Nov. 17, 1931. D. V. HURTUBISE 1,832,777

BOILER EXPLOSION PREVENTER

Filed April 25, 1930 2 Sheets-Sheet 1

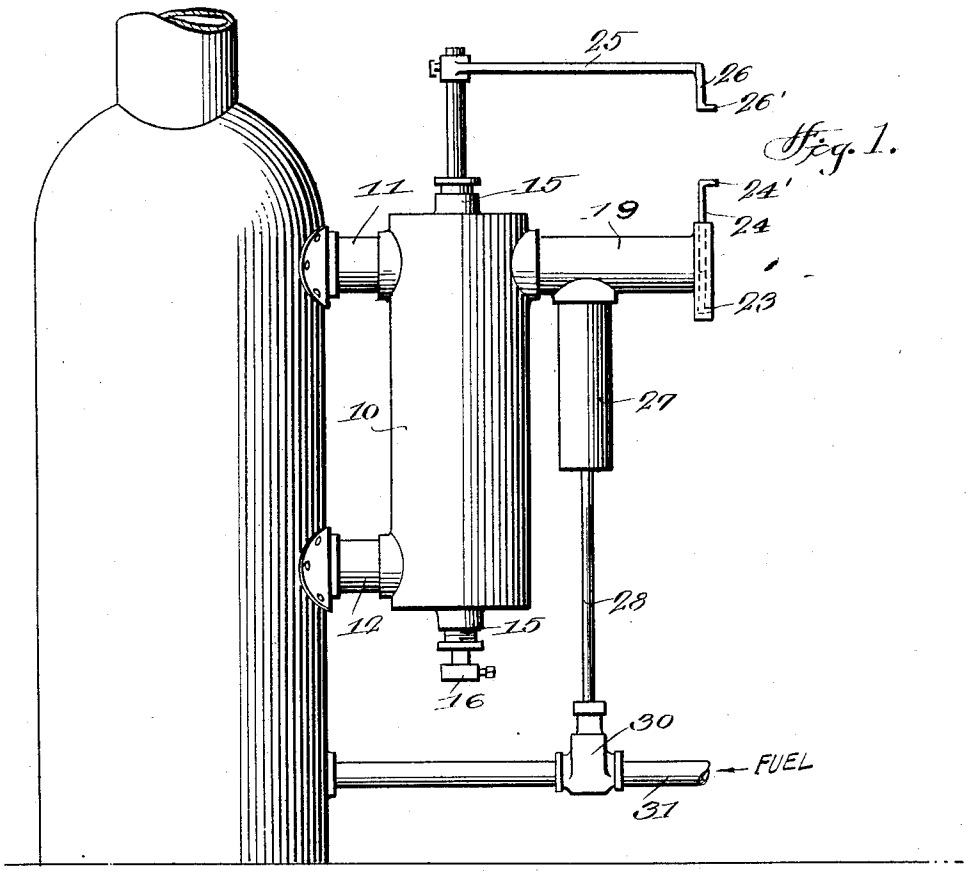

Fig. 1.

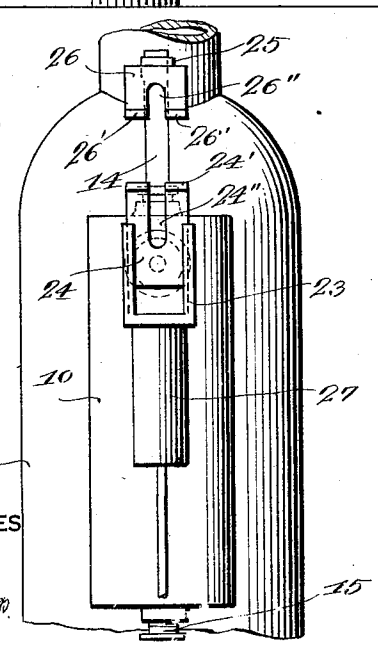

Fig. 3.

