Aug. 27, 1935. J. P. ANDERSON 2,012,596

FLUID PRESSURE VALVE

Filed April 19, 1933 2 Sheets-Sheet 1

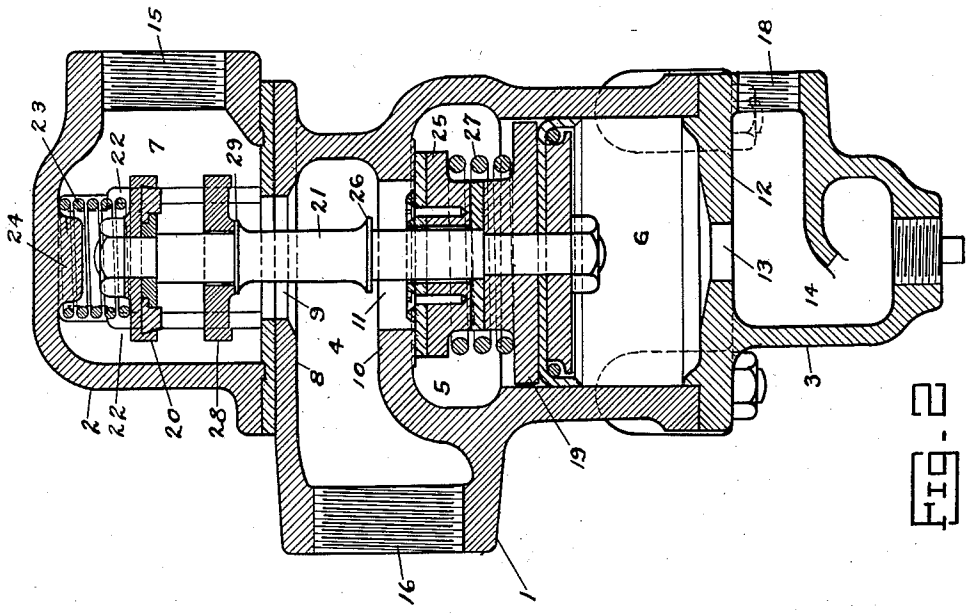


FIG. 2

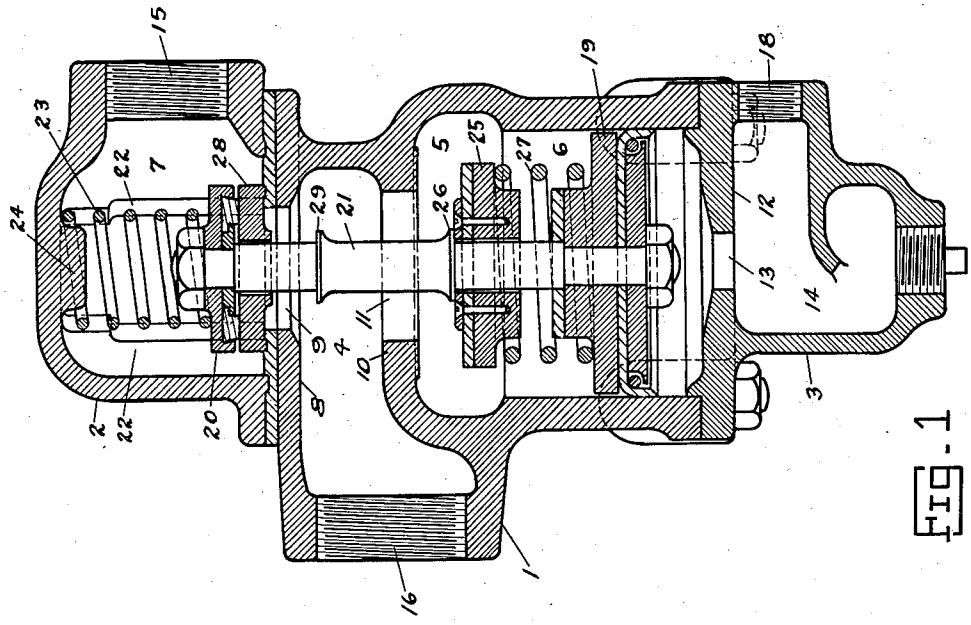


FIG. 1

INVENTOR
John P. Anderson.
BY
ATTORNEY

Aug. 27, 1935. J. P. ANDERSON 2,012,596

FLUID PRESSURE VALVE

Filed April 19, 1933 2 Sheets-Sheet 2

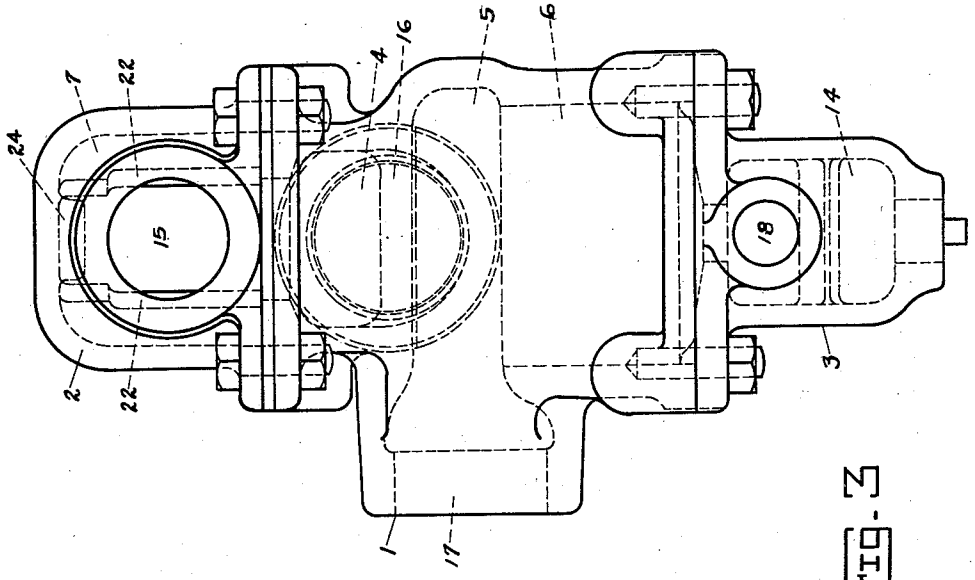


FIG. 2

INVENTOR
John P. Anderson.
BY
ATTORNEY

Patented Aug. 27, 1935

2,012,596

UNITED STATES PATENT OFFICE

2,012,596

FLUID PRESSURE VALVE

John P. Anderson, Koppel, Pa., assignor to Koppel Industrial Car and Equipment Company, Koppel, Pa., a corporation of Pennsylvania

Application April 19, 1933, Serial No. 666,808

9 Claims. (Cl. 303—50)

The invention relates to fluid pressure operated dump cars and more particularly to the valve for controlling distribution of fluid pressure to the body tilting mechanism.

An object of the invention is the provision of a valve for automatic control of the admission and exhausting of fluid pressure to and from the body tilting cylinders of a railway dump car.

Another object of the invention is the provision of an automatic valve having a fluid pressure supply chamber, a distribution chamber, an exhaust chamber and a piston within said valve for selectively connecting the distribution chamber to but one of the other chambers at any one time.

A further object of the invention is the provision in such a valve of means for preventing fluid pressure from leaking past the valve and building up in the body tilting mechanism, thereby accidentally operating the mechanism.

These and other objects will become apparent to those skilled in the art from the accompanying specification, in the drawings of which Fig. 1 shows a longitudinal cross section of the valve and its contained piston in the normal or exhaust position; Fig. 2 shows in section the valve of Fig. 1 with its contained piston in position to cut off the exhaust chambers and open the supply chamber to admit fluid pressure to the distribution chamber; Fig. 3 shows a side elevation of the of Fig. 2.

