May 4, 1926. 1,582,896

J. H. BERRY

FLUID PRESSURE REGULATION

Filed Jan. 31, 1923

Fig. 1.

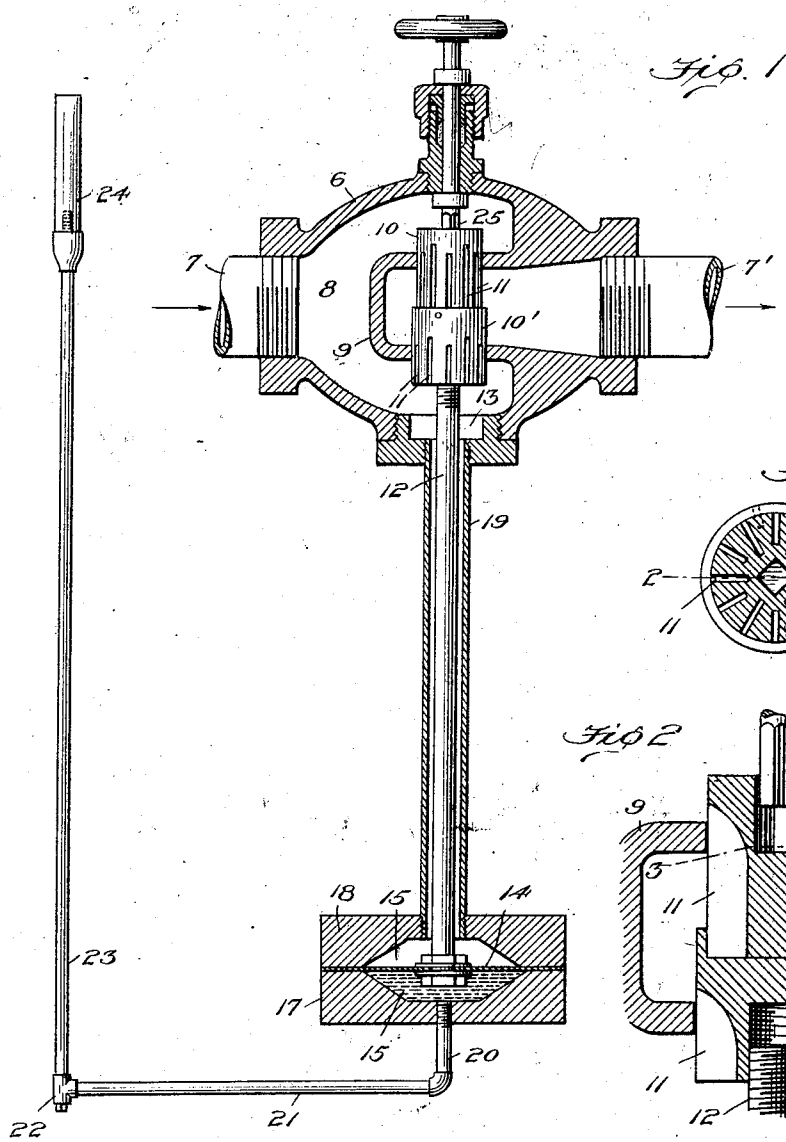


Fig. 3.

Fig 2

Inventor

Jack H. Berry

By Greene & Greene,

Attorneys

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JOEL H. BERRY, OF NORFOLK, VIRGINIA.

FLUID-PRESSURE REGULATION.

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To all whom it may concern:

Be it known that I, JOEL H. BERRY, a citizen of the United States, and resident of Norfolk, in the county of Norfolk and State of Virginia, have invented certain new and useful Improvements in Fluid-Pressure Regulation, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to regulating the pressure of liquid or gaseous fluid through pressure controlling devices which are themselves governed automatically and with almost perfect accuracy by the novel devices herein set forth.

I have selected for illustration apparatus suitable for accurately holding boiler pressure at a predetermined degree by regulating the flow of steam to intermediate devices, for example forced draft mechanism of known character. In fact, the invention has been used largely and with perfect satisfaction for this specific purpose.

In this selected apparatus, the steam pressure acts upon a flexible diaphragm which by its movement varies the height of a column of mercury and so quickly actuates the intermediate pressure changing mechanism, it being evident that the movement of the mercury and of the diaphragm are practically without friction or material wear.

In the largely diagrammatic drawings,

Figure 1 shows in axial section a valve and immediate connections embodying my invention.

Figure 2 is a section of a valve cylinder member, the plane of section being axial.

Figure 3 is a section on the line 3—3, Fig. 2.

