Sept. 28, 1926.

1,601,242

J. B. ENNIS

OIL BURNER

Filed Jan. 26, 1924

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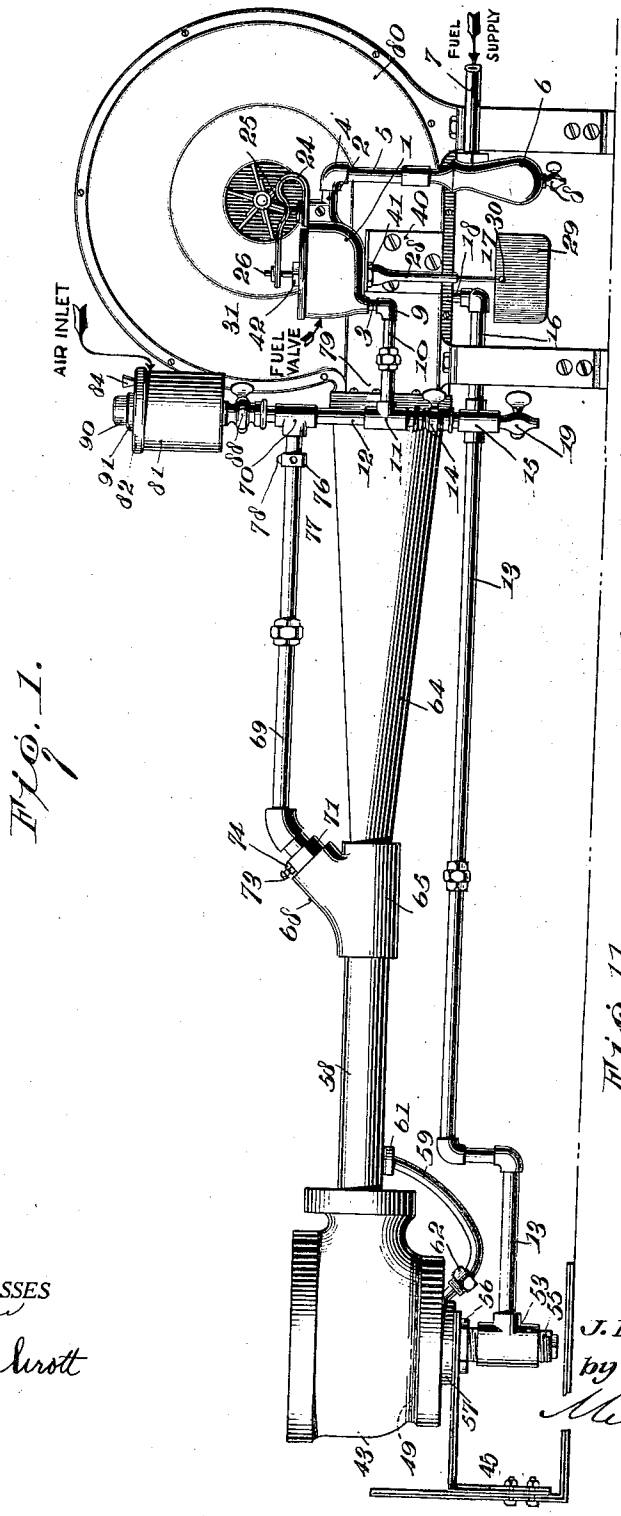


Fig. 1.

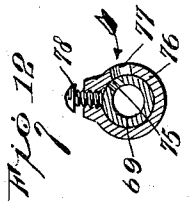


Fig. 12

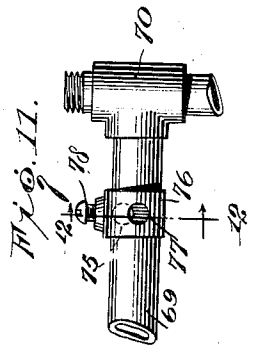


Fig. 11.

WITNESSES

M Fowler

J. P. Schrott

INVENTOR

J. B. Ennis

by Munn & Co.

