casing 13 while the fan rotates in the casing 14. Below the motor casing 13 is mounted a fuel feed tank or float tank 15, and the lower portion of the fan casing 14 is provided with a tubular casing 16 in which the outer barrel 17 of the burner proper is slidably mounted. At one side of the fan casing 14 is mounted a fuel pump 18 which is also driven by the motor 11.

The lower portion of the fan casing 14 is provided with an opening 19 through which air is delivered to the casing 16 and the outer barrel 17 of the burner, a slot 20 being provided in a wall of the barrel through which the air passes into the barrel. The construction of the fan 12 is preferably such that it will be practically free from the humming noise which the electrical fans now in use commonly produce. This noise it is found is due largely to the vibration of the fan blades, and in order to reduce this vibration to a minimum the fan 12 is provided with side walls 21 and 22 which converge towards each other and extend outwardly beyond the curved vanes 23 mounted between the side walls.

This construction serves to restrict somewhat the discharge of air from the outer periphery of the fan and as a result tends to equalize the air pressure upon the opposite faces of the vanes 23. This reduces the tendency of these vanes to vibrate and causes the fans to operate very quietly.

As stated, the pump 18 is driven by the

electric motor 11 and to this end the central shaft 24 of the motor extends through the fan casing into a gear casing 25 secured by bolts 26 to one face of the fan casing, and the shaft 24 is provided with a worm 27 which drives a worm gear 28 mounted in the housing 29 of the gear casing. The fuel pump 18 is supported at one side of the casing 29 by a laterally extending bracket 30 and the oil pump is shown as consisting of two co-operating gears 31 and 32 enclosed in the pump casing and which operate in a well known manner. The upper gear 31 of the pump is shown as having a laterally extending shaft which has a flattened outer end that extends into a cooperating notch formed in the end of the shaft 33 which supports and is driven by the worm gear 28. Stuffing boxes of the usual construction may be provided about the shaft 33 and about the similar shaft projecting from the gear casing, and the gland nut of one or both of these stuffing boxes may be yieldingly held in place by a spring 34.

The fluid feed tank or float tank 15, which is mounted below the fan casing, is formed air tight and this tank is provided with a removable cover 35 which may be secured in place by an eccentric clamp 36 pivoted to a support at 37, and a strip of suitable packing is preferably provided between the upper edge of the tank and its cover to insure an air tight joint between them. Fuel is delivered to the tank 15 by a pipe 38 leading from the pressure side of the pump 18, and a return pipe 39 is provided for conducting oil from the tank 15 to the pump. Fuel is supplied to the pump by a pipe 40 leading from the main supply tank T, which is usually located at a substantial distance from the furnace and when the pump is driven it draws fuel through the pipe 40 to a manifold 41 having a chamber 42 and between this chamber and a port 43, which leads to the pipe 39, is provided a check valve 44. The arrangement is such that when the fuel has once been drawn from the tank through the pipe 40 and has passed the check valve 44 it cannot return through this check valve. As the pump 18 continues to operate the height of the fuel in the tank 15 will rise. It is desirable to maintain the level of the fuel in this tank at a predetermined height and to this end the manifold 41 which is secured to a side wall of the tank 15 is provided with a projecting boss 45 which extends through a wall of the tank, as shown in Fig. 2, and in this boss is formed a port 46 located below the normal level of the oil, and which communicates with the port 43 above mentioned and also with the end of the pipe 39 which is screwed into a socket formed in the manifold, as best shown in Fig. 6. The passage of fuel into the port 46 is controlled by a

valve 47 operated by a float 48 having a bent arm 49 pivoted at 50 to lugs formed upon the boss 45, and the lower end of the bent arm 49 is pivotally secured to the valve 47 at 51. The arrangement is such that when the fuel in the tank 15 is below the predetermined level the valve 47 will be held closed by its float 48. This will prevent oil from being drawn from the tank 15 to the pump through the pipe 39 and as a result the suction produced by the pump will draw fuel from the main supply tank T, and the fuel which passes through the pump will be conducted by the pipe 38 to the float tank. This will cause the fuel to rise in the float tank and as it reaches the desired level the float 48 will be actuated to open the float valve; whereupon fuel will be permitted to pass out of the tank through the port 46 to the pump, and in this manner the float valve 47 will be opened and closed to maintain the height of the fuel at the desired level within the tank 15.

