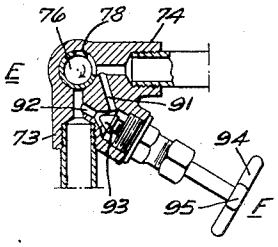
Nov. 8, 1932. H. L. DELANEY 1,886,472

FUEL OIL BURNER CONTROL SYSTEM

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FIG. 5.



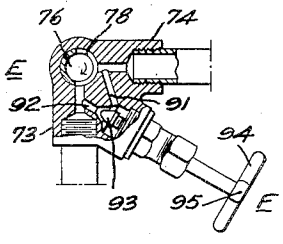


FIG. 6.

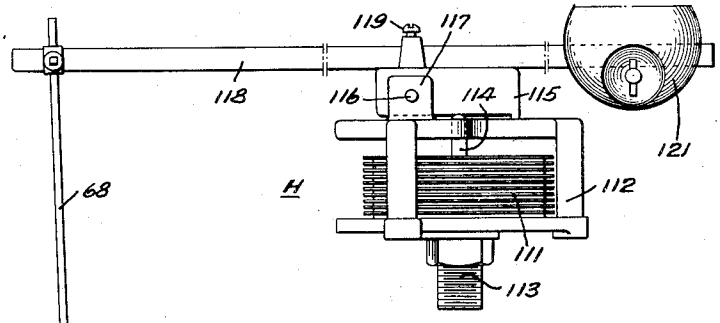
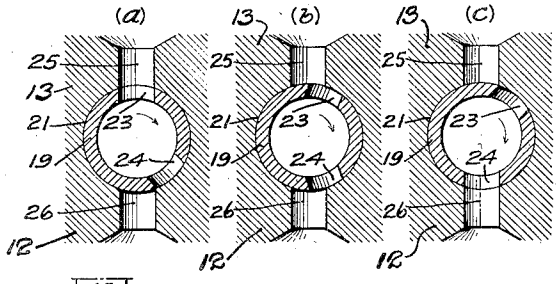


FIG. 11.



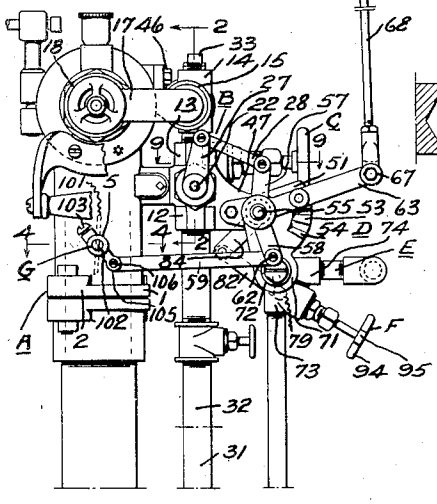


FIG. 1.

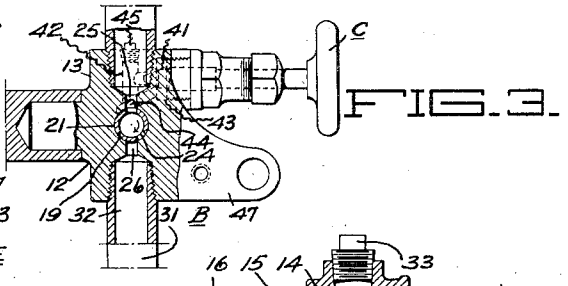


FIG. 3.

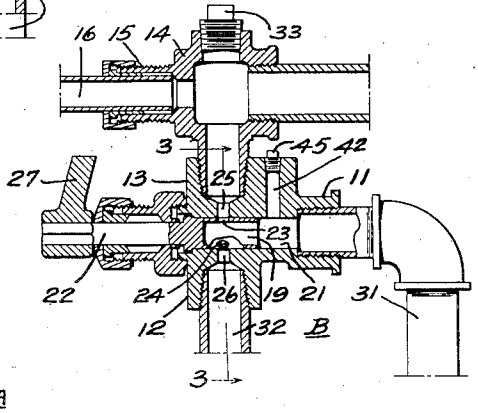


FIG. 2.

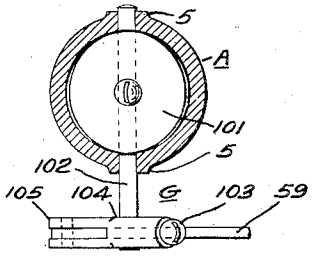


FIG. 4.

