J. M. DOUGHERTY AND H. C. TABLER.

SAFETY DEVICE FOR RELIEF VALVES.

APPLICATION FILED JUNE 6, 1919.

1,342,667. Patented June 8, 1920.

Fig. 1

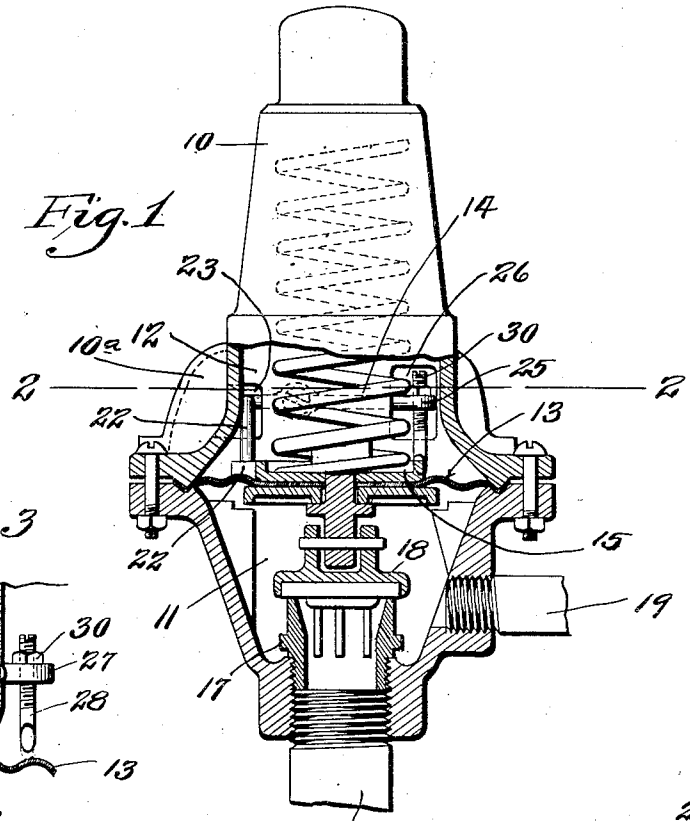


Fig. 3

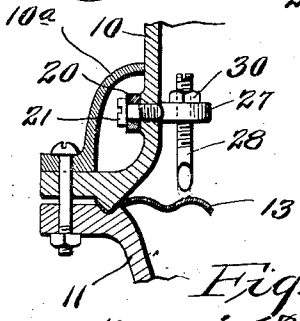


Fig. 2

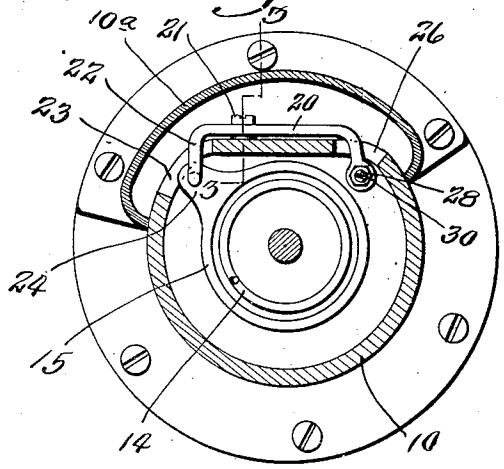
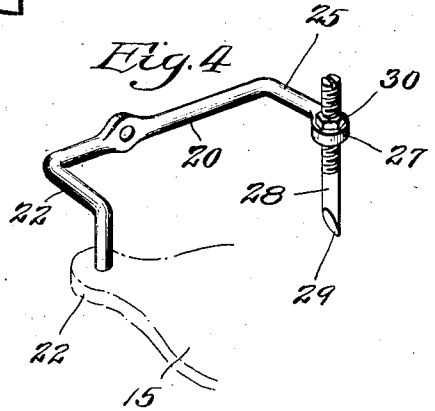


Fig. 4



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SAFETY DEVICE FOR RELIEF-VALVES.

1,342,667. Specification of Letters Patent. Patented June 8, 1920.

Application filed June 6, 1919. Serial No. 302,208.

To all whom it may concern:

Be it known that we, JOHN M. DOUGHERTY and HARRY C. TABLER, citizens of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Safety Devices for Relief-Valves, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

Our invention relates generally to relief valves of the type disclosed in our Patent No. 1,210,913, dated January 2, 1917, and more particularly to a safety device for such relief valves, the principal object of our invention being to provide a relatively simple and positively acting safety device which will be effective in puncturing the diaphragm of the relief valve in the event that the latter from any cause fails to function properly and open to relieve abnormal pressures in the system with which the device is associated.

The relief valve to which our improved safety device is applied is generally utilized in connection with hot water heating systems, and said valve is intended to automatically open to permit the discharge of water and air in the system in the event that the pressure in said system rises beyond a predetermined point. This valve includes a diaphragm adapted to be actuated by pressure developed in the system and said diaphragm carrying a pressure discharge control valve which under normal conditions is closed.

If, for any cause, this last mentioned valve is not unseated and opened when the pressure developed in the system passes a predetermined high degree and becomes abnormal, there is danger of bursting of some part of the system and such action is liable to result in considerable damage.

We propose to wholly eliminate this dangerous liability by providing a relatively simple and positively acting safety device in the form of a diaphragm puncturing member which will act automatically in the event that the diaphragm is moved beyond its normal limits of travel by abnormal pressures developed in the system.

With the foregoing and other objects in view, our invention consists in certain novel features of construction and arrangement of parts, hereinafter more fully described and claimed, and illustrated in the accompanying drawings, in which—

Figure 1 is an elevational view partly in section of a hot water heating system relief valve and showing our improved safety device applied thereto.

