Aug. 6, 1940. W. H. SCHWEIZER 2,210,329

SMOKE SUPPRESSING DEVICE

Filed Sept. 16, 1937 2 Sheets-Sheet 1

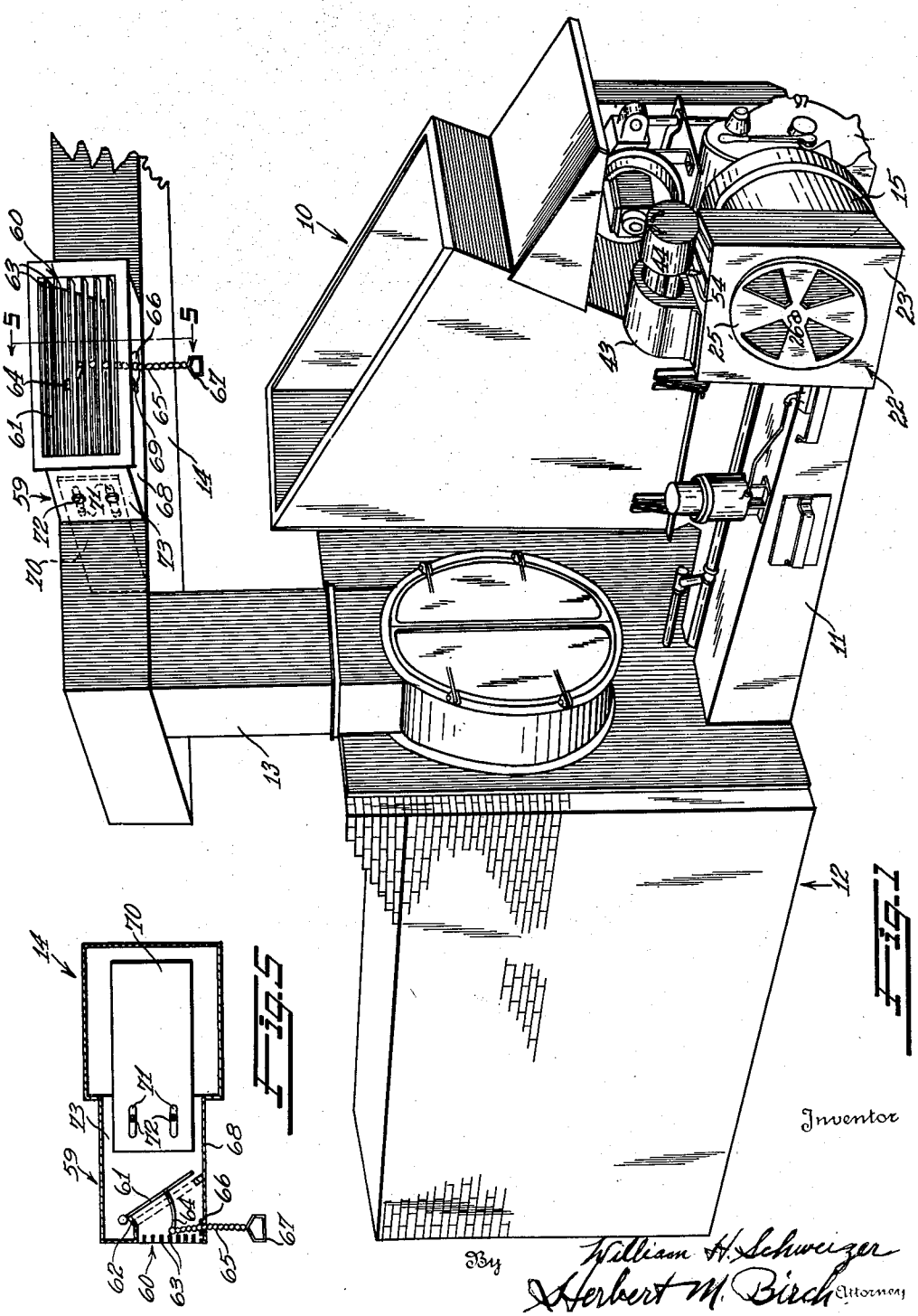


Fig. 1

Fig. 5

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SMOKE SUPPRESSING DEVICE

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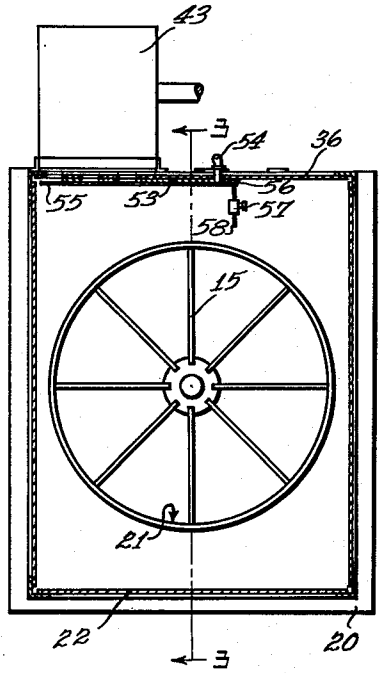


Fig. 2

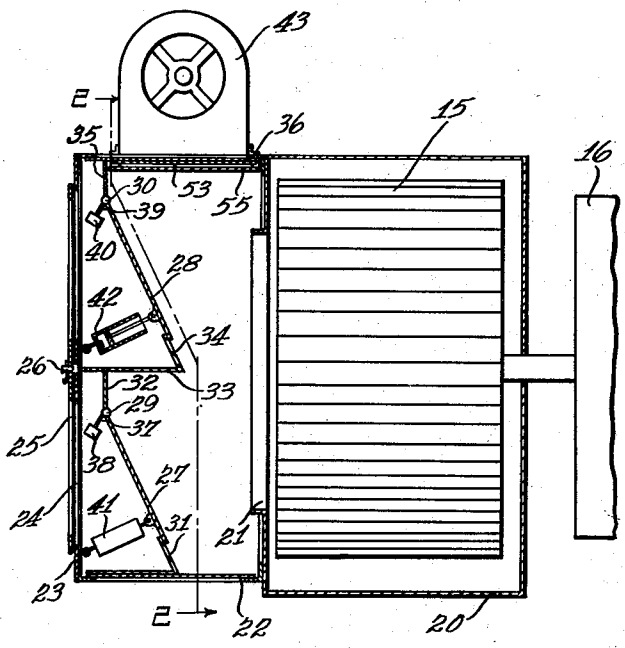


Fig. 3

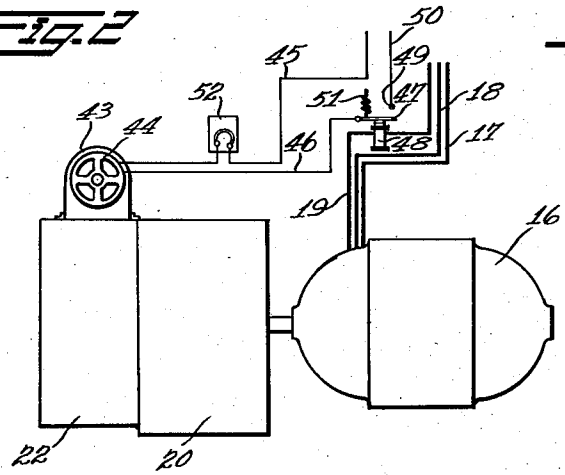


Fig. 4

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Patented Aug. 6, 1940 2,210,329

UNITED STATES PATENT OFFICE

2,210,329

SMOKE SUPPRESSING DEVICE

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Application September 16, 1937, Serial No. 164,259

8 Claims. (Cl. 110—72)

This invention relates to heating devices and more particularly to an improved smoke suppressing device for use in combination with a furnace or boiler so as to prevent the accumulation of smoke and soot in the boiler or furnace and in the flue or breeching leading from the heater to the smoke stack.

An object of this invention is to provide in combination with a force feed means in a boiler an auxiliary air feeding means to force a relatively small quantity of air through the heater so as to maintain an even burning of the fuel during the time that the main heat producing means is inactive.

Another object of this invention is to provide in a device of this kind means to automatically actuate the auxiliary draft producing device when the main draft producing means is inactive, and to automatically cut off the auxiliary draft producing means when the main draft producing means is active.

A further object of this invention is to provide an improved method of producing heat in a boiler or furnace which is so constructed that the suction from the uptake will not draw out unburned gases which normally produce soot or accumulations in the smoke stack.

