A. P. HANSEN.

DRAINAGE AND RELIEF VALVE.

APPLICATION FILED NOV. 20, 1919.

1,359,988.

Patented Nov. 23, 1920.

2 SHEETS—SHEET 1.

Fig. 1

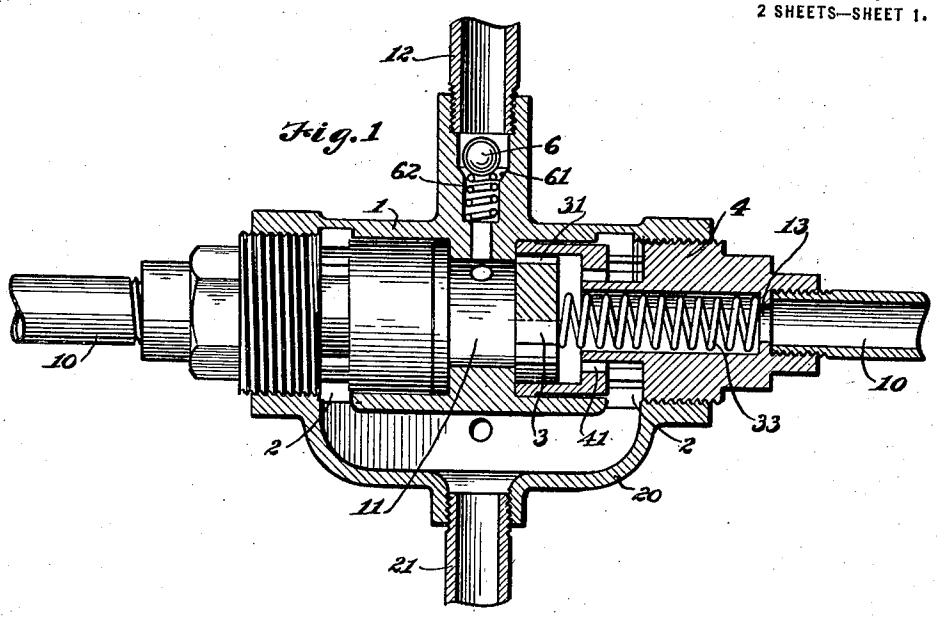
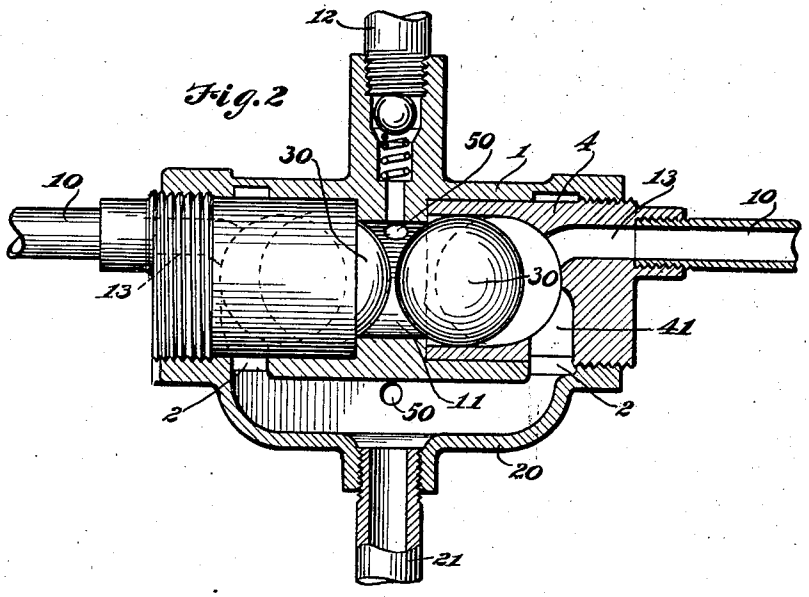


Fig. 2



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2 SHEETS—SHEET 2.

