W. V. TURNER.

FLUID PRESSURE REGULATOR.

APPLICATION FILED FEB. 13, 1906.

953,403.

Patented Mar. 29, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

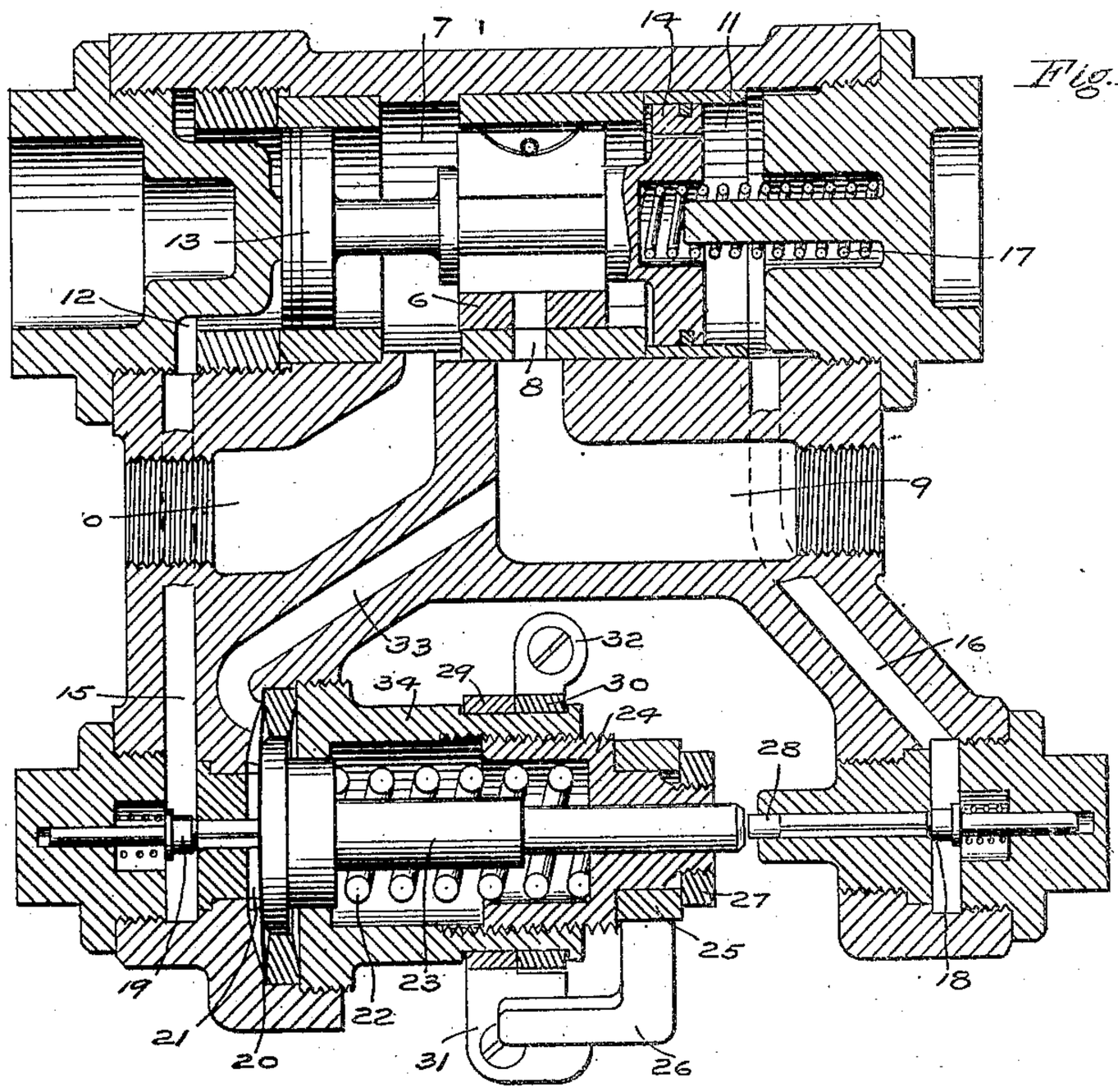


Fig. 2.

