

Sept. 2, 1952

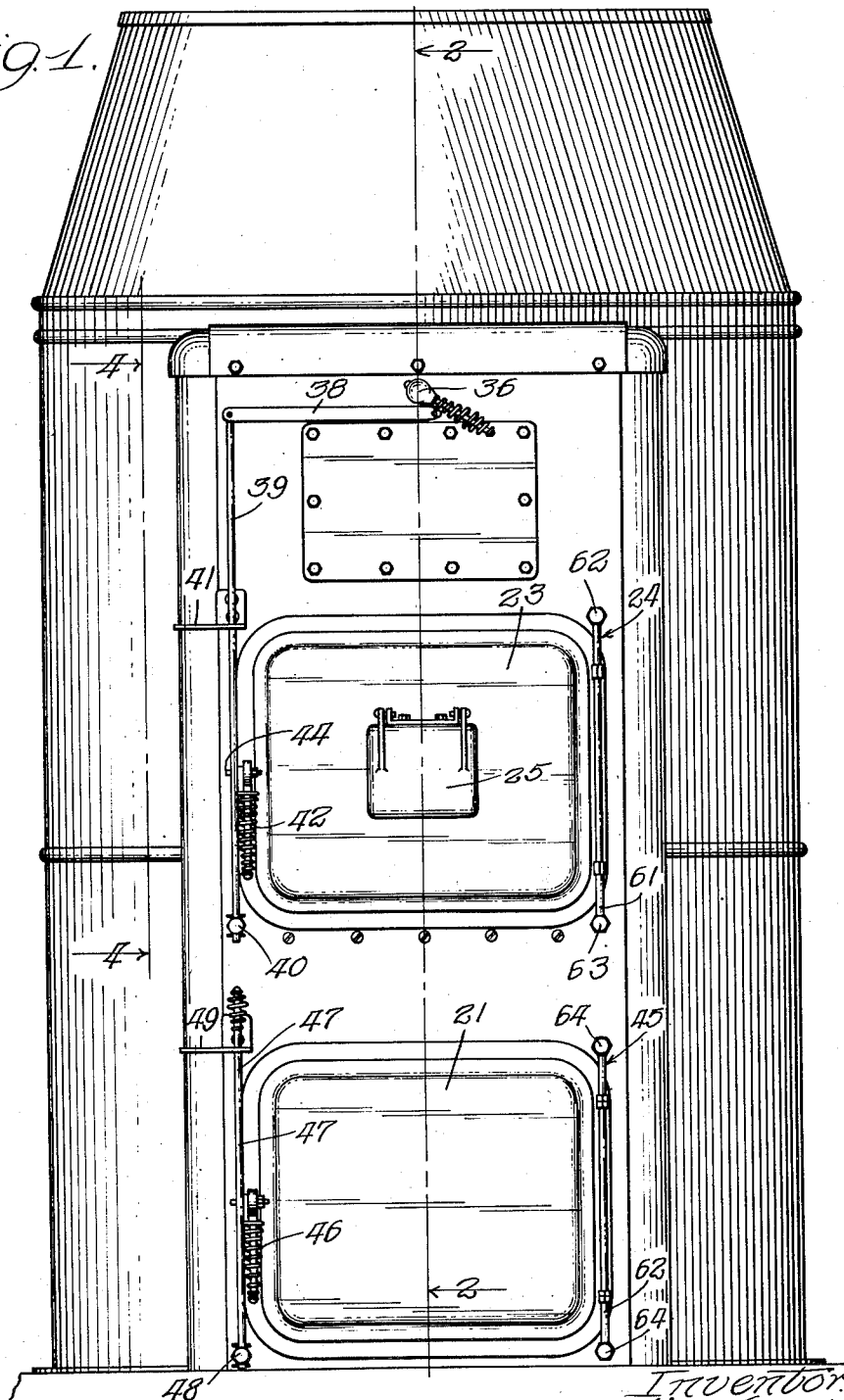
J. W. NORRIS
FURNACE WITH DOOR LATCHING MEANS AND COMBUSTION
GAS BY-PASS CONTROLLED THEREBY

2,608,944

Filed Dec. 31, 1948

3 Sheets-Sheet 1

Fig. 1.