The float valve just described serves to maintain the fuel in the tank 15 below the level of the burner proper so that oil will not flow by gravity to the burner, but is fed thereto by establishing a slight air pressure within the tank 15 as above stated. The oil burner proper consists of a head 52 which is fitted in the rear end of the tubular barrel 17 and this head is provided with a laterally extending portion 53 best shown in Fig. 4. Fuel from the tank 15 is delivered, through connections to be described, to a port 54 formed in the arm 53 of the head and from this port it passes through the passages 55, 56 to a tube 57 disposed centrally within the barrel 17 and the oil is conducted by the tube 57 to the delivery end of the burner. The tube 57 has threaded engagement with the head 52, as best shown in Fig. 11.

The barrel 17 is mounted slidably within its tubular support 16 so that the barrel may be slid rearwardly to withdraw the discharge end of the burner from the furnace, and it is important that means be provided for cutting off the supply of fuel to the burner when the burner is withdrawn from its normal firing position. To this end a valve casing 58 is provided which is secured to a wall of the base 10 by bolts 59 (see Fig. 3). Within this valve casing is formed a port 60 which communicates with the port 54 above mentioned and the discharge of fuel through the port 60 is controlled by a valve 61 to the opposite ends of which are rigidly secured a yoke 62, and a clamping bolt 63 is threadedly mounted in an intermediate portion of the yoke. The arrangement is such that when the yoke is moved to the position shown in Figs. 1 and 4, the valve 61 is opened and the clamping bolt 63 may be tightened against the outer face

of the extension 53 to clamp the burner in its firing position and to hold the port 54 in alignment with the port 60 to conduct fuel from the float tank to the burner. When it is desired to withdraw the burner from the firing position the bolt 63 is retracted and the yoke is swung to an angle of 90 degrees, whereupon the valve 61 is closed and danger of fuel escaping through the port 60 is avoided. At the outer end of the head 52 is provided a knob 64 which may be grasped when it is desired to move the burner from its firing position. The discharge end of the burner is shown as mounted within a casing 65 which is supported from the tubular housing 16 by a bracket 66 which serves to support the casing 65 so that it projects a slight distance into the furnace and the interior of the casing 65 is preferably filled with heat-resistance material 67.

The fuel which passes from the tank 15 to the burner leaves the tank through a port 68 formed laterally in a plug or sleeve 69 extending upwardly through the base of the tank 15 and the fuel passes from the port 68 through a conduit 70, which is best shown in Fig. 4, to the valve casing 58 and when the valve 61 is open the fuel passes through the ports 54, 55, 56 and tube 57 to the discharge end of the burner.

It is possible that the float valve 47 may stick and fail to prevent fuel within the tank 15 from rising above the predetermined level, and it is therefore desirable to provide additional means to prevent the burner from becoming flooded in case the fuel should rise to an abnormal height in the tank 15 and to this end in the construction shown a second float 71 is provided in the float chamber to operate a valve 72 having the form of a hollow sleeve the lower end of which is adapted to cooperate with and close the bore formed in the upper end of the plug 69. The float 71 has a laterally extending arm which is pivotally secured at 73 to a fixed bracket 74 and the outer end of this arm is pivotally secured at 75 to the valve 72. The arrangement is such that as the fuel continues to rise in the tank 15 upon failure of the float 48 to function properly the upper float 71 will be operated to seat the valve 72 upon the upper end of the plug 69 and thereby prevent oil from entering the bore 76 in this tube which conducts oil to the port 68.

