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GOVERNOR VALVE.

APPLICATION FILED JAN. 2, 1920. RENEWED DEC. 7, 1921.

1,406,015.

Patented Feb. 7, 1922.

2 SHEETS—SHEET 1.

FIG. 1.

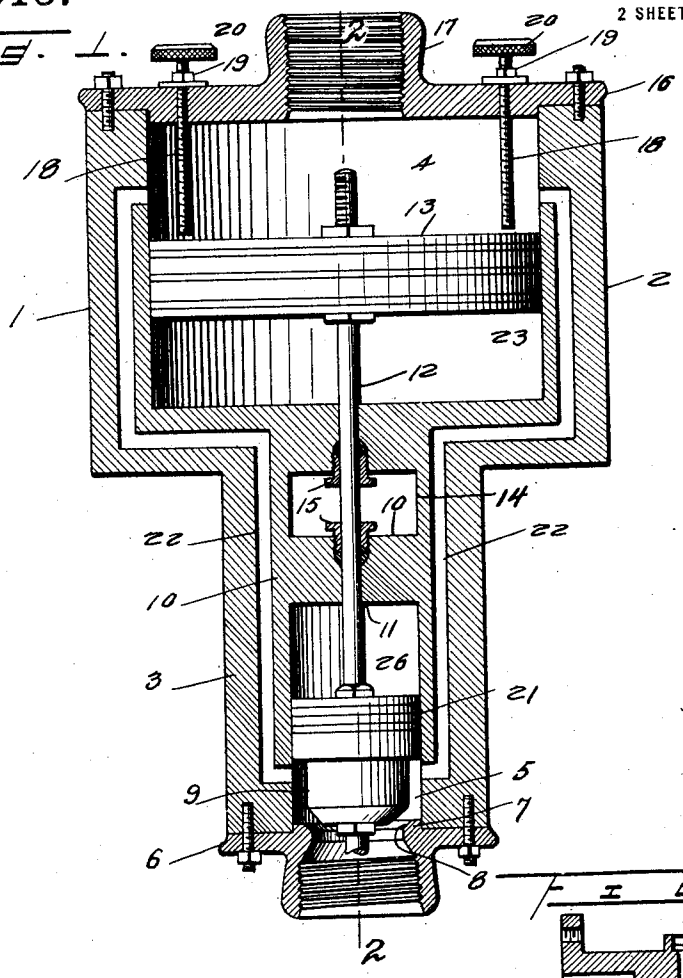


FIG. 4.

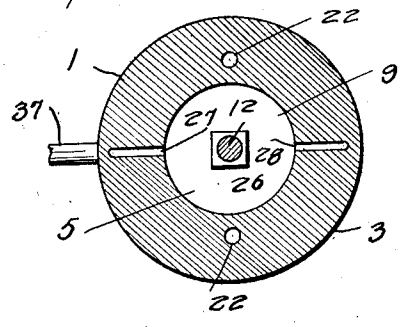
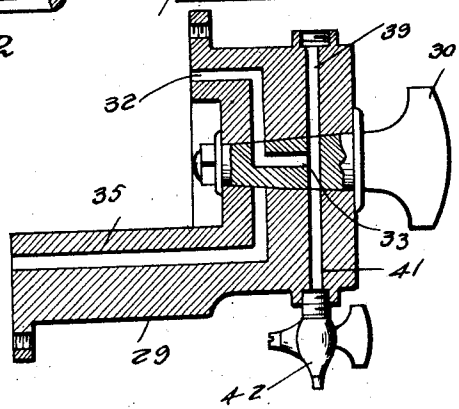


FIG. 5.



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2 SHEETS—SHEET 2.

FIG. 2.