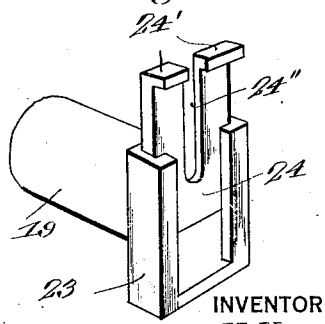

Fig. 5

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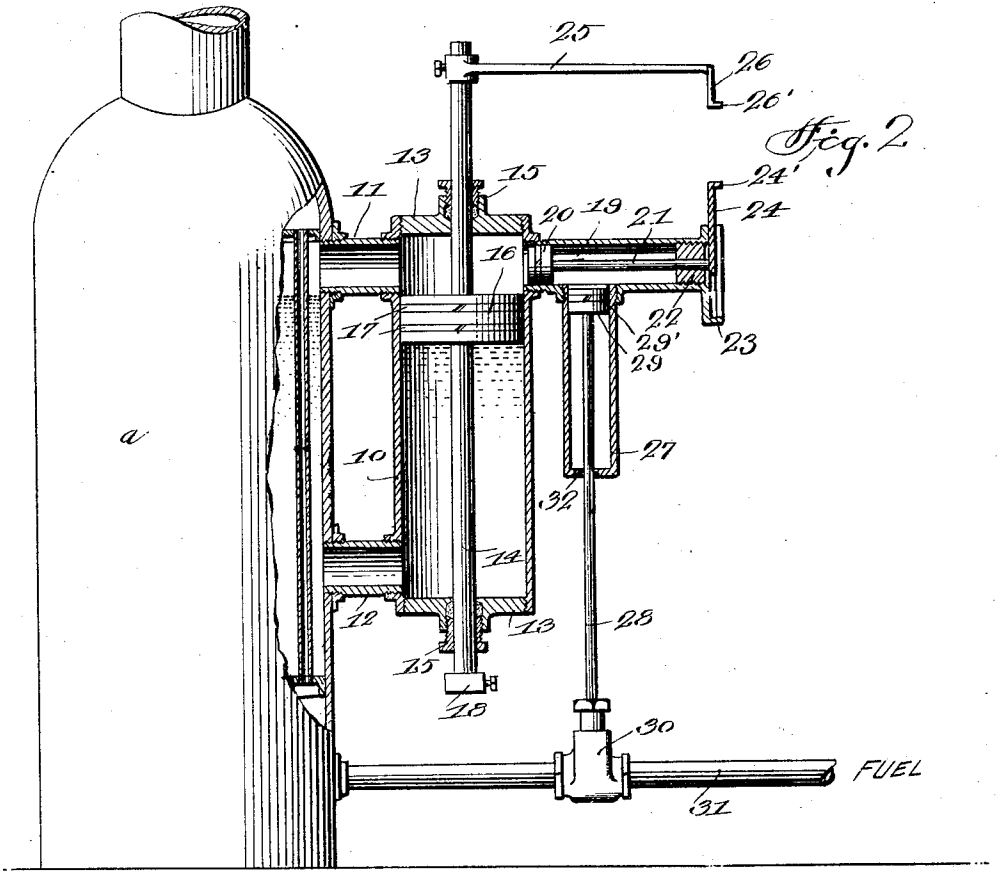
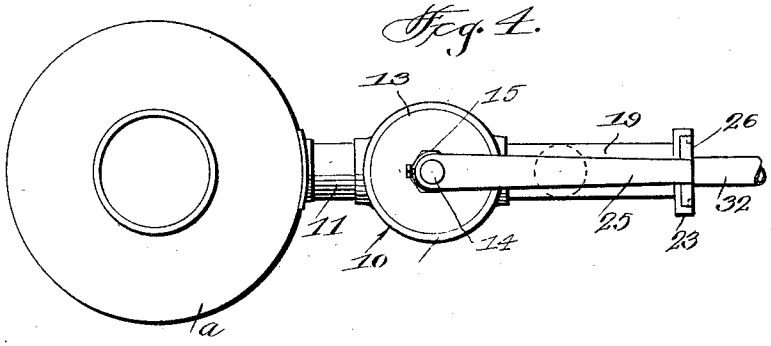


Fig. 4.



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UNITED STATES PATENT OFFICE

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BOILER EXPLOSION PREVENTER

Application filed April 25, 1930. Serial No. 447,308.

This invention appertains to an improvement in means for preventing explosions in boilers ordinarily caused by the lowering of the water therein beyond a safe level.

An object of the invention is to provide a means of the class described and which will automatically operate to cut the heat completely from the boiler just as the water lowers to a predetermined level.

Another object of the invention resides in the provision of a means of the character mentioned which will operate in the manner aforesaid by controlling a liquid or gaseous fuel supply to a boiler employing either or these two classes of fuel.

A further object of the invention is to provide a means as hereinbefore characterized which is extremely simple in design, comparatively inexpensive to manufacture and install, durable and efficient in contruction and operation and capable of automatically operating with but a minimum of attention and care.