Fig. 3

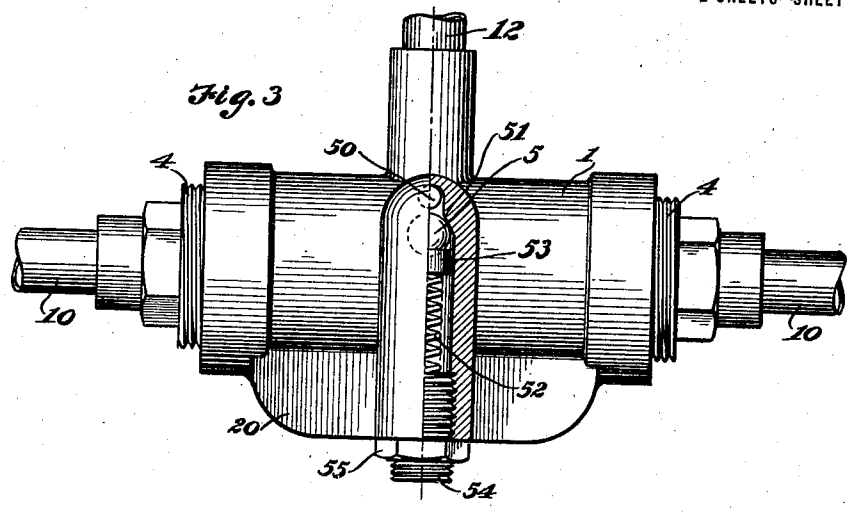


Fig. 4

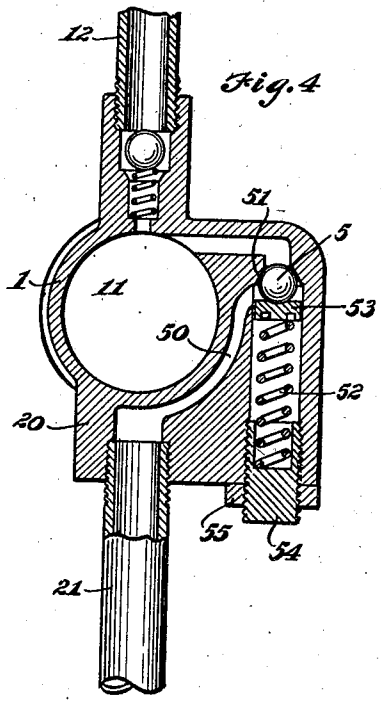
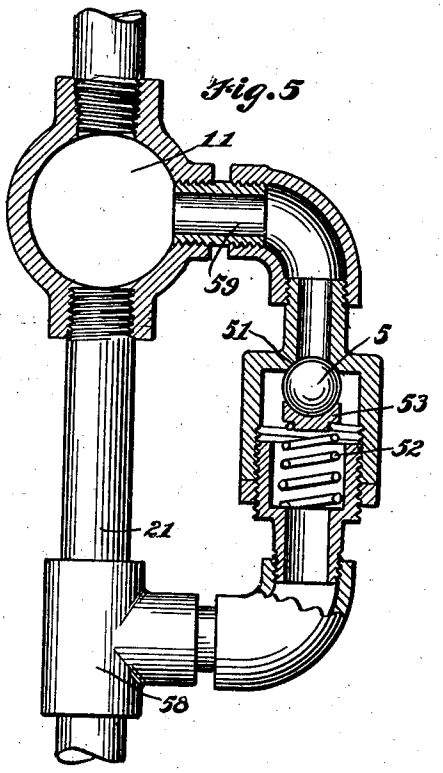


Fig. 5



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UNITED STATES PATENT OFFICE.

AMANDUS P. HANSEN, OF TACOMA, WASHINGTON.

DRAINAGE AND RELIEF VALVE.

1,359,988. Specification of Letters Patent. Patented Nov. 23, 1920.

Application filed November 20, 1919. Serial No. 339,402.

