

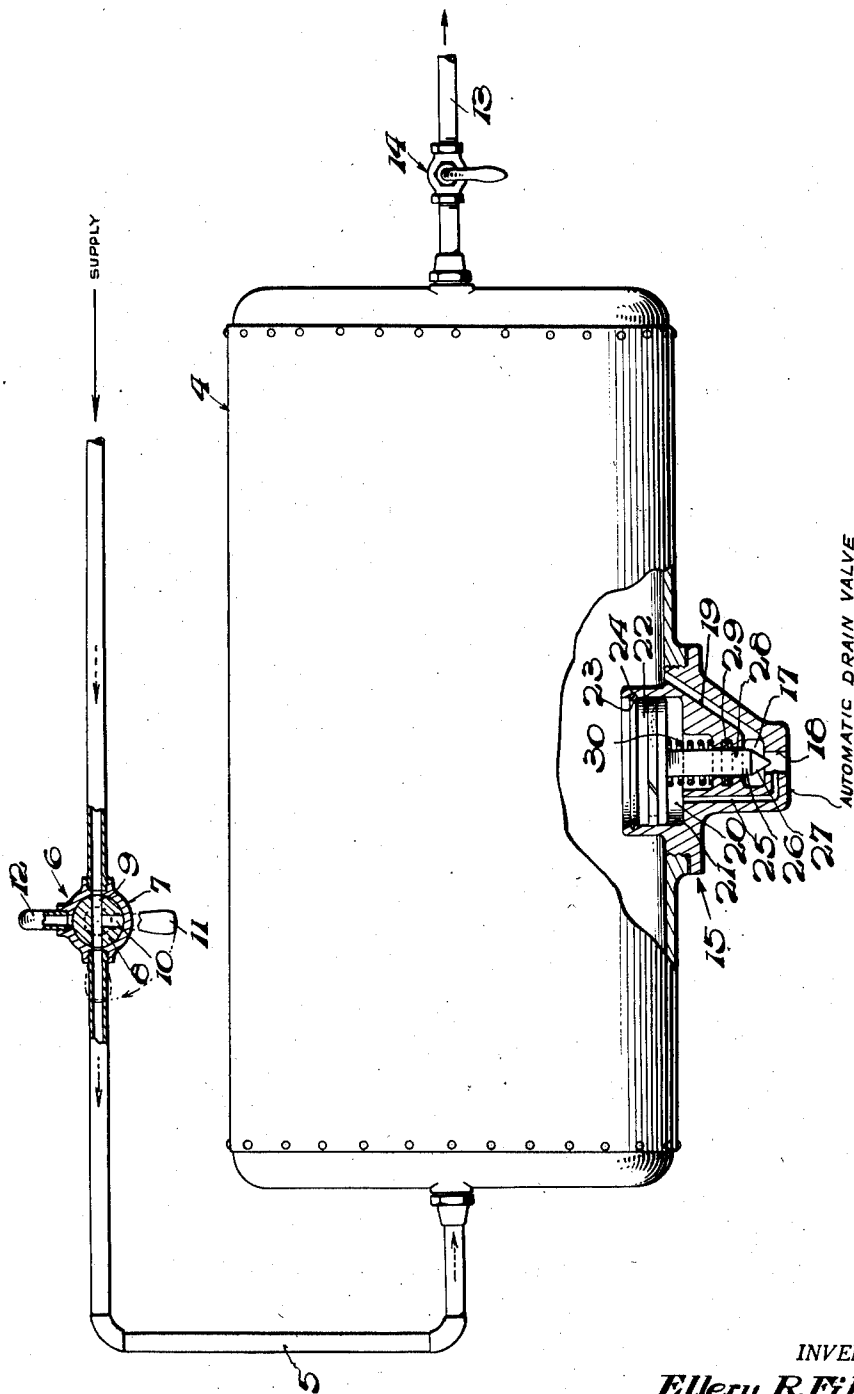
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VALVE MECHANISM

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VALVE MECHANISM

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This invention relates to valve mechanism, and more particularly to fluid pressure operated valve mechanism for automatically draining the condensate from a reservoir or other receptacle. It has previously been proposed to employ automatic drain valves for the above purpose, but many of the mechanisms previously proposed have been complicated as well as costly to manufacture, and it is accordingly an object of the present invention to provide simple and efficient automatic drain valve mechanism which may be manufactured at low cost.

Another object of the invention is to provide valve mechanism of the above type so constituted as to automatically control the discharge of condensate from a reservoir in accordance with variations in the pressure of fluid therein.

A further object of the invention is to provide drain valve mechanism of the above type so constituted as to be reliable and positive in operation.

Yet another object of the invention is to provide, in a fluid pressure supply system, automatic drain valve mechanism adapted to be readily controlled from a point situated remotely from the drain valve.

These and other objects and features of the invention will become more readily apparent in the light of the following detailed description, when taken in connection with the accompanying drawing, but it is to be expressly understood that the invention is not limited thereto but may well take other forms as will be readily understood by those skilled in the art. Reference will, therefore, be had to the appended claims for a definition of the limits of the invention.