The valve 72 not only serves to shut off the supply of fuel to the burner, but serves also to shut off the supply of air to the tank 15, as will now be described. In order to supply a small amount of air to the float tank 15 for the purpose of feeding fuel to the burner, a valve casing 77 is bolted to one side of the housing 16 (see Figs. 4 and 8) and this casing has a port 78 which

communicates with a port 79 leading from the interior of the housing 16 and through which some of the air forced into the housing by the rotating fan will enter the port 78. From this port the air passes through an adjustable valve 80 to the chamber 81, in which chamber is formed a cylindrical portion containing a strainer 82 which serves to remove dust from the air and this strainer may readily be removed and cleaned by unscrewing the cap nut 83. After the air has passed through the strainer it is led by a pipe 84 (see Figs. 4 and 10) to a vertical tube 85 mounted within the plug 69 and extending upwardly through the base of the tank 15. The upper end of the tube 85 extends upwardly within the cup-shaped valve 72 and the air which reaches the lower end of the tube 85 passes upwardly within this tube and escapes from the upper end thereof into the closed tank 15 through a port 86 formed in a side wall of the cup-shaped valve 72 (see Fig. 9). From the foregoing it will be seen that when the valve 72 is moved downwardly by the upper float 71, it not only shuts off the supply of fuel to the burner, but it also shuts off the supply of air to the tank 15 by moving the port 86 downwardly below the upper end of the tube 85.

From the foregoing description it is clear that should the lower float 48 fail to open its valve and the upper float 71 be actuated by the rise of fuel, to shut off the supply of fuel to the burner and also to cut off the supply of air to the tank 15, all ports leading from the tank 15 will be closed. Should the oil pump continue to operate at this time, an undue pressure might be established within the tank 15 due to the accumulation of oil therein. To avoid this the oil pump may be provided with a relief valve 87 (see Fig. 11) which is normally held seated by a spring 88, the tension of which may be adjusted by a threaded bolt 89 and the arrangement is such that when the oil pressure at the discharge side of the pump becomes excessive, the relief valve 87 will open and permit the oil to flow through the passage 90 in the direction indicated by the arrow, to the suction side of the pump.

It is necessary to establish an air pressure within the tank 15 which is only slightly in excess of the normal atmospheric pressure and a relatively small amount of air is required to feed the fuel to the burner. The air valve 80 above mentioned is, therefore, constructed so that it provides a relatively small air passage and accordingly is shown as consisting of the threaded stem 91 the lower end of which is slabbled off slightly as at 92 to permit the passage of air between the slabbled off portion and the valve seat.

Should the upper float valve 71 fail to

operate when an excessive amount of fuel is delivered to the tank 15, the present invention contemplates still further means for preventing the burner from being flooded, and to this end the lower end of the vertical air tube 85 is provided with a vent 93 so that should the sleeve valve 72 fail to close when the fuel in the float tank has reached the level of the upper end of the tube 85, the fuel will enter the tube 85 through the port 86 and escape through the vent 93 at the lower end of this tube into a bucket 94, which bucket is supported by a pivoted arm 95 adapted to operate an emergency valve 96. This vent serves also to relieve the air pressure promptly within the tank 15 when the fan is stopped. The arm 95 is pivoted at 97 to a supporting bracket 98 and this arm is normally held in the position shown in Fig. 2 by a spring 99 one end of which is anchored to a fixed arm 100 and the other end of the spring is secured to a plug 101 supported by a housing 102 formed integral with and extending laterally from the pivoted portion of the arm 95. The arrangement is such that the spring normally lies slightly above the pivot 97 and holds the arm 95 in a raised position, but as fuel accumulates in the bucket 94 the weight of the fuel will pull the arm downwardly to move the axis of the spring below the pivot 97. This will serve to open the emergency valve 96. The tension of the spring 99 may be adjusted by a threaded nut engaging the plug 101 and the normal elevated position of the arm 95 may be adjusted by adjusting the threaded bolt 103.

