Jan. 8, 1935. W. O. LUM 1,987,447

SAFETY CONTROL DEVICE

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Fig. 1.

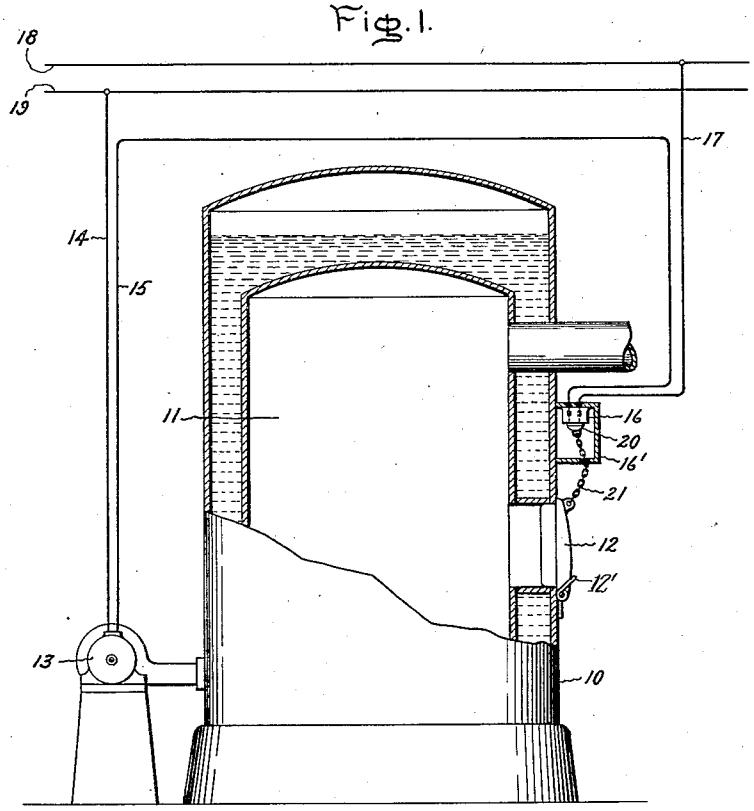


Fig. 2.

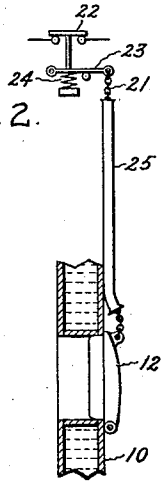
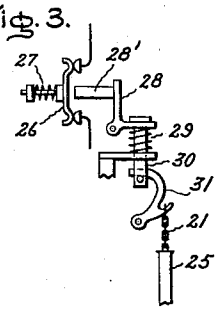


Fig. 3.



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Fig. 4.

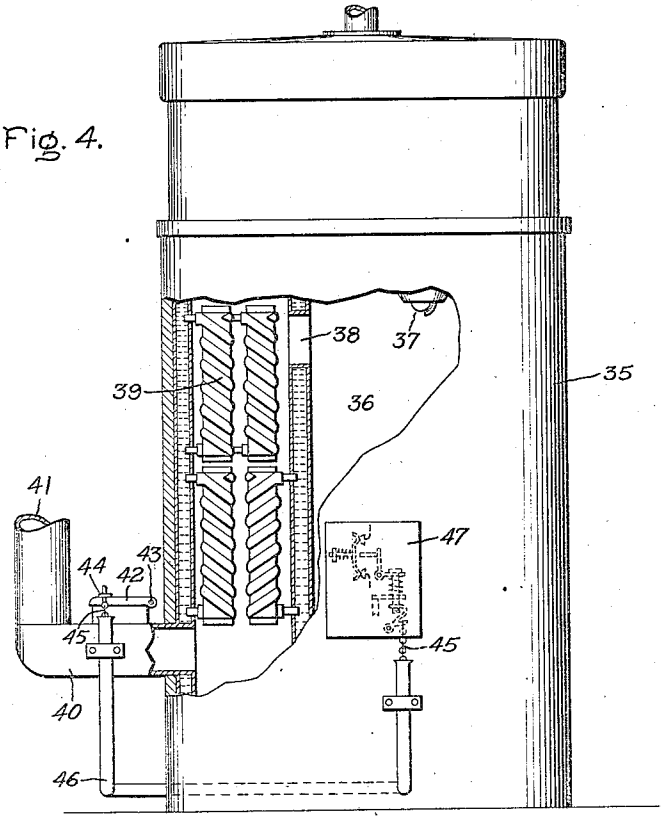
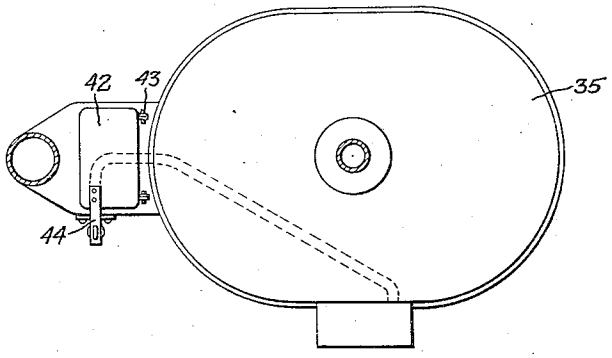