ATTORNEYS

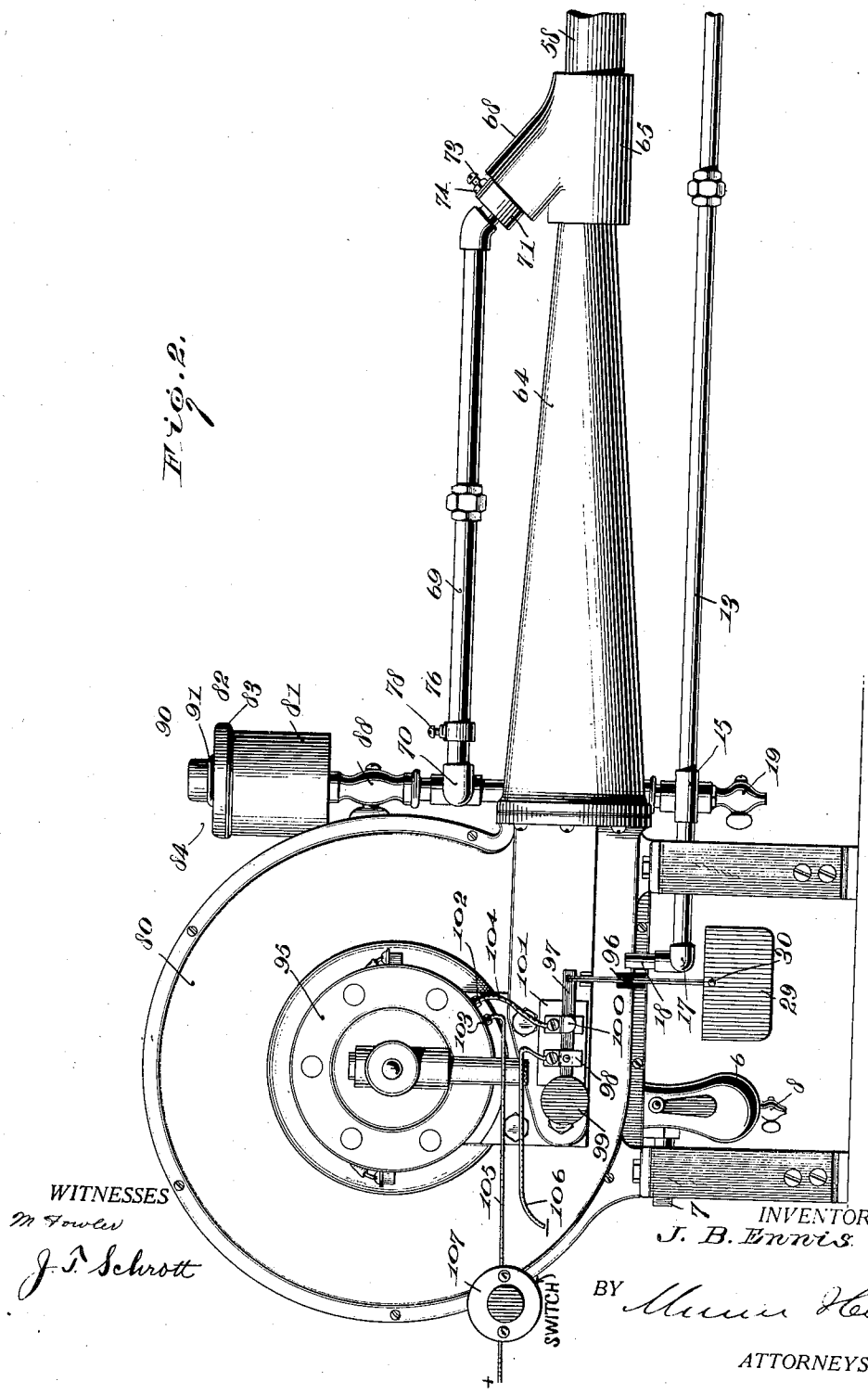
Sept. 28, 1926. 1,601,242

J. B. ENNIS

OIL BURNER

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Fig. 2.



WITNESSES

M Fowler

J. T. Schrott

INVENTOR

J. B. Ennis

BY Munn & Co.