The emergency valve 96 is operated by a plunger 104 connected to the operating arm 95 by a link 105 and the plunger 104 is shown as slidably mounted within the tubular valve stem 96, and a spring 106, confined between the inner end of the plunger and the valve stem, serves to hold the valve properly seated. A flexible diaphragm 107 which surrounds the valve stem 96 prevents leakage from the valve chamber 108. The diaphragm 107 is shown as secured in place by a threaded cap 107^a, and the bracket 98 may be supported by this cap and secured in place by a nut 107^b. When the emergency valve 96 is opened fuel passes from the float tank 15 through the port 109 to the chamber 110 and from this chamber through the valve to the chamber 108 and then to the pipe 40 leading from the main supply tank. The chamber 108 communicates with the chamber 42 above mentioned and when the emergency valve 96 is open a sufficient amount of fuel is admitted to the chambers 108 and 42 to fully meet the capacity of the pump 18, whereupon the pump will no longer produce a suction within the pipe 40 leading from the main supply tank.

It is contemplated that the tank T be pro-

vided with a vacuum tank such as described and claimed in the M. A. Fesler Patent No. 1,308,005, granted June 24, 1919, and such vacuum tank is designated by 111. This vacuum tank is connected to a downwardly extending portion of the pipe 40 as at 112 and a pipe 113 which is connected to the pipe 40 and extends downwardly well into the tank T is provided with a pressure valve 114 such as is fully described in the patent just mentioned. The arrangement is such that when the oil pump 18 is first started it will produce a suction within the pipe 40 and this will exhaust the air within the tank 111, whereupon the pressure valve 114 will open and fuel will be drawn from the tank T to the pump and this condition continues throughout the ordinary operation of the present oil burner, the check valve 44 being provided to prevent the vacuum within the tank 111 from acting upon the fuel within the tank 15 when the pump is not operating.

When the emergency valve 96 is opened by accumulation of fuel in the bucket 94, oil flows freely from the tank 15 to the communicating chambers 108 and 42, whereupon as above stated the oil pump will no longer maintain a suction within the pipe 40. The vacuum produced within the tank 111 will then serve to suck the oil out of the tank 15 and pipe 40, whereupon danger of fire is prevented.

If, through any possibility, the various safety devices above described should fail to take care of any emergency, danger of fire may still further be prevented by providing a weighted hammer 115 which is pivotally secured to the supporting base at 116 and this hammer is normally held in an elevated position by a fusible link or the like 117, the arrangement being such that should the oil burner unit be subjected to an abnormal temperature, the link 117 will give way and allow the hammer 115 to drop and strike a portion carried by the housing 102 of the bucket supporting arm 95. This will serve to depress the arm and open the emergency valve 96, whereupon fuel will be drawn from the tank 15 in the manner above described.

In the construction shown a gas pilot light is provided near the inner end of the burner and to this end a tube 118 is mounted within the casing 65 and illuminating gas is supplied to this tube by a pipe 119 which communicates with a gas supply pipe connected to the lower portion of the air valve casing 77. It is highly important that fuel be prevented from reaching the burner when the pilot flame is extinguished and to this end, in the present case, a blind air pipe 120 is provided extending from the strainer containing portion of the air valve casing 77 to a point near the outer end of the pilot tube 118. This blind pipe is provided with a vent 121 through which air may escape to relieve the pressure of the air within the float tank 15. The vent 121 is normally closed by a cap held in place by a strip of thermostatic metal 122 which metal is connected to the rear end of the pilot tube 118 by a heat-conducting bracket 123. The arrangement is such that as long as the pilot flame is burning the thermostatic metal 122 will receive sufficient heat from the pilot tube to hold the cap over the port 121 and thereby prevent the escape of air through this port, but, when the pilot flame becomes extinguished, the thermostatic strip 122 will become cooled, whereupon it will open the port 121 and permit the air pressure within the tank 15 to drop, so that fuel will not be fed to the burner.

From the foregoing description, when read in connection with the drawings, it will be seen that the burner may be placed in and out of operation by simply starting and stopping the electric motor 11, since the supply of both air and fuel to the burner is controlled by this motor. It will be understood that when the motor is started the fan will be operated to deliver air for atomizing purposes to the burner and also to establish sufficient air pressure within the tank 15 to feed fuel to the burner, and the rate at which fuel is supplied to the burner may be accurately regulated by simply adjusting the air valve 80. As the atomized fuel issues from the burner, it will be ignited by the pilot and if, for any reason, the pilot flame should be out, sufficient air pressure will not be established within the tank 15 to feed oil to the burner.

