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FUEL BURNER

Filed April 4, 1932

2 Sheets-Sheet 1

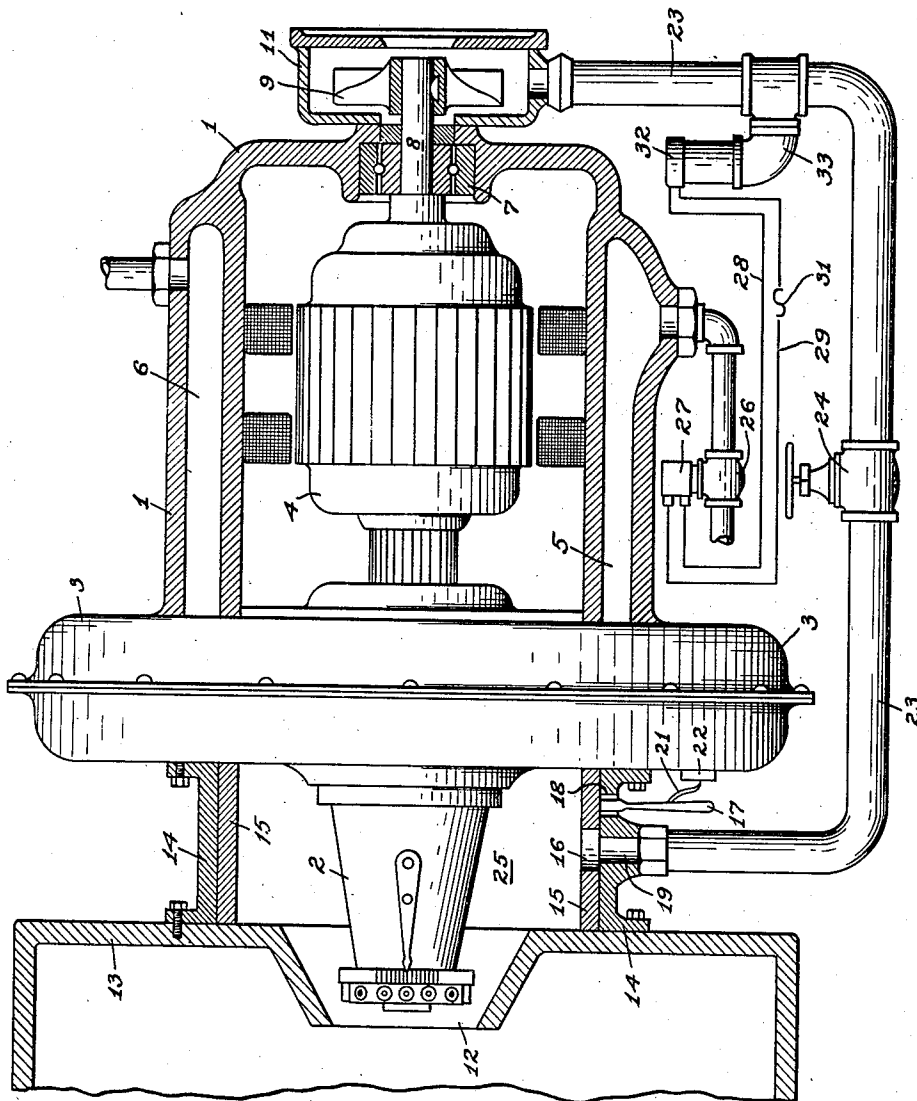


Fig. 1 -

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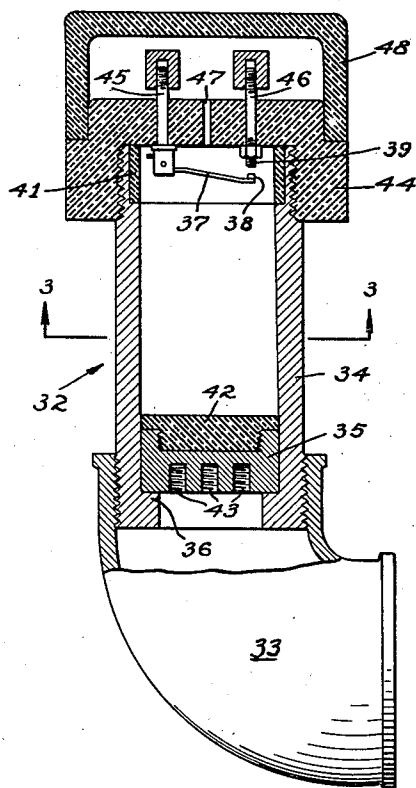


Fig. 2.

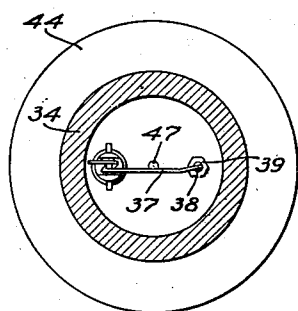


Fig. 3.

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FUEL BURNER

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9 Claims. (Cl. 158—109)

This invention relates to fuel burners and in particular to gas and/or oil burners.

It is customary in fuel burners to form a combustible mixture of fuel and primary air within the burner nozzle by the manual operation of suitable valves on the fuel and air lines. The proper combustion of the fuel depends upon the presence of a sufficient air supply, and if at any time, there is a deficiency of air there will be consequent accumulation of unburned fuel within the furnace which in some instances results in an explosion.

The economy of a furnace depends among other things, upon its efficiency in scavenging the products of combustion with as little loss of heat as possible to and through the stack. Scavenging is usually accomplished by means of a draft created by a relatively high stack or by means of a forced draft. The longer the stack is, the greater is the loss of heat, and therefore if the required draft can be obtained by some other means, the stack should be made as short as possible.

One of the objects of my invention is to automatically control the fuel feed in correlation with the primary air supply.

Another object of my invention is to provide a forced draft of secondary air around the burner nozzle to thereby maintain the nozzle cool and consequently to permit the use of higher temperatures and to eliminate the necessity of high stacks.