Fig. 2 is a horizontal section taken approximately on the line 2—2 of Fig. 1.

Fig. 3 is a vertical section taken approximately on the line 3—3 of Fig. 2.

Fig. 4 is a perspective view of our improved safety device.

Referring by numerals to the accompanying drawings, 10 designates a valve housing, the space within which is divided into a pressure chamber 11 and a spring chamber 12, these chambers being separated by a movable diaphragm 13, preferably of metal, such as copper, in which is formed a series of annular corrugations. The upward movement of this diaphragm is yieldingly opposed by a spring 14, the tension of which may be regulated in any suitable manner and positioned on top of the central portion of said diaphragm is a plate 15 which constitutes a seat or bearing for the lower end of said spring.

Leading from the lower portion of housing 10 is a discharge pipe 16 and disposed immediately above the open end of this pipe is a collar 17, the upper end of which constitutes a seat for a valve 18, the latter being connected in any suitable manner to the diaphragm 13. Leading through the wall of the housing 10 into chamber 11 is a tubular connection 19 and which latter leads from the main return pipe of the heating system.

Water entering pressure chamber 11 through pipe 19 will trap air in said chamber beneath the diaphragm 13 and as said air is compressed, it will exert upward pressure against diaphragm 13 and which upward pressure is yieldingly resisted by spring 14. In the event that this pressure rises beyond a predetermined degree, diaphragm 13 will be moved upward until valve 18 is unseated, thereby permitting the pressure to escape through tubular connection 16.

If for any cause the diaphragm 13 should fail to act in the intended manner to raise the valve 18 from its seat, there is liability of bursting of some part of the system due to rise of internal pressure to an abnormal degree, but this danger is entirely elimi-

nated by our improved diaphragm puncturing member which is located in the spring chamber 12 and is automatically actuated by the upward movement of said diaphragm.

The device comprises a short horizontally disposed arm or lever 20, the same being pivotally mounted on a pin or screw 21, the latter being seated in the wall of housing 12, a short distance above diaphragm 13. The fulcrum or pivot for this lever is located to one side of the center thereof so that said lever has a relatively short arm and a longer arm. Projecting from the end of the short arm of this lever is an inverted L-shaped member 22, the same extending through an opening 23 formed in the wall of the housing 12 and the lower end of said member 22 bears directly on top of the ear or lug 24 which projects from the edge of spring plate 15. Projecting forwardly from the end of the long arm of lever 20 is a horizontally disposed arm 25, the same extending through an opening 26 formed in the wall of housing 12, and the end of said arm terminating in a lug or disk 27 that is provided with a vertically disposed threaded aperture.

Screw-seated in this aperture is the threaded upper portion of a pin 28, the lower end of which is pointed as designated by 29 and seated on the threaded portion of said pin above the lug 27 is a lock nut 30.

Secured to the housing 10 in any suitable manner is a secondary housing 10^a which incloses the member 20 and parts carried thereby and covers the openings 23 and 26. Pin 28 is adjusted in the end of arm 25 so that its point 29 terminates in a plane slightly above the plane occupied by the diaphragm 13 when the latter is at its highest limit of normal movement, that is, the plane into which it moves when subjected to highest normal pressure within the chamber 11 and to which plane said diaphragm travels when valve 18 is unseated to relieve the relatively high pressure.

In the event that the valve is not unseated when the diaphragm is moved to its upward limit of normal travel and pressure should continue to increase in the system, and chamber 11, then the continued and abnormal upward movement of the diaphragm will cause spring plate 15 which is formed by the top of said diaphragm to exert upward pressure on the depending leg of the L-shaped member 22, thereby rocking lever 20 on its fulcrum and as a result, the longer arm of the lever 20 carrying pin 28 will be forced downward until the point 29 of pin 28 punctures said diaphragm 13, thus providing an escape for the abnormal pressure developed within chamber 11. As soon as this puncturing action takes place, the abnormal pressure within the system will be relieved, thereby eliminating all danger of bursting of any parts of the heating system due to said abnormal high pressure.

A safety device of our improved construction is very simple, is positive in action, very effective in performing its intended functions, and can be advantageously employed with all pressure relief valves employing a movable diaphragm or the like.

It will be readily understood that minor changes in the size, form and construction of the various parts of our improved safety device can be made and substituted for those hereon shown and described, without departing from the spirit of our invention, the scope of which is set forth in the appended claims.

What we claim is:

1. The combination with a pressure relief valve having a movable diaphragm, of a movably mounted member adapted to be actuated by abnormal movement of said diaphragm for puncturing the latter.

2. The combination with a pressure relief valve having a movable diaphragm, of a pivotally mounted member adapted to be actuated by abnormal movement of said diaphragm, and a diaphragm puncturing member carried by said pivotally mounted member.

3. The combination with a pressure relief valve having a movable diaphragm, of a puncturing member, and means adapted to be actuated by abnormal movement of said diaphragm for imparting movement to said puncturing member.

4. The combination with a pressure relief valve having a movable diaphragm, of a fulcrumed member, a puncturing pin carried by one end of said member, and means for transmitting movement of the diaphragm to said fulcrumed member.

5. The combination with a pressure relief valve having a pressure chamber, and a diaphragm forming one of the walls of said pressure chamber, of movable means adapted to be actuated by the movement of the diaphragm resulting from abnormal pressure within the pressure chamber for puncturing said diaphragm.

6. The combination with a pressure relief valve having a pressure chamber and a diaphragm forming one of the walls of said pressure chamber, of a fulcrumed lever, one end of which bears upon said diaphragm, and a diaphragm puncturing member carried by the other end of said lever.

In testimony whereof we hereunto affix our signatures this 30th day of April, 1919.

JOHN M. DOUGHERTY.
HARRY C. TABLER.