The burner proper as illustrated contains various novel features which will now be described. The central tube 57 which supplies oil to the burner is held centrally within the outer tubular barrel 17 by a spider 124. The outer end of the tube 57 is closed by a threaded plug 125 and upon the outer end of this tube is mounted a stationary deflector or mushroom 126 having a tubular portion 127 which embraces the tube 57 and which is provided with a downwardly extending nipple 128 which communicates with a port 129 in a wall of the tube 57 and fuel passes from the tube 57 through the nipple 128 into a cup 130 which is rotatably mounted upon the tube 57. The cup 130 in the construction shown is secured to a bearing tube 131, in which are mounted spaced anti-friction bearings 132 and 133 and these bearings are retained in spaced relation by a sleeve 134 that embraces the tube 57. The rear end of the bearing tube 131 is provided with a turbine 135 which is rotated by the air traveling within the barrel 17 towards the delivery end of the burner and this rotates the cup 130 to impart a whirling movement to the fuel delivered to this cup. Since the cup 130 rotates at a high speed and its

walls flare outwardly slightly, the oil is discharged from the cup with a substantial amount of centrifugal force and is thrown against the wall of air issuing through the space provided between the flaring outer edge of the cup and the end of the outer nozzle 136. As the oil is thrown outwardly by the cup 130 a vacuum tends to be created in this cup. This is undesirable and may be prevented by providing one or more ports 137 near the rear end of the cup through which air may pass into the cup. It is desirable to deflect the air that enters through the ports 137 away from the walls of the cup so that this air will not disturb the oil therein, and to this end an annular deflector 138 is provided within the cup which serves to deflect the air inwardly towards the axis of the cup.

It is necessary to supply the bearings 132 and 133 with a lubricant and to this end a tube 139 is mounted within the barrel 117 and its rear end communicates with an oil cup 140 through a port 141, while the forward end of the tube 139 communicates with a port 142 leading to the bearing 133. When it is desired to remove the rotating parts of the burner just described, this may be easily done by removing the threaded plug 125, whereupon the stationary deflector 126 may be stripped off of the tube 57, and the cup 130, bearing tube 131 and bearings mounted therein may be removed as a unit. A coiled spring 143 is preferably provided between the anti-friction bearing 132 and the inner end of the tubular portion 127 of the deflector, which spring serves to hold the anti-friction bearings in their proper position lengthwise of the tube 57.

What is claimed is:—

1. In a device of the class described, in combination, a burner, a fan for supplying atomizing air to the burner, a closed oil tank, a pump for forcing oil to said tank, a motor for driving the fan and pump, means for maintaining the level of the oil in the tank below the burner, a conduit for conducting oil from the tank to the burner, valve controlled means for delivering air from the fan to the tank to feed fuel to the burner and for regulating the rate of feed by varying the air pressure in the tank, a pilot light for the burner, and means controlled by the pilot to relieve the air pressure in said tank and thereby stop the supply of oil to the burner when the pilot is out, including a piece of thermostatic metal and a bleed valve having a closure directly secured to said metal so that its movement caused by expansion and contraction is directly imparted to the closure to move it to and from the closed position.

2. An oil burner unit, comprising in combination, a closed oil tank, a burner having a conduit for conducting oil from the tank

to the burner, means for delivering air under pressure to the tank to force oil to the burner, a valve for checking the flow of air to said tank, a second valve for checking the flow of oil from the tank to the burner, a float for operating both of said valves, an overflow conduit, and an emergency valve adapted to be actuated by oil escaping through the overflow conduit when the float fails to operate its valves.