With the foregoing and other equally important objects and advantages in view, the invention resides in the certain new and useful combination, construction and arrangement of parts as will be hereinafter more fully described, set forth in the appended claims and illustrated in the accompanying drawings, in which:

Figure 1 is a front elevation of a conventional form of boiler and of a practical embodiment of the invention as it appears when installed thereon;

Figure 2 is a view similar to that of Figure 1, but showing the improved apparatus and adjacent portion of the boiler in vertical section;

Figure 3 is a fragmentary side elevation;

Figure 4 is a top plan view; and

Figure 5 is a slightly enlarged perspective view of the means for controlling the operative movements of the steam operated control valve.

Referring to the drawings, wherein like characters of reference designate corresponding parts in the several views thereof, the embodiment of the invention, as shown therein by way of example only, is constituted in a vertical elongated tubular body or cylinder 10, which is connected by pipes 11 and 12 leading laterally from the upper and lower end portions thereof to the adjacent side of a boiler *a*; the upper pipe 11 opening into the boiler at a point immediately above the normal water level therein and the lower pipe 12 at a point above the minimum safe water line or level.

The upper and lower ends of the body or cylinder 10 are closed by head plates 13 which are centrally apertured to have the opposite ends of a vertical piston rod 14 projected therethrough; packing glands 15 being provided at the outer side of each plate to form steam and water tight joints about the piston rod. Secured on the piston rod 14 within the body or cylinder 10, is a piston 16 which is supported on the body of water supply to the latter through the lower pipe 12 from the boiler *a*. Seated in grooves in the periphery of the piston 16 are packing rings 17. An adjustable collar 18 is mounted on the lower end of the piston rod 14 to limit its upward movement.

Projecting from the outer side of the upper end of the body or cylinder 10, substantially in line with the pipe connection 11, is a tubular body or cylinder 19 on which a valve body 20 having the form of a piston is movably mounted. The body or piston 20 is connected to the inner end of a guide stem or rod 21 and normally acts to close communication between the main cylinder 10 and the valve cylinder 19. The outer end of the stem 21 is slidably engaged in a centrally disposed bore formed in a removable plug 22 closing the outer end of the body or cylinder 19. The valve body 20 is circumferentially grooved to seat a packing ring therein.

The outer end of the body or cylinder 19 terminates in a vertical guide member 23 which supports a vertically movable lock plate 24 in abutting relation with the outer end of the closure plug 22 and, in its normal partially raised position, the lock plate 24 also abuts the outer end of the guide stem or rod 21 to hold the body or piston 20 positioned within the extreme inner end of the body or cylinder 19.

Adjustably mounted on the upper end of the piston rod 14, above the main cylinder 10, is an arm 25 which has its outer free end angularly bent to provide a depending portion 26. This portion 26 is disposed in line with the lock plate 24 and in spaced relation above the same. The top edge of the lock plate 24 and the lower edge of the depending portion 26 are provided with outwardly angled portions 24′ and 26′ respectively, in order to provide increased bearing areas to the opposed surfaces thereof.

The lock plate 24 is longitudinally slotted for a major portion of its upper length and outwardly of its top edge, as at 24″, while the depending portion 26, of the arm 25 cooperative therewith is similarly slotted in the downward direction, as at 26″, so that both of the parts 24 and 26 will ride past the guide stem or rod 21 when the same is projected outwardly of the bore in the closure plug 22, as and for the purpose to be hereinafter more fully explained.

Depending from the lower side of the valve cylinder 19 and opening into the same at a point adjacent the body or piston 20 is another tubular body or cylinder 27 which is closed at its lower end but apertured to allow a piston rod 28 to depend therethrough from a piston 29 housed within the same. This piston 29 is circumferentially grooved to seat a packing ring 29′ therein. The lower end of the piston rod 28 is connected to a control valve 30 coupled in on a liquid or gaseous fuel supply line 31 leading into the fire box at the base of the boiler *a*.

In the operation of the apparatus as thus constructed, arranged and installed on a boiler *a*, water in the boiler will pass therefrom through the lower pipe connection 12, and fill the main cylinder 10 beneath the piston 16, while steam from the upper part of the boiler, above the water level therein, will enter the cylinder 10 through the upper pipe connection 11 and above the piston 16. The arm 25 will be adjusted on the upper end of the piston rod 14 to space the depending portion 26 at a distance above the lock plate 24 correspondingly for a predetermined lowering of the water level in the boiler *a* and the cylinder 10 and of the downward travel of the piston 16 which lowers with the fall of the water level in the latter.

As soon as the water has lowered in the boiler *a* and the cylinder 10 and the piston 16 has moved downwardly of the latter a distance corresponding to the initial spacing or setting of the depending portion 26 above the lock plate 24, the depending portion will abut the top edge of the lock plate, so that further lowering of the water level and piston in the main cylinder 10 will result in the lock plate 24 being forced downwardly of the guide 23 and until the slot 24″ therein registers with the outer end of the guide stem or rod 21.

