W. B. LAKEY & G. STAUNTON.

SYSTEM FOR STORING FLUIDS UNDER PRESSURE.

APPLICATION FILED JAN. 29, 1912.

1,070,491.

Patented Aug. 19, 1913.

2 SHEETS—SHEET 1.

Fig. 1.

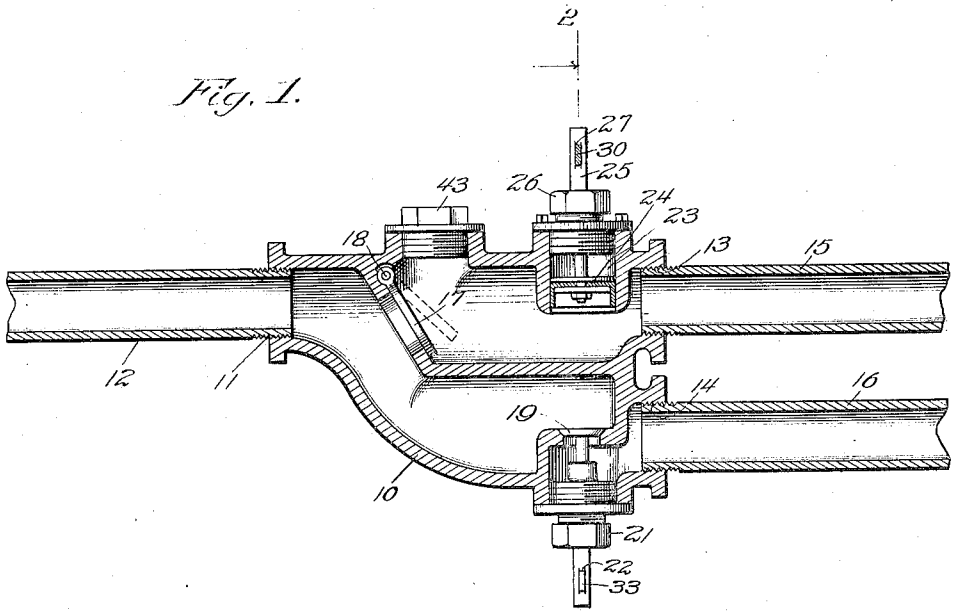
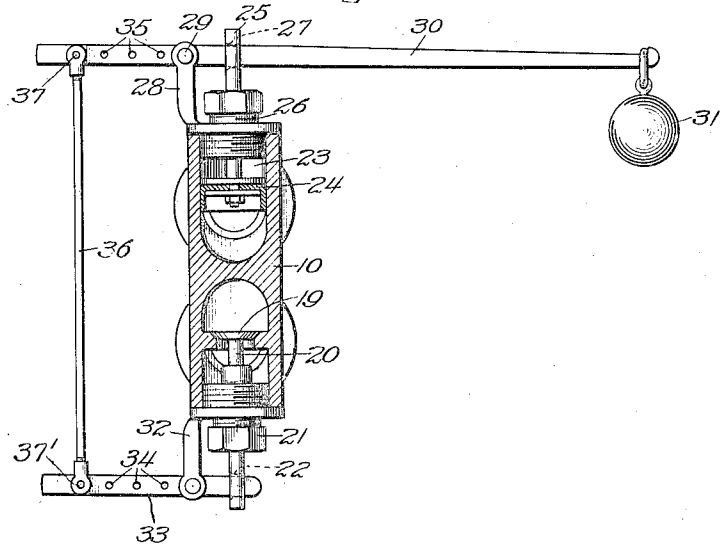


Fig. 2.