3. An oil burner unit, comprising in combination, an oil tank, a burner having a conduit for conducting oil from the tank to the burner, means for delivering air under pressure to the tank to force oil to the burner, including an oil overflow pipe through which air is admitted, a float actuated valve for checking the flow of air into the tank and constructed to admit oil to the overflow pipe upon failure of the float valve to close.

4. An oil burner unit, comprising in combination, an oil tank, a burner connected to said tank, a conduit leading from a source of fuel supply to the tank, a vacuum tank at the source of fuel supply for exerting a suction force upon the oil in said conduit, a pump connected to said conduit for delivering oil to the oil tank in opposition to the suction of the vacuum tank, a conduit for conducting excess oil from the tank to the suction side of the pump to thereby avoid returning the excess oil to said source of fuel supply, a port leading from the oil tank to the first mentioned conduit and by-passing the pump, and an emergency valve for controlling said port and which when opened permits the vacuum tank to drain oil from the oil tank back to the source of fuel supply through the first-mentioned conduit.

5. An oil burner unit, comprising in combination, an oil tank, a burner connected to said tank, a conduit leading from a source of fuel supply to the tank, a vacuum tank connected to said conduit to exert a suction force upon the oil in said conduit, a pump connected to the conduit for delivering oil to the oil tank in opposition to the suction of the vacuum tank, a port leading from the oil tank to the conduit, and an emergency valve controlling said port and which when opened admits oil to the conduit in excess of the capacity of the pump to permit the vacuum tank to drain oil from the oil tank and conduit.

6. An oil burner unit, comprising in combination, an oil tank, a burner connected to said tank, a conduit leading from a source of fuel supply to the tank, a vacuum tank at the source of fuel supply for exerting a suction force upon the oil in said conduit, a pump connected to said conduit for delivering oil to the oil tank in opposition to the suction of the vacuum tank, a conduit for conducting excess oil from the tank to the

suction side of the pump to thereby avoid returning the excess oil to said source of fuel supply, a port leading from the oil tank to the first-mentioned conduit and for bypassing the pump, and an emergency valve for controlling said port and which when open admits oil to the conduit to relieve the suction of the pump and permits the vacuum tank to drain oil from the tank and conduit.

7. In a fuel feeding system, a fuel tank, a conduit leading from a source of fuel supply to the tank, a vacuum tank connected to said conduit to exert a suction force upon the fuel in the conduit, a pump connected to the conduit for delivering oil to the fuel tank in opposition to the suction of the vacuum tank, and an emergency valve which when opened admits fuel to the conduit from the fuel tank to relieve the suction of the pump and permit the vacuum tank to drain oil from the tank and conduit.

8. In a fuel feeding system, a fuel tank, a conduit leading from a source of fuel supply to the tank, a vacuum tank connected to said conduit to exert a suction force upon the fuel in the conduit, a pump connected to the conduit for delivering oil to the fuel tank in opposition to the suction of the vacuum tank, means for controlling the height of fuel in the fuel tank, and an emergency valve operable upon an excess amount of fuel reaching said tank and which admits fuel to the conduit from the fuel tank to relieve the suction of the pump and thereby permits the vacuum tank to drain fuel from the fuel tank.

9. An oil burner unit, comprising in combination, a closed oil tank, a burner having a conduit connecting it with the tank, a pilot for lighting the burner, means for supplying oil to the tank, means for establishing an air pressure in the tank sufficient to force oil to the burner, a closed air conduit leading from said tank to a position near the pilot and having a bleed aperture adjacent the pilot, a piece of thermostatic material mounted in position to be heated by the pilot, and a closure for said aperture secured directly to said material so that it is held by the expanded material in the aperture-closing position as long as the pilot is lighted and is moved when the pilot goes out to relieve the air pressure in the tank and stop the supply of oil to the burner.

10. An oil burner unit, comprising in combination, a closed oil tank, a burner having a conduit connecting it with the tank, a pilot for lighting the burner, means for supplying oil to the tank, means for establishing an air pressure in the tank sufficient to force oil to the burner, a bleed valve for relieving the air pressure in the tank to cut off the supply of oil to the burner comprising an aperture and a closure therefor, and a piece

of thermostatic metal anchored at one end and having the closure directly secured to its other end and constructed and arranged to be heated by the pilot and to hold the closure in one position when the pilot is burning and in a different position when the pilot is out.