Referring now in detail to the drawings where like reference characters refer to like parts the valve comprises an outer casing or body which is made in three parts, the intermediate portion 1, and end portions 2 and 3. The portions 2 and 3 are connected to the intermediate portion 1 by removable stud and machine bolts for a purpose which will hereinafter become apparent. The intermediate body portion 1 is comprised of a distribution chamber 4, an exhaust chamber 5, and an operating chamber 6. The body portion 2 forms the supply chamber 7 and the body portion 3 completes the operating chamber 6. A wall 8 having a port 9 separates the supply and distribution chambers. A wall 10 having a port 11 separates the distribution and exhaust chambers. There is preferably no wall separating the exhaust and operating chambers. A wall 12 closes the lower end of the operating chamber 6 and has a port 13 therein. The body portion 3 provides an auxiliary chamber 14 for supplying fluid pressure to the operating chamber and acts as a general drain for water in the valve.

Formed in the outer walls of the valve body are outlets for connecting the various portions of the mechanism in which the valve is used. It will be understood that the valve is adapted to many other uses than in controlling fluid pressure in the body tilting mechanism of a railway dump car as herein described. When used in a dump car the supply chamber has an inlet 15 for connection to a reservoir in which fluid under pressure is stored. It will be understood that the term "fluid" is here applied to air as this medium is the most plentiful and in regular use for other purposes on a railway car. An outlet 16 connects the distribution chamber to the mechanism to be actuated by the fluid pressure. In the case of a railway dump car this is the body tilting cylinders. The exhaust chamber has an outlet 17 to the atmosphere and the auxiliary operating chamber 14 has an inlet 18 for admission of fluid pressure to operate the valve. An operating line is usually connected to the inlet 18 and the flow of fluid pressure therein is controlled by any suitable valve which will selectively admit and exhaust the fluid therefrom.