Still another object of my invention is the provision of a burner unit in which independent blowers for the combustible mixture and the secondary air supply are operated by a single motor and in which the fuel supply is made responsive to predetermined pressures in the secondary air supply line.

A further object of my invention is the provision of a pressure responsive switch mechanism for automatically controlling a motor operated fuel valve.

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.

Referring to the drawings:

Fig. 1 is an elevation of a burner partly in sec-

tion in which the objects of my invention are embodied.

Fig. 2 is a section of a pressure responsive switch.

Fig. 3 is a section taken on the line 3—3 of Fig. 2.

As shown in Fig. 1 my invention comprises the usual burner casing 1, a burner nozzle 2, a blower 3 for delivering a combustible mixture under superatmospheric pressure to the burner nozzle and a motor 4 for driving the impeller of the blower. Fuel in the form of gas is delivered to the blower, which also serves as a mixing chamber, by means of a duct 5 formed in the casing 1 while a portion of the air necessary to support combustion is delivered to the blower by means of a duct 6 also formed in the casing.

Extending outwardly through a suitable bearing 7 supported in the casing 1, is an extension 8 of the motor shaft, which has keyed to its outer end, the impeller 9 of a blower 11 secured to the casing in any suitable manner.

The burner nozzle 2 registers in the usual manner with an opening 12 in the front face of the fire box 13, and is secured in proper relation thereto by means of a flanged collar 14 bolted to the fire box and to the blower 3. It is of course to be understood that the burner may be hingedly or otherwise movably secured to the fire box in any well known manner, but since this forms no part of my invention, the specific method used is immaterial.

