Aug. 10, 1937. L. N. HUNTER ET AL 2,089,262

RELIEF DEVICE FOR COMBUSTION CHAMBERS

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Fig. 1.

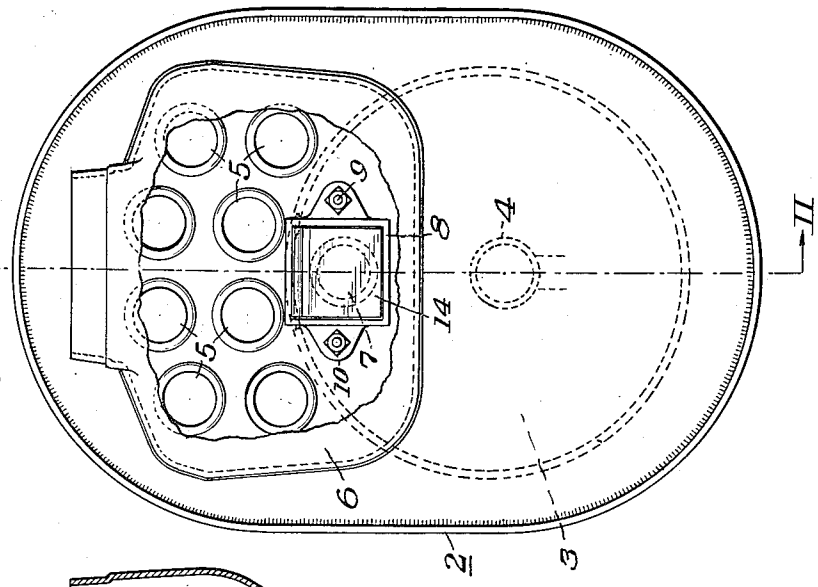


Fig. 2.

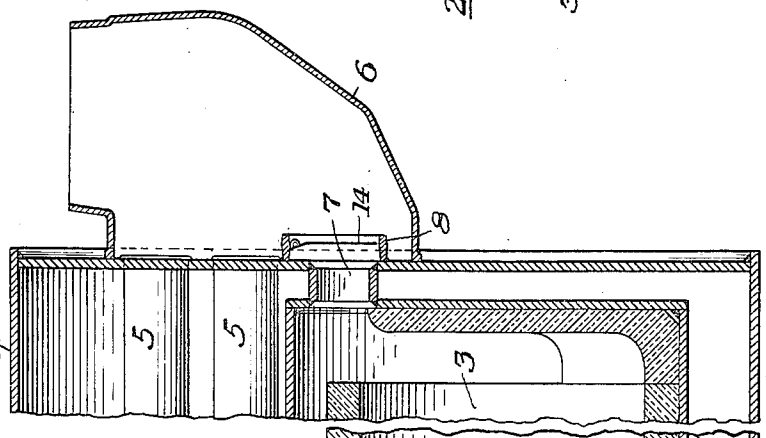
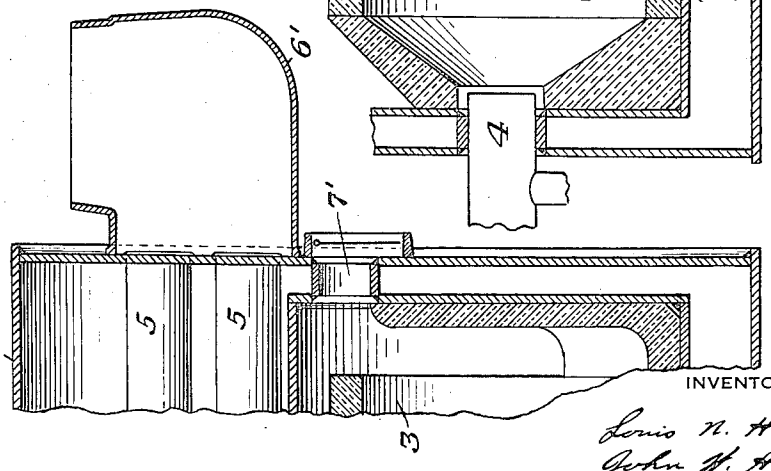


Fig. 3.



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Fig. 4.

