July 25, 1933. R. H. GEORGE 1,919,696

DRAIN VALVE

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Fig. 1.

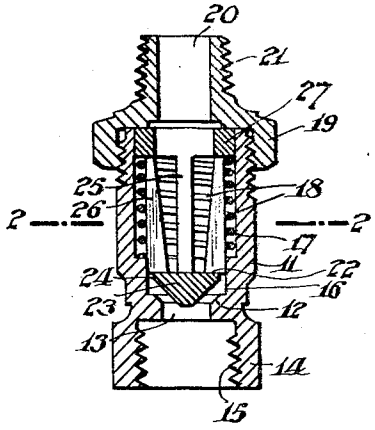


Fig. 2.

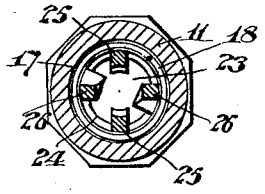


Fig. 3.

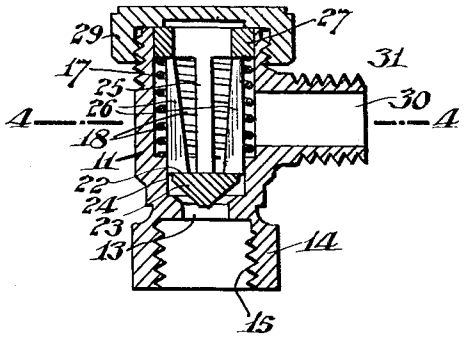


Fig. 4.

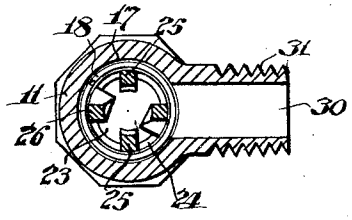


Fig. 5.

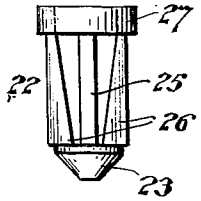
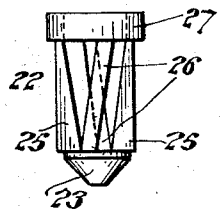


Fig. 6.



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DRAIN VALVE

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Fig. 7.