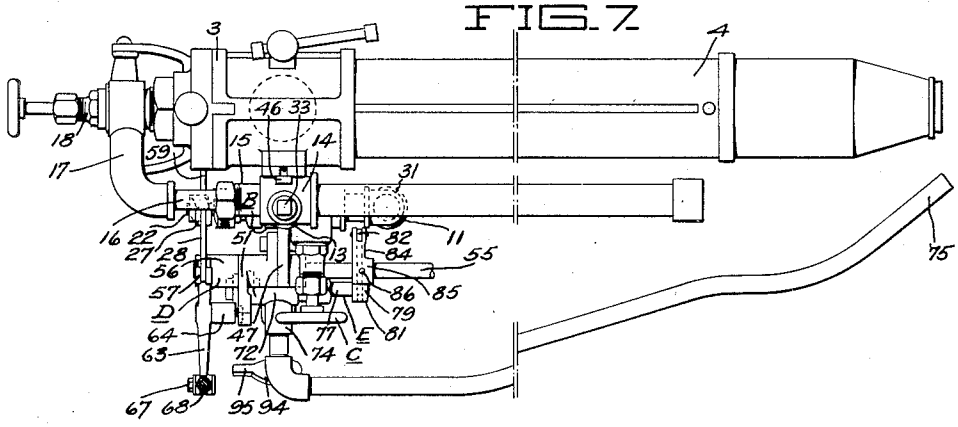
INVENTOR:
Herbert L. Delaney
BY White, Frost & Fryer
ATTORNEYS.

Nov. 8, 1932. H. L. DELANEY 1,886,472

FUEL OIL BURNER CONTROL SYSTEM

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FIG. 7.



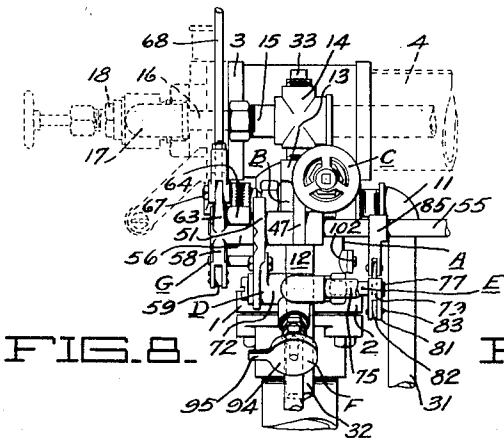


FIG. 8.

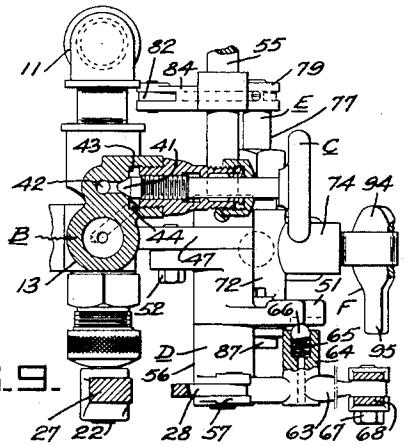


FIG. 9.

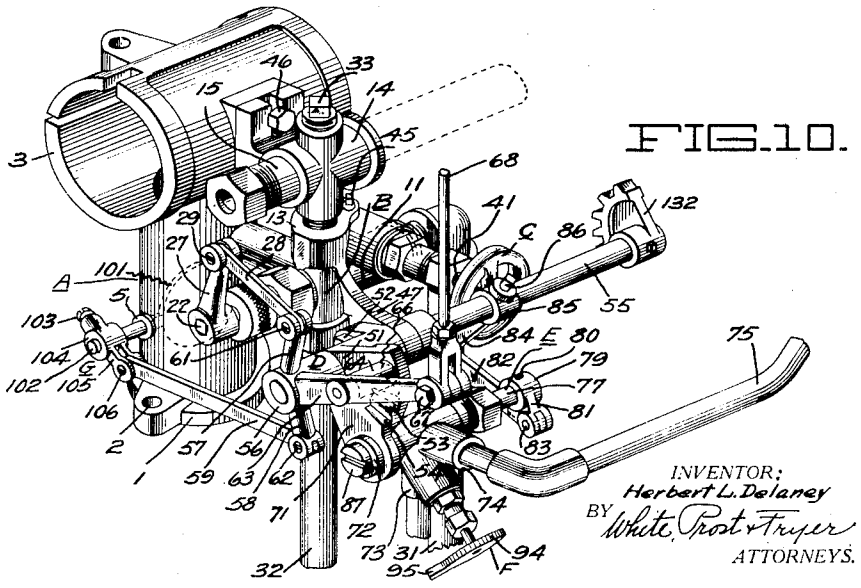


FIG. 10.

INVENTOR:
Herbert L. Delaney
BY White, Prost & Fryer
ATTORNEYS.