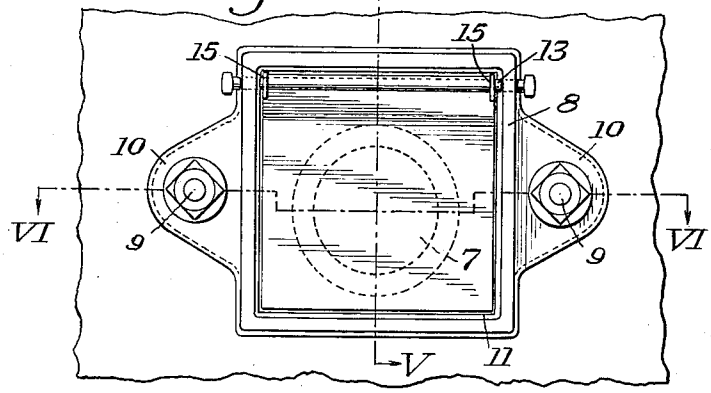


Fig. 5.

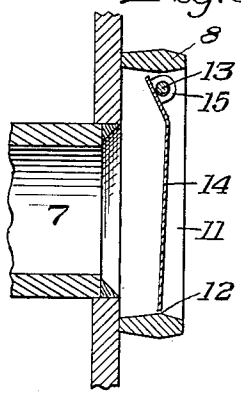


Fig. 6.

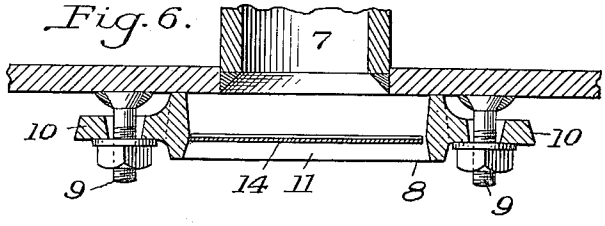


Fig. 7.

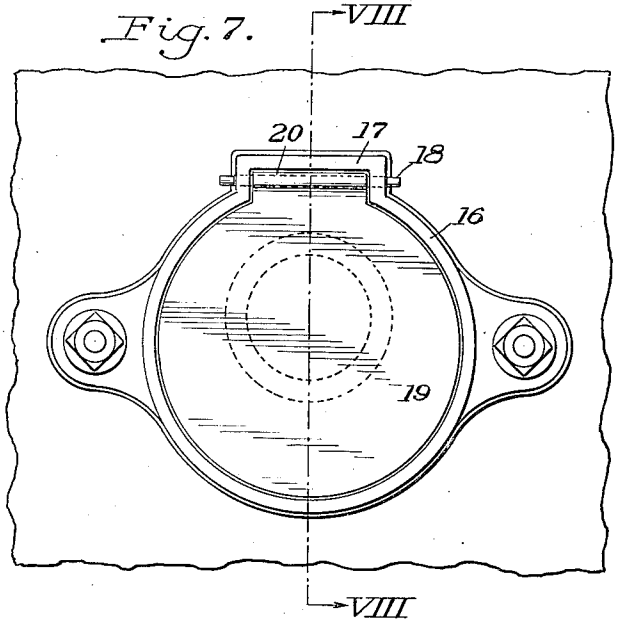
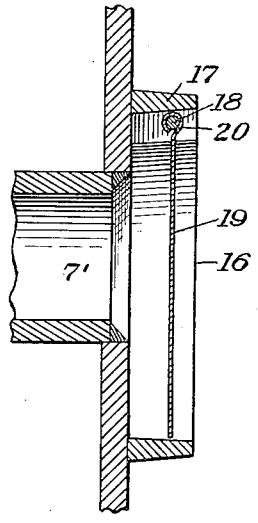


Fig. 8.



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UNITED STATES PATENT OFFICE

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RELIEF DEVICE FOR COMBUSTION CHAMBERS

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Application May 29, 1935, Serial No. 24,059

3 Claims. (Cl. 158—1)

This invention relates to fuel burning equipment, and more particularly to a relief device for closed combustion chambers. The invention is particularly applicable to fuel burning equipment wherein oil is burned, and is applicable also to combustion chambers equipped with other types of fuel burners where conditions similar to those encountered in the burning of oil are found. The invention will be described particularly in connection with boilers provided with oil burning equipment. Boilers designed for use with oil burners usually have the combustion chamber thereof relatively tight to exclude either the entrance of atmospheric air into the combustion chamber, except such air as is purposely admitted through the burner, and to prevent the escape of gases of combustion. Great difficulty has been encountered in such boilers by reason of the noise produced under some conditions of operation. Instead of the fuel burning freely and evenly, a condition is often set up where the flame is of a rapidly pulsating character. This vibratory or pulsating or reverberating character of combustion makes so much noise as to be highly objectionable. Various elaborate arrangements have been provided to try to control such conditions of combustion.