A still further object of this invention is to provide means whereby the light dust particles in the furnace or boiler will not be drawn up into the smoke stack and in the flue or breeching during the time that the furnace proper is being cleaned.

A further object of this invention is to provide an attachment in the form of an auxiliary draft producing or air feeding means which may be readily connected to conventional stokers of the mechanical feed type so that when the main stoker is inactive the clean fuel forced into the retort or tuyère will not smolder and thus produce smoke and soot during this inactive period.

With the foregoing and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claims appended hereto.

In the drawings, wherein like symbols refer to like or corresponding parts throughout the several views:

Figure 1 is a perspective view of a heater and stoker having a device constructed according to an embodiment of this invention mounted thereon.

Figure 2 is an end cross section view of the force feed fan and housing taken on line 2—2 of Fig. 3.

Figure 3 is a side cross section view of the force feed device air control means and housing taken on line 3—3 of Fig. 2.

Figure 4 is a diagrammatic view of the electric circuits incorporated with this invention.

Figure 5 is a section taken on the line 5—5 of Fig. 1.

Referring to the drawings, the numeral 10 designates generally a mechanical stoker which is connected by means of a pipe or flue 11 to a furnace or boiler 12. The boiler 12 is provided with an outlet or smoke pipe 13 which in the present instance has a horizontal portion 14 leading directly to the smoke stack. The stoker 10 is of conventional construction and includes a relatively large fan 15 operated by means of a motor 16. The motor 16 is connected by means of wires 17, 18 and 19 to a source of current supply and the usual thermostatic devices (not shown) and pressure controlling devices connected to the boiler 12 may be interposed in the electric circuit in which the wires 17, 18 and 19 are interposed.

The fan 15 includes a housing 20 having an inlet opening 21 in a face thereof through which air is drawn by the fan 15 when the motor 16 is operated. The stoker 10 is preferably associated with a relatively large boiler 12 and the motor 16 is preferably a relatively large powered motor so as to produce the necessary draft through the flue 11 to the retort or tuyère positioned within the plenum chamber below the boiler or grate. At the present time, when the stoker 10 is inactive due to the production of the desired steam pressure or heat, the fuel forced into the retort smolders and produces smoke and it is, therefore, to eliminate this objectionable feature that the hereinafter described auxiliary draft producing means is combined with the stoker 10.

A housing 22 is in the present instance secured to the fan housing 20 about the intake opening 21 thereof and this housing 22 has a front wall 23 provided with an opening 24 which is partially covered by means of an adjustable valve 25. Preferably the air intake opening 24 may be formed as a plurality of radially arranged openings which may be regulated by means of the rotatable valve 25 mounted on a shaft 26. A pair of valve members 27 and 28 are swingably mounted within the housing 22, the valve member 27 being mounted on a shaft 29 and the valve member 28 being mounted on a shaft 30. The lower or free end of the valve member or plate 27 is adapted to engage against a flange 31 secured to the bottom wall of the housing 22. A partition or inner wall 32 is secured to an inner horizontal wall 33 disposed in substantially the center of the

housing 22. The horizontal wall 33 at its inner end is provided with a flange 34 against which the valve member or plate 28 is adapted to engage when in closed position. An upper vertical partition 35 extends downwardly from the top 36 of the housing 22 and coacts with the valve member 28 and the flange 34 in closing the upper portion of the casing 22.

An arm 37 is secured to the valve member or damper 27 and extends downwardly and outwardly thereof. A weight 38 is adjustably secured to the arm 37 and acts to substantially balance the valve member 27 so that a very slight suction will cause the valve member 27 to be drawn to an open position. The valve member 28 also has a forwardly and downwardly inclined arm 39 secured thereto and an adjustable balancing weight 40 is mounted on this arm 39.

In order to eliminate the noise of the closing of the valve members 27 and 28 when the fan 15 is cut off, I have provided check members 41 and 42 which are secured at one end to the housing 22 and at the other end thereof to the valve members or plates 27 and 28, respectively. These check members are constructed in the form of a cylinder having a piston slidable therein with one part secured to the casing 22 and the other part secured to the swingable valve members 27 and 28.