In the drawing, the single figure is illustrative of a simple fluid pressure supply system having a reservoir provided with automatic drain valve mechanism constructed in accordance with the principles of the present invention.

As shown on the drawing, the fluid pressure system illustrated includes a reservoir 4 supplied with fluid pressure through a conduit 5 which in turn is connected to a suitable source of supply, not shown, through the medium of a remotely positioned three-way valve 6, of conventional design, which is connected in the supply line and serves to normally permit the flow of fluid pressure from the source to the reservoir. The valve 6 is provided with a casing 7 and a plug portion 8 having passages 9 and 10 formed therein, a handle 11 being provided for operating the valve, and the casing further being provided with an exhaust outlet 12. With the valve in the posi-

tion shown, the passage 9 in the plug serves to connect the supply conduit 5 with a source of fluid pressure, while on movement of the handle 11 through an arc of 90 degrees in a clockwise direction, the passage 9 is moved into register with the exhaust conduit 12 and the passage 10, which is connected with the passage 9 as shown, is moved into register with the left portion of the conduit 5, thus serving to exhaust fluid pressure from the reservoir 4 to atmosphere. The reservoir is also supplied with an outlet conduit 13 leading to a device or devices to be operated, and this conduit is provided with a shut-off valve 14 which may be operated to open or close the outlet conduit. The reservoir thus serves as a chamber for collecting condensate which would otherwise tend to be supplied to the devices to be operated through the outlet conduit 13.

In order that condensate may be automatically discharged from the reservoir in accordance with variations of pressure therein, the lower portion of the tank is adapted to threadedly receive an automatic drain valve mechanism 15. This drain valve is provided with a casing 16 having an outlet chamber 17 formed in the lower portion thereof provided at its lower end with a discharge port 18, and also provided with a preferably restricted drain passage 19 leading to the interior of the reservoir as shown. The upper portion of the casing is provided with an enlarged cylinder portion 20 having a bore 21, and the bore is provided with a slidably mounted piston 22 which is retained in the cylinder by means of a split ring 23 of resilient material carried in a groove 24 formed in the wall of the bore. The portion of the cylinder thus formed below the piston is connected with atmosphere by means of a passage 25 which enters the wall of the discharge port 18 as shown, the lower side of the piston being thus subjected at all times to atmospheric pressure, while the upper end of the piston is subject at all times to the pressure within the reservoir. In order that the piston may be effective to control the opening and closing of the discharge port 18, a downwardly extending valve stem 26 of smaller diameter than the piston is provided on the piston, this stem having a valve portion 27 formed on its lower end adapted on downward movement thereof to engage and close the upper end of the discharge port 18. This stem is slidably mounted in a bore 28 formed in the casing and centrally located with respect to the bore 21, leakage of fluid between the chamber 17 and the cylinder past the valve stem being prevented by means of a suitable seal 29 posi-

tioned in the bore. The valve is normally maintained in open position by means of a spring 30 interposed between a portion of the casing and the lower face of the piston 22, the upper end of the piston thus being normally maintained in engagement with the retaining ring 24. Thus with the valve and piston in the position shown, the interior of the reservoir is connected with atmosphere through port 18, chamber 17 and discharge port 18, while on downward movement of the valve, the upper end of the port 18 is closed and the pressure acting on the top of the piston and the pressure of fluid in the chamber 17 acting on the valve act to maintain the valve in closed position.

Assuming, by way of example, that the entire system is at atmospheric pressure and that fluid pressure is then supplied to the reservoir through the supply line 5 and the three-way valve 6, it will be understood that the pressure will tend to increase in the interior of the reservoir and that a certain amount of the fluid supplied to the reservoir will be initially discharged to atmosphere through the passage 19 and the discharge port 18. As shown in the drawing, however, the area of the passage 19 is relatively small with respect to the area of the supply line 5, the result being that the pressure in the reservoir will tend to increase as more fluid is supplied thereto. This pressure acts on the upper end of the piston 22, and since the cylinder portion 20 is connected at all times with atmosphere through the passage 25 and the discharge port 18, a force will be exerted on the piston tending to move the latter downward to close the valve 27 when the pressure in the reservoir reaches a predetermined value, this value being determined by the tension of the spring 30 as well as by the relative areas of the piston 22 and the valve stem 26, and it will further be understood that when the valve is closed, it will thereafter remain closed at all higher pressures. Assuming that the valve 14 is now opened to supply fluid pressure to a device to be operated, it will be clear that any condensate flowing through the reservoir will tend to be deposited therein and will eventually collect in the bottom portion of the reservoir adjacent the port 18. On completion of the desired operation, the valve 14 will be closed, and in the event a supply of fluid pressure is no longer required in the reservoir 4, the three-way valve 6 may be operated to exhaust the reservoir to atmosphere. As the pressure in the reservoir decreases in response to the operation of the three-way valve, a point may be reached, such that the force exerted by the spring 30 will be sufficient to overcome the fluid pressure acting on the piston and on the valve to hold the latter in closed position, and the valve and piston will thereupon be moved upward in order to open the port 18 and connect the reservoir with atmosphere through the passage 19, the chamber 17 and the port 18, whereupon the pressure remaining in the reservoir will act to force any collected condensate to atmosphere through the above described path. It is also well-known to those skilled in the art that fluid pressure systems of the above type tend to leak slightly when left standing for long periods of time, and in the event the above described automatic drain valve is applied to the reservoir of an air brake system for a vehicle, for example, the pressure in the system may be depleted sufficiently to operate the drain valve to discharge condensate from the system in the event the vehicle is left standing for a rela-