ATTORNEYS

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J. B. ENNIS

OIL BURNER

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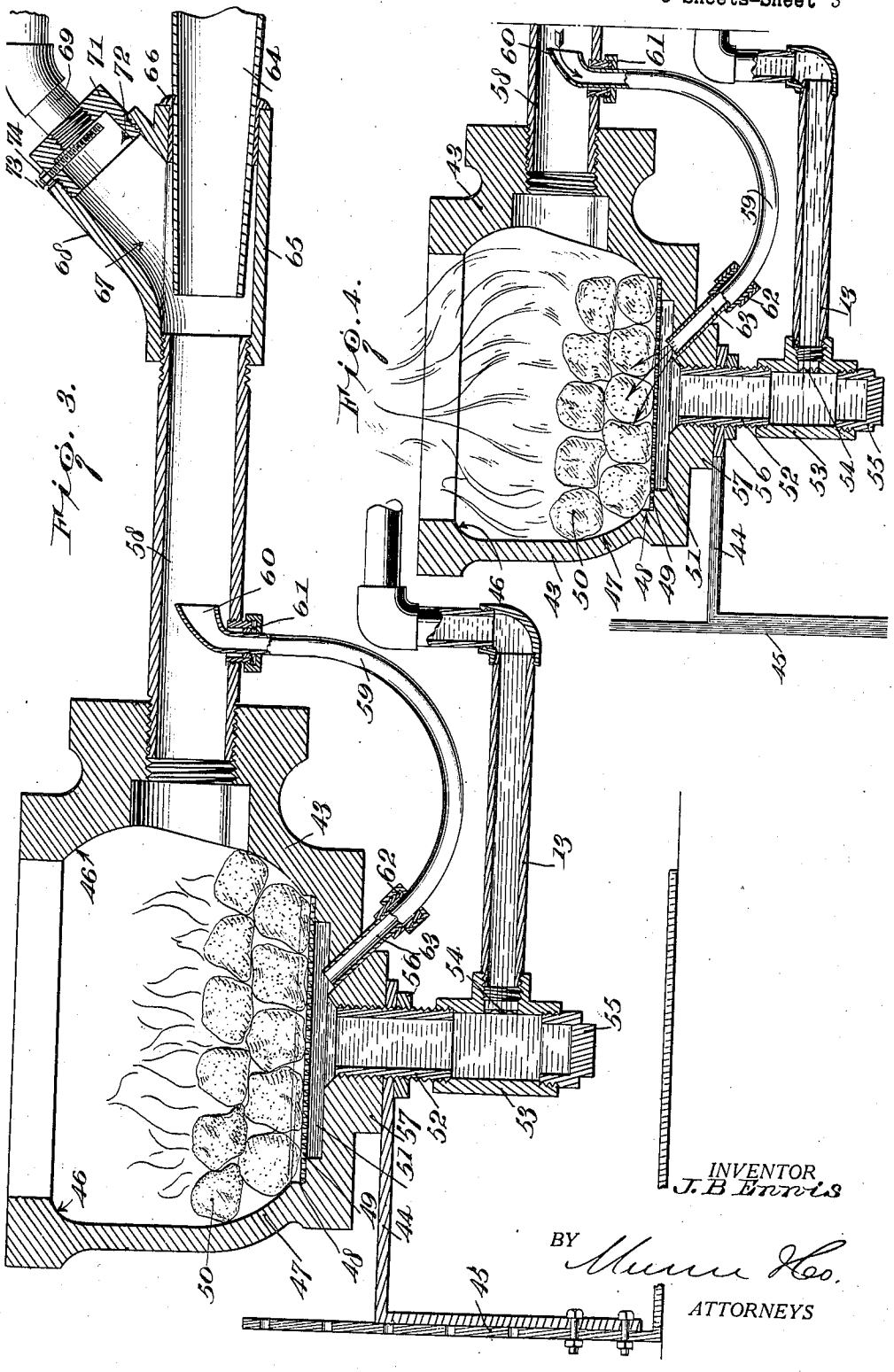


Fig. 3.

Fig. 4.

INVENTOR
J. B. Ennis

BY Munn & Co.

ATTORNEYS

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J. B. ENNIS

OIL BURNER

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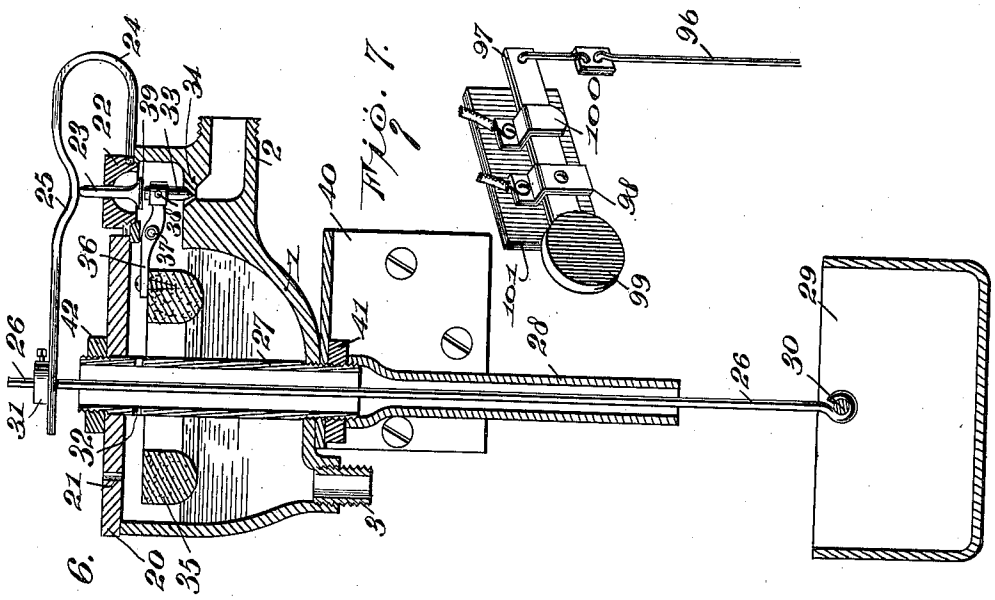


Fig. 6.