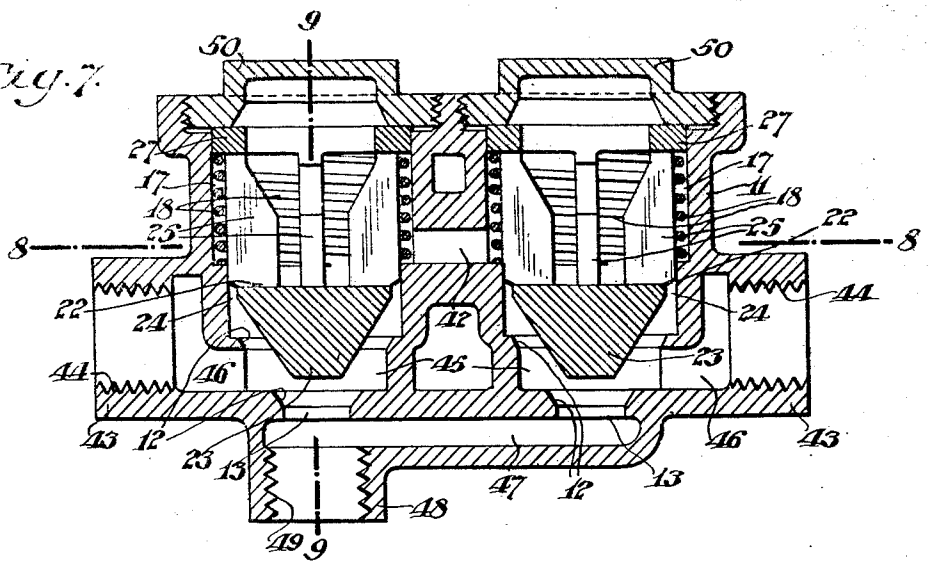


Fig. 8

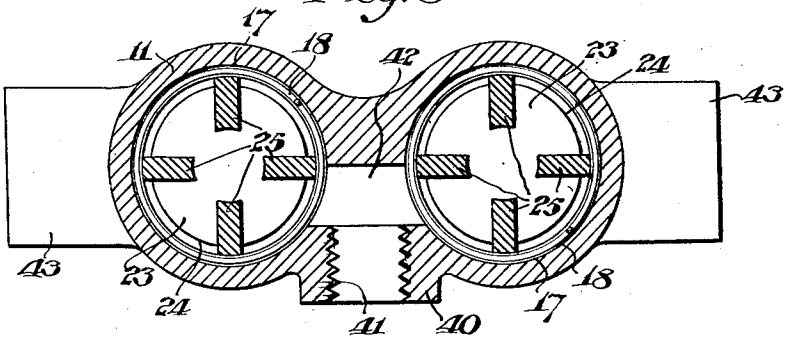


Fig. 9.

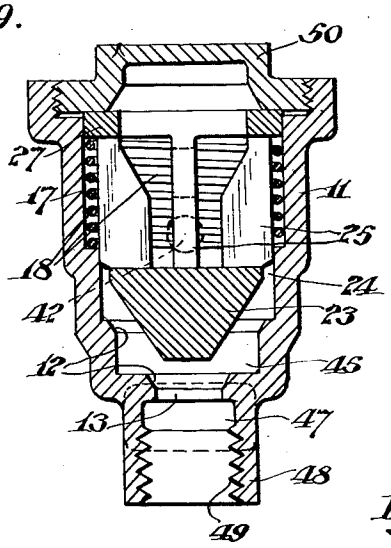
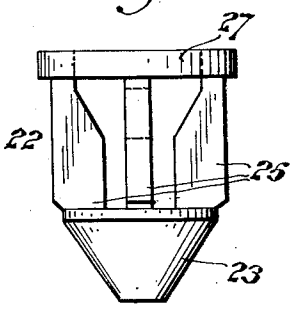


Fig. 10.



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UNITED STATES PATENT OFFICE

ROBERT H. GEORGE, OF PHILADELPHIA, PENNSYLVANIA

DRAIN VALVE

Application filed August 21, 1929. Serial No. 387,306.

My invention relates to drain valves for steam apparatus and the like, and it relates more particularly to that type of drain valve which automatically permits the water of condensation to flow from the steam apparatus, the valve member being spring supported, and in use being normally held on its seat by the live steam pressure against the tension of the supporting spring. Devices of this general character are well known and in common use for draining the water of condensation from the cylinders of steam engines and pumps, pipe lines, and other steam chambers and passageways.

My invention further relates to a drain valve which may also serve as a relief valve in the event of any abnormal pressure existing in the working chamber of the steam apparatus which the valve is adapted to drain.

The principal object of my present invention is to provide an improved form of valve of the above mentioned type, which will be simple and efficient in its action, which is so constructed and arranged as to permit the use of a compression spring therein for supporting the valve member, and in which the valve member will be properly guided to its seat to the end that the same will function properly at all times.

A further object of my invention is to provide, as a specific embodiment, a drain valve for steam engines and the like which will not only serve to drain the steam chest and cylinder of the engine, but also act as a relief valve in the event of any abnormal pressure existing in the cylinder by reason of the accumulation of water therein, or otherwise.

With the foregoing objects in view, my invention contemplates certain improved details of construction, as will be hereinafter more fully set forth.

The nature and characteristic features of my invention will be more readily understood from the following description, taken in connection with the accompanying drawings forming part hereof, in which:

Figure 1 is a vertical, central, sectional view of a drain valve embodying the main features of my present invention, the valve being shown in the raised or elevated position assumed when the steam supply is shut off;

Fig. 2 is a transverse section thereof, taken on the line 2—2 of Fig. 1;

Fig. 3 is a view similar to Fig. 1, but showing an embodiment of my invention in which the steam connection is made in the side of the body instead of in the cap, as shown in Fig. 1;

Fig. 4 is a transverse section thereof, taken on the line 4—4 of Fig. 3;

Fig. 5 is an elevational view of the valve member removed from the casing;

Fig. 6 is a view similar to Fig. 5, but looking from another side;

Fig. 7 is a vertical, central, sectional view of a drain and relief valve embodying the main features of my present invention;

Fig. 8 is a horizontal section thereof, taken on the line 8—8 of Fig. 7;

Fig. 9 is a horizontal section thereof, taken on the line 9—9 of Fig. 7; and

Fig. 10 is an end elevation of the valve member shown in Figs. 7 to 9, inclusive, the same being removed from the casing.