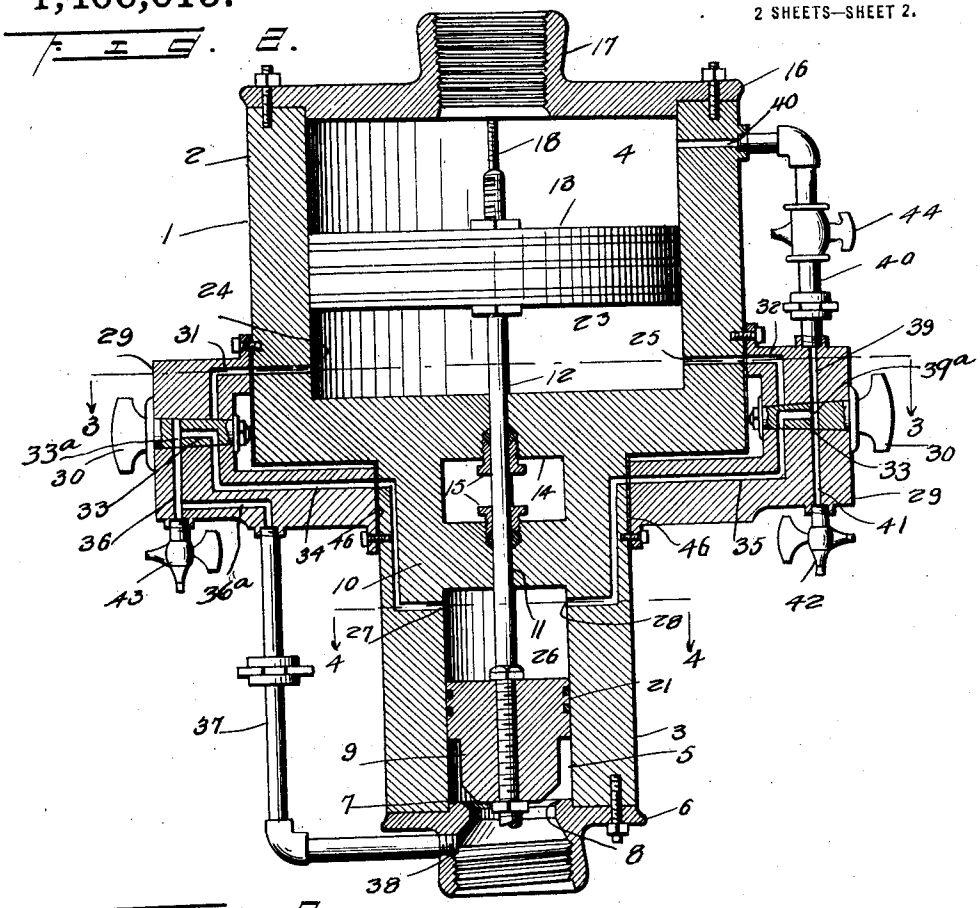
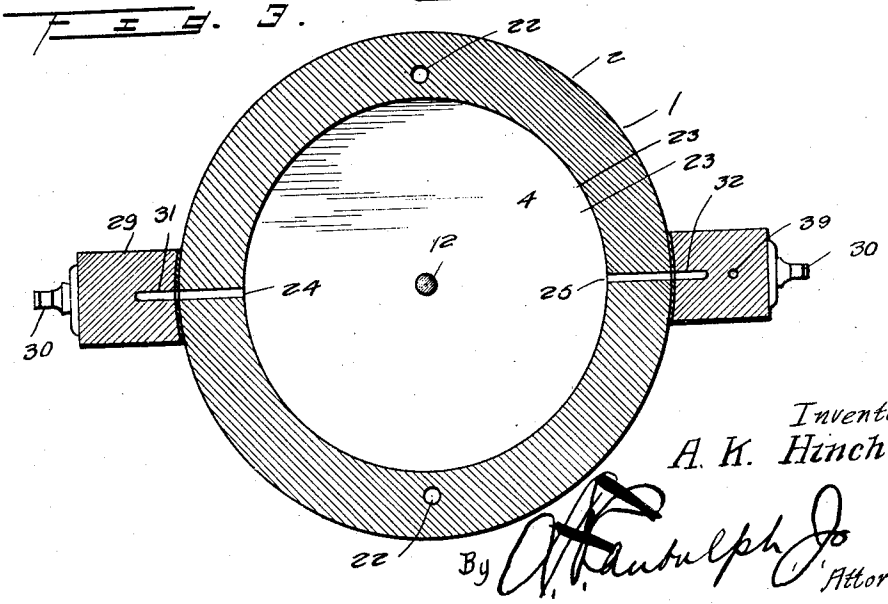


FIG. 3.



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UNITED STATES PATENT OFFICE.

ALVA K. HINCHMAN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-FOURTH TO CHARLES H. MORTON AND ONE-FOURTH TO CHARLES H. QUIMBY, BOTH OF PHILADELPHIA, PENNSYLVANIA.