Mounted within the valve is a differential piston for controlling the flow of fluid pressure therein. This piston comprises a large head 19 seated in the operating chamber 6, and a small head 20 seated within the supply chamber 7. These heads 19 and 20 are connected by a piston stem 21 and are rigidly secured to the stem. For the purpose of guiding the piston, guides 22 are formed in the supply chamber 7 and are engaged by suitable openings in the head 20. To insure a quick action of the piston in one direction and to prevent the piston from sticking, a spring 23 under initial compression is placed between the end of the piston stem 21 and the wall of the supply chamber. This spring seats on the head 20 and the seat 24 formed upon the inner wall of the supply chamber.

As it is desirable, in valves used for the purpose herein described, to insure the closing of the exhaust outlet before admitting fluid pressure to the distribution chamber and to close the port between the supply and distribution chambers before opening the exhaust chamber port to prevent loss of the fluid pressure, I have provided valve discs adjacent each head of the piston.

Adjacent the large head 19 is provided a valve disc 25 slidably mounted upon the piston stem 21. This valve disc 25 is freely movable upon the stem 21 and is limited in one direction by an annular shoulder 26 on the stem and in the other direction by the head 19. A spring 27 encircles the stem and embraces the head 19 and valve

disc 25 so as to normally hold the valve disc 25 spaced from the head and against the shoulder 26. This valve disc is small enough to be free of engagement with the walls of the exhaust and operating chambers and too large to pass through the port 11. The annular shoulder 26 on the piston stem can, however, pass freely through the port 11.

Adjacent the small head 20 and upon the piston stem is a valve disc 28. This valve disc is freely movable upon the stem 21 and is restricted in movement between the head 20 and an annular shoulder 29 on the stem. The valve disc 28 is confined in the supply chamber 7 and normally assists the small head in closing the port 9.

The function of the valve discs 25 and 28, as previously described, is to control the opening and closing of the ports 9 and 11 while permitting limited independent movement of the piston. For this purpose the shoulders 26 and 29 are spaced from the said valve discs so as to permit the closing of the port 11 before the port 9 is opened when the piston is moved upwardly and to insure the closing of the port 9 before opening the port 11 when the piston moves downwardly. When the piston is moving upwardly from normal position the spring 27 holds the valve disc 25 against the shoulder 26 until the shoulder 26 passes from the exhaust chamber 5 and the valve disc seats against the wall 10 closing the port 11. During this upward movement of the piston the head 20 moves away from the valve disc 28 but the valve is held in position by the fluid pressure within the supply chamber 7, there being no pressure against the underside of the valve disc 8 as the exhaust chamber port has been open during the major portion of this movement.

Thus it will be seen that during the up stroke of the piston there will occur a fractional period of time when the port 11 is closed by the valve disc 25 and the port 9 will be closed by the valve disc 28. The shoulder 29, thereafter engaging with the valve disc 28, raises it free of the port 9 permitting the free flow of the fluid pressure in the chamber 4 through the outlet 16. Until the piston reaches its uppermost position the spring 27 is sufficient to hold the valve disc 25 in position as the fluid pressure within the chamber 4 is largely dissipated through the outlet 16 to the actuated mechanism. Upon reaching the limit of the up stroke of the piston the head 19 engages with the valve disc as shown in Fig. 2 and holds the valve disc against the full pressure in the chamber 4 by reason of the greater pressure on the underside of the large head 19.

The complete cycle of operation of the valve is as follows: with the valve mechanism in position as shown in Fig. 1 fluid pressure is admitted through the inlet 18 into the auxiliary chamber 14 where it passes through the port 13 and builds up in the chambers 6 and 14 until the pressure upon the head 19 overcomes the pressure of the fluid and spring in the chamber 7 and raises the piston, the small head moving within the guides 22 and compressing the spring 23. After the valve disc 25 closes the port 11 the valve disc 28 is lifted by a shoulder 29 and the head 19 holds the valve 25 against fluid pressure moving from the reservoir through the inlet 15 into the supply chamber 7 thence through the port 9, the distribution chamber 4, and the outlet 16 to the body tilting cylinder. The piston will remain in this position so long as the pressure within the auxiliary chamber 14 is maintained. Upon reduction of the pressure in the operating chamber 6 and auxiliary chamber 14, the fluid pressure on the head 20 and the valve disc 28 plus the pressure of the springs 23 and 27 causes the piston to snap downward, first closing the port 9 by the disc 28 and cutting off pressure from the reservoir to the chamber 7 and with the continued downward movement of the piston the shoulder 26 engages with the valve 25 opening the port 11 to permit the fluid pressure in the tilting cylinders to exhaust through the chamber 5 and outlet 17 to the atmosphere. In this position the head 20 is seated upon disc 28.