It will, of course, be understood that the drawings and description herein contained are illustrative merely, and that various modifications and changes may be made in the structure without departing from the spirit of my invention.

Referring now more particularly to Figs. 1 and 2 of the drawings, in the particular embodiment of my invention therein shown, 11 is a casing having an internal valve seat 12. An outlet opening 13 is provided below the valve seat to permit the drainage to pass therethrough when the valve member is in the elevated position shown in the drawings.

An extension 14 in the bottom of the casing is threaded as at 15, whereby an outlet pipe may be connected to the structure for carrying away the drainage water.

The lower portion of the interior of the casing, as at 16, is of a certain diameter, while above said portion 16 of the interior, the casing is counterbored, as at 17, of a larger diameter than the portion 16, to pro-

vide a space within which the valve supporting spring 18 is located.

The top of the casing is closed by a cap member 19, having a connection nipple 20 threaded as at 21, for the connection of the pipe which extends from the steam apparatus to the drain.

The valve member 22 is slidably mounted in the interior of the casing, the underface of the body portion 23 of the valve being shaped complementally to the seat 12, which as hereinbefore stated is provided at the lower portion of the interior of the casing.

The valve body 23 is of a diameter slightly less than the lower interior portion 16 of the casing, thereby to provide a space 24 around the outside of the valve body to permit the drainage to pass from the interior of the casing through the port 13, to the pipe which is connected to the lower extension 14 of the casing.

A plurality of integral arms extends upwardly from the valve body 23, certain of these arms 25 being parallel to the axis of the valve member, and others of these arms 26 being inclined to said axis.

By arranging the arms 25 and 26 as above, the valve member will be rendered more rigid, and at the same time the inclined arms 26 will serve to give the valve member a slight rotative movement from time to time, thus insuring more even wear of the faces of the valve and the valve seat.

The exterior surfaces of the arms 25 and 26 lie in a common cylinder of such diameter that the lower portions thereof will form a sliding fit in the lower interior portion of the casing, and the upper portions thereof will serve to guide the supporting spring and retain the same in the counterbore 17 in the upper portion of the casing.

The upper portion of the valve member comprises an integral ring shaped portion or annulus 27 of such external diameter as to form a sliding fit in the counterbore 17 in the interior of the casing.

The supporting spring 18 bears at one end against the shoulder provided at the lower end of the counterbore 17 of the casing. The upper end of said spring bears against the under side of the annulus 27 of the valve member.

When the steam pressure is shut off in the device to which the drain valve is connected, the valve member will be held in the elevated position shown in Fig. 1 of the drawings, by means of the spring 19.

When the valve member is in the elevated position, any water of condensation which collects in the steam apparatus will be drained through the connection nipple 20, thence through the interior of the valve member, thence through the space 24 around the outside of the valve body, and thence through the port 13 to the pipe which is connected to the extension 14 at the lower end of the casing.

In Figs. 3 and 4 of the drawings, the construction and arrangement are substantially similar to those shown in Figs. 1 and 2, with the exception that a different form of cap member 29 is used, the same being closed at the top, and in lieu of the pipe connection nipple shown in Fig. 1, the casing is provided with a connection nipple 30, extending from the side thereof and threaded as at 31 for the purpose of attaching thereto the pipe which extends from the steam apparatus in connection with which the device is used.

In the arrangement shown in Figs. 3 and 4, the drainage water will pass through the connection nipple 30, thence through the convolutions of the spring 18, through the interior of the valve member, then around the exterior thereof, through the space 24, through the port 13, and thence to the pipe connected to the lower extension 14 of the casing.

In Figs. 7 to 10 of the drawings, there is shown a duplex type of valve, particularly adaptable for use in connection with a steam engine and the like, for draining the ends of the cylinder as well as the steam chest and also for relieving the ends of the cylinder against abnormal pressure, resulting from an accumulation of water therein, or otherwise.