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FUEL OIL BURNER CONTROL SYSTEM

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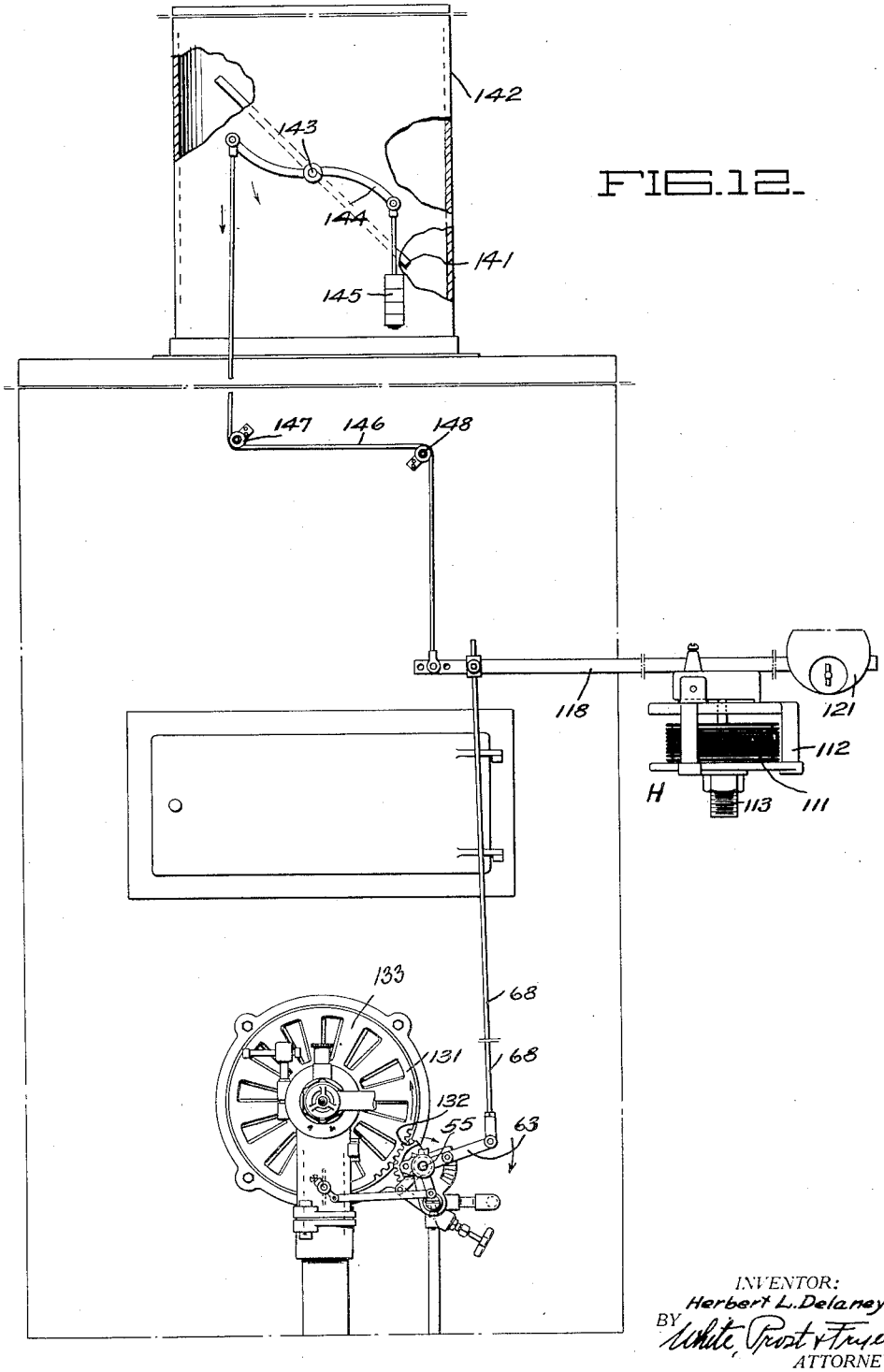


FIG. 12.

INVENTOR:
Herbert L. Delaney
BY White, Frost & Fryer
ATTORNEYS.

Patented Nov. 8, 1932

1,886,472

UNITED STATES PATENT OFFICE

HERBERT L. DELANEY, OF BERKELEY, CALIFORNIA, ASSIGNOR TO BUNTING IRON WORKS, OF SAN FRANCISCO, CALIFORNIA, A CORPORATION OF CALIFORNIA

FUEL OIL BURNER CONTROL SYSTEM

Application filed September 25, 1928. Serial No. 308,154.

My invention relates to fuel oil burners and particularly to the mechanism by which such burners are controlled. Burners of this character must be supplied with fuel oil, with air for furnishing the necessary oxygen for supporting the combustion of this fuel and with means for initially igniting the fuel, such means usually consisting of a pilot light.

The steam pressure of a boiler fired by a burner is of course dependent on the heat generated by the burner and the heat so generated is in turn dependent on the fuel supplied to the burner and the amount of air necessary to support combustion of the fuel is directly proportional to the amount of fuel used. It is therefore advantageous to control the fuel and air supply by some means which is responsive to conditions in the boiler such as the pressure. Since the pilot light is effective only in initially igniting the fuel, it is desirable to cut off the gas supply or at least materially diminish it once the burner is in operation. If it is thought that the burner while in full operation may possibly be blown out, it is of course best to always maintain a pilot light.