To all whom it may concern:

Be it known that I, AMANDUS P. HANSEN, a citizen of the United States, and resident of the city of Tacoma, in the county of Pierce and State of Washington, have invented certain new and useful Improvements in Drainage and Relief Valves, of which the following is a specification.

My invention relates to cylinder relief valves, and particularly to that class of valves which are used in connection with locomotives, hoisting engines, pile drivers, and similar engines, where the steam must at times be let into the cylinders rapidly and with considerable force.

The object of my invention is to produce a valve of the class described which will not be forced closed nor be locked or held in closed position by a sudden increase in pressure in the steam chest or supply line, and which will act to accommodate and relieve such super-normal pressures.

Another object of my invention is to produce a valve of the class described which will at all times function to drain water of condensation or boiler water from the cylinder and from the steam chest or supply line, notwithstanding the application of pressures above normal in either the steam chest or the cylinder.

My invention comprises the novel parts and combinations of parts which are shown in the accompanying drawings, described in the specification, and particularly defined in the claims terminating the same.

In the accompanying drawings I have shown my invention in the forms which are now preferred by me.

Figure 1 is an axial section through one form of my valve.

Fig. 2 is an axial section through a modified form of my valve.

Fig. 3 is an elevation of my valve, a part being shown partially in section.

Fig. 4 is a transverse section through my valve.

Fig. 5 is a transverse section through a modified form of valve.

In locomotives, pile drivers, and similar engines, it is often necessary or desirable to open the throttle or the valve controlling the steam supply to the engine quickly. In railway locomotives this is often done in order to overcome the inertia of the cars of a train by a sudden jerk or bump. In pile drivers this is done to catch the hammer on the rebound, and thus to use the force of the rebound to again hoist the hammer. Such practice tends to draw over from the boiler an amount of boiler water, and this, combined with the sudden force of the steam jet, produces an extra high or super-normal pressure in the steam supply line and in the steam chest.

In the type of relief valve which I prefer to use, which has a high-pressure connection to the steam chest between two opposed valves which are connected at their outer sides to their respective cylinder ends at a lower pressure, and which normally close drain openings to a still lower pressure, the super-normal pressure induced as above described tends to lock and to hold the opposed valves upon their seats, and in this manner to close the drain openings tightly. This prevents the escape of any of the excess pressure through the valve, and prevents the escape of the water which causes the excess pressure, or which accompanies it.

It is to correct this fault, and to provide means which are operable only under super-normal pressure to relieve the pressure in the steam chest, that my present invention is designed. At the same time, relieving the excess pressure in the steam chest relieves any excess pressure in the cylinder, and opens the drain openings for the removal of any water in the steam chest or cylinder.

A casing 1 is connected through the pipes 10 and the cylinder ports 13 at each end thereof to each end of a steam cylinder, at opposite sides of the piston. Within the casing 1, between its ends, I provide a high pressure chamber 11, connected to a steam supply line 12 to the cylinder, or to the steam chest. I have not shown the engine parts, as these form no part of my invention. Drain ports 2 within the casing may be combined in a drain manifold 20, and drain the waste water to the atmosphere, or to a lower pressure than the cylinder pressure, through a suitable drain pipe 21.

Between the cylinder ports 13 on either side and the high pressure chamber 11 I provide valves which are adapted to seat at the ends of the cylinder bore to close the drain ports 2 and the respective cylinder ports 13. The style of valve used is immaterial. It may be of the type of piston valve

3, held from its seat by the spring 33, as shown in Fig. 1, or it may be a ball type valve 30, as shown in Fig. 2, or any other suitable type of valve. In either case I prefer to contain the valve and to provide its seat in a sleeve 4 which is secured in the end of the casing, and which contains the cylinder port 13 and the ports 41 which connect with the drain ports 2 in the casing. There should be sufficient clearance between the valve and the sleeve 4 to permit drainage from the high pressure chamber past the valve, when the valve is unseated. In the ball valve type, this is accomplished by making the sleeve, at least at its inner end, slightly larger in diameter than the ball. In the piston valve type this is accomplished by forming the valve with a number of small spacer ribs 31 upon its periphery, which hold it spaced from the sleeve. However, in either type of valve there is no drainage past the valve when the valve is seated. This may be seen by inspection of Figs. 1 and 2.

