Aug. 12, 1958 A. G. BLANCHARD 2,846,985

AUTOMATIC CONTROL MECHANISM FOR PRESSURE VESSELS

Filed March 7, 1945 2 Sheets-Sheet 1

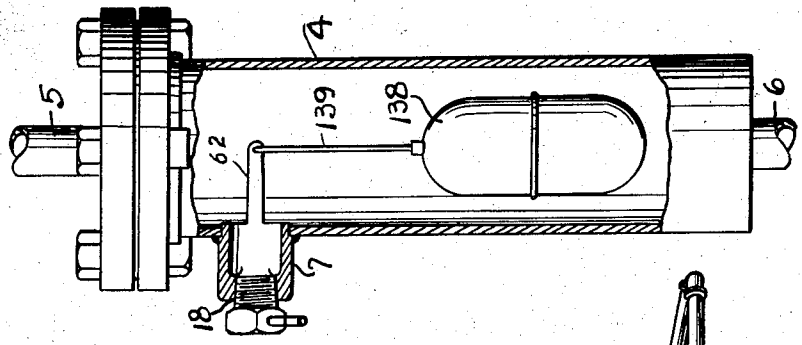


Fig. 2.

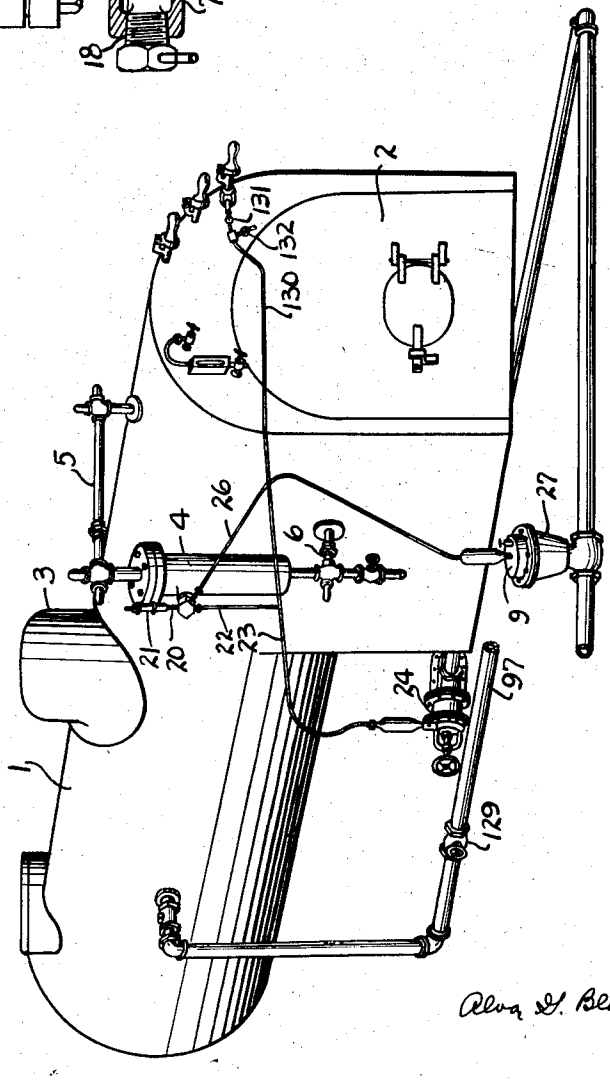


Fig. 1.

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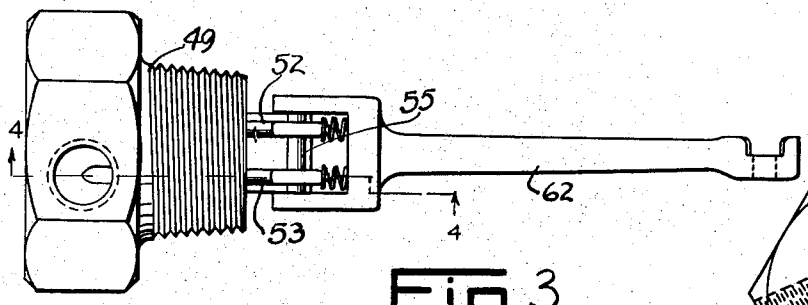