A fan member 43 is secured to the top wall 36 of the casing 22 and is operated by means of a motor 44. The motor 44 is a relatively low powered motor having a conductor 45 connected to a suitable source of current supply and a second conductor 46 which is connected to an armature 47 of a relay 48. The relay 48 is adapted to be placed in circuit with the main motor 16 so that when the main motor 16 is in operation, the relay 48 will be energized and the armature 47 will be drawn away from a stationary contact or terminal 49 connected by means of a wire 50 to a source of current supply. In this manner, when the main motor 16 is inactive, the armature 47 will be drawn by means of a spring 51 into contact with the terminal 49 and thus complete the electric circuit to the auxiliary motor 44. If desired, a pressure operated switch member 52 may also be interposed in the electric circuit to the motor 44, this pressure operated switch 52 being interposed in the wire 45 and the pressure member 52 being affected by the temperature or pressure in the boiler or furnace 12. It will be apparent from this that if during the time the auxiliary fan 43 is in operation, the pressure or heat in the boiler or furnace 12 becomes excessive, the auxiliary draft member will be automatically cut off.

A plate or valve member 53 is slidably carried by the top wall 36 of the housing 22 and is provided at one end with a knob 54 so that the opening from the fan 43 into the casing 22 may be regulated in order not to produce too great a draft to the boiler or furnace 12.

In order to prevent back draft through the fan 43, I have provided a plate 55 which is swingably mounted, as at 56, on the underside of the top wall 36 and this plate or valve member 55 is balanced to a normal closed position by means of an adjustable weight 57 mounted on a depending arm 58 carried by the pivoted end of the valve member 55.

A casing 59 is secured to the horizontal flue or duct 14 and is provided with an open outer end 60. A plate or valve member 61 is swingably secured at its upper end to the casing 59 and normally engages against a frame member 62 which is disposed on an inclination to the vertical so that the door or valve 61 will gravitatingly close the opening 60 in the casing 59. A grill 63 may be placed across the open outer end of the casing 59 so as to prevent paper or other articles from being drawn into the breeching or duct 14. The plate or door 61 has an arm 64 secured to the outer side thereof and a chain or operating member 65 is secured at its upper end to the arm 64 and extends downwardly through an opening 66 in the bottom wall of the casing 59. A handle 67 is secured to the lower end of the chain 65, so that when it is desired to clean the furnace or boiler 12, the damper or valve member 61 may be moved to an open position. The bottom wall 68 of the casing 59 may also be provided with a notch 69 opening into the hole 66 so that the chain 65 may be moved laterally into the notch 67 and thus held against movement so as to keep the valve or door 61 in open position.

A baffle 70 having a plurality of elongated openings 71 is adjustably secured as by bolts 72 to a side wall 73 of the casing 59. This baffle 70 is relatively smaller in width than the width or diameter of the breeching or flue 14 so that in any position of the baffle 70 across the flue or breeching 14 the gases may pass over the edges of the baffle 70. With the use of this baffle 70, the products of combustion are retained for a longer period in the combustion chamber of the boiler or furnace 12 and in this manner, a greater heat exchange will be effected than where the breeching or smoke uptake 14 is not provided with a baffle of this type. The adjustment of the baffle 70 is made during the time that the stoker 10 is in normal operation so that no undue pressure will be set up in the furnace housing 12.

In the use and operation of this device, the normal running of the furnace 12 is effected by the operation of the motor 16 and the fan 15. It will be understood that the stoker 10 includes a conveyor in the duct 11 to convey the fuel to the retort or tuyère so that a continuous feeding of fuel will be provided. When the desired temperature has been produced by the stoker 10, the conventional controlling devices operatively connected to the motor 16 will cut off the current supply through the conductors 17, 18 and 19 and at this time the relay 48 will be de-energized so that the spring 51 will be able to swing the armature 47 into circuit closing position with the terminal 49. The motor 44 will then be operated and the air forced into the casing 22 by the fan 43 will swing the valve members 27 and 28 to closed position so that the air from the auxiliary fan 43 will not pass outwardly through the intake opening 24 of the casing 22. The air from the fan 43 will enter the casing 22 and then pass through the fan housing 20 into the duct 11. The pressure of air from the fan 43 will be substantially less than the pressure produced by the fan 15 so that the fuel in the retort will be burned at a slower rate but at a sufficient rate to prevent smoldering or smoking.