GOVERNOR VALVE.

1,406,015. Specification of Letters Patent. **Patented Feb. 7, 1922.**

Application filed January 2, 1920, Serial No. 348,890. Renewed December 7, 1921. Serial No. 520,718.

To all whom it may concern:

Be it known that I, ALVA K. HINCHMAN, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Governor Valves; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates to fluid pressure regulators and has for an object to provide a regulator in the nature of a governor and valve for regulating and controlling the pressure of a fluid from its source of supply to the place of its disposition or use.

Among other features the invention comprehends a governor and reducing valve which primarily provides for reducing the pressure of the fluid from the source of supply so that it can be conveniently adapted to an engine system or some form of motive power at a reduced pressure which is of a pre-determined nature.

Further the invention comprehends an apparatus which will govern the flow of the fluid at a pre-determined pressure.

As an instance of the use of the invention, the same may be adapted to the operation of a turbine which is to be operated by a fluid having a pressure less than the pressure of the fluid in the boiler or other source of supply and to this end the apparatus will reduce the pressure of the fluid before it enters the turbine and maintain the fluid at this reduced pressure so that the supply of the fluid at a reduced pressure to the turbine will be maintained constant.

With the above objects in view the reduction in pressure assured by the apparatus together with the governing action whereby a constant pressure of the fluid is supplied, is brought about without the use of springs or other resilient mechanical elements which, because of the very nature of their construction and their use in connection with fluids such as steam and the like, are subject to variation and cannot accurately bring about the reduction of a fluid to a pre-determined pressure and maintain the fluid at the reduced pressure. In my invention I accomplish the above results by means of an apparatus in which the various moving parts are positive and direct in their nature and in which the very fluid itself, is the resilient force which in combination with the valve and piston structure enables me to accurately and constantly maintain and supply to a power medium, a fluid pressure which will be less than the pressure of the fluid at the source of supply and which will be a constant factor, governed in this manner by the very nature and operation of the power or other unit to which the fluid is supplied.

In the further disclosure of the invention reference is to be had to the accompanying drawings constituting a part of this specification, in which similar characters of reference denote corresponding parts in all the views, and in which—

Figure 1—is a vertical sectional view taken through the structure.

Figure 2—is a vertical sectional view taken through the structure shown in Figure 1, at right angles thereto and substantially on the line 2—2 in Figure 1.

Figure 3—is a horizontal sectional view taken substantially on the line 3—3 in Figure 2.

Figure 4—is a horizontal sectional view taken substantially on the line 4—4 in Figure 2, and

Figure 5—is an enlarged vertical sectional view of one of the by-pass units, detached.

Referring to the views and more particularly to Figure 1, I provide a casing 1, having its upper portion preferably enlarged as at 2 and the lower portion correspondingly reduced as at 3. The enlarged or upper portion 2 provides a low pressure chamber 4, while the reduced or lower portion 3 is formed to provide a high pressure chamber 5. The lower end of the portion 3 is closed by a coupling plate 6 which has connection in any suitable manner with a pipe leading from a source of fluid supply, such as a boiler or the like, (not shown). The coupling plate 6 is formed with an inner flange 7 providing a beveled seat 8 for a valve 9 correspondingly formed to provide a perfect fit with the seat 8.

The high and low pressure chambers 4 and 5, are of course separated by an intervening wall 10, integral with the casing 1, and which is formed with a vertical bore 11 for a piston stem 12, at the lower end of which is carried the valve 9 with a low pressure

piston 13 carried on the upper end of the valve stem, the said piston being of a considerably greater area and fitting the low pressure cylinder 4. The body of the reduced or restricted portion 3, including the wall 10 is formed with a chamber or opening 14 provided to permit of positioning suitable stuffing glands 15 in the bore 11 to provide suitable leak-proof joints between the high and low pressure cylinders as to the piston stem 12.