Fig. 3

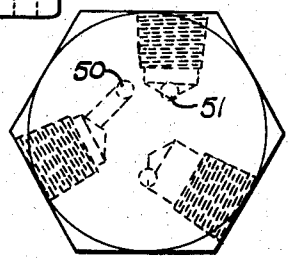


Fig. 5

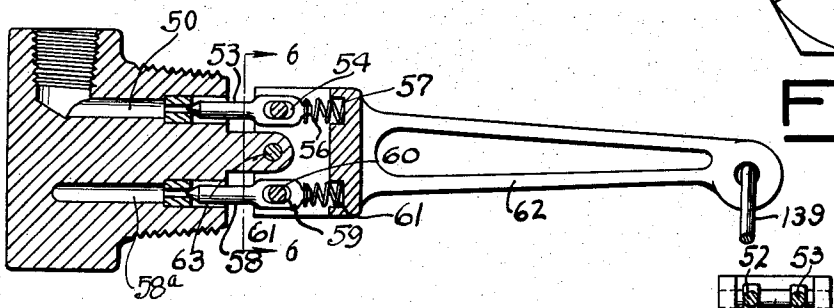


Fig. 4

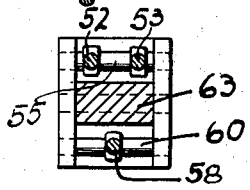


Fig. 6

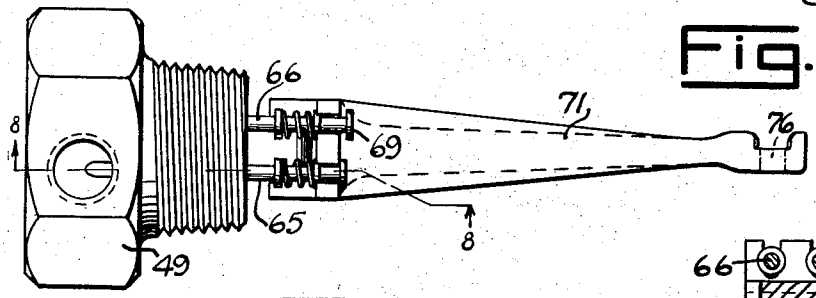


Fig. 7

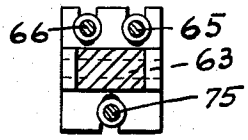


Fig. 9

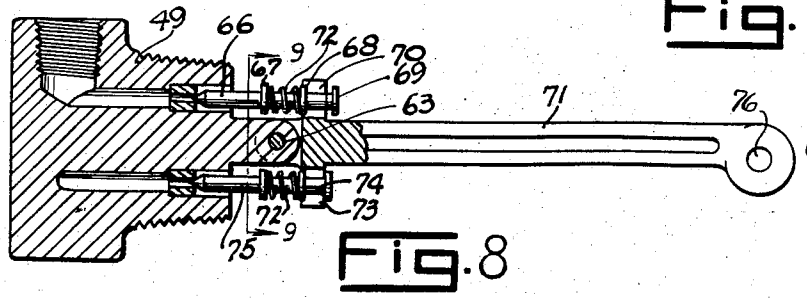


Fig. 8

Inventor
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AUTOMATIC CONTROL MECHANISM FOR PRESSURE VESSELS

Alva G. Blanchard, Shreveport, La.

Application March 7, 1945, Serial No. 581,373

5 Claims. (Cl. 122—504.2)

My invention relates to steam boilers and pertains particularly to mechanism employed in connection therewith to control the water in use.

This application is a division of application Serial No. 379,822 (Automatic Control Mechanism for Pressure Vessels) filed February 20, 1941 on which Patent No. 2,395,212 was issued February 19, 1946, which was a continuation in part of my application Serial No. 44,988 (Safety Apparatus for Boilers) filed October 14, 1935 on which division was required, and on which Patent No. 2,233,395 issued dated March 4, 1941. Under the division requirements on my application Serial No. 44,988 filed October 14, 1935 I made the following applications Serial No. 210,585 (Valve Operating Structure) Patent No. 2,199,611 dated May 7, 1940 and Serial No. 322,625 (Pivot Structure) Patent No. 2,362,429 dated November 7, 1944.

In the operation of steam boilers it is desirable to have connected therewith automatic mechanism for controlling the supply of water to the boiler or the fuel, or both, and also to provide for the blowoff of fluid from the boiler when said fluid becomes contaminated.

It is an object of my invention to provide an automatically operating valve or series of valves through which steam from the boiler may be directed to a plurality of steam operated devices for effecting the control of the water and fuel, or to operate other devices employed in connection with said boiler.

I have as a further object to provide an efficient type of compound valve which may effectively operate to deliver steam from a plurality of ports leading from the steam boiler.

The invention also includes an effective means of operating the individual valves in the boiler from a common float, said float being mounted to control the valves in a most effective manner.

The invention resides in the combination of the parts and their construction making up my improvement and attention is called to the drawings herewith wherein the several parts are disclosed.