Concentrically disposed within the collar 14 is a rotatable ring 15 provided with an opening 16. A lever 17 secured to the ring 15 passes through a slot 18 formed in the collar 14 and serves as a means for moving the opening 16 into and out of registration with an opening 19 in the collar 14. The opening 16 may be maintained in any desired position relative to the opening 19 by means of a spring finger 21 carried by the lever 17 and adapted to frictionally engage a serrated and graduated arc 22 carried on the blower 3.

A conduit 23 provided with a valve 24 connects the blower 11 with the opening 19 in the collar 14 and delivers a supply of secondary air from the blower 11 to the annular space 25 formed by the nozzle 2 and ring 15.

The fuel duct 5 is connected with the fuel supply line through a valve 26 driven by an electric motor 27 and since any well known valve of this type may be used, such as for example a Minneapolis Honeywell, it is thought unnecessary to further describe its construction. The terminals of the motor 27 are connected by leads 28 and 29

with a source of electric current 31. Inserted in series with the lead 28 is a pressure responsive switch 32 secured to an elbow 33 which is in communication with the conduit 23.

5 The construction of the pressure responsive switch 32 is clearly illustrated in Figures 2 and 3. Slidably engaged within a cylinder 34 is a plunger 35 adapted in its lowermost position to seat on a flange 36 and in its uppermost position to engage the movable switch element 37 to thereby close the contact points 38 and 39. The cylinder 34 may be made of metal but in such case suitable provision must be made for insulation. For this reason a ring 41 of insulating material such as for example "Bakelite", is embedded in the upper end of the cylinder and the plunger 35 has secured to it by means of suitable threads, a "Bakelite" cap 42. The lower face of the plunger is tapped as at 43 to accommodate plugs (not shown) of any desired specific gravity in order to vary the weight of the plunger at will.

Threaded to the upper end of the cylinder 34 is a cover 44, preferably made of insulating material and secured to the cover are binding posts or terminals 45 and 46, the lower ends of which are respectively in electrical communication with the movable switch element 37 and the contact point 39. A small aperture 47 provided in the the cover 44 permits the exit and entrance of air to the cylinder 34 during the movement of the plunger 35 and to thereby establish equal pressures on the upper and lower sides of the plunger. A bonnet 48 of insulating material fits snugly over the cap 44 and is provided with suitable apertures or slots (not shown) for permitting the leads 28 and 29 to pass therethrough and be connected to the terminals 45 and 46.

The lower end of the cylinder is threaded to the elbow 33 which as clearly shown in Fig. 1 is in communication with the conduit 23. It will therefore be seen that the motion of the plunger 35 is controlled by the air pressure within the conduit 23 and that since this pressure is governed by the blower 11, the operation of the plunger 35 and consequently the switch contacts 38 and 39 and the motor operated valve 27 is correlated to the speed of the burner motor 4. Since the motor 4 drives the blower 3 as well as the blower 11, the operation of the valve 27 may be considered to be correlated to the air pressure generated by either of these blowers.

Before starting the burner it is assumed that there is a constant or safety pilot as ordinarily required by city ordinances, and that the under-draft doors (not shown) of the fire box are closed. It is furthermore assumed that the weight of the plunger 35 of the pressure responsive switch 32 has been adjusted so as to rise only when the pressure of secondary air within the conduit 23 has reached a predetermined value corresponding to a sufficient pressure of primary air in the nozzle 2, to support the combustion of the fuel passing through the valve 26 when the valve is in its full open position. The electric circuit of the motor 4 is then closed to thereby put the blowers 3 and 11 in operation, and as a consequence a pressure of both primary and secondary air is built up respectively in the nozzle 2 and in the conduit 23. When the motor comes up to speed and the blower 3 is delivering a sufficient quantity of primary air to support combustion of the fuel delivered to the nozzle 2 when the valve 26 is in its full open position, the plunger 35 rises in response to the secondary air pressure within the line 23 and thereby closes the contacts 38 and 39.