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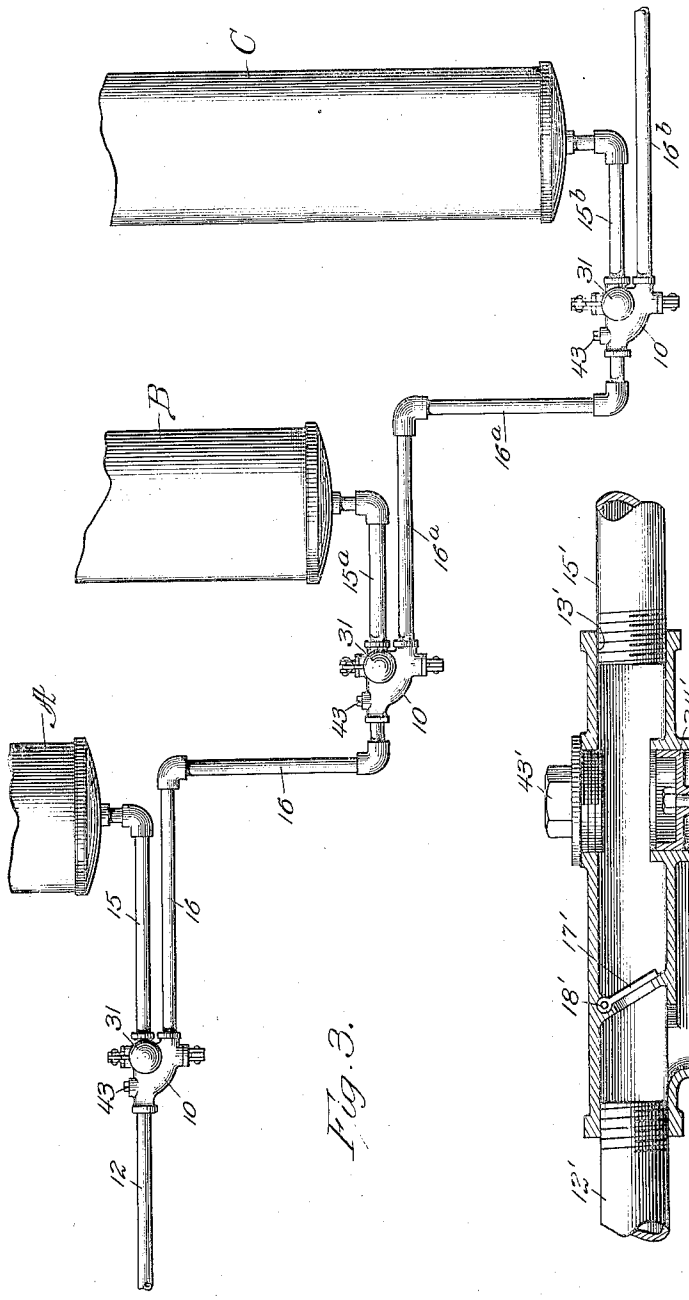
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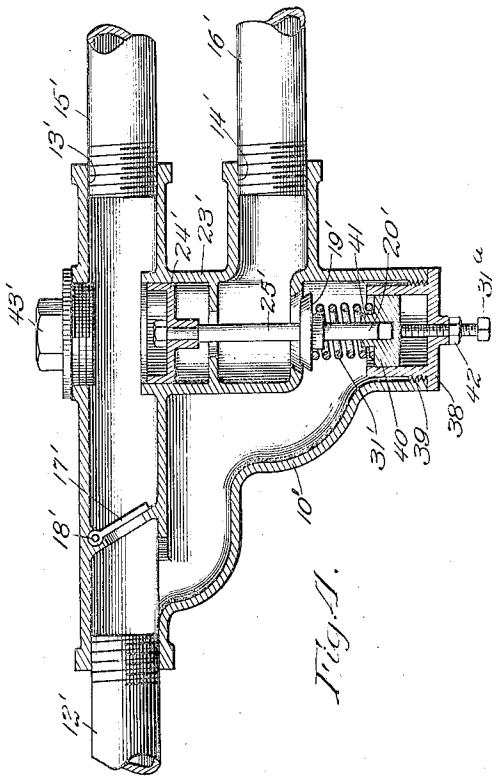
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UNITED STATES PATENT OFFICE.

WILLIAM B. LAKEY AND GRAY STAUNTON, OF MUSKEGON, MICHIGAN.

SYSTEM FOR STORING FLUIDS UNDER PRESSURE.

1,070,491. Specification of Letters Patent. Patented Aug. 19, 1913.

Application filed January 29, 1912. Serial No. 674,054.

To all whom it may concern:

Be it known that we, WILLIAM B. LAKEY and GRAY STAUNTON, citizens of the United States, both residing at Muskegon, in the county of Muskegon and State of Michigan, have invented certain new and useful Improvements in Systems for Storing Fluids Under Pressure, of which the following is a specification.

Our invention relates to improvements in systems for storing fluids under pressure, and an automatic pressure operating valve necessary in carrying our invention into effect.

One of the objects of our invention is to provide in a system wherein a plurality of receptacles are to be maintained charged at a given pressure, a valve and arrangement of pipes whereby, after a receptacle has been so charged it will not offer any further resistance to the pressure effecting means until the pressure within such receptacle has fallen below the initial pressure.

Another object of our invention is to provide an automatically operating valve which will open a bypass around a given receptacle when the pressure therein has reached a predetermined value.