Fig. 5.



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UNITED STATES PATENT OFFICE

1,987,447

SAFETY CONTROL DEVICE

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Application March 1, 1932, Serial No. 596,067

5 Claims. (Cl. 158—42.1)

My invention relates to control devices and provides an improved safety control device for a fuel burner.

One of the hazards of oil burner equipments is the possibility of excessive combustion chamber pressures developing when an unburned charge of oil spray or vapor is ignited in the combustion chamber. Such an abnormal pressure condition is due to some improper functioning of the burner apparatus in which case it is desirable immediately to deenergize the fuel supplying apparatus and the control therefor until proper investigation and correction of the difficulty can be made. By means of the present invention, provision is made for immediately stopping further operation of the oil burner equipment in case any puffback or abnormal pressure of this nature occurs.

In the preferred embodiment of my invention, I provide a special safety circuit controlling switch which is automatically operated to stop operation of the fuel supplying apparatus and the control therefor in case of excessive pressures within the combustion chamber. I provide the combustion chamber of the boiler or the stack breeching with a safety door which is biased to closed position and which, upon excessive pressures, opens to relieve the pressure within the combustion chamber. This is connected to operate the safety switch under abnormal pressure conditions whereby the control and the fuel supplying apparatus is rendered inoperative until the safety switch is returned to the closed position.

Referring to the drawings, Fig. 1 shows a cross section of an oil burner boiler with my invention applied to immediately stop further operation of the oil burner equipment in case any puffback or abnormal pressure occurs in the combustion chamber of the boiler. Figs. 2 and 3 show modifications of the safety circuit controlling apparatus responsive to abnormal combustion chamber pressure conditions. Figs. 4 and 5 show the application of my invention to another type of furnace boiler having the abnormal combustion chamber pressure safety responsive control applied to the stack breeching of the boiler.

In one embodiment of my invention I provide the boiler furnace 10 having a combustion chamber 11 with the pressure safety door 12, which is normally biased to closed position by means of the coil spring 12' to close the combustion chamber, as shown in Fig. 1. It should be understood, however, that the specific form of means shown in Fig. 1 for biasing the door to closed position is not essential to my present invention and that any suitable form of door biasing means may be employed. The particular coil spring biasing means illustrated is a part of the furnace door invention of Aldo Macchi disclosed in Patent No. 1,934,438, filed August 14, 1931 and patented November 7, 1933 and assigned to the assignee of my present invention. A fuel supplying motor 13 drives suitable mechanism indicated diagrammatically in the drawings which furnishes fuel to the combustion chamber which may be a fluid such as oil. The fuel supply motor 13 is connected to the electric power supply lines 18 and 19 by means of a safety circuit including the conductors 14, 15, the safety switch 16 which is normally closed, and the conductor 17. The safety switch, as shown, consists of the socket 16 and plug 20, the plug 20 being connected to the pressure safety door by means of the chain 21. If excessive or abnormal pressures occur within the combustion chamber 11, the door 12 in response thereto swings outwardly to relieve this pressure and at the same time pulls the plug 20 downwardly and opens the circuit to the motor 13. As soon as the abnormal pressure in the combustion chamber is relieved, the door 12 immediately recloses in accordance with its bias thus preventing spread of fire or release of poisonous gases in case of faulty operation of the oil burner mechanism. The cover 16' for the switch is so arranged that it must be removed before the switch can be reset. This is to prevent unauthorized tampering with the switch during normal operation.

In Fig. 2 is shown a modification of the safety switch-operating mechanism. The safety switch 22 is biased to open by means of the spring 24, but is held against its bias by means of the lever 23 and chain 21, which is connected to the door 12, a guide tube 25 being provided for the chain. A weak link in the chain is provided at lever 23 or preferably at the door 12, which breaks when the door 12 responds to excessive pressures within the combustion chamber, permitting the spring 24 to open the switch 22.