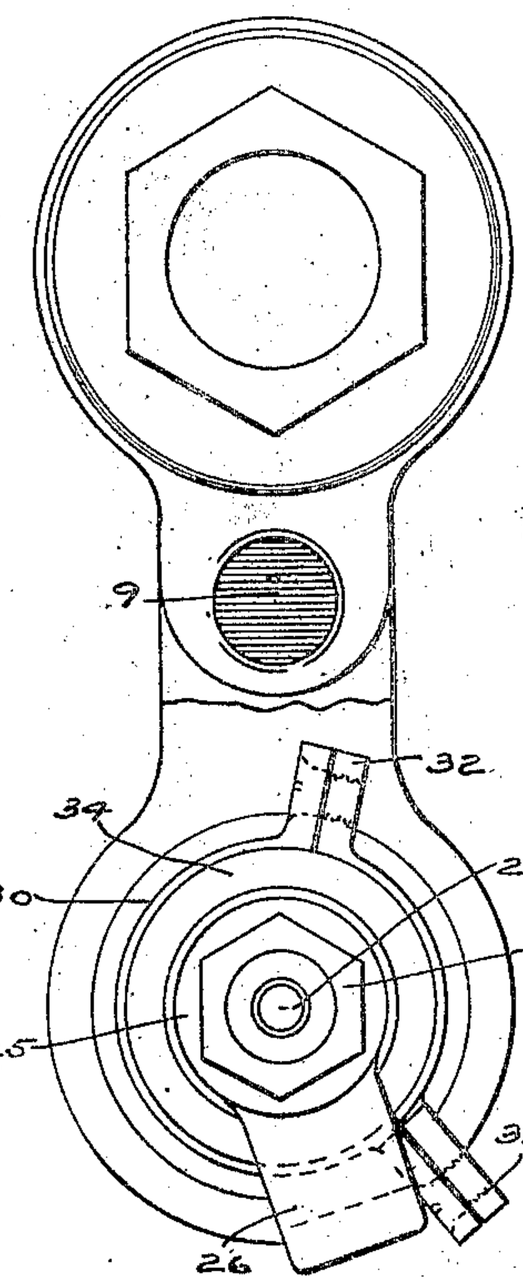
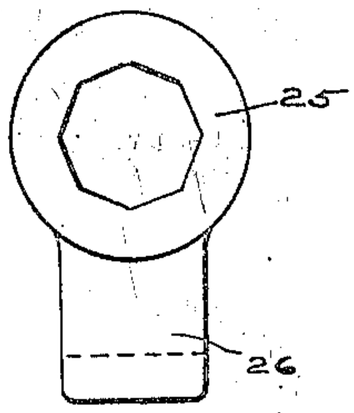


Fig. 3.



WITNESSES

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2 SHEETS—SHEET 2.

Fig. 4.