Other and further objects of our invention will become readily apparent to persons skilled in the art from a consideration of the following description, taken in conjunction with the drawings wherein;

Figure 1 is a longitudinal, central section of an automatic, weight operating valve; Fig. 2 is a transverse section taken on line 2—2 of Fig. 1; Fig. 3 shows a plurality of receptacles with an automatic valve for each receptacle; Fig. 4 is a longitudinal, central section of our automatic valve, showing its adaptation to spring operation.

In all of the views the same reference characters indicate similar parts.

Our invention is especially designed to meet the requirements where it is desired to maintain a constancy of pressure in a plurality of receptacles in which the medium under compression is supplied by a single source. It further operates to automatically shut off each receptacle in turn, as the pressure therein has reached a predetermined value at which the particular valve associated therewith has been previously adjusted, and when so shut off to remove the resisting effect of the pressure of the receptacle so segregated from the pressure producing source. Thus when all of the receptacles have been thus cut off the pressure producing source may continue to operate with practically all of its resistance or load removed, but ready to resume its work when any one or more of the receptacles have had its pressure reduced.

For purposes of complete disclosure we have illustrated a weight adjustable valve, as shown in Figs. 1 and 2, and a spring adjustable valve, as shown in Fig. 4. Both of these types of valves act upon the same principle and either form may be used in the same situation.

Referring now to Figs. 1 and 2; specifically 10 is a casing provided with an intake pipe opening 11, for intake pipe 12 and discharge openings 13 and 14 for bypass pipes 15 and 16 respectively. The opening 11 is normally closed from communication with pipe 15 by gravity check valve 17, hinged to the casing, as at 18. Valve 19 is normally closed and shuts off communication between openings 11 and 14. The valve 19 is provided with a valve stem 20 which passes through a stuffing box 21 and is slotted through its outer end, as at 22. In axial alinement with the valve 19 is a cylinder 23 formed in the casing 10, back of the check valve 17, containing a piston 24. The piston is provided with a piston stem 25 that passes through a stuffing box 26 and is slotted through its outer end, as at 27. A bracket 28 is secured to the casing and provides a pivotal support 29 for the beam 30. The weighted beam or lever 30 passes through the slot 27 in the piston stem 25, and carries on its longer end an adjustable weight 31, that is movable along the beam as in a scale or steelyard, the object of which will hereafter be described. A bracket 32 is also secured to the casing and provides a pivotal support for the lever 33. The lever 33 passes through the slot 22 in the valve stem 20, and has a number of perforations 34 in the longer extended end just as the beam 30 has perforations 35. A link 36 connects the levers 30 and 33 by means of pins inserted through the bifurcated ends of said link and through either of the perforations, as at 37, 37'.

It will be observed that when the extended end of the beam 30 is depressed, as by the weight 31, the valve 19 is thereby closed, and that the vertically movable piston 24 is raised and valve 19 again opened when the pressure within that part of the casing with

which pipe 15 communicates is sufficient to overpower the weight, the position of the weight 31 on the beam 30 therefore controlling the pressure necessary to raise the weight.

In Fig. 4 we have marked corresponding parts with exponent prime (′). In Fig. 4 there is a spring 31′ which is a substantial equivalent of the weight 31 and an adjusting screw 31^a is a means for varying the tension of the spring which accomplishes substantially the same result as moving the weight 31 in and out along the beam 30. A screw cap 38 is centrally threaded for the screw 31^a and makes threaded engagement with the casing 10′ as at 39. It is hollow for a movable follower 40. The follower is bored to provide a guide for the valve stem 20′ and it is provided with a projection, 41, of smaller diameter, as a means for holding the spring 31′ in place. The follower is moved inwardly by the screw 31^a to increase the tension of the spring and is permitted to move outwardly to decrease the tension thereof. A check nut 42 holds the screw in adjusted position. A screw cap 43′ permits access to the interior of the casing.