The casing 22 with the fan 43 and the motor 44 are here disclosed as being mounted directly on the main fan housing 20, but it will be understood that this auxiliary draft producing means may also be mounted at any desired point along the length of the duct 11 or at a suitable point in communication with the plenum chamber below the boiler 12. The device herein disclosed has been placed in practical operation and has been found to substantially entirely eliminate

the accumulation of dust particles and soot in the boiler or furnace and in addition this attachment effects a considerable economy in the burning of fuel. The device is here disclosed as being combined with a coal stoker but it will be understood that this device and the method of operation may also be combined with other types of burners, such as oil burners or the like.

It is apparent that various changes may be made in this invention, especially in the details of construction, within the scope of claims herewith appended.

What is claimed is:

1. In a smoking suppressing heating assembly, a heater, an electrically operated air feeding means for said heater, an electrically operated auxiliary air feeding means connected to said heater, and means automatically cutting off operation of said auxiliary air feeding means during operation of said first air feeding means.

2. In combination with an air feeding means for a heater, a housing, means securing said housing to the intake side of said air feeding means, said housing having a relatively large air passage in one wall thereof, suction operated valve members normally closing said air passage, said housing having a second air opening in another wall thereof, and air feeding means connected to said second air opening.

3. An auxiliary air feeding means for a heater, comprising a housing, said housing having a relatively large air passage in one wall thereof, suction operated valve members normally closing said air passage, means connecting said housing with said heater, said housing having a second air opening in another wall thereof, and air feeding means connected to said second air opening.

4. In combination, a main air feeding means for a heater, including a main blower and electrically operated power means connected to said blower, a relatively small blower operatively connected to said heater, electrically operated power means for said small blower, and a relay operatively connected to each of said power means whereby to render said second power means ineffective during operation of said first power means.

5. In a continuously operating smoke suppressor unit for attachment to a furnace combustion chamber, including a main motor driven fan, a coal feeding conveyor means, an auxiliary motor driven fan and operating relay means adapted to drive the said main motor driven fan and the said auxiliary motor driven fan alternatively whereby a continuous flow of air is fed through the furnace combustion chamber to maintain constant combustion temperature and thereby eliminate smoldering of fresh fed coal.

6. In a constantly operating smoke suppressor unit secured to a furnace combustion chamber, comprising a motor operated main blower, a coal feeding conveyor, an auxiliary motor operated blower and operating means for said main blower and coal feeding conveyor adapted to operate said main blower and coal conveyor when the auxiliary blower is idle and adapted to operate the auxiliary blower when the main blower and coal feeding conveyor are idle, whereby a constant flow of air to the furnace combustion chamber is maintained to keep continuous combustion temperature in the furnace combustion chamber.

7. A smoke-suppressing, mechanically stoked furnace for burning solid fuel comprising a combustion chamber for said fuel, a mechanical stoker for feeding fuel to said combustion chamber, an electrically operated air feeding means for creating a forced draft in said combustion chamber sufficient to assure combustion of said solid fuel under predetermined conditions, an electrical circuit for applying current to said means in accordance with said predetermined conditions, an auxiliary electrically operated air feeding means for creating a forced draft in said combustion chamber only sufficient to prevent smoldering of said solid fuel and to effect combustion of the gases formed in said combustion chamber during the intervals when said first mentioned air feeding means is inoperative, a normally open auxiliary electrical circuit for supplying current to said auxiliary air feeding means, and a relay in said first mentioned electrical circuit operative upon cessation of current flow through said first mentioned circuit to close said auxiliary electrical circuit.

8. Air feeding means for a smoke-suppressing mechanically stoked furnace for burning solid fuel comprising a housing having a relatively large air inlet passage and a substantially smaller air inlet passage, a flue interconnecting the interior of said housing and said furnace for supplying air to said furnace, suction operated valve members normally closing said relatively large air inlet passage, means in said housing for drawing a primary supply of air into said housing and opening said valve members and an electrically operated means on said housing operable alternately with respect to said last mentioned means for forcing an auxiliary supply of air into said housing through said substantially smaller air inlet passage when said valve members are closed, said auxiliary supply of air being only of sufficient quantity to prevent smoldering of the fuel in said furnace.

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