By repeated experiments, it has been found that there is a certain minimum fuel supply below which a clean, effective fire cannot be obtained. Therefore, when the fuel oil valve is being opened, it should be quickly opened to this minimum position and when it is being closed it should be quickly and entirely closed once it has reached this minimum position.

In general the object of my invention is to provide a fuel oil burner control mechanism responsive to variations in the boiler pressure for controlling the fuel supply to the burner, the gas supply to the gas pilot and the air to the burner in a predetermined manner.

Another object of my invention is the provision of a fuel oil burner control mechanism responsive to boiler pressure variations in such a manner that the fuel supply will be quickly and entirely cut off when the pressure has risen to a predetermined value and such that when fuel is being supplied to the burner, it will never be supplied below a certain predetermined minimum amount.

The invention possesses other advantageous features, some of which with the foregoing, will be set forth at length in the following description, where I shall outline in full that form of my invention which I have selected for illustration in the drawings accompanying and forming part of the present specification. In said drawings, I have shown one form of my invention, but it is to be understood that I do not limit myself to such form since the invention, as set forth in the claims, may be embodied in a plurality of forms.

The oil burner per se forms no part of my invention, although my control mechanism has been provided with a clamp which is adapted to be fastened to the oil burner and which serves as a support for the control mechanism used. The device is intended for use in connection with a fuel oil circulating system and in general consists of a three-way fuel oil valve, a two-way gas pilot valve, and several air dampers, all interlinked with and controlled by a pressure responsive mechanism. In combination with this mechanism there has been provided a retarding means for causing the fuel oil valve to operate in stages rather than continuously. For initially starting up the burner, a fuel oil by-pass valve and a gas pilot by-pass valve have been provided.

Referring to the drawings:

Fig. 1 is a rear elevation of the valve mechanism in combination with the pressure responsive controlling mechanism.

Fig. 2 is a vertical section of the fuel oil valve taken on the line 2—2 of Fig. 1.

Fig. 3 is a section of the fuel oil valve taken on a plane at right angles to the plane of Fig. 2 and taken on the line 3—3 of Fig. 2.

Fig. 4 is a horizontal section taken on the line 4—4 of Fig. 1 showing the air damper of my mechanism.

Fig. 5 is a vertical section taken thru the gas by-pass valve.

Fig. 6 is a modification of the gas by-pass as shown in Fig. 5 in which the by-pass is never entirely closed.

Fig. 7 is a plan view as shown in its oper-

ative relation with the oil burner per se and the gas pilot.

Fig. 8 is a side elevation of my control mechanism and has therefore been taken on a plane at right angles to the plane of Fig. 1.

Fig. 9 is a horizontal section taken on the line 9—9 of Fig. 1.

Fig. 10 is a perspective view of the control mechanism.

Fig. 11 is a diagrammatic representation of the three positions of the fuel valve.

Fig. 12 is a diagrammatic representation of the mechanism used for controlling the stack, furnace and burner dampers.

As best shown in Fig. 10 my control mechanism consists of a cylindrical supporting member A, a three-way fuel oil valve B, an oil by-pass valve C, a retarding mechanism D, a two-way gas pilot valve E, a gas by-pass valve F, an air damper G and a pressure responsive mechanism H (shown in Fig. 1).

The supporting member A is provided at its foot with a flange 1 which in turn is provided with a number of apertures 2 by which it may be anchored to any suitable base. The upper end of the support A is provided with a horizontally extending cylindrical clamp 3 adapted to hold a burner 4 in its cooperative position with respect to the control mechanism. Since the specific clamping means forms no part of my invention it may be of any standard form. Intermediate the ends of the support A are a pair of apertured bosses 5, diametrically opposed to each other and in which the air damper G (to be described later) is supported.

The three-way fuel oil valve B is provided with an oil inlet terminal 11, an outlet terminal 12 communicating with the suction side of a pump not shown of the system, and an outlet terminal 13 which communicates by means of the fittings 14, 15, 16, and 17 with a fuel valve 18 at the head of the burner 4.

As best shown in Figs. 2 and 3, the fuel oil valve B consists of a cylindrical sleeve 19 closely fitting within a horizontal bore 21 of the valve and carried at the end of a control rod 22. For the purpose of sealing the end of the control rod 22, use is made of the well known forms of bushings, packings and glands as shown in Fig. 2. Two apertures 23 and 24 are provided intermediate the ends of the cylindrical sleeve 19 and are adapted to register, when the sleeve 19 is in certain positions, with apertures 25 and 26 which in turn communicate with the outlets 13 and 12 respectively of the valve. Since the left hand end of the shell 19 is open there is direct communication between the inlet terminal 11 and the interior of the sleeve 19.