tively long period of time, in which case it will be unnecessary for the operator to move the handle of the three-way valve to discharge position in order to effect operation of the drain valve to discharge condensate from the system. If it is desired to insure positive draining of the condensate from the reservoir of the vehicle, however, it will be understood that the valve 6 may be located at a point convenient to the operator, and that it is only necessary for the operator to exhaust pressure from the reservoir when the vehicle is stored for the night in order to effect automatic operation of the drain valves on all of the vehicle reservoirs for the purpose of discharging any condensate collected in the system.

At the present time, it is customary for the operator to open pet cocks in all of the reservoirs in order to accomplish this end, and since these pet cocks in most cases are somewhat inaccessible to the operator, the operation is often neglected and the condensate which collects in the system results in serious difficulties due to freezing of the condensate in the various parts of the system.

There has thus been provided by the present invention simple and efficient means for automatically draining condensate and other foreign substance from the reservoir in a fluid pressure supply system so constituted as to be readily controlled by the operator from a remote station, and further constituted in such a manner as to automatically drain condensate from the reservoirs in the system whenever the pressure in the system is dropped below a predetermined value due to leakage therein.

Although one embodiment of the present invention has been illustrated and described in detail herein, it is to be expressly understood that various changes and substitutions may be made therein without departing from the spirit of the invention, as will be readily understood by those skilled in the art. Reference will, therefore, be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

45 1. Automatic drain valve mechanism for a fluid pressure reservoir including a casing attached to the bottom of the reservoir, a cylinder formed in the upper end of the casing having its upper end in communication with the interior of the reservoir, a piston slidably mounted in the cylinder, an exhaust port in the casing having a connection with the reservoir, a downwardly extending stem connected with the piston and having a valve portion formed on its lower end adapted to close the exhaust port, means for subjecting the lower side of the piston to atmospheric pressure at all times, and a spring interposed between the casing and piston for urging the latter and valve stem in an upward direction, whereby the exhaust port is open when the pressure in the reservoir is less than a predetermined value.

2. Automatic drain valve mechanism for a fluid pressure reservoir including a casing attached to the bottom of the reservoir, a cylinder formed in the casing having its upper end in communication with the interior of the reservoir, a piston slidably mounted in the cylinder, a groove in the wall of the cylinder and a removable split ring of resilient material positioned in said groove for retaining the piston in said cylinder, an exhaust port in the casing having a connection with the reservoir, a downwardly extending valve connected with the piston and adapted to close the exhaust port, a spring interposed between the

piston and casing for urging the piston upwardly to maintain the valve in open position when the pressure in the reservoir is less than a predetermined value, and means for subjecting the lower side of the piston to atmospheric pressure at all times, whereby the valve is moved downward by the piston to close the exhaust port when the pressure in the reservoir acting on the upper end of the piston exerts a force sufficient to overcome the tension of the spring.

3. Automatic drain valve mechanism for a fluid pressure reservoir including a casing attached to the reservoir, a cylinder formed in said casing having its upper end in communication with the interior of the reservoir, an exhaust port adjacent the lower portion of the casing, an exhaust chamber adjacent the port having a connection with the port and a connection with the reservoir, a bore formed in the casing of lesser diameter than the cylinder and connecting said exhaust chamber and cylinder, a piston slidably mounted in said cylinder, a valve member slidably mounted in said bore and connected with said piston, sealing means associated with said valve member and bore for preventing the flow of fluid pressure between said exhaust chamber and cylinder, means for connecting a chamber defined by the piston,

cylinder and valve member with atmosphere, and a spring interposed between said casing and piston for moving the latter to move the valve member to port opening position when the pressure in the reservoir acting on the upper end of the piston to move the valve to port closing position is less than a predetermined value.

4. Automatic drain valve mechanism for a fluid pressure reservoir including a casing attached to the bottom of the reservoir, a chamber formed in the upper end of the casing having its upper end in communication with the interior of the reservoir, a pressure responsive member mounted in said chamber for movement therein, an exhaust port in the casing having a connection with the reservoir, a downwardly extending stem having an operative connection with the pressure responsive member and having a valve at its lower end adapted to close said exhaust port, means for subjecting the lower side of said pressure responsive member to atmospheric pressure at all times, and a spring for urging said valve toward open position, whereby the exhaust port is open when the pressure in the reservoir is less than a predetermined value.

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