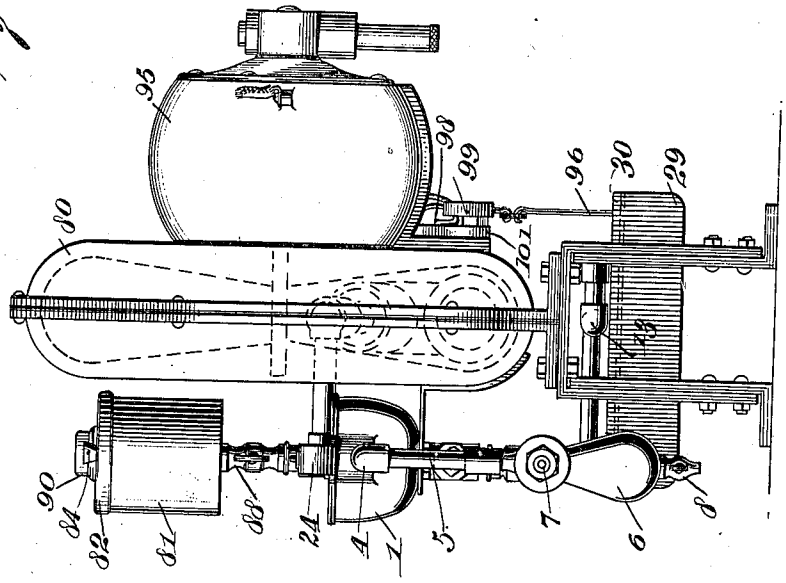


Fig. 5.

Fig. 7.

WITNESSES

W. Fowler

J. P. Schrott

INVENTOR

J. B. Ennis

BY Munn & Co.

ATTORNEYS

Sept. 28, 1926. 1,601,242

J. B. ENNIS

OIL BURNER

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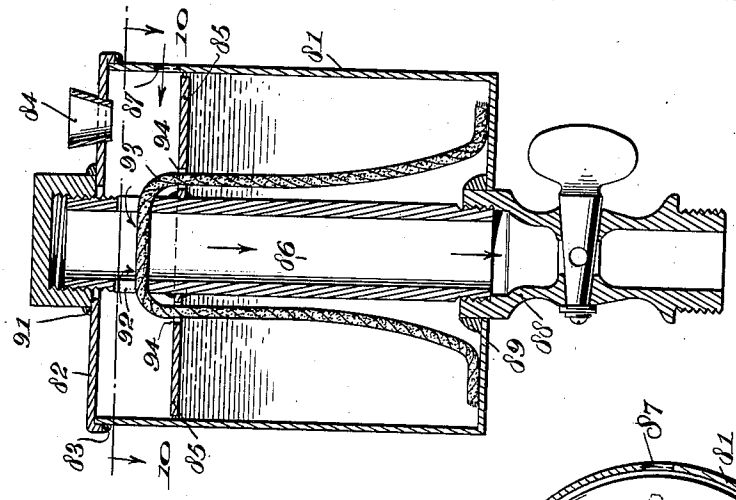


Fig. 9.

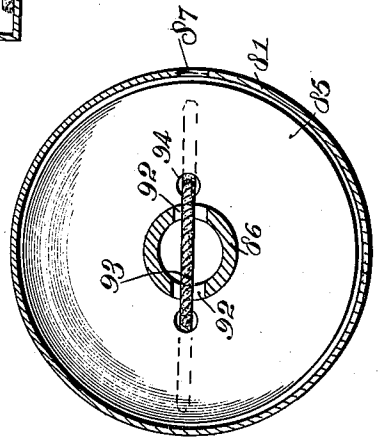


Fig. 10.

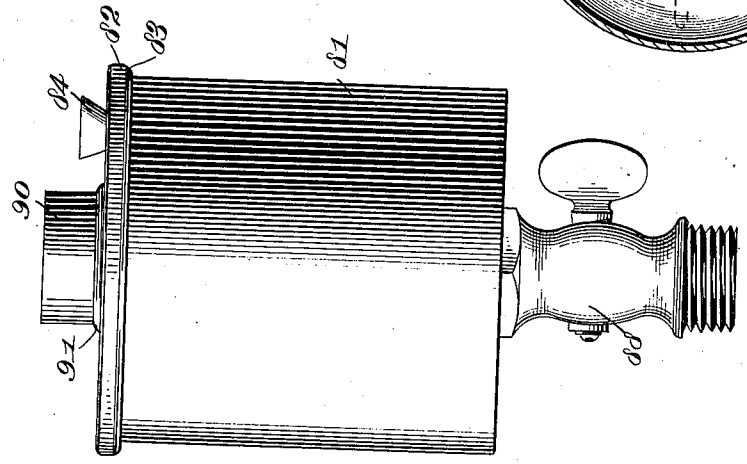


Fig. 8.

WITNESSES

M Power

J. P. Schrott

INVENTOR

J. B. Ennis.

BY Munn Reo.

ATTORNEYS

Patented Sept. 28, 1926. 1,601,242

UNITED STATES PATENT OFFICE.

JOSEPH BENJAMIN ENNIS, OF NORFOLK, VIRGINIA.

OIL BURNER.

Application filed January 26, 1924. Serial No. 688,785.

My invention relates to improvements in oil burners and it consists of the constructions, combinations and arrangements herein described and claimed.

An object of the invention is to provide an oil burner adapted particularly for consuming fuel oil, the burner being adaptable to uses other than in home furnaces for which purpose it is primarily intended.

Another object of the invention is to provide an oil burner which has a complete arrangement of means for respectively controlling the inflow of fuel oil both to the main valve and combustion pot, insuring that the pilot flame shall not be blown out in the fire pot upon introduction of the initial blast of air, stopping the motor upon a flooding of either the main valve or the fire pot and moistening the inflowing air, all of the foregoing functions being performed automatically.