As shown in Figs. 3 and 11, there are three positions of the valve, one in which the apertures 23 and 25 are in full registration (shown in Fig. 11*a*). In this position the apertures 24 and 26 are out of registration and therefore the only escape for the fuel entering the inlet terminal 11 is through the apertures 23 and 25 which communicate directly with the fuel oil burner. The second position of the valve, (shown in Fig. 11*b*) is an intermediate one in which both pairs of apertures, that is 23 with 25 and 24 with 26, are in partial registration. In this position, the fuel oil entering the intake 11 takes a divided circuit, partly through the upper pairs of apertures into the oil burner and partly through the lower pairs of apertures to the suction side of the pump. In the third and last position of the valve, (as shown in Fig. 11*c*) the lower apertures 24 and 26 are in full registration, the upper apertures 23 and 25 being entirely closed, thereby preventing any fuel from being delivered to the burner and causing all the fuel to circulate back to the suction side of the pump. To the outer end of the control rod 22 is keyed in any desirable manner, a lever 27 the outer end of which is apertured and bifurcated, as shown in Fig. 10, in order to accommodate a link 28 secured thereto by means of a pin 29. Inlet and outlet pipes 31 and 32 are of course, connected to the inlet and outlet terminals 11 and 12 of the valve by any suitable connections.

The fitting 14 is provided with a plug 33 which can be unscrewed from its position in order that the valve opening in the sleeve 19 may be cleaned if necessary, as is sometimes the case when the system has been in disuse in cold weather and the fuel has become very viscous.

For initially putting the oil burner into operation and in the event that the relatively small apertures in the valve sleeve 19 become clogged, use is made of the fuel oil by-pass valve C which has been made integral with the fuel oil valve B. This valve is best shown in Fig. 9 and consists of a standard hand controlled needle valve 41 adapted to open and close the communication between the passageway 42 and the chamber 43. The passageway 42 is in direct communication with the inlet terminal 11 while the chamber 43 is in communication with the upper outlet terminal 13 by means of the port 44 as shown in dotted lines in Fig. 9. It will be seen, then, that the opening of this valve establishes direct communication between the inlet terminal 11 and the fuel oil burner per se provided, of course, that the valve 18 at the head of the burner is open. If desirable, a screw threaded plug 45 (see Fig. 3) may be provided in registration with the passageway 42 for the purpose of cleaning it out in case it becomes clogged.

From Fig. 10 it will be seen that the entire control mechanism is supported from the fitting 14 which in turn has been secured to the clamp 3 by any suitable means such as screws 46. Integral with valve B, and ex-

tending forwardly in a vertical plane is a bracket 47 which serves as a support for the retarding mechanism D, the gas pilot valve E and the gas by-pass valve F, to be described later.

The retarding mechanism D consists of a sector 51 secured in any suitable manner such as by a bolt 52 to the bracket 47. On the outer face of the sector 51 is provided a pair of indentations 53 and 54. Rotatably journaled in the bracket 47 and the sector 51 is a rod 55, to the outer left hand end of which is non-rotatably secured a sleeve 56. Extending radially from the sleeve 56 is a pair of relatively short arms 57 and 58 which are apertured and bifurcated at their ends in order to accommodate the link 28 and a link 59, secured thereto by means of pins 61 and 62 respectively. Integral with the sleeve 56 and extending radially therefrom intermediate the arms 57 and 58 is a relatively long control arm 63. Integral with the arm 63 and extending at right angles thereto at a point intermediate its ends is a stud 64, the end of which is provided with a recess adapted to accommodate a coil spring 65 and a ball-latch 66, (see Fig. 9) the spring serving to press the ball outwardly in engagement with the sector 51.

In operation, as the arm 63 is rotated about the control rod 55, the stud 64 travels in the path of an arc and as it approaches its lower limiting position, the ball-latch 66 is pressed successively into the indentations 53 and 54 thereby latching arm 63 in position. The outer end of the arm 63 is apertured and connected by means of a bolt 67 to a vertically disposed rod 68 which in turn is secured to the pressure responsive mechanism H to be described later.

