Oct. 17, 1933. H. MEACHEM 1,930,902

AUTOMATIC MEANS FOR THE DELAYED ACTUATION OF FUEL CONTROL MEANS

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Fig. 2

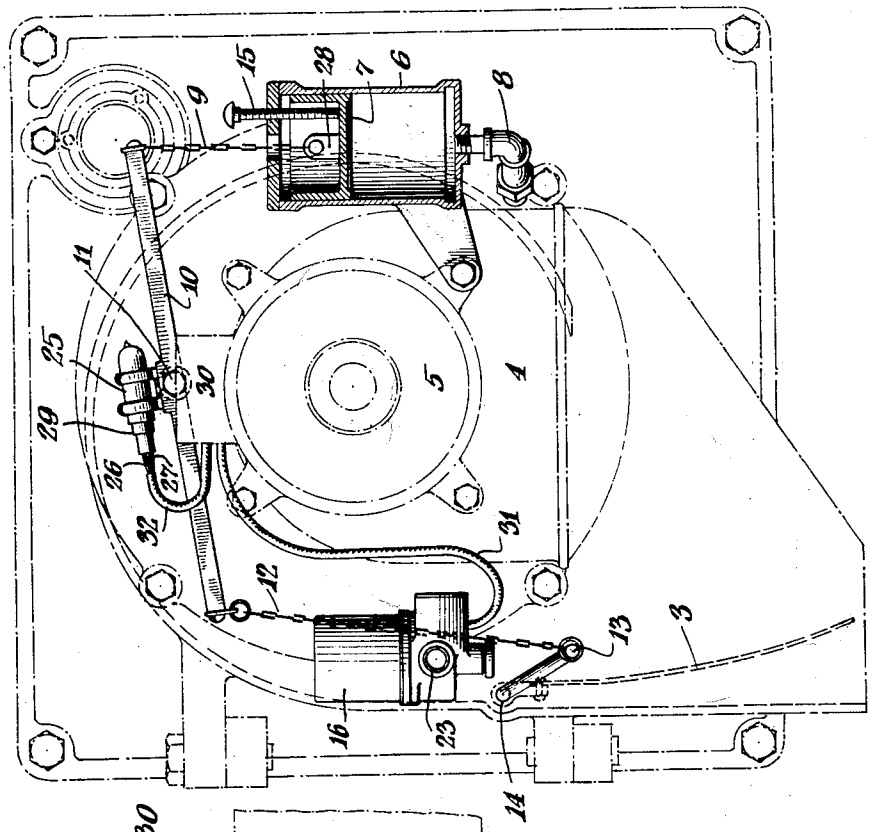
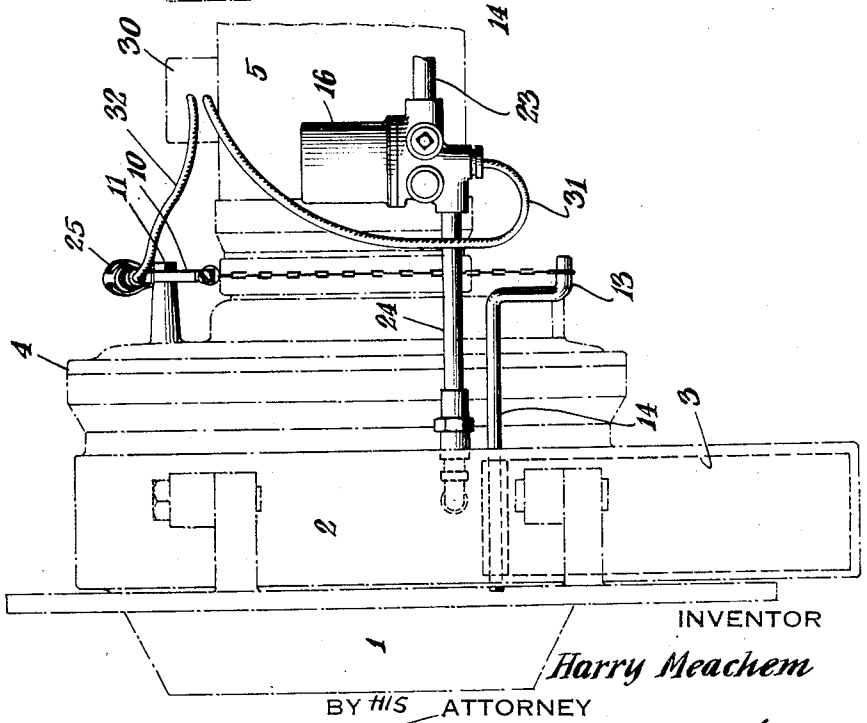


