Nov. 6, 1934. C. F. GARDNER ET AL 1,979,462

COMBUSTION CONTROLLING DEVICE

Filed May 27, 1931

Fig. 1.

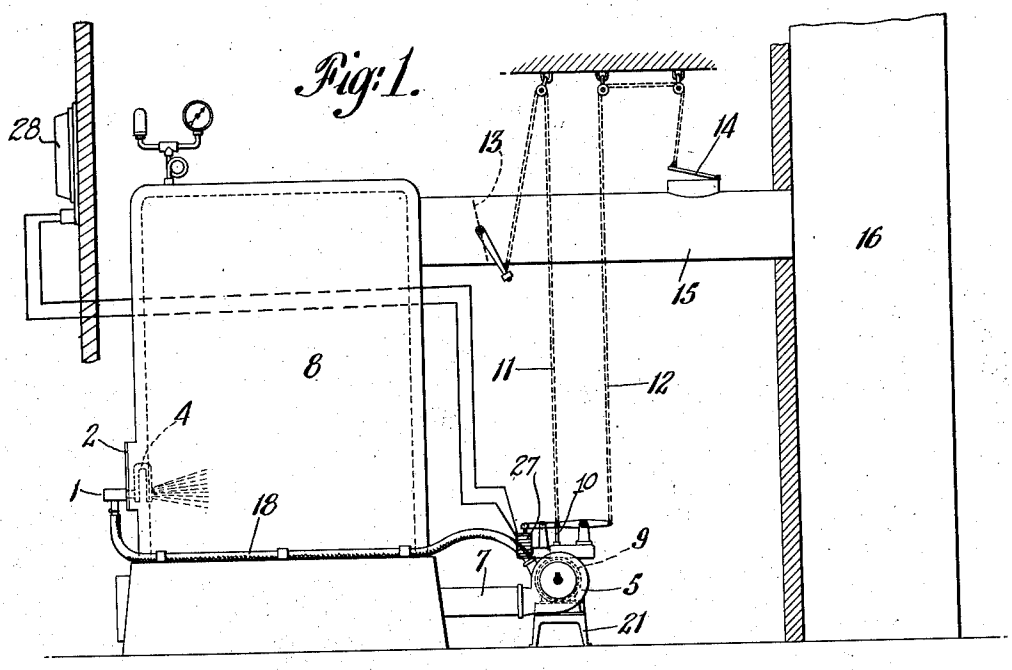


Fig. 2.

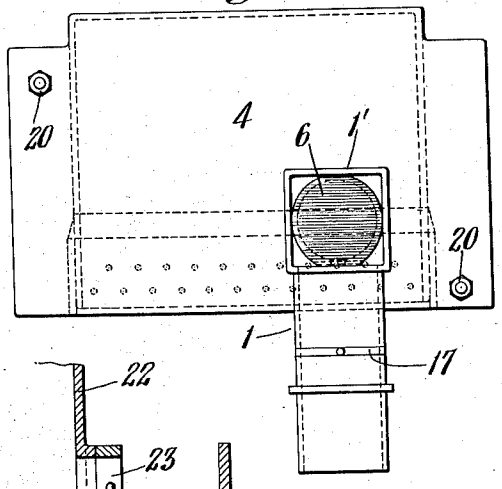


Fig. 3.

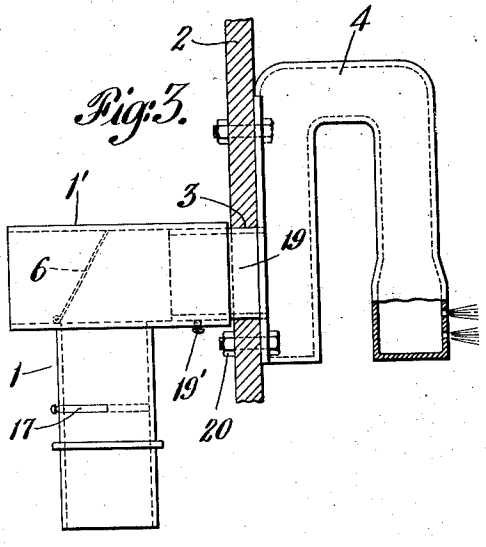
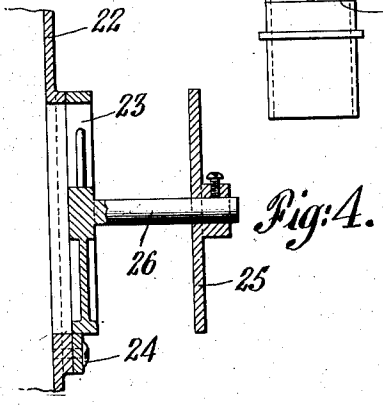


Fig. 4.



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COMBUSTION CONTROLLING DEVICE

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1 Claim. (Cl. 110—75)

This invention relates to a method and apparatus of the burning of small sizes of coal in furnaces.

In home installations the usual form of furnace is not adapted to burn the cheap, small sizes of anthracite, bituminous and lignite coals.

One of the objects of this invention is to provide a method and apparatus whereby smaller sizes of coal can be burned in furnaces.

Another object of the invention is to provide an apparatus for the complete and efficient combustion of small size coal in a furnace.

A further object of the invention is to provide an automatic control of temperatures.