The gas pilot valve E is secured to a downwardly extending portion 71 of the sector 51 by means of a flanged externally and internally threaded tube 72. This valve consists of an inlet terminal 73 and an outlet terminal 74 to which is secured by suitable connections a gas pilot 75. The valve mechanism has best been shown in Fig. 5 and consists of a cylindrical sleeve 76 carried at the end of a control rod 77 and is provided with a slot 78. As shown in Fig. 5, this slot is long enough to establish communication between the inlet and outlet terminals 73 and 74 when turned to the proper position. The usual packing and glands are used for sealing the rod 77 with the valve body. To the outer right hand end of the rod 77 is non-rotatably secured a sleeve 79 by means of a set screw 80 or any other suitable means. Integral with and extending downwardly from this sleeve is a short arm 81 which is apertured and bifurcated at its end in order to accommodate a link 82, secured thereto by means of a pin 83. The opposite end of the link 82 is pivoted, as best shown in dotted lines in Fig. 1, to an arm 84 non-rotatably carried by a sleeve 85 which in turn is non-rotatably secured by means of a set screw 86, to the control rod 55. It will therefore be seen that a rotation of the control rod 55 effects a corresponding rotation of the rod 77 and that therefore the fuel oil valve and gas pilot valve operate in unison although inversely with respect to each other as will later be described. A screw threaded plug 87 engaged in the end of the tube 72 may be disconnected therefrom when it is desired to clean the valve.

In Fig. 6 is shown a modification of the gas pilot valve in which the slot 78' of the sleeve 76 has been sufficiently extended to cause this valve to be slightly open at all times. This enables the pilot light to burn during the full operation of the burner and serves to reignite the burner in the event that it has for some reason or other been blown out. Needless to say communication between the inlet terminal 73 and the gas main is established in any well known manner.

The gas by-pass valve F has been made integral with the gas pilot valve and merely consists of two ports 91 and 92 which establish communication between the inlet and outlet terminals 73 and 74 when the needle valve 93 is in its open position. The operation of this valve is of course independent of the automatically operated gas pilot valve E. In order to clearly indicate to the operator the position of this valve, its handle 94 is provided with a pointer 95.

The support A serves as an air intake for the burner and has mounted within it an air damper G consisting of a disc 101 as shown in Fig. 4. This disc is carried by the control rod 102 journaled in the aperture 5 of the support. Non-rotatably secured to the end of the control rod 102 by means of a set screw 103 is a sleeve 104. Extending radially from this sleeve is an arm 105 whose outer end is apertured and bifurcated and has pivotally secured thereto by means of a pin 106, one end of the link 59. It will therefore be seen that a rotation of the control rod 55 controls the position of the damper disc as well as the position of the fuel oil valve B and the gas pilot valve E. The sleeve 104 is so adjusted on the rod 102 that the disc 101 is in its closed position when no fuel is being furnished to the burner and is in its fully open position when a maximum amount of fuel is being furnished to the burner.

This entire mechanism is controlled by the control rod 68 which in turn is actuated preferably by means of the pressure responsive mechanism H. A bellows 111 mounted in any suitable support or housing 112, is in direct communication with the boiler by means of a nipple 113. The bellows carries a pin 114 adapted to engage a block 115 which in turn is pivoted by means of a pin 116 to upwardly

extending ears 117 forming part of the support 112. A first class lever arm 118 is secured to the block 115 by means of a set screw 119 and a weight 121 is adjustably secured to its right hand end. The left hand end of the lever 118 is pivotally secured to the control rod 68 by any suitable means. From an inspection of Fig. 1, it will be seen that an increase in the boiler pressure will cause the bellows 111 to expand and to force the pin 114 upward against the block 115. This in turn causes the lever arm 118 to rotate in a counter clockwise direction about its pin 116 thereby moving the control rod 68 downward and with it the arm 63. A decrease in the boiler pressure causes a reverse action.

For the purpose of controlling a furnace damper or register 131 (Fig. 12) the control rod 55 has been provided at its right hand end with a gear-sector 132 as clearly shown in Fig. 10. The teeth of this gear-sector are arranged to mesh with a set of gear teeth formed on the periphery of a rotatable element 133 of the register 131. This construction makes the register responsive to the movement of the control arm 63.

A stack damper 141 is rotatably mounted within the stack 142 on a rod 143 journalled in the walls of the stack. Keyed to one end of the rod 143 is a rocker arm 144, one end of which carries a weight 145 for urging the damper to its open position. The opposite end of the rocker arm 144 is connected to the left hand end of lever arm 118 by means of a cable 146 passing over a pair of suitably arranged pulleys 147 and 148.

Both the furnace register 131 and the stack damper 141 are therefore controlled by the action of the bellows 111 and have been so arranged that both are open when the bellows is in its collapsed position, that is when the boiler pressure is at a minimum value such as zero. As the boiler pressure increases the bellows expands and forces the left hand end of the lever arm 118 downwardly, thereby closing both the register and the damper. This arrangement prevents any motion of air within the furnace when it has been heated up and permits a maximum amount of air to be furnished when the burner is in full operation.

With a minimum boiler pressure the arm 63 is in its uppermost position. In this position the fuel oil valve is so adjusted that the apertures 23 and 25 only are in registration (as shown in Fig. 11*a*), the air damper 101 is in its fully open position and the gas pilot valve, if of the modification shown in Fig. 5, is entirely closed while, if of the modification as shown in Fig. 6, it is in its minimum position. As the boiler pressure rises the arm 63 moves downwardly gradually moving the apertures 23 and 25 out of registration and simultaneously moving the apertures 24 and 26 into registration, (as shown in Fig. 11*b*).