Other objects and advantages will appear from the following specification, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of the complete oil burner,

Figure 2 is a detail side elevation, viewed from the opposite side, particularly illustrating the blower motor control,

Figure 3 is a detail longitudinal section of the combustion or fire pot, and its associated parts,

Figure 4 is a detail of the fire pot illustrating how the pilot flame is aroused prior to the initial entrance of the fuel vapor blast upon starting the burner.

Figure 5 is a rear elevation of the burner,

Figure 6 is a vertical section of the automatic supply and safety cut-off valve,

Figure 7 is a detail perspective view of the counter-balanced electric switch,

Figure 8 is a side elevation of the air moistener,

Figure 9 is a vertical section thereof,

Figure 10 is a horizontal section on the line 10—10 of Figure 9.

Figure 11 is a detail side elevation of the auxiliary air valve in the vapor pipe,

Figure 12 is a cross section on the line 12—12 of Figure 11.

In order that the constituent parts of the oil burner may more readily be understood each is separately described approximately in the order in which the respective functions occur. These individual descriptions are summarized in a description of the operation.

The automatic supply and cut-off valve comprises a brass bowl 1 (Figure 6) which has an inlet nipple 2 at one side and an outlet nipple 3 at the bottom and at the other side of the center. The first nipple has connection by means of an elbow 4 (Figure 1) with a pipe 5 upon which a sediment bulb 6 is suspended. The fuel supply pipe 7 connects with the bulb, and a cock 8 at the bottom permits draining the bulb when required. The nipple 3 has connection by means of an elbow 9 (Figure 1) with a pipe 10 which is screwed into a T 11. The T makes the connection between the pipe 10, the fuel lift pipe 12 and the combined feed and overflow pipe 13. Connection with the latter is made through a valve 14 and a four-way fitting 15. The continuation 16 of the pipe 13 has elbows 17 which terminate in a nipple 18 at which oil overflows upon flooding of the combustion pot. The valve 14 controls the flow of oil to the feed pipe 13. The purpose of this pipe is to supply the pilot flame in the combustion pot. A cock 19 permits draining the pipe 13.

Referring to Figure 6 the valve bowl 1 is shown to be provided with a cover 20 which has a vent 21 for the purpose of equalizing air pressures. The cover has a plug or cap 22 which serves both as a guide for a plunger 23 and a means for securing the spring lever 24 upon the cover. For the latter purpose the cap 22 is shouldered so that the spring may be wedged in place upon screwing the cap down.

A hump 25 in the spring lever 24 engages the exposed end of the plunger 23. The free end of the spring lever is apertured to admit the pull rod 26 which passes down through the overflow tube 27 and pull rod guide 28 to a place of attachment with the swinging trough 29. A rod 30 running lengthwise of the trough provides one element of a hinge connection of the pull rod. A collar 31 on the upper end of the pull rod holds the latter in place on the lever.

Should it occur that oil in the brass bowl 1 should overflow into the tube 27 through openings 32, the weight of oil accumulating in the trough 29 would pull down on the spring lever 24 until the plunger 23 forcibly seats the needle valve 33 upon the valve seat 34 so that no more oil may enter at the inlet 2. The occasion for this forcing of the

needle valve will ordinarily occur should a bit of foreign matter become wedged between the needle valve and its seat preventing the needle valve from seating upon rising of the float 35 when the oil rises above the normal level indicated. This function may also occur when oil from the combustion pot overflows into the trough 29 at the nipple 18 (Figure 1).

An arm 36, pivoted at 37 inside of the bowl 1, carries the float 35 and needle valve 33 at opposite ends. The connection at 38 between the needle valve and the arm is pivotal so that the needle valve may properly seat upon rocking movement of the arm. The plunger 23 has an enlarged head 39 bearing down on the end of the needle valve. A bracket 40, by which the valve 1 is supported, is clamped in place by a nut 41 which is screwed upon the threaded ends of the tube 27 for the purpose. The threaded end of the tube also carries the guide 28 which is sufficiently flared at the upper end to receive the tube. The tube 27 is threaded at the upper end to receive the lock nut 42 after it emerges from the cover of the valve 1.

The combustion pot to which reference has already been made, is composed of a heavy bowl 43 of cast iron or other suitable material, arranged to be situated inside of a furnace or other place where the burner is to be used. For either purpose provision is made of a suitable bracket 44 (Figure 3) which is adjustable in respect to a companion bracket 45 so that any necessary elevation may be obtained. The upper portion of the interior wall of the combustion pot is fully rounded or curved at 46 to deflect the flame inwardly and prevent undue flaring or spreading thereof. The lower portion of the pot is gradually rounded inwardly at 47 until it emerges with a recess 48 which provides a seat for a screen or perforated metal disk 49 upon which the combustion nuggets 50 are piled.

Another and smaller recess 51 beneath the disk 49 provides a well which is filled with oil. The normal level of oil lies above the perforated disk 49 so that the hot nuggets 50 may be kept supplied for the burning of a pilot flame. As stated before, the opening of the valve 14 (Figure 1) provides the necessary oil supply for the maintenance of the pilot flame when the burner is not in active use.