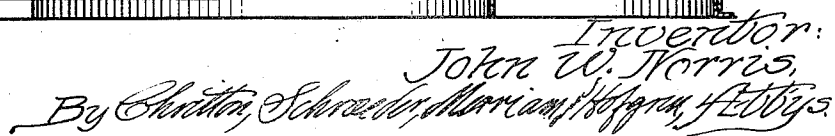


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Fig. 3.

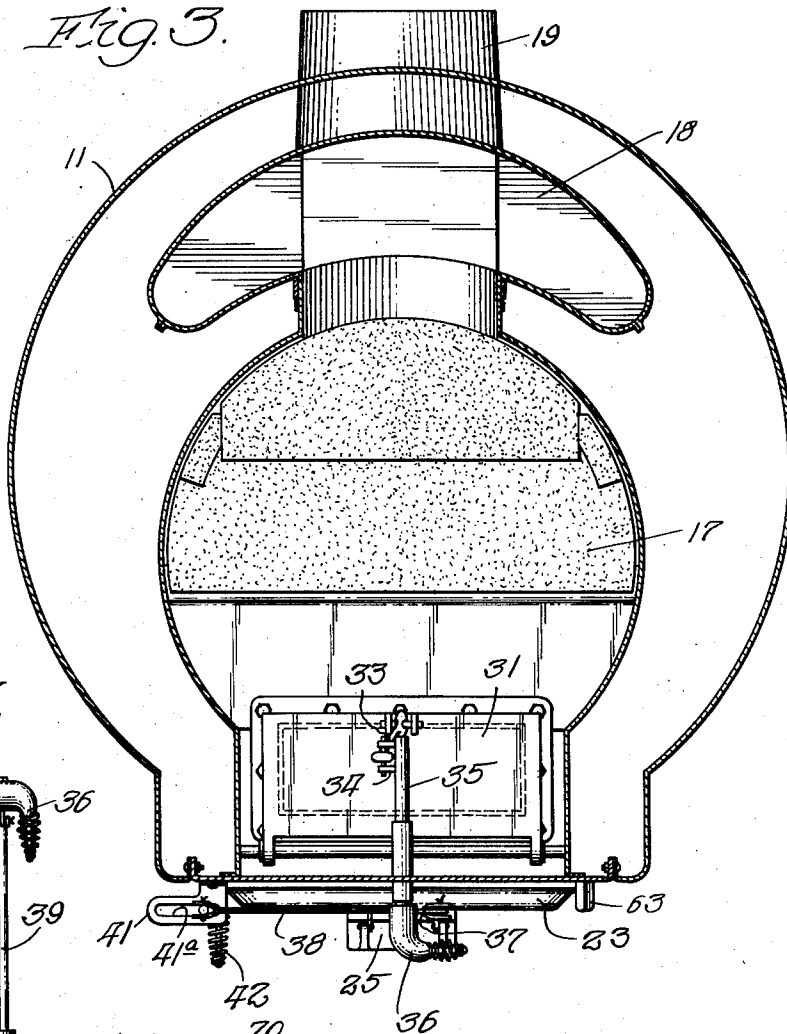


Fig. 4.

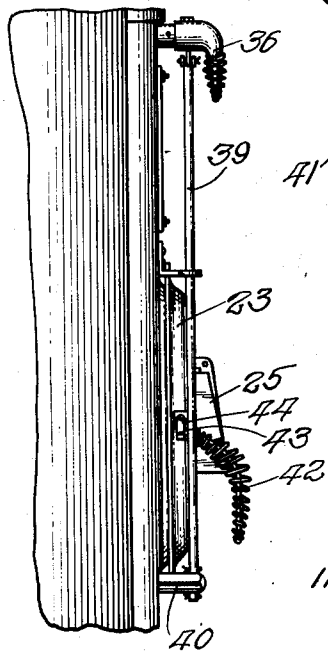
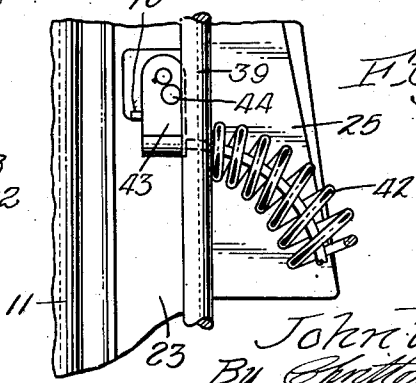


Fig. 5.