As above explained, in the intermediate position of the fuel oil valve, the fuel entering the inlet terminal takes a divided path, part of it going to the burner and part of it being returned to the suction side of the pump. With the fuel oil valve in this position, the air damper is partially closed and the gas pilot valve, if of the form shown in Fig. 5, has come to a slightly open position. These intermediate positions of the various valves occur when the ball latch 66 has been forced into the first indentation 53. Due to the action of the spring 65 on the ball latch 66, the motion of the arm 63 during the time that the ball moves from the edge of the indentation 53 to its seat within the indentation, is very rapid and due to the simultaneous downward movement of the lever arm 118 a slight expansion of the bellows 111 takes place, thereby slightly decreasing the pressure therein. In order that the motion of the arm 63 be continued downward, an increased pressure must be built up within the bellows 111 in order to move the ball latch 66 against the action of the spring 65 out of the indentation 53.

When the pressure has been sufficiently increased, the arm 63 continues its downward motion against the action of the ball latch 66 and then on reaching the edge of the second indentation 54 its motion during the interval in which the ball latch 66 is being seated in the second indentation is very rapid. The placing out of registration of the apertures 23 and 25 is accomplished by this last movement of the arm 63 and is therefore effected in a correspondingly short interval of time. It is this action of the fuel oil valve which entirely cuts off the fuel supply to the burner at a point where the amount of fuel being supplied is ineffective in producing a clean fire.

As the pressure diminishes below a certain predetermined value, the reverse operation takes place, that is, instead of the apertures 23 and 25 of the fuel oil valve being gradually placed into partial registration and thereby supplying the burner for a period of time, with a quantity of fuel insufficient to produce a clean fire, the apertures 23 and 25 are abruptly put into that position of registration which will permit the minimum amount of fuel to pass thru in order to produce a clean fire.

It is to be noted that spring 65 biases the ball latch 66 into engagement with the indentations. Movement of the ball latch from engagement with an indentation will only occur after the motivating element—the sylphon—for moving the arm 63 has stored enough force to overcome the friction between the ball latch and the indentation and the bias of the spring 65. The sylphon, therefore, must store up sufficient energy to overcome this friction and bias. In practice, the sylphon actually stores up sufficient energy, upon a pressure change, so that when the

ball latch releases, the arm is moved very rapidly from one position to another.

The operation of the system is as follows. The support A is mounted in front of one of the walls of the fire box and has secured thereto a burner 4 by means of the clamp 3. The burner nozzle, of course extends within the fire box. When the system is in its inoperative position, the valve 18, on the head of the oil burner 4, is closed and the boiler pressure being at a minimum, say zero, the arm 63 in its uppermost position. As explained above, this places the apertures 23 and 25 in full registration, places the apertures 24 and 26 entirely out of registration, places the air damper in its fully open position, opens both the stack damper and the furnace register and entirely closes the gas pilot valve (unless this valve is of the modification as shown in Fig. 6). The fuel oil by-pass valve is closed, the gas by-pass valve is closed and the fuel oil pump shut down as is also the usual fuel oil heater.

To start up the burner, the gas by-pass valve is opened and the gas pilot ignited by hand, the hand valve 18 at the head of the burner is opened, the oil pump is put into operation and, if climatic conditions necessitate it, the fuel oil heater should also be put into operation so that the fuel oil will flow more readily. Unless the oil is too viscous it will pass thru the apertures 23 and 25, thru the valve 18 to the burner nozzle and is there ignited by the gas pilot. In the event, however, that the fuel oil is too viscous to flow thru the small apertures 23 and 25, the fuel oil by-pass valve may be opened, thus insuring a flow of oil to the burner. As soon as the fuel oil has been ignited the gas by-pass valve may be closed and when the fuel oil has been somewhat heated and flows more readily the fuel oil by-pass valve may also be closed. From this point on the operation of the system is automatic as has been described above.

As the fire continues to burn steam is generated and the boiler pressure rises. When the pressure has risen sufficiently to move the fuel oil valve to its intermediate position, the gas pilot valve is opened and the pilot is ignited from the burner. An additional increase in boiler pressure cuts off entirely the fuel supply to the burner thereby leaving only the gas pilot burning. When the boiler pressure has reached a predetermined minimum value fuel is again supplied to the burner and is ignited by the gas pilot. A further decrease in pressure cuts out the gas pilot and throws the entire fuel supply into the burner.