According to the present invention an extremely simple and easily installed device is provided for preventing this rapidly pulsating type of combustion or for instantaneously checking it in the event that there is a tendency for it to start. With the present invention, means is provided whereby the inequalities in air pressure which exist where this pulsating character of combustion takes place, can be automatically relieved, thus preventing the tendency toward pulsation. The invention may be readily understood by reference to the accompanying drawings, in which

Figure 1 represents a rear view of a boiler having the relief device secured thereto inside the flue connection of the boiler;

Figure 2 is a transverse vertical section in the plane of line II—II of Figure 1;

Figure 3 is a view similar to Figure 2 of a slightly modified arrangement where the relief device is below the flue;

Figure 4 is a detailed view showing in elevation the relief attachment applied to the wall of a combustion chamber;

Figure 5 is a transverse vertical section in the plane of line V—V of Figure 4;

Figure 6 is a horizontal section in the plane of line VI—VI of Figure 4;

Figure 7 is a view similar to Figure 4 of another modification; and

Figure 8 is a transverse vertical section in the plane of line VIII—VIII of Figure 7.

Referring to the drawings, 2 designates generally a fuel burning apparatus, such for instance, as a domestic house heater or boiler. It is provided with a combustion chamber 3. The combustion chamber is of the closed type, and I have indicated the boiler as being provided with a fuel burner conventionally indicated at 4. This fuel burner may be an oil burner, or it may be a powdered coal burner, or any other burner wherein conditions of operation similar to those encountered in an oil burner are produced. The particular unit 2 shown in the drawings is provided with fire tubes 5, these fire tubes discharging into a flue connection 6. The particular boiler illustrated is the same as that shown in our copending application Serial No. 19,401, filed May 2, 1935, for Improvement in boilers, which application is at present allowed. In this boiler, the gases of combustion leave the refractory combustion chamber at the rear end thereof, the combustion chamber opening vertically to allow for the escape of the gases of combustion. The gases of combustion then flow forwardly outside the combustion chamber and over the top thereof to a vertical passage at the front of the boiler. The fire tubes 5 communicate with this vertical passage, thereby providing for the circulation of gases first outside the combustion chamber to the front of the boiler, and then rearwardly through the fire tubes 5 to the flue connection 6.

According to the present invention, a relief device or by-pass is provided for maintaining substantially uniform pressure conditions in the boiler during the period when the burner is operating. In the drawings, the combustion chamber is shown as being provided with a port 7 in the rear wall thereof, this port opening to the atmosphere. In the arrangement shown in Figure 2, the communication between the outer atmosphere and the interior of the combustion chamber is provided inside the flue connection 6. In the arrangement shown in Figure 3, wherein similar reference numerals designate corresponding parts, the port designated 7' is located below the flue connection 6'. These two views show merely typical positions for the location of the port, but it will be understood that the port may be located at any other convenient point in the combustion chamber.

Secured to the back wall of the boiler around the port 7 or 7' as the case may be, is a frame

member 8 which is most clearly shown in Figures 4 to 6, inclusive. For securing the frame member in place, bolts 9 are welded to the outer plate of the boiler, and these bolts pass through ears 10 on the frame 8, the bolts being provided with nuts to retain the frame against the outer wall of the boiler. In the construction shown in Figures 4, 5 and 6, the frame has a passageway or opening 11 therethrough, the opening being shown in this particular form as having a slight taper from both faces of the frame toward a point of minimum cross sectional area, forming in effect, a ridge at 12. Passing through the frame at the top thereof is a pintle 13. Hung from this pintle is a gate member 14. The gate member is made of a light weight material, sheet metal preferably being used. A gate which is too heavy will not effectively relieve the condition which it is sought to remedy. In the particular construction shown in Figures 4 to 6, the gate 14 has its upper end slightly offset, and the offset portion is provided with ears 15 through which the pintle passes. The plane of the gate 14 is in substantially the plane of the restricted or ridge portion 12. The arrangement is such that the plate can swing either inwardly or outwardly with reference to the port 7, but will return by gravity to the normal position shown in Figure 5, in which position the gate serves most effectively to close the port.