Fig. 1



INVENTOR

Harry Meachem

BY HIS ATTORNEY

Frederick W. Baker

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Fig. 4

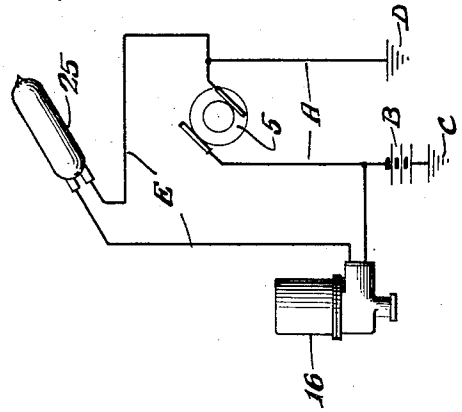


Fig. 5

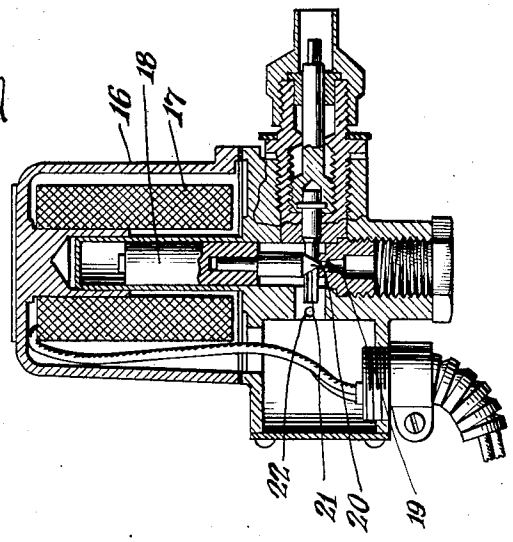
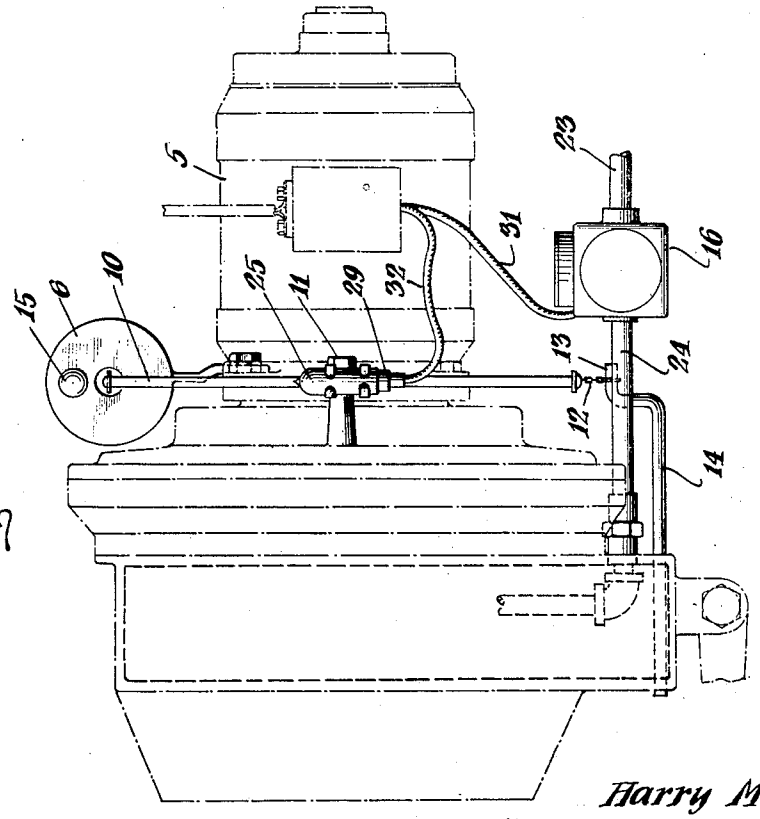