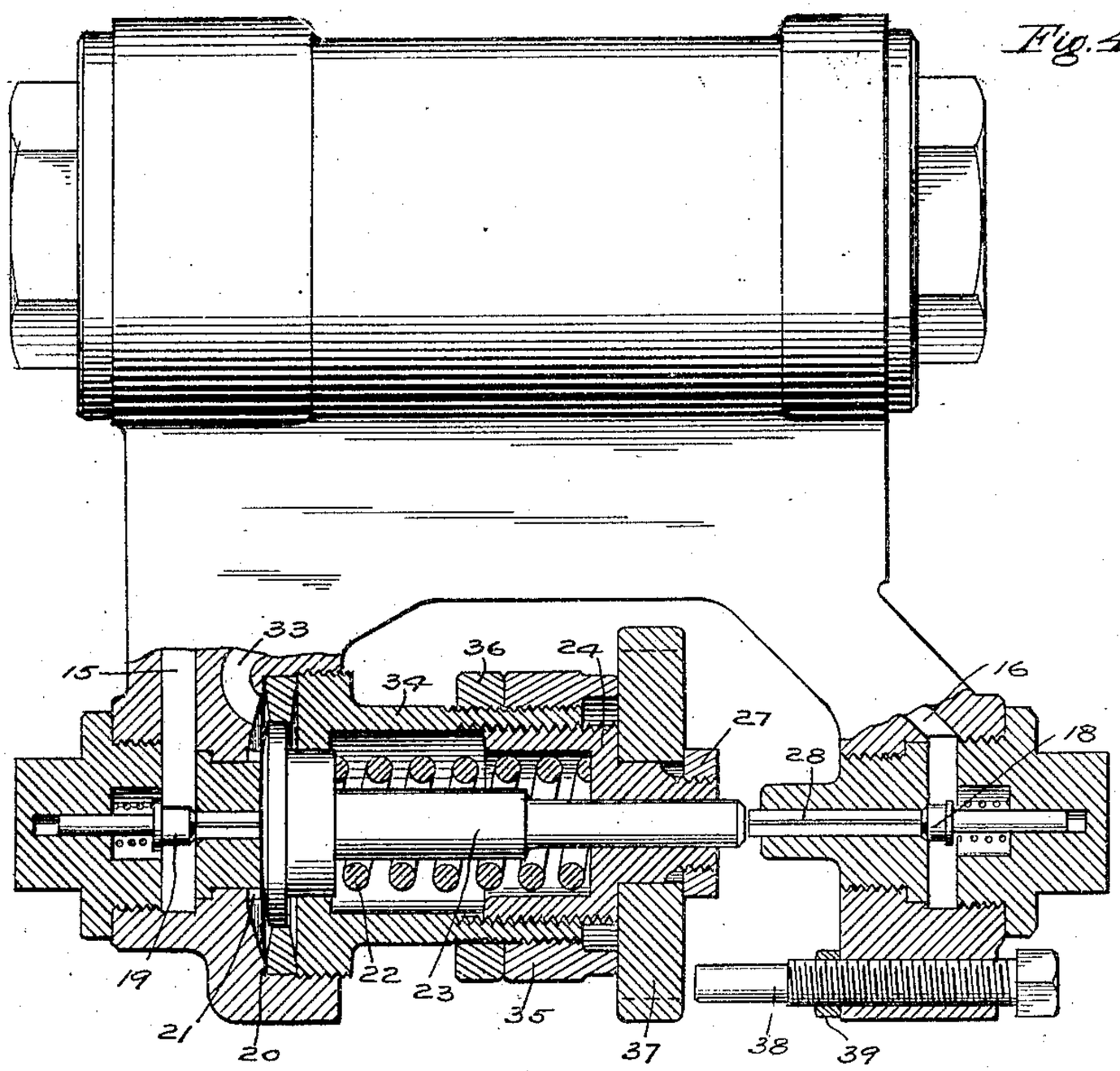
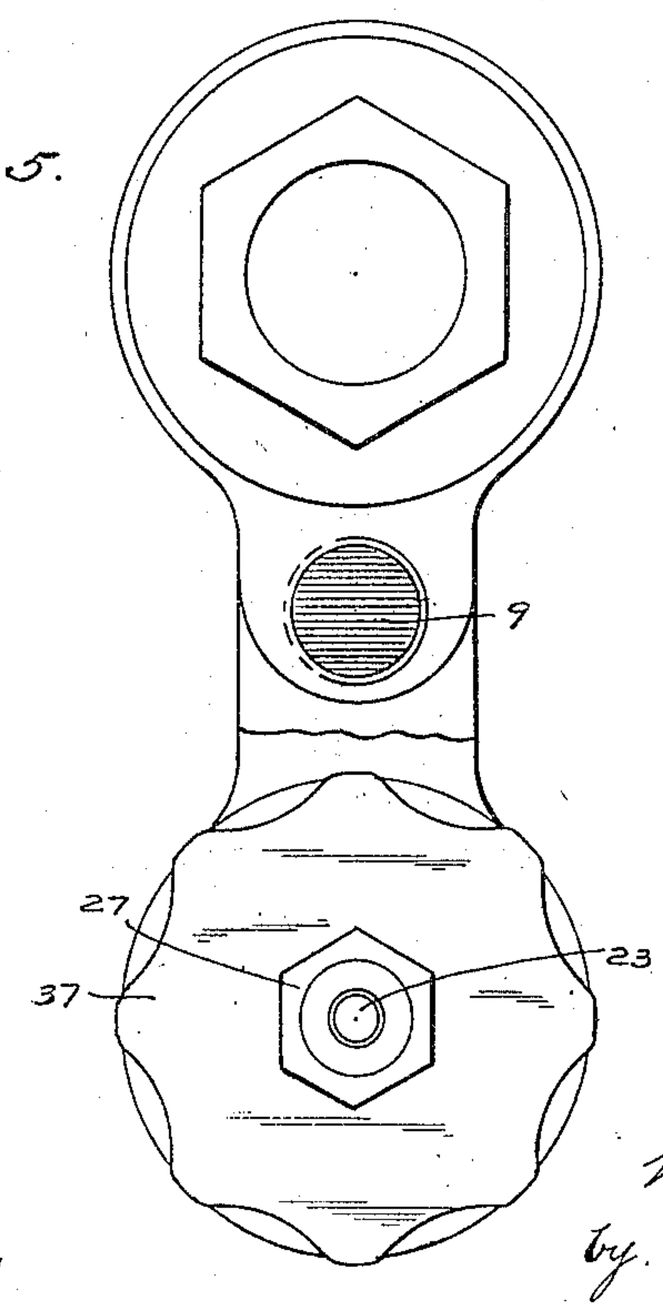


Fig. 5.