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FURNACE WITH DOOR LATCHING MEANS
AND COMBUSTION GAS BY-PASS CON-
TROLLED THEREBYJohn W. Norris, Marshalltown, Iowa, assignor to
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profit corporation of Illinois

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6 Claims. (Cl. 110-173)

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This invention relates to a furnace, and relates particularly to means for positively locking a door against an opening in said furnace.

In furnaces that have been designed to burn all the products of combustion without producing smoke and unconsumed gases, it is necessary that the air supply to the furnace be carefully controlled. This air supply comprises dampers located over passages to supply air to the coking zone of the firebox, the combustion zone for the gases and the burning zone for the coked coal. As furnaces also contain other openings such as ash removal openings and openings for the introduction of fuel, it is necessary that means be provided for positively closing these openings to prevent the introduction of additional air. Various locking arrangements have been proposed for accomplishing this, but most of these are unsatisfactory as they fail to keep the various doors closed in airtight condition especially when the gaskets on the doors have become worn. In the present invention means are provided for positively closing a door and for preventing its accidental opening.

In the smokeless furnaces it has also been found necessary to provide means for by-passing unconsumed gases when the fuel feed door is opened. As these gases normally gather at the top of the firebox and as the fuel door is normally located at this point, there is danger that when the fuel door is opened some of the gases will escape or that there will be miniature explosions caused by the incoming oxygen mixing with this fuel. The latching means of this invention is usable for preventing opening of the fuel door until a by-pass opening has been uncovered permitting the gases to escape from the top of the firebox into another portion of the furnace. In the preferred construction, this by-pass is normally located between the top of the firebox and a passage for the burned gases. In the preferred construction a single operating means is provided for opening the by-pass and unlatching the fuel door.

The invention will be described as related to the embodiment shown in the accompanying drawings. Of the drawings: Fig. 1 is a front elevation of the furnace embodying the invention; Fig. 2 is a section taken substantially along line 2-2 of Fig. 1; Fig. 3 is a section taken substantially along line 3-3 of Fig. 2; Fig. 4 is a fragmentary section taken substantially along line 4-4 of Fig. 1; and Fig. 5 is an enlarged fragmentary side elevation of a portion of the structure of Fig. 4.

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The furnace shown in the accompanying drawings comprises a main furnace portion 10 and a shell 11 therearound. The main portion 10 contains grates 12 near the bottom thereof beneath which is located an ash pit 13 and above which is located the coke burning zone 14. The interior of the furnace is divided into a firebox 15, a combustion zone 16 in which are burned the combustible gases and a passage 17 for the burned gases. This passage leads through a radiator 18 into an exit passage 19 which conveys the products of combustion to a smoke stack or the like. The firebox 15 includes a coking zone near the top thereof and the coke burning zone 14 that is between the grates 12 and the bottom of the combustion zone 16.

In order to permit the removal of ashes from the ash pit 13, there is provided an ash removal opening 20 normally closed by a door 21 provided with a gasket 21a. The ash removal opening 20 and door 21 are located near the bottom of the furnace.

In order to permit the introduction of fuel into the firebox 15, there is provided a fuel opening 22 adjacent the top of the firebox with this opening normally being closed by a door 23 closed with a gasket 23a. The door is hinged to the furnace by means of a hinge structure 24 and contains a damper 25 for admitting coking air into the firebox. The damper 25 normally covers an opening 26 in the door 23 and communicates with a downwardly directed spout 27 which serves to direct the coking air to a point adjacent the top of the fuel within the firebox.

In order to provide air for burning the coke in the bottom of the firebox 15 and for burning the combustible gases in the combustion zone 16, there is provided an air passage 28 leading to the exterior of the furnace and normally closed by a damper 29. Air from the passage 28 is also directed by means of the vertical passage 28a to the portion of the furnace beneath the grates 12. This passage 28a is enclosed by channel 60 which is provided with perforations to permit secondary air to enter the firebox at one side of the coke burning zone 14.