It is to be observed that the so-called normal level of oil in the combustion pot 43 is even with the upper end of the overflow 18. A fully threaded nipple 52 has connection with a T 53 to one side of which the end of the feed pipe 13 is connected. A screen 54 prevents sediment from combustion pot being carried into pipe 13 should a backflow occur.

A plug 55 in the lower end of the T provides for cleaning out any sediment that may accumulate. That portion of the T below the screen 54 provides a sediment well. The threaded nipple 52 also carries a lock nut 56 by means of which the bracket 44 is secured beneath the box 57 of the combustion pot. Screwed into one side of the pot 43 is the discharge nozzle 58 of the air gun. A curved pipe 59 provides a by-pass between the nozzle 58 and the well 51. The right portion of the by-pass terminates in a cowl 60 which is intended to receive and conduct some of the air of the initial blast upon starting the operation of the burner beneath the nuggets 50 so as to arouse the pilot flame and prevent it from being blown out.

Suitable couplings 61 and 62 make tight connections of the by-pass 59 with the nozzle 58 and a nipple 63 respectively. The latter enters the combustion pot 43 from below at an angle which leans away from the nozzle 58. The air by-pass 59 also functions in the regular operation of the burner. The air jets at the nipple 63 will keep the oil in the well 51 stirred up and also insure the oil being blown up through the disk 49 and nuggets 50, keeping disk clear.

The air-vacuum gun so-called because of its functions, comprises a tapering nozzle 64 which discharges into the nozzle 58 (Figure 3). The small end of the nozzle 64 enters a cast iron jacket 65, the joint being permanently welded at 66. The end of the nozzle 64 falls short of the end of the nozzle 58 so that ample communication may be had with the chamber 67 of an angled extension 68 of the jacket. The chamber 67 may be called a vacuum chamber in that there is a tendency toward rarification of the air therein upon the issuance of a jet at the small end of the nozzle 64.

The rarification of the air in the chamber 67 attracts both air and oil from the automatic air moistener and the fuel lift pipe 12 (Figure 1), the necessary connection being had through a pipe 69 which joins a mixing T 70 (Figure 1) with a plug or nut 71 in the extension 68. It is to be observed that the diameter of that portion of the pipe 69 which enters the nut 71 is considerably smaller than the internal diameter 72 of the nut itself (Figure 3). This difference of diameters is taken advantage of in the mounting and functioning of a threaded pin 73. This pin is screwed into one side of the nut 71 and is held at various adjustments by a lock nut 74. The pin 73 extends across the outlet of the pipe 69 at the center. Its function is to split the emerging vapor so that it will eddy in the chamber 67 and produce a very thorough commingling of its constituents before passing on to the combustion pot 43. It is the fuel vapor supplied

by the pipe 69 (Figure 1) and such oil that is blown up through the disk 49 by the nozzle 63 that keeps the flame in the combustion pot 43 going in the operation of the burner.

Air may be admitted to the vapor pipe 69 independently of that admitted at the air moistener. An arrangement in the nature of a valve in the pipe 69 serves this purpose. The pipe 69 has an opening 75 (Figure 11) at one side. A ring or band 76 fitted on the pipe at this place also has an opening 77 which may be set by a screw 78 into more or less registration with the opening 75 to draw in varied quantities of outside air according to the particular setting.

Connection of the tapering nozzle 64 is made with the outlet 79 of the blower casing 80 in any suitable manner. The blower itself may be of any suitable type, its purpose being to drive the air into the nozzle 64 for discharge into the nozzle 58 (Figure 3) as already stated. This blast of air drives the flame out of the combustion pot 43.

The automatic air moistener is situated at the upper end of the fuel lift pipe 12 (Figure 1). It consists of a brass tank 81 (Figure 9) upon which a cover 82 is permanently welded at 83. A cup or funnel 84 is used in filling the tank 81 up to a baffle or splash plate 85 which is fixed upon the air tube 86. An adjacent opening 87 provides for the overflow of the water should more than the desirable amount be poured in at the cup 84. This opening also admits the necessary air.

A suction regulator or valve 88 fits into the bottom of the tank 81 where it is welded in place at 89 to remain a permanent part of the tank. The internal threads of the valve 88 provide a mounting for the tube 86. The upper threaded end of the tube extends beyond the top or cover of the tank, a brass cap 90 being screwed on until the cover 82 is reached, whereupon the joint is made permanent by welding at 91.

The suction tube 86 has alining air holes 92 through which a wick 93 is threaded. This wick also passes through holes 94 in the splash plate 85, the ends of the wick resting on the bottom of the tank 81. Water is introduced in the tube 86 by the capillary attraction of the wick. The inwardly passing current of air takes up the moisture. The volume of moist air is controlled by the movable plug of the valve 88. The blower 80 is operated by a motor 95 (Figure 2) of any suitable type.