In this form of the valve, the casing 11 is so shaped as to provide two internal chambers, in each of which a valve member 22 is mounted.

A connection nipple 40 is provided on the side of the casing and threaded, as at 41, for the attachment thereto of the pipe which extends from the steam chest of the engine. A port 42 extends from the interior of the connection nipple 40 to the counterbored portions 17 of the valve chambers in which the respective valve members 22 are mounted.

In each end of the casing there is provided a connection nipple 43, threaded as at 44 for the connection of the pipes which extend from the respective ends of the cylinders. Each valve seat is provided with an annular recess 45 which is in communication with a port 46 which extends from the inner end of its connection nipple 43.

In this arrangement, each port 13, below the valve seat, communicates with a chamber 47, suitably formed in the casing, and providing a passageway between the respective ports 13 in the two valve structures.

On the under side of the casing there is provided an outlet nipple 48, threaded as at 49 for the connection thereto of a drain pipe. The interior of the outlet nipple 48 communicates with the chamber 47.

Each of the valve chambers is closed at

the top by means of a bonnet 50, which is threaded in the top of the casing 11 above the respective valve chambers.

Except as above noted, the construction and arrangement of the respective valve structures shown in Figs. 7 to 10 are substantially similar to those shown in Figs. 1 to 4 of the drawings, and hereinbefore described.

As above stated, the device shown in Figs. 7 to 10 of the drawings is primarily intended for draining the cylinders of steam engines and the like, and also serves as a relief valve in the event of abnormal pressure in the ends of the cylinders.

The connection nipple 40 being connected by means of a suitable pipe to the steam chest of the engine, it will be understood that when the engine is running, live steam will be supplied to the valve chambers above the body portions of the respective valves, and the valves will therefore be maintained closed and held on their seats.

When, however, the steam supply to the engine is shut off, as the pressure falls in the steam chest the valve members will be elevated, and thereafter any condensation water which accumulates in the steam chest or in the respective ends of the cylinder, will be permitted to pass through the various passageways provided in the structure.

However, it will be understood that when the valve members are in their seated positions, in the event of any abnormal pressure occurring in either end of the cylinder, the valve member will be forced from its seat, and such pressure relieved.

It will also be noted that when the steam supply to the engine is shut off, and the valve members are in their elevated position, if the engine continues to run, the passageway afforded by the chamber 47 will permit the contents of the respective ends of the engine cylinder to pass back and forth, thus obviating the sucking of air from the exterior.

It will be seen that, by the present invention, there is provided a relatively simple and inexpensive, yet efficient form of drain valve, in which a compression spring is employed, and in which proper axial movement of the valve member to and from its seat will at all times be insured.

I claim:

1. An automatic drain valve comprising a casing having an internal valve chamber, a valve seat at the bottom of said chamber, the upper portion of the chamber being counterbored, a valve member mounted in said chamber, said valve member having a body portion provided with a face complemental to the valve seat, the diameter of the valve body being slightly less than the diameter of the lower portion of the valve chamber, the valve member having a plurality of arms extending upwardly from the body portion, the outer faces of said arms being of a diameter corresponding to the lower portion of the valve chamber, the valve member having a portion carried by the upper ends of said arms, the external surface of said portion lying in a cylinder of a diameter corresponding to the diameter of the counterbored portion of the valve chamber, a spring adapted to support the valve member in its elevated position, said spring being seated in the counterbored portion of the valve chamber, the casing structure having an inlet communicating with the valve chamber above the body portion of the valve member, and having an outlet communicating with the valve chamber through the valve seat.

2. An automatic drain valve comprising a casing having an internal valve chamber, a valve seat at the bottom of said chamber, the upper portion of the chamber being counterbored, a valve member mounted in said chamber, said valve member having a body portion provided with a face complemental to the valve seat, the diameter of the valve body being slightly less than the diameter of the lower portion of the valve chamber, the valve member having a plurality of arms extending upwardly from the body portion, the outer faces of said arms being of a diameter corresponding to the lower portion of the valve chamber, the valve member having an annulus connecting the upper ends of said arms, the external surface of said annulus being of a diameter corresponding to the diameter of the counterbored portion of the valve chamber, a spring adapted to support the valve member in its elevated position, said spring being seated in the counterbored portion of the valve chamber, the casing structure having an inlet communicating with the valve chamber above the body portion of the valve member, and having an outlet communicating with the valve chamber through the valve seat.