A still further object of the invention is to provide for control of secondary and primary air to maintain an even burning of the fuel in a furnace.

Referring to the drawing:

Figure 1 is a view in side elevation of a device embodying the principles of our invention.

Figure 2 is a front view of the secondary air mixer valve affixed to the furnace door.

Figure 3 is a view in side elevation partly in section of air mixer valve and preheater.

Figure 4 is a sectional view of the blower suction valve.

In carrying out our invention we propose to provide a complete control of the air to a furnace as well as the control of the drafts and preferably to have the control automatic.

The mechanism of the device is as follows:

An air mixer valve 1 is secured in any suitable manner to the furnace door 2 and communicates through an opening 3 cut therein to preheater 4. The air mixer 1 has a horizontal longitudinal conduit 1' which is open to the air when the blower 5 is shut down by reason of the dropping of the flap valve 6 to permit of free secondary air being admitted through conduit 1' into and out of preheater 4. Air mixer valve 1 is connected by a suitable conduit such as a flexible tubing covered with asbestos to blower 5. Blower 5 has a connection 7 below the grate in the ash pit for the admission of primary air preferably at the rear of the furnace 8. Blower 5 is driven in any well known manner such as by an electric motor 9. Motor 9 is provided with a cut off switch 10 which switch can be operated by any well known form of automatic control or manually. Upon the operation of the switch 10 through chains 11 and 12, damper 13 is closed and check damper 14 is opened in the connection 15 to stack 16. The mechanism for manipulating dampers 13 and 14 and switch 10 may be a solenoid valve 27, magnetic switch or any suitable device to automatically open and close the dampers in conjunction with shutting off the motor blower.

The air mixer valve 1 in appearance is a T. The cross bar 1' is a conduit open at both ends, one end of which communicates with conduit 19 and is secured thereto by set screw 19'. Conduit 19 in turn communicates with preheater 4. The upright of the T has flap valve 6 which normally closes the open end of conduit 1' when secondary air is being admitted and closes the upright when secondary air is not admitted permitting the free air to have access through preheater 4 to furnish a small amount of air across the fuel bed while at the same time acting as a check on the natural draft. A slide damper 17 in the upright of air mixer valve 1 regulates the volume of secondary air. This slide damper is manually controlled.

The preheater 4 is a U shaped casting having small holes drilled in the face of the arm adjacent the fuel bed for the heated air to pass out and is bolted to the furnace door 2 by bolts 20. The motor 9 and blower 5 are mounted on base 21 to form a unit construction. The blower 5 may receive the air from the cellar as shown or from the outside of the building. A thermostatic control 28 can control the motor switch 10 to stop and start the motor and regulate the drafts. This control may be placed on the motor unit as shown or a distant thermostatic control can be used to regulate the switch.

Figure 4 shows a cross section of the blower suction valve. Housing 22 carries spider 23 bolted thereto by bolts 24. Spider 23 carries shaft 26 which has journaled thereon shutter 25.

The operation of the device is as follows:

The fire in the fire box is started with the motor in operation blowing primary air through conduit 7 into the ash pit and up through the grate and fuel bed. At the same time secondary air is admitted by means of conduit 18 to air mixer valve 1 through preheater 4. The secondary air is blown over the top of the fuel bed to ignite the combustible gases in the furnace, the damper 13 being open and damper 14 closed. This arrangement furnishes maximum draft and maximum combustion and permits of complete combustion of the small sizes of coal in the furnace. Without the secondary air a large proportion of combustible hot gases pass up through the stack and are lost for use.

Upon the temperature reaching the desired amount the damper 13 is closed and damper 14

opened and the motor stopped. Flap valve 6 of the air mixer valve 1 closes by reason of the drop in pressure through conduit 18 and admits free air from the cellar over the fire bed to check the draft and consume the combustible gases such as CO. Upon the temperature falling to the predetermined amount the motor again is started and the process is repeated automatically.

It should be understood that there is an interrelationship and cooperation between dampers 13, 14, and the quantity and velocity of flow of the secondary and primary air. Dampers 13, 14, must be initially adjusted when the primary and secondary air is shut off except the free secondary air so that sufficient draft is maintained for slow but complete combustion. By this means, even burning is accomplished with efficient operation and without the fire going out when small sizes of coal are used. In each individual installation an initial adjustment must be made with respect to the amount of secondary and primary air to be admitted by adjustment of blower suction valve as well as adjustment of dampers 13, 14. A draft gauge of any well known type enables the operator to make all settings.

It has been found that with such a device attention on the part of the householder is reduced to a minimum in that a relatively high fuel bed can be carried which permits of infrequent filling with coal and a more economical result in that a more complete combustion of the coal by reason of a relatively thick fuel bed and control of air is accomplished.

It will thus be seen that I have provided a method and apparatus for the burning of small sizes of coal in house furnaces or other installations such as domestic hot water supply, apartment house heating and boilers up to 200 H. P., which will permit of the complete combustion of the coal with a relative minimum of attention.

What we claim is:

A combustion controlling device comprising a secondary air inlet adapted to admit secondary air under pressure to the furnace, means for controlling the quantity of pressure air passing through the inlet and a flap valve for automatically admitting atmospheric air through said air inlet to the furnace when the flow of secondary pressure air is stopped.

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