The automatic motor control is accomplished by the trough 29, which, in addition to being swung upon the pull rod 26 (Figure 6) is also swung upon a link 96 from the switch arm 97 (Figure 2). The pull rod and link furnish the support for the trough as clearly shown in Figure 5. The switch arm is pivoted to a bracket 98, that end opposite to the connection of the link 96 carrying a weight 99 which ordinarily keeps the switch arm in engagement with a bracket contact 100. The members 98 and 100 are mounted upon an insulating base 101 which is supported by an adjacent part of the frame work. The weight 99 is a little heavier than the trough 29 so that the switch arm 97 will normally remain in engagement with the contact 100.

The terminals 102 and 103 of the motor 95 respectively have connection with the contact 100 through a wire 104 and connection with one side of the current source through a wire 105. The wire 106 on the other side of the current source connects with the pivot support 98. The circuit is completed when the switch arm 97 engages the contact 100 as shown in Figures 2 and 7. Upon depression of the trough 29 by the accumulating weight of overflowing oil the switch arm 97 is moved out of engagement with the contact 100 and the motor circuit broken. A suitable snap switch 107 in the wire 105 provides for stopping and starting the motor 95 in the first instance and thereby controlling the operation of the burner.

The operation of the improved burner may be readily understood from the following description. Inasmuch as the operation of the burner depends upon the issuance of a blast of air from the tapering nozzle 64 into the discharge nozzle 58 it is the control of the blower 80 which constitutes the control of the burner in the first place. The burner is therefore started by turning on current at the switch 107 (Figure 2). This starts the electric motor 95 which in turn causes the blower to furnish the blast of air mentioned.

However, consider the condition of the burner before the switch 107 is turned on. The combustion nuggets 50 (Figure 3) are supposed to be hot from the previous operation of the burner also by pilot flame. Oil is kept at the proper level in the well 51 by the valve 14 in the fuel lift pipe 12 (Figure 1). This valve controls the flow of oil from the supply valve 1. The valve 14 is so regulated as to maintain sufficient oil in the well 51 for the burning of the pilot flame. This valve is intended to remain at the proper adjustment when once obtained.

Upon desiring to start the burner the switch 107 is closed as stated before whereupon the blower 80 delivers a blast of air at the nozzle 64 (Figure 3). This air enters the discharge nozzle 58, but simultaneously with or perhaps a little before the reaching of the interior of the combustion pot 43 by said air some of the air will be conducted through the by-pass 59 and issue in a jet at the nipple 63. The action is well illustrated

in Figure 4. The air jet at the nipple 63 will suddenly blow a quantity of oil up through the hot nuggets 50 so that the main stream of air from the nozzle 58 will meet a flame of a good size in the pot. The action of the issuing blast of air at the nozzle 64 creates a vacuum in the chamber 67 which is partly filled by a vapor of air and oil from the fuel lift pipe 12 (Figure 1).

It takes but a few seconds to introduce fuel vapor into the discharge nozzle 58, and the action of the by-pass 59 will serve to keep the flame in the pot alive until the active agents arrive. The supply of fuel vapor at the chamber 67 and into the nozzle 58 is continuous with the discharge of air at the nozzle 64.

The suction created in the vapor pipe 69 lifts the fuel from the pipe 12 where it commingles with the air entering at the air moistener 81. An auxiliary supply of air is admitted at the valve 76. The size of the orifice of this valve is regulated by moving the band 76 as suggested in Figures 11 and 12. Air enters the air moistener at 87 (Figure 9) whence it passes down the suction tube 86, carrying with it moisture taken up from that portion of the wick 93 which passes the tube at the holes 92. The amount of moist air admitted is regulated by the valve 88.

Suppose the combustion pot 43 to have become flooded. The surplus oil, filling the feed and overflow pipe 13, will overflow at the nipple 18 into a swinging trough 29. It takes but a little weight of oil to draw the trough 29 down so that both the needle valve 33 is closed (Figure 6) and the switch arm 97 is withdrawn from engagement with the contact 100 (Figure 2). The shutting off of the inflow of oil and the stopping of the motor 95 are therefore simultaneous. The trough 29 may be tilted and emptied resuming the operation of the burner after proper adjustment has been made.

The trough 29 also functions to force the closure of the needle valve 33 under a circumstance other than the flooding of the combustion pot 43. Suppose that it be desired to stop the operation of the burner by opening the switch 107. The oil in the valve 1 tends to rise and causes the float 35 to move the needle 33 toward its seat. Should the valve seat be obstructed by a bit of foreign matter which prevents the valve from engaging its seat, the supply valve will become flooded and overflow the tube 27 into the trough 29. Again the weight of oil will draw down on the spring lever 24 so that the hump 25 forces the plunger 23 down and forcibly seats the valve 33.

While the construction and arrangement of the improved oil burner as herein described and claimed is that of a generally preferred form, obviously modifications and changes may be made without departing from the spirit of the invention or the scope of the claims.

I claim:—

1. An oil burner comprising a combustion pot containing combustion nuggets, means to supply fuel oil to maintain a pilot flame at said nuggets, means to deliver a blast of air to the combustion pot in initiating the function of the burner, and means by-passing some of said air to a point of discharge beneath the nuggets to stir up the oil and arouse the pilot flame.