The arrangement of the plate therefore, is such that in the normal operation of the fuel burning apparatus the gate serves to effectively close the port 7 or 7'. However, when conditions are such that the flame from the oil burner begins to pulsate or reverberate so as to produce an objectionable sound, the gate will yield sufficiently under the relatively slight variations in pressure which occur with this pulsating of the flame, and relieve the conditions which are conducive to the continued pulsating character of the combustion. By reason of this arrangement, all of the pulsating or reverberating noise which so commonly accompanies an oil burner is avoided. It will be understood that the gate 14 to relieve this condition does not need to swing very far in either direction, its function being largely to provide a diaphragm which normally closes the port against the by-pass of products of combustion, but which in effect provides a yieldable diaphragm or automatic vent which moves just enough when the flame tends to pulsate in the manner peculiar to oil and similar fuel burners to break up the frequency at which the pulsations tend to occur and thereby eliminate the noise.

The arrangement shown in Figures 7 and 8 is closely similar to the arrangement previously described, except that the gate is shown as being substantially circular and being positioned in a circular frame.

In this modification, 16 designates a frame member secured to the outside of the boiler around the by-pass port. It is substantially circular but has an offset portion 17 at the top thereof. Passing through the offset portion is a pin 18 from which is pivotally hung a relief gate 19, the relief gate 19 being of such size as to close the opening through the frame 16, the gate having an offset portion 20 at the top thereof which engages the pin 18. The passageway through the frame 16 is shown as being of substantially uniform diameter instead of being sloping inwardly from opposite directions as is the structure shown particularly in Figure 5.

In either of the particular constructions which have been shown, the gate is biased to swing to a normal position where it closes the passageway. This biasing in the two modifications shown is effected by gravity, but it is obvious that where desired the gate may be provided with a spring hinge or other arrangement for biasing it to a normally closed position. As pointed out above, either the weight of the gate, or any other biasing means should not be too great.

The advantage of having the relief gate positioned in the flue connection 6, as shown in Figure 2 instead of below the flue connection or at some other point as indicated in Figure 3, is that the device performs its function just as effectively when it is positioned in the flue connection but avoids the objection that some persons might have to a gate which would open directly into the cellar or other room in which the boiler is located.

While we have illustrated and described certain specific embodiments of the invention, it will be understood that various changes and modifications may be made therein and that the relief by-pass port can be variously positioned according to the type of fuel burning apparatus in connection with which the invention is employed, and the constructional requirements of a particular boiler or other fuel burning appliance.

We claim:

1. A fuel burning apparatus comprising a combustion chamber, an oil burner for the combustion chamber, a furnace structure housing the combustion chamber, a flue connection on the furnace structure, the furnace having a normal passage for conducting gases of combustion from the combustion chamber to the flue connection, the furnace being provided with a by-pass port in addition to the normal passage for the gases leading directly from the combustion chamber to the interior of the flue connection, and a gate in said by-pass arranged to normally close the same but free to vibrate under varying pressure conditions within the combustion chamber to relieve those pulsations of pressure created by the burner which tend to set up reverberatory noises.

2. A fuel burning apparatus comprising a furnace equipped with a fluid fuel burner, the furnace having a combustion chamber, said furnace also having a flue outlet connection and flues between the combustion chamber and flue outlet connection, the furnace having a port in the wall of the combustion chamber in advance of said flues leading from the outside of the combustion chamber directly to the interior thereof, and a closure biased to assume a position where it normally closes said port covering the port and free to vibrate inwardly and outwardly from its normal position when the flame from the burner tends to pulsate and thereby check such pulsations and eliminate reverberatory noises.

3. The combination with a furnace having a combustion chamber and a fluid fuel burner, the furnace also having a port opening directly into the combustion chamber through a wall of the furnace, of a relief gate of light weight hinged over said port and mounted to swing inwardly or outwardly from a normal position with those variations in pressure occurring in the combustion process in the furnace which otherwise tend to produce reverberating sounds and thereby eliminate such sounds.

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