Fig. 3



INVENTOR

Harry Meachem

BY HIS ATTORNEY

Frederick K. Barker

Patented Oct. 17, 1933

1,930,902

UNITED STATES PATENT OFFICE

1,930,902

AUTOMATIC MEANS FOR THE DELAYED ACTUATION OF FUEL CONTROL MEANS

Harry Meachem, Teaneck, N. J., assignor to Todd Dry Dock, Engineering & Repair Corporation, Brooklyn, N. Y.

Application June 30, 1931. Serial No. 547,902

1 Claim. (Cl. 137—139)

This invention relates to furnaces employing a blower to create the primary air supply, and having a magnetic valve, of the solenoid type, for controlling the fuel supply, together with a damper for controlling the supply of secondary air to the furnace.

In my earlier patent application, Serial No. 530,178, filed April 15, 1931 now Patent No. 1,873,656 issued August 23, 1932, I have described means whereby pressure of air from the blower casing serves as the power medium for opening the damper to admit secondary air to the furnace, said power medium operating against gravity means whose function it is to close said damper when the blower pressure is shut down.

But in the present application, while employing the same or corresponding instrumentalities for opening and closing the damper for control of the secondary air supply, I have combined therewith means for actuating the means whereby the fuel supply is controlled, to the end that said fuel supply may be automatically shut off when the blower pressure ceases, and also that the fuel supply to the furnace may become automatically re-established when the blower is again operating to deliver the primary air at efficient pressure.

A particular feature of my invention in the automatic means for causing the opening of the fuel supply consists in the provision of means for delaying the opening of the fuel control valve, after the starting up of the blower, for a period of sufficient duration to permit the blower to first attain its maximum speed for the delivery of the primary air under such pressure as is necessary to efficiently atomize the fuel, so that when the fuel is finally introduced into the furnace it will at once be subjected to the process of atomization. In this manner the liability of raw fuel flowing into the furnace in a liquid state is eliminated, and a combustible mixture, capable of instant ignition by the usual pilot flame, is assured.

Also, my invention comprehends the further feature that the fuel control valve becomes automatically closed, thereby shutting off the fuel supply in the gravity closing of the damper, when the operation of the blower ceases.

Other features and advantages of my invention will hereinafter appear.

In the drawings:

Figure 1 is a side elevation of a furnace front, having an air box, with a damper, and provided with a blower, and a motor, also having damper control means and magnetic, fuel supply control means, together with my improved automatic means for the delayed operation of the fuel supply control means.

Fig. 2 is a front view of Fig. 1.

Fig. 3 is a top plan view.

Fig. 4 is a diagrammatic view of the wiring employed, and

Fig. 5 is a cross-section taken through a standard type of magnetic oil valve.

In the drawings let 1 indicate the throat of a furnace which may be equipped with suitable fuel burning means, (not shown) and let 2 indicate a hollow front, or air box, having the damper 3 to control the inlet for secondary air supplies.

At 4 there appears a blower, which is operated by a motor 5, for delivering the primary air supply under pressure to the fuel burning means.

The parts thus far referred to are of usual character.

As in my earlier application for patent, Serial No. 530,178, filed April 15, 1931, a vertically disposed cylinder 6 is attached to the blower casing, said cylinder having its upper end open and containing a piston 7; and, also as in said earlier application, the bottom of cylinder 6 is connected, as by a pipe 8, with the interior of the blower casing, so that when the blower is operating, pressure therefrom will pass to the cylinder to raise the piston therein.

The piston is connected, as by a flexible connector 9, with one end of a beam 10, which is here shown as pivotally mounted on a bearing stud 11 that projects from the blower casing, and the other end of said beam connects, as by a flexible connector 12, with a crank 13, whose shaft 14 carries the damper 3, for the operation of said damper.