Here, steam pressure within the upper part of the main cylinder 10 above the piston 16 now forces the body or piston 20 from its position at the inner end of the cylinder 19 and toward the outer end of the latter. As soon as the body or piston 20 passes the upper open end of the cylinder 27, depending from the valve cylinder 19, the steam acts on the upper side of the piston 29 and forces the same in a downward direction thereby causing the fuel control valve 31 to close. With the boiler replenished with water to its normal operating level therein, the parts of the apparatus will thereafter be set for a repeat operation. A vent 32 is provided in the lower closed end of the cylinder 27 in order to relieve any compression of air below the piston 29.

Without further description, it is thought that the features and advantages of the invention will be readily apparent to those skilled in the art, and it will of course be understood that changes in the form, proportion and minor details of construction may be resorted to, without departing from the spirit of the invention or its scope as claimed.

I claim:

1. The combination with a pressure water heater of a cylinder at one side of said heater and having upper and lower connections therewith a piston within said cylinder and movable therein correspondingly with variations of level of water in said heater and the cylinder, a second cylinder disposed in angular relation to said first named cylinder and in communication therewith at one end and above the said piston, a piston in said second cylinder and normally closing communication between the same and said first named cylinder, means for holding said last named piston in its normal position, a third cylinder disposed in angular relation to said second cylinder and in communication therewith outwardly from the normal position of the said piston therein, a piston in said third cylinder, connections between said last named piston and the heating medium of said heater, and means operable with said first named piston to release said holding means upon a predetermined lowering of the piston in its cylinder, whereby the piston in said second cylinder will be forced outwardly thereof by pressure from the upper side of said first named cylinder and to a point therein where the pressure will act against the piston in said third cylinder and cause the same to cutoff the heating medium from said heater.

2. The device as set forth in claim 1, characterized by the several cylinders being disposed in substantially right angular relation one with respect to the other, with the second cylinder arranged in horizontal position and having its attached end opening inwardly of the adjacent side of the first named cylinder, and the third cylinder having its

upper end opening into said second cylinder and depending therefrom.

3. The combination with a steam boiler, of a cylinder at one side of said boiler and having upper and lower connections therewith, a piston movable vertically within said cylinder and correspondingly with variations of level of water in the boiler and the cylinder, a second cylinder disposed in right angular relation to said first named cylinder and in communication therewith at one end and above said piston, a piston in said second cylinder and normally closing communication between the same and said first named cylinder, means for holding said last named piston in its normal position, a third cylinder depending from said second cylinder and in communication therewith outwardly of the normal position of the said piston therein, a piston in said third cylinder, connections between said last named piston and the heating medium of said boiler, means operable with said first named piston to release said holding means upon a predetermined lowering of the piston in its cylinder, whereby the piston in said second cylinder will be forced outwardly thereof by pressure from the upper end of said first named cylinder and to a point where the pressure will act against the piston in said third cylinder and cause the same to cutoff the heating medium from said boiler, and means for adjusting said last named means.

4. The device as set forth in claim 3, characterized by the piston in the second cylinder being provided with a rod extending outwardly through the cylinder and normally abutted against the holding means, the latter being in the form of a plate mounted for movement vertically of the outer end of the cylinder and provided with an opening to be moved into line with said rod for the movement of the same outwardly thereof when the piston in the second cylinder is subjected to pressure from the upper side of said first named cylinder and the piston in the latter causes the means cooperative therewith to actuate the holding means or plate.

5. The combination with a steam boiler having a liquid or gaseous fuel supply, of a cylinder at one side of said boiler and having upper and lower connections therewith, a piston movable vertically within said cylinder and correspondingly with variations of level of water in the boiler and the cylinder, a second cylinder disposed in right angular relation to said first named cylinder and in communication therewith at one end and above said piston, a piston in said second cylinder and normally closing communication between the same and said first named cylinder, means for holding said last named piston in its normal position, a third cylinder depending from said second cylinder and in communication therewith outwardly of the normal position of the said piston therein, a piston in said third cylinder, connections between said last named piston and a control valve for the said fuel supply of said boiler, a rod carried by the piston in said second cylinder and extending outwardly through the cylinder for cooperation with said holding means, a guide for said rod arranged within the outer end of the second cylinder, and an adjustable member carried by said first named piston and movable therewith to release said holding means upon a predetermined lowering of the piston in its cylinder, whereby the piston in said second cylinder will be forced outwardly thereof by pressure from the upper end of said first named cylinder and to a point where the pressure will act against the piston in said third cylinder and cause the same to actuate the said control valve to cutoff the fuel from said boiler.

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