It will be obvious that with the piston in normal lowered position fluid pressure leaking past the valve disc 28 into the distribution chamber will pass through the port 11 into the exhaust chamber and thence to the atmosphere through outlet 17, and not build up within the body tilting cylinders.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent is:

1. In a valve of the character described, in combination, a series of chambers spaced by walls, ports in the walls, a piston having heads in spaced chambers and connected by a piston stem, valve discs on the stem adjacent each head of the piston and movable relative thereto, a spring spacing one disc from its respective head and a spring resisting movement of the piston in one direction.

2. In a valve of the character described, in combination, a supply chamber, a distribution chamber, and an operating chamber, ports connecting said chambers, a piston having heads in the supply and operating chambers and actuated by fluid pressure therein, a valve disc on the stem of said piston adjacent one head and within the supply chamber, said disc being movable relative to said head and acting, through fluid pressure in the supply chamber, to close the port between the supply and distribution chambers independently of the piston, and means on the piston stem moving the disc against fluid pressure to open the port closed by the disc.

3. In a valve of the character described, a series of port connected chambers, an opening in the valve casing connecting with each chamber, a piston having heads in spaced chambers of said series and means on the piston providing alternate connection of one of said spaced chambers with an intermediate chamber as the piston moves during operation of the valve.

4. A valve comprising a body portion having a plurality of port connected chambers, a piston having heads lying in spaced chambers connected by a stem extending through the ports, one of the piston head containing chambers having a connection to a constant source of fluid under pressure, the other of said piston head containing chambers having a connection to a source of fluid pressure selectively applied to the chamber, a chamber disposed intermediate said head containing chambers, said intermediate chamber having a connection to a mechanism actuated by fluid pressure from the first-named chamber, said piston when actuated by fluid pressure acting to alternately connect said intermediate chamber with the piston head containing chambers.

5. In a valve of the character described, including a valve body having a plurality of port connected chambers, a piston stem disposed in each of said chambers, heads of different sizes disposed on opposite ends of the piston stem, the

chamber containing the smaller head being connected to a constant source of fluid under pressure, the chamber containing the larger head being selectively connected to a source of fluid under pressure, a chamber disposed between said head containing chambers and having a connection to a fluid pressure actuated mechanism energized by fluid pressure from the smaller head containing chamber, guides disposed in the smaller head containing chamber and engaging apertures in the smaller piston head, and a compression spring disposed between said guides and engaging the piston head.

6. In a valve of the character described, a valve body having a plurality of port connected chambers, a piston within the valve body having an integral stem and heads of different sizes at opposite ends thereof disposed in spaced chambers, a shoulder on the piston stem adjacent each head and spaced therefrom, a valve disc within each piston head containing chamber and slidably mounted on the piston stem between each of said shoulders and the adjacent head, a compression spring between the larger piston head and adjacent valve disc, the chamber containing the smaller head being connected to a constant source of fluid under pressure, the chamber containing the larger head being selectively connected to a source of fluid under pressure, an intermediate chamber disposed between the head containing chambers and having a connection to a fluid pressure actuated mechanism, actuated by fluid pressure from the chamber containing the smaller piston head, the chamber containing the larger head having a connection to the atmosphere disposed between the piston head and the port connecting said intermediate chamber.

7. In a valve of the character described, a body comprising an intermediate chamber connected to a fluid pressure actuated mechanism, a chamber on opposite sides of the first-named chamber, ports connecting the chambers, a differential piston having a stem extending through the ports and its end portions disposed in the spaced chambers, a small piston head connected to one end of said stem, a large piston head connected to the opposite end of said stem, each of said heads being contained within said spaced chambers, valve discs slidably mounted on said stem adjacent each head and within the respective chambers, shoulders on said stem between said heads limiting movement of said discs, a compression spring between the larger head and adjacent valve disc and of sufficient stiffness to overcome pressure on the disc from said intermediate chamber.

8. In a valve of the character described, a body comprising an intermediate chamber connected to a fluid pressure actuated mechanism, a chamber on opposite sides of the first-named chamber, ports connecting the chambers, a differential piston having heads moving in said spaced chambers and a connecting stem extending through said intermediate chamber and ports, shoulders on the stem spaced from the respective heads, valve discs slidably mounted on the stem and within said spaced chambers, openings in said spaced chambers connecting to sources of fluid under pressure, said fluid pressure actuating said piston by differences in pressure against said heads, and said valve discs acting to close the port in their respective chambers independently of movement of the piston until engaged by said shoulder which thereafter moves the discs with the piston.

9. In a valve of the character described, a series of port connected chambers, a piston having heads in the end chambers of said series and actuated by fluid pressure, a stem connecting said heads and disposed in said ports, valve discs movably mounted on said stem and seating against said ports, and shoulders on said stem for alternate engagement with said valve discs.

JOHN P. ANDERSON.