In these figures, 6 represents a valve casing interposed in a steam pipe 7, 7′ where constant pressure is desired, the pipe segment 7 opening into a chamber 8 in the casing, into which chamber projects, from the opposite side a terminally closed cup 9, integral with the casing 6, and having its open end in free communication with the pipe segment 7′. A cylindrical valve member 10, 10′ fits and slides transversely through the cup 9 in a suitable way, and has in its end portions deep slots or grooves 11 putting the chamber 8 and the interior of the cup in communication, the permitted passage of fluid in either direction varying as the cylinder is raised or lowered, the device acting under some conditions as a reducing valve. A rod 12 is threaded into the lower part of the cylinder and extends downward through the lower wall of the casing, and at some distance from the latter has its lower end attached centrally to a broad flexible diaphragm 14 which divides into two parts a broad chamber 15 formed in a two part block, the parts of which are numbered 18, 17, respectively. A pipe 19 is fixed in the lower wall of the casing and the middle of the block 18, its interior or bore being a continuation of a passage 13 in the casing and having the smaller rod 12 in its axis, the chamber 8 being thus in free communication with the space above the diaphragm. From the closed space below the diaphragm, lead pipes 20, 21 detachably connected at 22 with a vertical pipe 23 of predetermined or adjustable length detachably connected above with a short replaceable pipe segment 24 of different internal diameter. The lower part of the chamber 15, the pipes 20, 21, 23, and the lower part of the segment 24 are filled with mercury. If any fluid in the chamber 8 be under pressure, the mercury adjusts itself to balance that pressure and is motionless so long as that pressure is unchanged, and if the mercury column has a length just balancing the desired pressure, the diaphragm will be plane so long as that pressure is unchanged. If that pressure varies, the diaphragm is flexed and the mercury rises or falls.

Obviously, the flexing of the diaphragm raises or lowers the slotted cylindrical valve member, and the fluid allowed to pass in the slots from the chamber 8 into the cup and then out through the pipe 7′ is increased, while contrary flexing of the diaphragm has a contrary effect. The fluid or any of the moving parts may actuate the means first mentioned as common in controlling pressure.

This apparatus has the advantage that the diaphragm and the mercury are practically without friction and unchangeable in use, and the control devices are as sensitive as may be desired, for if the passage in the upper segment of the vertical pipe is very small, but not capillary, a slight variation in pressure and a correspondingly slight movement of the diaphragm will quickly and greatly increase the height of the mercury column and its resulting pressure. If the pipe segment be large, slight variations in pressure in the chamber 8 vary the mercury column slightly

and slowly, so that slight changes in pressure are without practical effect. It is plain that the vertical segment may be changed at will to change the sensitiveness of the devices.

It is sometimes desired to change the primary adjustment of the cylindrical valve member and the normal flow through the valve, and for this purpose a manually rotatable rod 25 passes into the casing and loosely but non-revolubly engages that member, so that rotating the rod raises or lowers that member, changing the effective opening of the slots in the member, because the member is screwed upwardly or downwardly upon the rod 12.

What I claim is:

1. The combination with a chamber for containing fluid under a predetermined normal pressure and a balanced cylindrical valve member having in its periphery a plurality of channels terminated at varying distances from one end of said cylinder controlling the passage of fluid from the chamber and having an axial extension of a mercury column arranged for rising and falling in a conduit and for balancing said pressure, and a flexible diaphragm directly attached to said axial extension separating said fluid from the mercury.

2. The combination with a chamber for containing fluid under pressure and a balanced cylindrical valve member having a plurality of deep peripheral channels controlling the escape of fluid from the chamber, of a column of mercury arranged by pressure directly applied to an extension of said valve to balance automatically varying pressure in the chamber, a flexible diaphragm separating the fluid from the mercury, and means for at will adjusting the valve for desired pressure and flow of the fluid.

3. The combination with a chamber for fluid under pressure and a valve therein governing the flow of fluid through the chamber and having an axial rod, of a flexible diaphragm directly attached to said rod having one side constantly pressed by said fluid, a mercury column of variable height acting against the opposite side of the diaphragm and normally balancing said pressure, and means whereby variation in the pressure of said fluid on the diaphragm varies the position of the valve.

4. The combination with a conduit for fluid under pressure, of a valve interposed therein and having in one end of its casing a chamber into which one part of the conduit opens and in the other end a cup primarily closed inwardly projecting into said chamber and outwardly in open communication with the other portion of the conduit, a transverse valve member fitting and slidable in a way through the cup and having in its periphery an upper and lower series of deep radially open channels terminating at varying distances from one end of said valve member leading from said chamber into tne cup, and means whereby change in pressure in the chamber varies the effectively exposed portions of said channels.

5. The combination with a chamber for fluid under a predetermined normal pressure, of a second chamber divided by a flexible diaphragm and having one of its divisional parts in free communication with said chamber first mentioned, a mercury column acting on the opposite side of said diaphragm to balance said normal pressure, and means whereby variation in the normal pressure and the consequent moving of the diaphragm governs discharge of fluid through said chamber.

In testimony whereof I hereunto affix my signature.

JOEL H. BERRY.