The use and operation of the device is as follows: In the schematic arrangement, shown in Fig. 3, the tanks are connected by pipes 15, 15^a and 15^b respectively, and by-pass pipes 16, 16^a and 16^b respectively are connected to the next adjacent valve, and to the return pipe, as the case may be. In the practice of the invention hydraulic jacks, or other motors may be connected to the tanks A, B, and C respectively, and each such motor may be used independently. Each valve may be adjusted by moving the weight 31 along the beam 30, or the spring tension of the spring 31′ may be varied by the screw 31^a, so that a given pressure will be independently maintained in each of the tanks. Assuming, for illustration, that the tanks are to carry a pressure of 200 pounds, and that the discharge of a liquid pump be connected to pipe 12 and pipe 16^b be returned to the intake of the pump (if economy in the use of fluid is not desired, as in the use of water or air as the medium, then the pipe 16^b need not be returned to the pump, but it may end, as shown in Fig. 3) then the operation will be as follows: Normally the valves 19 are closed by the weights, or springs as the case may be, the pressure upon the valve also tending to hold it closed. When the pump begins to force the fluid medium through pipe 12 the check valve 17 of the first regulating valve (of tank A the others being shut off by valve 19) will open, as shown in dotted lines in Fig. 1, and permit flow of fluid into tank A and will close with each reciprocation of the pump, as usual with such valves. Fluid will continue to flow into tank A until the pressure therein has attained the predetermined value, say 200 pounds, then piston 24 will be forced outwardly against the resistance of weight 31 or spring 31′, such movement of the piston serving to open the associate valve 19 and permit fluid to flow into pipe 16 and from thence into the next adjacent tank B, through the check valve 17 of that regulating valve. In turn the valve 19 of tank B will be opened and tank C will be charged in a similar manner. When valve 19 of tank C has been opened, in the manner described, then all three of the tanks are fully charged and the pump will continue to operate through the open passageway established by opening of the several valves 19. As the passage is open the pump will be doing practically little work, each tank automatically shutting off the resistance pressure from the pump.

Should the pressure in any of the tanks fall below that at which the controlling valves are set, to maintain the respective pressures, valve 19 will be again closed by operation of weight 31, or spring 31′ in moving the piston 24 in the opposite direction thereby permitting more of the pressure medium to be pumped into the tank the pressure of which has been reduced.

Great economy of power is effected by the use of our controlling valves in removing the resisting pressure from the pump as soon as the desired compression has been reached in the tanks, and thereby also increasing the capacity of the pump.

Of course it is obvious that the medium may be fluid, such as air, gas, or the like, or a liquid such as water, oil, or the like.

While we have herein fully described a specific embodiment of our invention of the preferred form, it is obvious that many changes may be made therein within the scope of the claims, without departing from the spirit of our invention.

What we claim is;

1. In a valve of the class described, a casing having two chambers, each chamber having an outlet pipe opening, and one of said chambers having an inlet pipe opening, a check valve between said two chambers opening from said inlet opening into one of said chambers, a positively operating valve in the other chamber closing said chamber from its outlet pipe opening, pressure responsive means affected by pressure in the check-valve chamber and mechanical connections between said pressure-responsive means and the positively operating valve for opening and closing said positively operating valve by said pressure-responsive means.

2. In a valve of the class described, a casing having an inlet pipe opening and two chambers each provided with an outlet pipe opening, a check valve between the

two chambers opening with the initial pressure into one of the chambers, and a positively operating valve in the other chamber, closable with the pressure to close communication between said inlet pipe opening and said outlet pipe opening of said chamber, and a yielding piston in the check valve chamber, adapted and arranged to control said positive valve in the other chamber.

3. In a device of the character described, a casing having two chambers separated by a check valve, each of said chambers having an outlet pipe-opening, and one of said chambers having an inlet pipe-opening, opening directly thereinto, a pressure responsive piston in the check valve chamber and a spring impelled valve in the other chamber adapted to close communication between said inlet pipe-opening and said outlet pipe-opening of said latter chamber.

4. In a device of the character described, a casing providing two outlet chambers and an inlet opening to one thereof, a valve for controlling discharge from one of said chambers, a pressure-moved part associated with the other chamber, yielding means to hold said valve in closed position, connections between said pressure-moved part and valve to open said valve against the effect of said yielding means, and a check valve in the chamber with which said pressure moved part is associated.

5. In a device of the character described, a casing providing two outlet chambers and an inlet opening to one thereof, a valve controlling discharge from one of said chambers, a pressure-moved part associated with the other chamber, yielding means to hold said valve in closed position, connections between said pressure-moved part and valve to open said valve against the effect of said yielding means, means to adjust said yielding means to vary pressure required to close said valve, and a check-valve in the chamber with which said pressure-moved part is associated.

6. In a valve of the character described, the combination with two chambers separated by a check-valve of a piston in one thereof, an outlet valve in the other thereof, said piston and valve being connected together for movement in unison, and means normally to maintain said movable parts in one position of movement.

7. The combination of a plurality of valve structures, each having an inlet and an outlet having connection to the inlet of the next succeeding structure, a valve for each said outlet, each said structure provided with another outlet, a check valve therefor, a tank in rear of said check valve, pressure responsive means in rear of said check valve, and connections between the responsive means and the valve which leads to the next succeeding structure, for purposes described.

In testimony whereof we hereunto set our hands.

WILLIAM B. LAKEY.
GRAY STAUNTON.

In the presence of—
GEORGE D. VANDERWERP,
JOSIE VANDERWERP.