The low pressure chamber 4, in the upper portion of the enlarged part 2, is closed by a cover 16 having a coupling portion 17 for the connection therewith of a pipe leading to the point of disposition of the fluid which is received in the apparatus through the lower end at the coupling plate 6, and which through the intervening structure is reduced from its boiler pressure to a pressure convenient to the use of the fluid for the particular purpose for which it is intended. The cover 16 carries vertically disposed threaded adjusting rods 18 which extend from the exterior to the interior of the low pressure chamber 4, which rods it will be seen, will limit the upward movement of the piston 13, suitable lock nuts 19 being provided for holding the rods in their adjusted positions with suitable knurled handles or operating knobs 20 on the exterior portions of the rods. By reference to Figures 1 and 2, it will be seen that the upper portion of the valve 9 is formed to provide a high pressure piston 21, operating within the reduced or restricted portion 3 of the casing and which as will be hereinafter more fully disclosed, comprehends a balancing chamber, designated by the numeral 26. A plurality of passages 22 are formed in the body of the casing to extend from the high pressure chamber 5 to the low pressure chamber 4 and it will be apparent that the fluid entering the high pressure chamber 5, will upon operation of the valve 9 and piston 21, permit the fluid to pass into the low pressure chamber 4.

Now referring particularly to Figure 1, it will be seen that with the valve 9 normally seated upon the valve seat 8, the flow of a fluid of high pressure such as steam, to the apparatus described, will cause the valve 9, to be unseated permitting the fluid to enter the high pressure chamber 5, causing the fluid to flow on through the passages 22, by reason of the fact that the entrance of the fluid into the high pressure chamber 5 and its consequent unseating of the valve 9, will cause the piston 21 to be raised vertically, uncovering the passages 22, so that the fluid can freely pass therethrough to the upper portion of the body and enter the low pressure chamber 4. It will now be apparent that as the fluid builds up in the low pressure chamber 4, the latter having a considerably greater area than the area of the high pressure chamber 5, will bring about a downward movement of the piston rod 12 resulting in a partial or entire cutting off of the passages 22 by the piston 21 and thus it will be apparent that a reduction of the pressure of the fluid will be brought about in the low pressure chamber 4 and as the fluid now passes on to the point of consumption to operate the particular machine, turbine, heating or other pressure system, the operation of the latter will be brought about by a constant supply of the fluid maintained at a constant reduced pressure when compared with the initial pressure of the fluid as it entered the lower part of the body.

From what has been said it will be apparent that the operation of the structure described insures the controlling of the fluid from the source of supply such as the boiler, to the place of use and that when an excess of pressure is built up in the low pressure chamber 4, the piston 21 will descend to partially or entirely cut off the passages 22, reducing the supply of the steam or other fluid or entirely cutting it off, as the case may be. I come now to the means for accurately and carefully regulating the valve and governing structure to the extent that any desired reducing pressure or balancing pressure can be obtained lending to the accurate and constant operation without fluctuation of the driven member or system.

The piston 13 which is located in the low pressure chamber or cylinder 4, with the walls of the cylinder, forms an auxiliary chamber 23 which might be termed a high pressure chamber on the low pressure side of the device, being in fact formed in the upper enlarged portion 2 of the structure. This arrangement is somewhat similar to the relationship that exists between the high pressure chamber 5 and the balancing chamber 26 with the intervening piston 21. The mentioned chamber 23 is provided with an inlet port 24 and an exhaust port 25 and the balancing chamber 26 has an inlet port 27 and an exhaust port 28. Distributing units 29 are bolted or otherwise secured to the body of the device, on opposite sides thereof, and each is provided with a suitable three-way valve 30 journaled in the unit and having auxiliary passages 31, 32, the passage 31 being formed in the left hand unit, as shown in Figure 2 and the passage 32 in the right hand unit, the former communicating with the inlet 24 and the latter with the outlet 25. Each three-way valve 30 includes a passage 33 which in the operation of the valve may be brought into communication with the passage 31 on the left side of the apparatus and the passage 32 on the right side of the apparatus and the passage 33 on the left side, in the operation of the valve may also be brought into position to communicate

with a passage 34 formed in the body and leading to the balancing cylinder 26. So also the right hand unit is provided with a passage 35 communicating with the passage 28 which is the outlet passage from the balancing cylinder. A passage 36 communicates with a passage 36ª to a pipe 37 which has one end secured to the left hand unit and the other end connected to the coupling plate 6 at 38, the intake from the boiler. The passage 36 can of course also communicate with one of the passages of the three-way valve in the left hand unit, designated by the numeral 33ª. The right hand unit has a vertical passage 39 which communicates with a vertical pipe 40 connecting with a passage 40ª to the low pressure chamber 4 and the passage 39 may communicate with a cross passage 39ª in the three-way valve of the right hand unit which latter may communicate with a drain passage 41 ending in a suitable drain cock 42 secured to the lower portion of the unit, a similar drain cock 43 being arranged on the left hand unit and having communication with the passage 36. The pipe 40 may be provided with any suitable valve or stop cock such as the one indicated at 44 and in order to insure a tight fit between the units 29 and the body or casing 1, suitable gaskets 46 are provided and conveniently disposed as shown.