In the valve as described so far, so long as the pressure in the high pressure chamber upon each valve remains above the pressure exerted by the steam in the cylinder drain pipes 10 and by the springs 33, the valves will remain seated, and there will be no drainage from the ports 2. As soon as the pressure in the cylinder, at either end, in addition to the force of the spring 33, exceeds the pressure in the high pressure chamber 11, the valve will be unseated, and the excess pressure or the water will drain from the cylinder ports 13 into the drain ports 2, through the ports 41, and the pressure in the cylinder will again fall below the pressure necessary to open the valve, that is, to the working pressure in the cylinder. The valve will again seat itself. While it is open, any water in the high-pressure chamber 11 may flow or be blown past the ribs 31, or past the ball 30, in the case of the ball type valve, and this chamber is thus drained.

In order to prevent jamming of the valves upon their seats, when an excess pressure is suddenly applied to the valves, I provide a by-pass leading from the high-pressure chamber 11 to the drain 21. It may be desired to form it, and I prefer to form it, as a port 50 which is made as a part of the casing 1, and I prefer to connect it directly with the drain manifold 20. It is obvious that the exact manner of connecting this by-pass is immaterial. It may be connected in the manner shown in Fig. 5, wherein the pipe 59 leads from the high pressure chamber 11, and connects by a T connection 58 to the drain pipe 21.

Within the by-pass 50 I place a valve 5. This valve is seated at 51 to close the by-pass against the high pressure steam in the chamber 11. I prefer to hold the valve upon its seat by means of a spring 52, acting upon a follower 53 which supports the valve 5. The pressure of the spring may be regulated by means of a sleeve 54 threaded in the casing, and which carries the end of the spring 52. A set nut 55 serves to hold the threaded sleeve 54 in adjusted position. The valve 5 is normally set so that it will remain seated for all normal pressures which may obtain in the high pressure chamber 11, but when the pressure in this chamber is suddenly raised in the manner above described, this valve will freely open. This permits the excess pressure to escape through the by-pass 50 to the drain manifold 20, and relieves the pressure which is forcing the valves 3 and 30 upon their seats. In this manner the valves 3 and 30 may be unseated in the usual manner to relieve the cylinder of the excess pressures generated there through the same causes.

As a further safeguard against jamming the valves upon their seats under excess pressure, I may employ a valve 6 which is placed in the high pressure connection 12 between the steam chest and the high pressure chamber 11. As I have shown this valve it comprises a ball 6 resting upon a spring 62, which normally holds it spaced from its seat 61. This valve may be formed in a part of the casing 1. The spring 62 should be sufficiently strong to keep the valve unseated until a pressure as high or higher than that which unseats the valve 5 is applied through the high pressure connection 12. When a pressure which is a predetermined amount higher than the super-normal pressure which unseats the valve 5 is applied through the connection 12, the valve 6 seats and remains seated until this excess pressure is relieved. This excess pressure is relieved by the operation of the pistons in the cylinders of the engine, and when said pressure drops to working pressure through the operation of the pistons the ball raises, allowing pressure to again enter the pressure chamber 11 of the valve.

The valve 6 is employed principally as a safety device to prevent jamming of the relief valve due to a sudden and very high pressure, which might not be readily relieved even through the by-pass 50. I might desire to use the valve 6 in connection with the valve 5 or independently of the latter. The valve 5 and the by-pass 50 may, however, be made large enough to take care of any excess pressure which might be applied to the relief valves 3 and 30 and the use of the valve 6 might be dispensed with entirely.