In Fig. 1 I have shown a perspective view of a boiler to which the invention may be applied.

Fig. 2 is a side view partly in section illustrating the connection of the float with the valve operating lever.

Figures 3, 4, 5 and 6 show one type of multiple valve structure and Figures 7, 8 and 9 represent another type of multiple valve structure.

Figure 3 is a top plan view of the first type of structure.

Figure 4 is a cross sectional view of the same structure along the line **4—4**, Figure 3.

Figure 5 is an end view of the same structure showing the location of the 3 needle valves in relation to their outlets.

Figure 6 is a cross sectional view of the same structure along the line **6—6**, Figure 4.

Figure 7 is a top plan view of the second type of structure.

Figure 8 is a cross sectional view of the same structure, along the line **8—8**, Figure 7.

Figure 9 is a cross sectional view of the same structure, along the line **9—9**, Figure 8.

My invention is adapted for application to any ordinary type of steam boiler. In Fig. 1 I have shown a boiler **1** having the usual fire box **2** and steam chest **3** thereon. Connected with this boiler I provide a float chamber **4**. This chamber may be located within the boiler, if desired, but in the preferred embodiment, however, the float chamber is arranged outside the boiler and connected with the upper end of the boiler through a pipe **5**. A lower pipe **6** connects with the boiler below the water line so that the chamber **4** will be filled with water to the same level as is the boiler.

With reference to Fig. 2, there is at one side of the valve chamber **4** a nipple **7** preferably welded within an opening in said chamber to hold said nipple securely in position and to provide a reliable seal against the leakage of steam therethrough. At the outer end of the nipple **7** is a threaded seat to receive a valve plug **18**, which is screwed tightly therein.

The plug **18** has therethrough a plurality of passages for the outlet of steam from the boiler, each of said passages being connected with a fluid conducting pipe. With reference to Figs. 3, 4, 5, 6, 7, 8 and 9 it will be seen that said plug **18** may have a plurality of separate outlets therethrough for the steam. One of said outlets Figure 1 may be connected with an upwardly directed pipe **20** leading to a whistle **21**. Another of said outlets **22** may be connected with a pipe **23** leading to the blow-off valve **24**. The third outlet may be connected with a pipe **26** leading to the fuel cutoff valve **27**. Passages are formed longitudinally of the plug leading to these outlets and each of the pipes **22** and **26** is provided with a restricted bleed port (not shown) to exhaust the fluid in said pipes when the supply thereto is shut off and to prevent a small leak in the needle valves from operating valves **24** or **27**.

It will be understood that in the operation of the boiler the supply of water to the boiler may be insufficient to maintain the proper level of the water in the boiler. As the level of the water in the boiler drops to a height which is sufficient the float **138** will pull the lever arm **62** downwardly. The valve **52** controlling the passage **51** will open first due to the lack of play of the pin **55** within the end of the valve stem. This movement of the valve **52** will open the passage of steam to the whistle and sound an alarm. If no further supply of water is pumped into the boiler the decrease in the level of the water in the boiler will cause the lever arm **62** to engage the inner end of the slot **54** in the valve **53** and pull said valve **53** from its seat, opening up the passage of steam to the fuel cutoff **27** and stop the supply of fuel to the fire box, thus preventing accident to the boiler through failure of a sufficient supply of water therethrough.

If the supply of water to the boiler is in excess of that necessary to maintain the proper level of the water therein, the float **138** will move upward, raising the float arm **62**, by the rod **139**, thereby bringing the pin **60** into contact with the back of the slot **59** in valve **58**, and thereby opening same. This allows steam pressure to pass through **58***a* and pipes **22** and **23** which opens the blow off valve **24**.

When sufficient water has been blown from the boiler to lower the water level to the seating point of valve **58**, it will close and the pressure holding the blow off valve **24** closed will be released through a small bleed opening (not shown) in the line **22**, thus permitting valve **24** to close. At the end of each valve stem is a short arm about which is engaged a spring **56**, one end of which is fitted

within a recess **57** in the lever arm **62** which tends to hold the valves closed until there is pressure within the valve chamber at which time the pressure holds the valves closed. The spring **61** serves the same purpose on the lower valve **58**.

In Figures 7, 8 and 9 the valve structure is modified. In this form the plug **49** has the same passages for fluid therein as in the previous embodiment and the valves are arranged in the same relative positions. The two upper valves **65** and **66** have their inner ends extended somewhat further and have formed thereon radially extending flanges **67**, **68** and **69**, the flange **69** forming a head at the inner end of the valve stem. The flange **68** is movable on the valve and bears against the side walls of an upwardly forked arm **70** on the float arm **71**. Thus the pressure of the spring **72** between the flange **67** and the flange or washer **68** tends to move the valve **66** inwardly and to be compressed by the upward movement of said lever arm.