Recalling now that it is possible with the construction set out in Figure 1, to regulate the flow of the fluid or steam from the high pressure intake to the low pressure outlet, it will now be seen that a further controlling and regulating action can be obtained when the high pressure fluid enters through the intake at the coupling plate 6, passes into the pipe 37 and thence through the passage 36ª to the passage 36, passage 33ª and passage 33 to the passage 34 and thence through the inlet 27 to the balancing cylinder or chamber 26. This will cause depression of the piston 21 to a further degree and the products of condensation in the balancing chamber or cylinder are removed through the outlet 28, passage 35 and thence by way of the three-way valve through the passage 39 to the pipe 40 and passage 40ª into the low pressure chamber 4. So also the fluid passing through the pipe 37 and passages 36ª and 36 to the three-way valve 30 of the left hand unit, can by mainipulating the three-way valve, be directed through the passage 31 to the inlet 24 and thence on into the chamber 23 so that this pressure of fluid admitted to the chamber 23 can act to boost or balance the pressure in the chamber 4, the products of condensation in this instance, passing out through the outlet passage 25 and by way of the three-way valve through the drain cock 42 or on up through the pipe 40 to the low pressure side of the piston 13, namely into the low pressure chamber 4. It must be borne in mind that the degree of opening or closing of the three-way valves will of course regulate the amount and extent of the fluid admitted and that with the structure set out there is provided a means for reducing and controlling the flow and extent of a high pressure fluid to obtain a low pressure fluid and control the flow thereof to the particular machine, apparatus or system that is to be operated.

In many reducing valves used heretofore, various forms of resilient members such as springs and the like have been employed with suitable means for increasing or decreasing the resilient action of the springs in order that a subsequent reduction of a high pressure can be obtained. As mentioned however the springs are not unfailing and particularly in cases where they are subjected to the action of a high pressure steam, they do not last and if not closely watched and properly attended to, will bring about a fluctation and a resultant low pressure which in turn will prevent proper steady and accurate operation of the driven machine or system to which the low pressure is applied.

I am aware that various forms of reducing valves have been employed heretofore and wherein the use of steam for instance in connection with certain apparatus, permits of the steam which is admitted to operate the valve, passing to the opposite side or end of the valve and operating thereon as a compensator for controlling the supply of the steam to the valve. I aim however to not only control the supply of the high pressure steam, but to regulate its movement, reduce its pressure and bring about a situation wherein the reduced pressure of steam will be constant and can be regulated so that whether the driven power is a turbine, a heating system or a pump, the particular amount and pressure of steam which it must of necessity have to bring about its proper operation, can be supplied by a mere initial regulation of my apparatus and to such degree that the very steam itself will act as the cushioning and balancing medium to bring about a constant supply of the steam at a reduced pressure without danger of fluctuation.

Having thus described my invention, what I claim is:—

1. A governor valve for fluid engines including a casing having independent high and low pressure chambers, means establishing communication between said chambers, a valve controlling fluid pressure to the high pressure chamber and simultaneously controlling the fluid pressure to the low pressure chamber from said high pressure chamber, a piston under the influence of the pressure in the low pressure chamber for actuating the valve, said piston and valve coop-

erating with the casing in forming auxiliary high and low pressure chambers, means controlling fluid pressure to the auxiliary chambers, and means conducting the fluid pressure from said auxiliary chambers to the low pressure chamber.

2. A governor valve for fluid engines comprising a casing having high and low pressure chambers, an integral wall separating said chambers, a piston stem slidable through said wall, a combined valve and piston secured to one end of the stem and operable in the high pressure chamber, a piston secured to the other end of the stem and of a diameter greater than the diameter of the combined valve and piston and operable in the low pressure chamber, means limiting the upward movement of said piston, means establishing communication from the high pressure chamber to the low pressure chamber, and controlled by the action of the combined piston and valve, means admitting fluid pressure to the high pressure chamber and controlled by the action of the combined piston and valve, said combined piston and valve and the piston defining auxiliary high and low pressure chambers, means admitting fluid pressure to the auxiliary chambers, and means conducting the fluid pressure from the auxiliary chambers to the low pressure chamber.