In the top wall of the firebox 15 there is provided a by-pass opening 30 normally closed by a by-pass door 31. This door is hinged at one side by a hinge structure 32 and has the other side attached by means of a rod 33 and linkage 34 to a rotatable bar 35 extending to the exterior of the furnace. The outer end of this bar 35 has attached thereto a generally downwardly directed handle 36. The handle 36 is attached by

means of a linkage 37 to a substantially horizontal metal strip 38 extending to the left of the handle 36, as viewed in Fig. 1. The end of the strip 38 that is opposite the handle 36 is rotatably attached to the top of a substantially vertical rod member 39. This rod member is springy and resistingly yieldable to applied pressure. The rod member extends down alongside the door 23 on the side thereof opposite the hinge 24 and has the bottom thereof rotatably attached to a stud 40 located adjacent the bottom edge of the door 23. The rod member 39 is guided for movement in a substantially vertical plane by a bracket 41 having an elongated slot 41a therein.

Located on the side of the door 23 opposite the hinge 24 is a normally downwardly directed handle 42 (Fig. 4). This handle is attached at its inner end to a normally substantially vertical short bar 43 that is hingedly attached to the side of the door. This bar 43 has a pin 44 mounted thereon at a point between the handle 42 and the hinge, but closer to the hinge. When the door 23, handle 42 and rod member 39 are in the positions shown in Fig. 1, the rod member 39 bears against the pin 44 and applies pressure thereto to hold the door 23 tightly closed.

The ash removal door 21 is provided with a hinge 45 along one edge thereof and is provided on the opposite edge with a handle 46 and latching arrangement similar to the handle 42, short bar 43 and pin 44 described in connection with the door 23. The locking arrangement of the door 21 is also provided with a substantially vertical rod member 47 similar to the rod member 39 previously described. This second rod member 47, which is considerably shorter than the rod member 39, has its lower end held in a stud 48 and is guided for movement in a substantially vertical plane by means of a bracket 49 also having an elongated slot therein.

With the described latching arrangement for the door 21 it is impossible to open the door 21 accidentally. When it is desired to open the door, the handle 46 is turned upwardly and the rod member 47 is moved to the left (Fig. 1) so as to release the handle catch. The door 21 may then be opened. When it is desired to close the door, the handle 46 is raised, the rod member 47 is again moved to the left, the door closed, the rod member moved to its normal position and the handle pressed downwardly to apply pressure against the rod member 47 and thus against the door 21 and hold the door tightly closed.

With the new latching arrangement for the fuel door 23, it is impossible to open this door without opening the by-pass door 31. When it is desired to open the fuel door 23, the handle 42 is raised, the handle 36 is turned to the left (Fig. 1) and the door opened. The movement of the handle 36 to the left moves the rod member 39 to the left and removes it from in front of the pin 44. The door can then be opened by means of the handle 42. When it is desired to close the door 23, the handle 42 is raised, the door closed and the handle 36 moved to the right to the position shown in Fig. 1. This movement of the handle 36 closes the by-pass door 31 and moves the rod member 39 into position over the pin 44. The handle 42 is then forced downwardly so that the pin 44 bears against the rod member 39 and holds the door 23 tightly closed.

Doors 21 and 23 are latched and unlatched in essentially the same manner. A typical operation will be described with respect to door 23 but substantially the same operations are per-

formed with the other door. In unlatching door 23 when the parts are in the position shown in Figures 4 and 5, the handle 42 is swung upwardly and outwardly until the pin 44 passes through an angle that is preferably more than 90° beyond dead center. This moves the pin 44 inwardly toward the front of the furnace and out of contact with the rod 39. During this movement the rod 39 is flexed outwardly as the pin 44 thus passes dead center position with respect to its pivot. Once the pin 44 has been moved out of contact with the rod 39 this rod may then be moved to the left as viewed in Figure 1 thereby permitting the door to be opened in the manner described in the preceding paragraph.

In latching door 23 the handle 42 is maintained in raised position and the rod 39 moved until it is in front of pin 44. The handle 42 is then moved downwardly to where the pin passes through dead center and beyond and assumes the position shown in Figures 4 and 5 whereby the door is held in latched position. The handle is maintained in this position by the bar 43 bearing against a stop member 70 that forms part of the bracket on which the bar 43 is rotatably mounted.