On the lower side of the arm **71** is another forked arm **73** which receives the end of a valve stem **74** and serves to operate the valve **75** in the same manner as are the upper valves **65** and **66**. The lever arm **71** is pivoted upon a pin **63** in the same manner as in the previous embodiment and the operation of the valves by a float attached to the outer end **76** of said arm is the same as in the embodiment disclosed in Figs. 3, 4, 5 and 6.

It will be understood that the downward movement of the arm **71** will compress the spring **72** on the valve **75** and move the valve to closed position while the upper valves will be open. Due to the longer distance between the flange **69** upon the valve which controls the fuel line, this valve will be opened slightly later than the opening of the valve leading to the whistle. Thus the valves will operate in the same sequence as in the other embodiments.

It may become desirable to operate the blowoff valve **24** at intervals so that the impurities in the water in the boiler may be flushed out. This may be accomplished by opening a valve **129** shown in Fig. 1 in the water line **97**. If this valve **129** is opened slightly water will feed therethrough to the boiler at a somewhat more rapid rate with the result that the liquid level will rise sufficiently to cause the float valve to open the steam passage leading through the pipe **23** to the blowoff valve and thereby blow the boiler down at frequent intervals, depending on the volume of excess water put into the boiler through valve **129**.

Also, it will be noted that steam may be fed directly to the blowoff valve through a pipe **130**, which is connected to a hand-operated valve **131** leading to the boiler. By opening the valve **131** fluid may pass directly through the pipe **130** to operate the blowoff valve in an obvious manner. When the valve **131** is closed a tap **132** adjacent thereto may be opened to bleed fluid from the line **130**.

It will be seen that I have provided a plurality of control devices for regulating the passage of steam from the boiler to any of a number of operated devices exterior to the boiler. Each of these devices functions in an economical manner through the operation of a float connected with the steam boiler. This construction is a simple and economical one and easily attached to any boiler in ordinary use.

The invention claimed is:

1. In a safety apparatus for boilers, the combination of a fuel supply conduit, a valve in said conduit, means for yieldingly holding said valve open, a compartment, a pressure responsive means to respond to pressure in said compartment arranged to close the valve, a housing, a plurality of outlet passages through said housing, a needle valve in each of said passages, single means responsive to conditions within said boiler to open said

valves in sequence, a conduit connecting the last of said sequentially opening valves to open with said compartment to supply fluid under pressure from said housing to said compartment to force said fluid against the pressure responsive means, and a conduit connecting another of said sequentially opening valves to an audible alarm actuating mechanism.

2. In a safety apparatus for boilers, the combination of a fuel supply conduit, a valve in said conduit, means for yieldingly holding said valve open, a compartment, a pressure responsive means to respond to pressure in said compartment arranged to close the valve, a housing, a plurality of outlet pasasges through said housing, a needle valve in each of said passages, a float operated lever fulcrumed within said housing, sequentially functioning connections between said valves and said lever operated by downward movement of said lever, a conduit connecting the last of said sequentially opening valves to open with said compartment to supply fluid under pressure from said housing to said compartment to force said fluid against the pressure responsive means, a conduit connecting another of said sequentially opening valves to an audible alarm actuating mechanism, and means to relieve the fluid pressure in said compartment.

3. A housing, a plurality of outlet passages through said housing, a valve in each of said passages, one of said valves communicating with an alarm for low water and another of said valves communicating with a fuel shut-off device, a lever fulcrumed within said housing, a float on the end of said lever, an operative connection between said lever and said low water alarm valve when said float is in one position and an operative connection between said lever and said fuel shut-off valve when said float is in a lower position.

4. An audible alarm actuating mechanism, a fuel shut off valve and a control unit including a plurality of needle valves sequentially operated by a single means responsive to water level within a boiler, one of said valves having an operable connection with said mechanism to operate said mechanism at a predetermined level of water within said boiler, and another of said valves having an operable connection with said fuel shut off valve to operate said fuel shut off valve after said level of water has fallen below said predetermined level.

5. In a safety apparatus for boilers, the combination of an audible alarm actuating mechanism, a fuel shut off valve and a control unit including a plurality of needle valves sequentially operated by a single means responsive to a variable condition within a boiler, one of said valves having an operable connection with said mechanism to operate said mechanism at a predetermined value of said condition within said boiler, and another of said valves having an operable connection with said fuel shut off valve to operate said fuel shut off valve at another value of said variable condition.

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