11. In combination with a burner, a fuel tank for supplying fuel to the burner, means for delivering fuel to the tank, means for controlling the level of the fuel in the tank, an overflow outlet through which fuel may escape from the tank upon failure of the control means to function, an emergency valve for the escape of liquid from the tank and having an operating lever, and a receptacle supported by the lever below said overflow whereby the emergency valve is opened by fuel overflowing into said receptacle.

12. In combination with a burner, a fuel tank for supplying fuel to the burner, means for delivering fuel to the tank, means for controlling the level of the fuel in the tank, an overflow outlet through which fuel may escape from the tank upon failure of the control means to function, an emergency valve for the escape of liquid from the tank and having an operating lever, a receptacle supported by the lever below said overflow whereby the emergency valve is opened by fuel accumulating in the receptacle, a hammer mounted in position to strike a portion of the emergency valve to open the valve, and a fusible support for said hammer adapted to release the hammer when the tank is subjected to an abnormal temperature.

13. In combination with a burner, a fuel tank for supplying fuel to the burner, means for delivering fuel to the tank, means for regulating the level of the fuel in the tank, a trip emergency valve for the escape of liquid from the tank upon failure of the control means to function, a hammer supported so that it will fall when released into position to trip and open the emergency valve, and a fusible support for the hammer adapted to release the hammer when the tank is subjected to an abnormal temperature.

14. In a fuel feeding system, a fuel tank for supplying fuel to the burner, a conduit leading from a source of fuel supply to the tank, a port leading from said tank, an emergency trip valve that normally closes the port, a vacuum tank remote to the fuel tank and connected to said port and means operable upon an excessive amount of fuel being delivered to the fuel tank to open the emergency valve and permit the vacuum tank to drain fuel from the fuel tank.

15. In a fuel feeding system, a closed fuel tank, a conduit leading from the tank to the burner, a pump for delivering fuel to the tank, a float valve for regulating the height of the fuel in the tank, an emergency float valve for cutting off the supply of fuel to

the burner when the first float valve fails to function, and a relief valve for relieving the pressure of the fuel in the tank when both of said valves are closed and the pump 5 continues to operate.

16. An oil burner unit, comprising in combination, a closed oil tank, a burner having a conduit connecting it with the tank, means for supplying oil to the tank, a pilot 10 for lighting the burner, means for forcing air into the tank to feed oil to the burner, a closed conduit leading from the tank to a position near said pilot and having an aperture near said pilot through which air may 15 escape to relieve the air pressure in the tank, a closure for said aperture, and a thermostat mechanically connected to said closure to move it to and from the active position and constructed to open said aperture when 20 the pilot is out thereby to relieve the pressure in said tank and arrest the flow of oil to the burner.

17. In a fuel feeding system, a fuel tank for supplying fuel to the burner, a conduit 25 leading from a source of fuel supply to the tank, an emergency trip valve leading from said tank, a vacuum tank remote from

the fuel tank and connected to the trip valve, means operable upon an excessive amount of fuel being delivered to the fuel 30 tank to open the emergency valve and permit the vacuum tank to drain fuel from the fuel tank, a hammer mounted independent of said valve operating means and adapted when released to trip and open said valve, 35 and a fusible support for the hammer adapted to release it when the fuel tank is subjected to an abnormal temperature.

18. An oil burner unit comprising in combination, a closed oil tank, a burner having a conduit connecting it with the tank, 40 means for supplying oil to the tank, means for forcing air into the tank to feed oil to the burner, an overflow conduit leading from said tank, and valve means having an 45 operating float and constructed to be moved by the float into a position in which it simultaneously shuts off the supply of fuel to the burner, stops the flow of air into the tank and excludes fuel from said overflow con- 50 duit.

In testimony whereof, I have signed my name to this specification.

MILTON A. FESLER.