With the latching arrangement of this invention, the doors are held tightly closed so as to prevent the leakage of air into the furnace. As more than one operation is required to open a door, it also reduces the possibility of a door being accidentally opened. The latching arrangement for the fuel door 23 has the additional advantage in that it always requires opening of the by-pass door and thus venting any unburned gases at the top of the firebox before the fuel door is opened.

The latching arrangements for the doors 21 and 23 hold the doors tightly closed irrespective of the degrees wear on the gaskets 21a and 23a as the "springiness" of the rods 39 and 47 automatically compensates for this wear. When the gaskets are new the rods will of course be distorted more than when the gaskets are worn.

Each hinge 24 and 45 comprises an elongated rod member 61 and 62 with each end of rod member 61 held in a mounting block 63 and each end of rod member 62 held in a block 64. These mounting blocks are spaced appreciable distances away from the corresponding door mounting so that each rod member 61 and 62 also exhibits a spring action to hold its door tightly closed. The rod members 39, 47, 61 and 62 are all located away from the hot furnace front so that they will be maintained at a temperature well below that at which the metal will become damaged.

Although the invention has been described in conjunction with a furnace, it is believed obvious that the invention may be used on any fuel burning installation such as a stove, hot water heater, furnace and the like.

Having described my invention as related to the embodiment shown in the accompanying drawings, it is my intention that the invention be not limited by any of the details of description unless otherwise specified, but rather be construed broadly within the spirit and scope as set forth in the accompanying claims.

I claim:

1. In a furnace having a firebox, said firebox having a fuel opening therein normally closed by a door, and said furnace having walls defining a passage adjacent the firebox for the gaseous products of combustion, a by-pass door between said firebox and said passage, a latching mechanism for said fuel door comprising a latch mem-

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ber for said fuel door, a movable member overlying said latch member for engagement therewith, and means operably connected to the movable member and the by-pass door for substantially simultaneously moving said movable member away from and out of engagement with said latch member and for opening said by-pass door, said movable member overlying said latch member when said fuel door is in closed position in order to retain said fuel door in said closed position.

2. In a furnace having a firebox, said firebox having a fuel opening therein and said furnace having walls defining a passage adjacent the firebox for the gaseous products of combustion, a door normally closing said opening, an extending member on one side of said door, said furnace having walls defining a by-pass opening between the firebox and said passage, a by-pass door normally closing said by-pass opening, a rod member located adjacent said fuel door normally overlying said extending member to latch said door, and means operably connected to the rod member and by-pass door for substantially simultaneously opening said by-pass door and displacing said rod member away from said extending member to unlatching position, said rod member overlying said extending member when said fuel door is in closed position in order to retain said fuel door in said closed position.

3. The furnace of claim 2 wherein there is provided a manually operable cam member for applying pressure to said rod member and forcing said first door against said opening.

4. In a furnace having a firebox, said firebox having a fuel opening therein and said furnace having walls defining a passage adjacent the firebox for the gaseous products of combustion, a hinged door normally closing said fuel opening, an extending member on the side of said door opposite the hinged mounting of the door, said furnace having walls defining a second opening extending between the firebox and said passage, a second door normally closing said second opening, a rod member attached at one end to said furnace below said extending member and located adjacent the first door to normally overlie the extending member and latch said first door in closed position, a handle for opening said second door, and linkage means between said handle and the upper end of said rod member for displacing said rod member to unlatching position

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upon opening of said second door, said rod member overlying said extending member when said first door is in closed position in order to retain said first door in said closed position.

5. The furnace of claim 4 wherein cam means are provided on said extending member for applying pressure to said rod member and forcing said first door against said opening.

6. In a furnace having an opening therein, a door normally covering said opening, an elongated resilient first rod member at one side of the door upon which the door is rotatably mounted at points intermediate the ends of said first rod member, an elongated resilient second rod member at the opposite side of said door, and a latch member bearing against said second rod member at a point intermediate the ends of the second rod member and the corresponding side of the door, said first elongated rod being spaced from the furnace and having its ends arranged in mountings each spaced from the nearest point of contact with the door in order to apply spring pressure thereto when the door is in closed position and said second elongated rod being disposed outwardly of the furnace with respect to the door and latch member, said second elongated rod having its ends arranged in mountings each spaced from the nearest point of contact with the latch member in order to apply spring pressure thereto and thus to the door when the door is in closed position.

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