From the above description, it will be noted that I have disclosed an automatically controlled fuel oil burner mechanism which controls the fuel supply to the burner in response to boiler pressure variations and which never furnishes fuel to the burner in an amount which is insufficient to produce an effective clean fire. The gas supply to the gas pilot may be automatically cut off when the burner is in full operation thereby economizing on gas and the air supply is automatically regulated.

I claim:

1. A fuel oil burner control mechanism comprising a fuel oil valve and a gas pilot valve in combination with means responsive to pressure in a variable pressure device, said means for operating said oil and gas pilot valve to vary the oil and gas supply inversely with respect to each other and means including a notched member in co-operation with a spring-pressed latch for effecting the operation of said first means in stages corresponding to predetermined pressures in said variable pressure device.

2. A fuel oil burner control mechanism for controlling the oil and gas supply to a burner and pilot respectively, comprising a source of variable pressure, means responsive to pressure at said source for varying the oil and gas supply inversely with respect to each other and frictionally operated means for retarding the action of said first means until the pressure at said source has reached a predetermined value.

3. A fuel oil burner control system including a variable pressure device comprising a valve for controlling the supply of fuel to a burner, and means responsive to pressure in said device in combination with friction means for quickly opening said valve to a predetermined extent upon the reaching of a predetermined pressure in said device and for opening said valve to a greater extent upon the reaching of another predetermined pressure in said device.

4. A fuel oil burner control system for a variable pressure device comprising a valve for controlling the supply of fuel to a burner, and means responsive to pressure in said device in combination with friction means for closing said valve to a predetermined extent upon the reaching of a predetermined pressure in said device and for quickly closing said valve to a greater extent upon the reaching of another predetermined pressure in said device.

5. A fuel oil burner control system for a variable pressure device comprising a valve for controlling the supply of fuel to a burner, and means responsive to pressure in said device in combination with friction means for quickly opening said valve to a predetermined extent upon the reaching of a predetermined pressure in said device and for varying the position of said valve upon the reaching of another predetermined pressure in the said device.

6. A fuel oil burner control system for a variable pressure device comprising a fuel

oil valve, an air register, and a gas pilot valve for controlling the supply of fuel, air and gas respectively to a burner, and means responsive to pressure in said device in combination with friction means for opening said fuel valve and said air register and for closing said gas pilot valve to predetermined extents upon the reaching of a predetermined pressure in said device and for simultaneously opening said fuel valve and said air register and closing said gas pilot valve to greater extents upon the reaching of a second predetermined pressure in said device.

7. A fuel oil burner control system for a variable pressure device comprising a fuel oil valve, an air register, and a gas pilot valve for controlling the supply of fuel, air and gas respectively to a burner, and means responsive to pressure in said device in combination with friction means for closing said fuel valve and said air register and opening said gas pilot valve to predetermined extents upon the reaching of a predetermined pressure in said device and for simultaneously closing said fuel valve and said air register and opening said gas pilot valve to greater extents upon the reaching of a second predetermined pressure in said device.

8. A fuel oil burner control system comprising a fuel oil valve for controlling the supply of fuel to a burner, and responsive to a condition in said system in combination with a notched member cooperating with a spring-pressed latch for quickly opening said valve to a predetermined extent upon the reaching of a predetermined condition in said system and for opening said valve to a greater extent upon the reaching of another predetermined condition in said system.

9. A fuel oil burner control system comprising a fuel oil valve for controlling the supply of fuel to a burner, and responsive to a condition in said system in combination with a notched member cooperating with a spring-pressed latch for closing said valve to a predetermined extent upon the reaching of a predetermined condition in said system and for quickly closing said valve to a greater extent upon the reaching of another predetermined condition in said system.

10. A fuel oil burner control for a variable pressure system comprising a fuel oil valve for controlling the supply of fuel to a burner, and pressure responsive means in combination with a notched member cooperating with a spring-pressed latch for quickly opening said valve to a predetermined extent and retaining said valve in such position upon the reaching of a predetermined pressure in said system; said means being adapted to release said valve and to open said valve to a greater extent upon the reaching of another predetermined pressure in said system.

11. A fuel oil burner control for a variable pressure system comprising a fuel oil valve for controlling the supply of fuel to a burner, and pressure responsive means in combination with a notched member cooperating with a spring-pressed latch for closing said valve to a predetermined extent and retaining said valve in such position upon the reaching of a predetermined pressure in said system; said means being adapted to release said valve and quickly to close said valve to a greater extent upon the reaching of another predetermined pressure in said system.

12. In combination, means responsive to a condition variation in a variable condition device, a valve, and a connection between said responsive means and said valve including a spring biased latch.

13. In combination, means responsive to a condition variation in a variable condition device, means actuated by said responsive means, and a connection between said responsive means and said actuated means including a spring biased latch, said latch retaining said actuated means in a predetermined position until said responsive means requires force sufficient to overcome said spring latch.

In testimony whereof, I have hereunto set my hand.

HERBERT L. DELANEY.