3. An automatic drain valve comprising a casing having an internal valve chamber, a valve seat at the bottom of said chamber, the upper portion of the chamber being counterbored, a valve member mounted in said chamber, said valve member having a body portion provided with a face complemental to the valve seat, the diameter of the valve body being slightly less than the diameter of the lower portion of the valve chamber, the valve member having a plurality of arms extending upwardly from the body portion, the outer faces of said arms being of a diameter corresponding to the lower portion of the valve chamber, the valve member having an annulus connecting the upper ends of said arms, the external surface of said annulus being of a diameter

corresponding to the diameter of the counterboard portion of the valve chamber, the casing structure having an inlet communicating with the valve chamber above the body portion of the valve member, and having an outlet communicating with the valve chamber through the valve seat, and a spring surrounding the arms of the valve member and adapted to support said valve member in its elevated position.

4. An automatic drain valve comprising a casing having an internal valve chamber, a valve seat at the bottom of said chamber, the upper portion of the chamber being counterbored, a valve member mounted in said chamber, said valve member having a body portion provided with a face complemental to the valve seat, the diameter of the valve body being slightly less than the diameter of the lower portion of the valve chamber, the valve member having a plurality of arms extending upwardly from the body portion, the outer faces of said arms being of a diameter corresponding to the lower portion of the valve chamber, the valve member having an annulus connecting the upper ends of said arms, the external surface of said annulus being of a diameter corresponding to the diameter of the counterbored portion of the valve chamber, a spring adapted to support the valve member in its elevated position, said spring being seated in the counterbored portion of the valve chamber and having its upper portion bearing against the under side of the annulus of the valve member, the casing structure having an inlet communicating with the valve chamber above the body portion of the valve member, and having an outlet communicating with the valve chamber through the valve seat.

5. An automatic drain valve comprising a casing having a plurality of internal valve chambers, a valve seat at the bottom of each of said chambers, the upper portions of said chambers being counterbored, a valve member mounted in each of said chambers, said valve members each having a body portion provided with a face complemental to the valve seat, the diameter of each valve body being slightly less than the diameter of the lower portion of its chamber, each valve member having a plurality of arms extending upwardly from its body portion, the outer faces of said arms of each valve being of a diameter corresponding to the lower portion of the respective valve chambers, each valve member having an annulus connecting the upper ends of the arms, the external surface of the annulus of each valve member being of a diameter corresponding to the diameter of the counterbored portion of the respective valve chambers, a spring for each valve member adapted to support said valve member in its elevated position, said springs being seated in the counterbored portions of the valve chambers, the casing structure having an inlet communicating with each valve chamber above the body portions of the valve members, and having an outlet communicating with the valve chamber through the valve seat, each of the valve seats having an annular recess, and the casing structure having a separate inlet terminating in each valve seat.

6. An automatic drain valve comprising a casing having a plurality of internal valve chambers, a valve seat at the bottom of each of said chambers, the upper portions of said chambers being counterbored, a valve member mounted in each of said chambers, said valve members each having a body portion provided with a face complemental to the valve seat, the diameter of each valve body being slightly less than the diameter of the lower portion of its chamber, each valve member having a plurality of arms extending upwardly from its body portion, the outer faces of said arms of each valve being of a diameter corresponding to the lower portion of the respective valve chambers, each valve member having an annulus connecting the upper ends of the arms, the external surface of the annulus of each valve member being of a diameter corresponding to the diameter of the counterbored portion of the respective valve chambers, a spring for each valve member adapted to support said valve member in its elevated position, said springs being seated in the counterbored portions of the valve chambers, the casing structure having an inlet communicating with each valve chamber above the body portions of the valve members, and having an outlet communicating with the valve chamber through the valve seat, each of the valve seats having an annular recess, and the casing structure having a separate inlet communicating with each valve seat recess.

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