What I claim as my invention is:

1. In a steam cylinder relief valve, in combination, a casing adapted to be connected at each end to an end of the cylinder, and having a high pressure chamber be-

tween the cylinder connections, adapted to be connected to a source of high pressure steam supply, a drain having a connection with each end of the casing, opposed valves between the high pressure chamber and the cylinder connections normally adapted to close said cylinder connections, and a by-pass normally closed connecting the high pressure chamber and the drain.

2. In a steam cylinder relief valve, in combination, a casing adapted to be connected at each end to an end of the cylinder, and having a high pressure chamber between the cylinder connections, adapted to be connected to a source of high pressure steam supply, a drain having a connection with each end of the casing, opposed valves between the high pressure chamber and the cylinder connections normally adapted to close said cylinder connections, a by-pass connection from the high pressure chamber to the drain, and a check-valve in said by-pass normally sustaining the pressure within said chamber.

3. In a steam cylinder relief valve, in combination, a casing adapted to be connected at each end to an end of the cylinder, and having a high pressure chamber between the cylinder connections, adapted to be connected to a source of high pressure steam supply, a drain having a connection with each end of the casing, opposed valves between the high pressure chamber and the cylinder connections normally adapted to close said cylinder connections, a by-pass connection from the high-pressure chamber to the drain, a spring-pressed valve in said by-pass normally closed to sustain the pressure within said chamber, and means for regulating the effective closing pressure upon said valve.

4. In a steam cylinder relief valve, in combination, a casing adapted to be connected at each end to an end of the cylinder, and having a high-pressure chamber between the cylinder connections, adapted to be connected to a source of high pressure steam supply, a drain having a connection with each end of the casing, opposed valves between the high pressure chamber and the cylinder connections normally adapted to close said cylinder connections, a by-pass connection from the high-pressure chamber to the drain, and a valve in said by-pass normally closed, said valve being adapted to be opened by super-normal high pressure.

5. In a steam cylinder relief valve, in combination, a casing adapted to be connected at each end to an end of the cylinder, and having a high-pressure chamber between the cylinder connections, adapted to be connected to a source of high pressure steam supply, a drain having a connection with each end of the casing, opposed valves between the high pressure chamber and the cylinder connections normally adapted to close said cylinder connections, a by-pass connection from the high-pressure chamber to the drain, a valve in said by-pass normally closed, said valve being adapted to be opened by pressures above normal high pressure, and means for adjusting said valve to regulate the minimum opening pressure.

6. In a steam cylinder relief valve, in combination, a casing adapted to be connected at each end to an end of the cylinder, and having a high-pressure chamber between the cylinder connections, adapted to be connected to a source of high pressure steam supply, a drain having a connection with each end of the casing, opposed valves between the high pressure chamber and the cylinder connections normally adapted to close said cylinder connections, a by-pass connection from the high-pressure chamber to the drain, a valve in said by-pass normally closed, said valve being adapted to be opened by pressures above normal high pressure, and a check valve in the high-pressure steam connection adapted to shut off the steam supply at a predetermined pressure above the pressure which opens the valve in the by-pass.

7. In a steam cylinder relief valve, in combination, a casing adapted to be connected at each end to an end of the cylinder and having a high-pressure chamber between the cylinder connections, adapted to be connected to a source of high pressure steam supply, a drain having a connection with each end of the casing, opposed valves between the high pressure chamber and the cylinder connections normally adapted to close said cylinder connections, and means for cutting off the steam supply operable at super-normal high pressures.

8. In a steam cylinder relief valve, in combination, a casing adapted to be connected at each end to an end of the cylinder, and having a high-pressure chamber between the cylinder connections, adapted to be connected to a source of high pressure steam supply, a drain having a connection with each end of the casing, opposed valves between the high pressure chamber and the cylinder connections normally adapted to close said cylinder connections, and a valve in the high-pressure steam line adapted to close at super-normal high-pressures.

Signed at Seattle, King county, Washington, this 12th day of November, 1919.

AMANDUS P. HANSEN.