3. A governor valve comprising a casing, high and low pressure chambers in said casing, a high pressure piston in the high pressure chamber, a low pressure piston in the low pressure chamber, a rod connecting said pistons to simultaneously operate the same, an inlet to the high pressure chamber, a valve in juxta-position to the high pressure piston, moving the latter with the former, passages from the high pressure chamber to the low pressure chamber and having their inlets interposed between the valve and the high pressure piston, the latter normally closing the inlets to the passages when the valve is seated to close the inlet to the high pressure chamber, and conduit means communicating with the inlet to the high pressure chamber below the valve therein and affording connection with and communication to the low pressure chamber to one side of the piston therein.

4. A governor valve comprising a casing, high and low pressure chambers in said casing, a high pressure piston in the high pressure chamber, a low pressure piston in the low pressure chamber, a rod connecting said pistons to simultaneously operate the same, an inlet to the high pressure chamber, a valve in juxta-position to the high pressure piston, moving the latter with the former, passages from the high pressure chamber to the low pressure chamber and having their inlets interposed between the valve and the high pressure piston, the latter normally closing the inlets to the passages when the valve is seated to close the inlet to the high pressure chamber, conduit means communicating with the inlet to the high pressure chamber below the valve therein and affording connection with and communication to the low pressure chamber to one side of the piston therein and valves for controlling the flow of a fluid through said conduit means to the said low pressure chamber.

5. A auxiliary valve comprising a casing, high and low pressure chambers in said casing, a main inlet to said high pressure chamber, a piston in the high pressure chamber, a piston in the low pressure chamber, a valve in juxta-position to the piston in the high pressure chamber for closing the inlet thereto, passages from the high pressure chamber to the low pressure chamber and normally closed by the piston in the high pressure chamber when the valve is seated to close the main inlet, independent auxiliary passages from the said inlet to the low pressure chamber and valves therefor, controlling the supply of a fluid from the inlet to the said low pressure chamber.

6. A governor valve comprising a casing, high and low pressure chambers in said casing, pistons, one for each of said chambers, passages from the high pressure chamber to the low pressure chamber, an inlet to the high pressure chamber, a valve co-operating with said pistons controlling the flow of fluid through said inlet to the high pressure chamber and when seated, having the piston in the high pressure chamber closing the passages of the low pressure chamber, a balancing chamber formed in the casing on the side of the piston opposite to the side thereof, forming one end of the high pressure chamber, valve controlled auxiliary passages communicating with the low pressure chamber and with the balancing chamber and a conduit connection between said inlet and said valve and auxiliary passages for supplying fluid from the inlet to the latter for the admission of the fluid to the low pressure chamber or said balancing chamber, depending upon the position of the valve.

7. A governor valve comprising a casing, high and low pressure chambers in said casing, pistons, one for each of said chambers, passages from the high pressure chamber to the low pressure chamber, an inlet to the high pressure chamber, a valve co-operating with said pistons controlling the flow of fluid through said inlet to the high pressure chamber and when seated, having the piston in the high pressure chamber closing the passages of the low pressure chamber, a balancing chamber formed in the casing on the side of the piston opposite to the side thereof, forming one end of the high pressure chamber, valve controlled

auxiliary passages communicating with the low pressure chamber and with the balancing chamber, a conduit connection between said inlet and said valve and auxiliary passages for supplying fluid from the inlet to the latter for the admission of the fluid to the low pressure chamber or said balancing chamber, depending upon the position of the valve, an auxiliary exhaust passage from the balancing chamber, an auxiliary exhaust passage from the low pressure chamber, a valve controlling said exhaust passages and a conduit connection between said last mentioned valve and the auxiliary exhaust passages for controlling the flow of the exhaust fluid to the low pressure chamber to one side of the piston therein.

In testimony whereof I affix my signature in presence of witnesses.

ALVA K. HINCHMAN.

Witnesses :

R. R. EVANS,

D. M. KNOWLTON,

R. V. JEWETT.