The weight of piston 7 exceeds that of damper 3, so that when there is no pressure in cylinder 6 the piston will be at rest upon the cylinder bottom, and in that position the excess weight of the piston will overbalance the damper and hold said damper in its closed position, thus preventing the flow of secondary air into the furnace.

But when the blower is started up to supply primary air for fuel atomization, then the air bypassed through pipe 8 into cylinder 6 will gradually raise the piston to the limit of its up stroke, which limit may be determined by an adjustable stop device 15.

As the piston rises so the damper 3 is permitted to fall by its own weight to the damper open position for the admission of secondary air.

The means herein shown for controlling the opening and closing of the damper through the

respective action and in action of the blower are disclosed in substance in my said earlier application, but are somewhat modified in this application in order to better suit another purpose for which my present invention is especially intended.

The new purpose, thus referred to, is the control of the fuel supply to the furnace through the operation of the pressure and gravity actuated piston, whereby also the delivery of the fuel is delayed during the period occupied by the piston in moving through a part of its upstroke.

A usual element in the equipment of liquid fuel burning furnaces is a magnetic valve, indicated in the drawings at 16, and more clearly represented in Fig. 5 as of the solenoid type, having the coil 17, plunger 18, valve seat 19, valve 20, and metering pin 21. The liquid fuel inlet is shown at 22 and is in communication with a source of fuel supply (not shown) through a pipe 23, the fuel leaving the valve through a pipe 24 that communicates with a burner (not shown).

Supported upon the beam 10, preferably over the pivotal portion of said beam, is a mercury switch 25, having electrical circuit terminals 26, 27 of opposite sign introduced therein at one end thereof, to close the circuit through the mercury when the beam 10, and consequently the switch borne thereby, are tilted in one direction, and to open the circuit when the beam and switch are tilted in the opposite direction, thereby causing the mercury to flow away from contact with said terminals.

In the position of the parts shown in Fig. 2 piston 7 has been raised to its full height by blower pressure and during the period occupied in its rise the blower will have attained its efficient speed for the delivery of primary air at a pressure capable of efficiently atomizing the fuel. Since the beam 10 is connected with the piston by flexible connector 9, which engages a lug 28 that extends upwardly from the piston, the beam 10 has been tilted by the weight of damper 3, whose carrying crank 13 has exerted a down pull upon the other end of beam 10, through flexible connector 12.

In this tilted attitude of the beam 10 and switch 25 the mercury has flowed into contact with the terminals 26, 27, thus completing the circuit for the opening operation of the magnetic valve, thereby permitting the delivery of liquid fuel to the burner, for atomization and combustion.

It will be noted that the mercury does not flow into contact with terminals 26, 27 at the beginning of the piston upstroke, for, when the blower pressure is off and the piston is at the lower end of its stroke in cylinder 6, then the beam is tilted in the opposite direction, with the mercury settled in the end 29 of switch 25, and it is not until the piston has moved upwardly a sufficient distance, permitting the beam to pass through a horizontal position, that the mercury is enabled to perform its function of a circuit closer.

The period of time occupied by the piston in so rising is relied upon for permitting the blower to reach its efficient speed, and to provide the desirable delay period prior to the actuation of the magnetic valve for delivery of the liquid fuel.

A terminal box 30 is shown as attached to the motor 5, and cables 31, 32, containing the circuit wires, connect respectively from said circuit box with the magnetic valve and the mercury switch.

In the wiring diagram of Fig. 4 the primary circuit is shown at A, as including the motor 5, a source of electrical energy B and ground connections C, D; and the secondary circuit E is shown as including the magnetic valve 16 and the mercury switch 25.

Variations within the spirit and scope of my invention are equally comprehended by the foregoing disclosure.

I claim:

The combination with a magnetic valve, an electrical circuit for said magnetic valve, and a blower, of a mercury switch included in said circuit, a pivotal support for said switch, a gravity-operated piston and damper carried by said support to tilt the same oppositely, said piston overbalancing the damper, and normally tilting the support in one direction for circuit opening by the switch, whereby the valve is held closed, and means for applying pressure from said blower for raising the piston, thereby permitting the damper to tilt the support in the opposite direction for circuit closing by the switch, whereby the valve is caused to open.

HARRY MEACHEM.