In Fig. 3, in which I have shown another modification, the switch 2[illegible] is normally maintained closed by the biasing spring 27. The lever 28 provided with a stud 28' is biased to rotate in a counter-clockwise direction by means of the spring 29, but is held against its bias by the pin 30 and the latch member 31 cooperating therewith. The chain 21 is connected to the pressure safety door with the chain 21 sliding in the guide tube 25. When excessive pressures cause the door 12 to open, the chain 21 rotates latch 31 clockwise

to release the pin 30, and biasing spring 29 in turn is released as is evident from the drawings. The biasing spring 29 then operates lever 28 to open the switch 26.

In Figs. 4 and 5 I have shown my invention applied to a furnace in a different manner than that shown in Fig. 1.

The oil burner furnace 35 is provided with a combustion chamber 36 into which fuel is directed in a downward direction by means of the fuel supply nozzle 37 of the electrically operated oil burner fuel supply mechanism (not shown). The products of combustion leave the combustion chamber through the exit 38 and pass around the secondary heat absorbing units 39. The products of combustion then pass through the stack breeching 40 to the smoke pipe 41 leading to the stack. The safety door 42 is pivotally mounted at 43 on the stack breeching 40 so as to be biased by gravity to the closed position. It opens in a clockwise direction upon excessive pressures within the combustion chamber. An arm 44 carried by the door 42 is attached to the switch operating chain 45 slidably supported in the guide tube 46. The chain is attached to the safety circuit controlling switch mounted in the switch box 47.

The operation of my invention in the application shown in Figs. 4 and 5 is the same as in the other modifications. Upon excessive pressures in the combustion chamber, the pressure builds up in the stack breeching opening the door 42 which relieves the pressure within the combustion chamber and at the same time opens the switch in the switch box 47 to shut down the oil burner apparatus.

The embodiments of the invention illustrated and described herein have been selected for the purpose of clearly setting forth the principles involved. It will be apparent, however, that the invention is susceptible of being modified to meet the different conditions in its use, and I, therefore, aim to cover by the appended claims all modifications within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In combination, an oil burner furnace having a combustion chamber, an electrically driven means for supplying a combustible mixture of air and oil to said combustion chamber, an energizing circuit for said fuel supplying means, a safety pressure responsive door associated with said combustion chamber, circuit controlling means for controlling the circuit for said electrically driven fuel supplying means, and connections between said circuit controlling means and said safety door whereby in response to abnormal pressure conditions said safety door will open to relieve the abnormal pressure condition and operate said circuit controlling means to deenergize said electrically driven fuel supplying means.

2. In combination, an oil burner furnace having a combustion chamber, an electrically driven means for supplying fuel to said combustion chamber, an energizing circuit for said fuel supplying means, a manually closed switch for controlling the circuit to said fuel supplying means, a pressure safety door associated with said combustion chamber, means biasing said door to the closed position and permitting opening thereof in response to abnormal pressures in said combustion chamber, operating means connecting said switch and said door for opening said switch upon the opening of said safety door in response to abnormal pressure in said combustion chamber and for maintaining said switch open after reclosure of said door in accordance with its bias.

3. In combination, a furnace having a combustion chamber, electrically operated means for supplying fuel thereto, an energizing circuit for said fuel supply means, a movable door operable to relieve excessive pressure in the combustion chamber, and a safety switch connected to be operated upon the opening of said door for interrupting the said energizing circuit for said fuel supply means.

4. In combination, a furnace having a combustion chamber, electric motor driven means for supplying fuel to said combustion chamber, an energizing circuit for said electric motor driven means, a movable door operable to relieve excessive pressures in the said combustion chamber, means biasing said door to closed position, a safety switch having manual reset means for closing said energizing circuit and connected to be operated to the open position upon the opening of said door for interrupting said energizing circuit and maintaining said circuit interrupted upon reclosure of said safety door in accordance with its bias until operation of said manual reset means.

5. In combination, a furnace having a combustion chamber, electric motor driven means for supplying fuel to the combustion chamber, an energizing circuit for said electric motor driven means, a movable door operable to relieve excessive pressures in the combustion chamber, means biasing said door to closed position, a manually closed plug switch for controlling said energizing circuit, and means connecting said door and said plug switch whereby upon a predetermined opening of the door said plug switch is opened to deenergize the circuit for said electric motor driven fuel supply means and to maintain said circuit deenergized upon reclosure of said door in accordance with its bias until said plug switch is manually closed.

WALTER O. LUM.