2. An oil burner comprising a combustion pot containing combustion nuggets, means to supply fuel oil to maintain a pilot flame at said nuggets, means to deliver a blast of air to the combustion pot in initiating the function of the burner, means by-passing some of said air to a point of discharge beneath the nuggets to stir up the oil and arouse the pilot flame, and means operated by the escaping blast of air to draw in and discharge fuel vapor into the combustion pot.

3. An oil burner comprising a combustion pot containing combustion nuggets, means to supply fuel oil to maintain a pilot flame at said nuggets, means to deliver a blast of air to the combustion pot in initiating the function of the burner, means by-passing some of said air to a point of discharge beneath the nuggets to stir up the oil and arouse the pilot flame, an oil feed pipe, an air supply pipe in conjunction therewith, a vapor pipe through which a vapor of oil and air are conducted, and means at which the vapor is drawn from the vapor pipe by the passing air blast for discharge into the combustion pot.

4. An oil burner comprising a combustion pot containing combustion nuggets, means to supply fuel oil to the pot to maintain a pilot flame, means to deliver a blast of air to the pot in initiating the function of the burner, a by-pass entering the pot beneath the nuggets, and a cowl at the opposite end of the by-pass situated in the path of the blast of air to transfer some of the air beneath the nuggets and arouse the pilot flame.

5. An oil burner comprising a combustion pot containing nuggets, a source of fuel oil supply including a pipe conducting oil to maintain a pilot flame, tapering and discharge nozzles for conducting a blast of air to the pot in initiating the function of the burner, a casting in which said nozzles are connected in separated relationship, said casting having a chamber, a by-pass having a portion entering the pot beneath the nuggets, a cowl at the other end of the by-pass situated in the discharge nozzle to intercept air for the arousing of the pilot flame, means at which air is introduced to commingle with oil from said supply, and a

pipe for conducting the resulting vapor to said casting chamber upon the creation of a vacuum therein by the jet of air issuing from the tapering nozzle.

6. An oil burner comprising a combustion pot, a screen in the pot upon which combustion nuggets are piled, means to supply fuel oil to the pot beneath the screen to feed upward through the nuggets, means to introduce a blast of air to initiate the function of the burner, a by-pass having a nipple directed into the pot beneath the screen and away from the blast of air, and a cowl at the other end of the by-pass to intercept some of the air for discharge upward through the oil and pass through the nuggets to arouse the pilot flame.

7. An oil burner comprising a combustion pot having recesses of different diameters, a screen occupying the largest recess and supporting combustion nuggets piled thereon, means supplying fuel oil to the second recess constituting a well feeding upward through the screen and nuggets to maintain a pilot flame, means to discharge a blast of air into the pot upon initiating the function of the burner, a by-pass having a nipple at one end entering the well beneath the screen, and a cowl at the other end of the by-pass in position to intercept some of the air for delivery through the oil in the well, the screen and past the nuggets to arouse the pilot flame.

8. An oil burner comprising a combustion pot having concentric recesses of two diameters, a screen occupying the largest recess and supporting a pile of combustion nuggets, means in connection with the smallest recess to supply fuel oil to the burner and constitute an oil well, means to discharge a blast of air into the pot in the direction of the nuggets, a by-pass including a nipple entering the pot at an angle and communicating with the oil well, and a cowl at the other end of the by-pass in position to intercept some of the air to discharge upward through the nuggets, the pot being so formed as to deflect the flame toward the center.

9. An oil burner comprising a combustion pot having concentric recesses of two diameters at the bottom, a screen occupying the uppermost and largest recess and supporting a pile of combustion nuggets, a nipple threaded into the bottom to communicate with the smallest recess, said nipple having a T to receive oil and supply fuel to the recesses which constitute a well, means entering the side of the pot to deliver a blast of air in initiating the function of the burner, a by-pass having a nipple at one end entering the bottom of the pot at an angle and communicating with the well, and a cowl at the other end of the by-pass in position to intercept some of said air for upward discharge through the nuggets to arouse a burning pilot flame.

10. An oil burner comprising a combustion pot, means to supply the main blast of air to the pot including a blower and a nozzle, a fuel supply valve, an air intake, means to moisten the air supplied by said intake, said fuel supply valve and air intake constituting vaporizing means which is drawn upon by said air blast to supply fuel vapor, a T at which the moist air and fuel meet, a pipe conducting the resulting vapor to a place of discharge adjacent to the end of said nozzle, and an adjustable valve device in said vapor pipe for supplying an auxiliary quantity of outside air.

11. An oil burner comprising a combustion pot containing combustion nuggets, means constituting a well beneath said nuggets, a main fuel valve having a pipe which supplies the pot with oil in the operation of the burner, an overflow pipe extending from the well, and another valve which is opened to supply oil from the main valve through the overflow pipe to said oil well to maintain a pilot flame at said nuggets when the burner is inoperative.

JOSEPH BENJAMIN ENNIS.