This in turn puts the motor 27 in operation to completely open the valve 26. In this connection it is to be noted that the valve 26 is not gradually opened or closed to supply varying amounts of fuel to the nozzle 2, but is quickly opened or quickly shut to either furnish a full supply of fuel or none at all. In this respect the operation of my burner differs materially from the operation of burners now on the market, for ordinarily when starting up a burner, the fuel valve is merely cracked. As is well known, this method of operation results in puff-backs. Puff-backs are avoided by my method of operation for no fuel whatsoever is delivered to the nozzle 2 until there is a sufficient supply of air to support the combustion of a full supply of fuel.

The secondary supply of air furnished by the blower 11 serves three purposes. In the first place it supplements the primary air furnished by the blower 3 in supporting the combustion of the fuel. In the second place, it furnishes the required draft to scavenge the fire box by doing away with the necessity of high stacks and their consequent initial cost and cost of maintenance. And in the third place, since the secondary air is supplied to the annular space surrounding the burner nozzle it maintains the nozzle cool, preventing carbonization of the nozzle and of the atomizing cup in case that oil is being used. Furthermore and very important, it enables the operation of the burner to be carried on at higher temperatures.

Although the blower 11 is designed to supply substantially the desired amount of secondary air, the precise quantity of secondary air can be regulated by means of the lever 17 or by the valve 24.

I claim:

1. A fuel burner comprising a burner nozzle, a source of fuel and a source of air, means for supplying secondary air to said burner under pressure and means responsive to the pressure of said secondary air for instantaneously opening or cutting off the supply of fuel to said nozzle.

2. A fuel burner comprising a burner nozzle, means for delivering fuel and air to said nozzle, a valve for controlling the fuel supply, means for generating a pressure of secondary air and means responsive to the secondary air pressure for instantaneously operating said valve.

3. A fuel burner comprising a casing provided with a burner nozzle, a collar surrounding said nozzle and forming therewith an annular space, means for delivering fuel and air under pressure to said nozzle, means for delivering a supply of secondary air under pressure to said annular space and means correlated to the secondary air pressure for instantaneously opening or cutting off the supply of fuel to said nozzle.

4. A fuel burner comprising a casing provided with a burner nozzle, a collar surrounding said nozzle and forming therewith an annular space, a blower for delivering a combustible mixture of fuel and air through said nozzle; and a second blower for delivering a supply of secondary air to said annular space.

5. A fuel burner comprising a casing provided with a burner nozzle and forming therewith an annular space, a blower for delivering a combustible mixture of fuel and air through said nozzle, a second blower for delivering a supply of secondary air to said annular space and a single motor associated with said casing for driving both of said blowers.

6. A fuel burner comprising a casing provided with a burner nozzle and forming therewith an

annular space, a blower for delivering fuel and air to said nozzle, a second blower for delivering a supply of secondary air to said annular space, a single motor associated with said casing for driving both of said blowers and means operating in correlation to the air pressure generated by said second blower for instantaneously opening or cutting off the fuel supply to said nozzle.

7. A fuel burner comprising a casing provided with a burner nozzle and forming therewith an annular space, a blower for delivering fuel and air to said nozzle; a second blower for delivering a supply of secondary air to said annular space, a single motor associated with said casing for driving both of said blowers, a valve for instantaneously opening or cutting off the fuel supply to said nozzle and means operating in correlation to the air pressure generated by said second blower for instantaneously operating said valve.

8. A fuel burner comprising a motor; a primary blower associated with and driven by one end of said motor; a secondary blower associated with and driven by the opposite end of said motor; a burner nozzle in communication and formed integral with said primary blower; a collar surrounding said nozzle and secured to said primary blower; means for establishing communication between said secondary blower and the annular space formed between said nozzle and said blower; individual air and fuel intakes communicating with said primary blower; a motor driven valve associated with said fuel intake for controlling the fuel fed to said primary blower and means responsive to the pressure generated by said secondary blower for controlling said motor driven valve.

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