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UNITED STATES PATENT OFFICE.

WALTER V. TURNER, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO THE WESTINGHOUSE AIR BRAKE COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

FLUID-PRESSURE REGULATOR.

953,403. Specification of Letters Patent. Patented Mar. 29, 1910.

Application filed February 13, 1906. Serial No. 300,375.

To all whom it may concern:

Be it known that I, WALTER V. TURNER, a citizen of the United States, residing in Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Fluid-Pressure Regulators, of which the following is a specification.

This invention relates to fluid pressure regulators, and has for its object to provide an improved valve mechanism for controlling the supply of fluid from a source of higher pressure to a pipe or compartment in which it is desired to normally maintain the pressure constant at a predetermined lower degree.

While this improvement is adapted for general use, it is particularly designed to be employed as a feed valve device in air brake systems for limiting the degree of air pressure normally supplied from the main reservoir to the train brake pipe of the system, and comprises an improved valve mechanism adapted to more accurately regulate the pressure and to more rapidly supply or feed the train pipe pressure up to the predetermined maximum degree after a reduction has been made in the train pipe pressure and communication from the main reservoir is again opened through the feed valve to the train pipe for restoring the normal degree of pressure therein.

It has heretofore been proposed to employ a main valve operated by a piston for controlling the flow of liquid, and to govern the pressure on said piston by means of a regulating valve operated by the opposing pressures of the fluid in the low pressure compartment, or train pipe, and an adjustable spring, and the regulating valve has been designed to control the release of fluid from one side of said piston either to the compartment on the outlet side of the valve or to the atmosphere.

According to the preferred form of my present improvement, I employ a movable abutment for operating the main valve and govern the pressure upon the opposite faces of said abutment or piston heads by any suitable means, such as two regulating valves governed by the pressure on the train pipe or low pressure side of the main valve, whereby the said main valve will remain substantially fully open until the desired degree of pressure has accumulated and then close promptly, thereby rendering the action positive and giving a rapid recharge to the system.

Another feature of my improvement comprises improved means for adjusting the valve device to either one of two pressures at which it may be desired to have the system operate.

In the accompanying drawings, Figure 1. is a vertical section of a pressure regulating valve device embodying my improvements; Fig. 2 an end elevation of the same, the lower portion of the casing containing one of the regulating valves being broken away to more clearly show the spring adjusting device; Fig. 3 a detail view showing the adjusting wrench or handle; Fig. 4 a side view, partly in elevation and partly in section, showing a modified form of adjusting device; and Fig. 5 an end view of this modified structure with a part of the casing broken away.

According to the preferred construction as shown in Fig. 1, the fluid pressure regulator comprises a main valve 6, which is shown in the form of a slide valve operating in the chamber 7 and controlling the outlet port 8 communicating with the low pressure side or train pipe space 9, the valve chamber being in open communication with the high pressure source of supply or main reservoir through passage 10.

The main valve is preferably operated by a movable abutment in the form of two piston heads 13 and 14, the inner or adjacent sides of which are subject to the pressure of the valve chamber 7, while the outer or opposite faces are subjected to the pressure in chambers 12 and 11 respectively, these chambers extending by passages 15 and 16 to the respective regulating valves 19 and 18.

Any suitable means may be used for controlling the pressure in said chambers according to the variation of pressure on the outlet side of the valve device, but I prefer to employ a diaphragm 20, subject on one side to the pressure in diaphragm chamber 21, which communicates by passage 33 with the outlet pressure which it is desired to regulate, and on the opposite side to adjustable spring 22, the diaphragm being adapted

to engage the regulating valve 19 and also having a stem 23 extending out through the adjusting nut 24 and adapted to engage at certain positions with the stem 28 of regulating valve 18.

The main valve 6 is normally held in its wide open position by means of spring 17, as indicated in Fig. 1, when the pressure upon the opposite faces of the pistons is equalized. The piston heads 13 and 14 may be of the same size, but are here shown as of slightly different diameters, in order to facilitate the assembling of the parts. Fluid under pressure being supplied through inlet 10 to the valve chamber 7, it leaks around piston heads 13 and 14 to the chambers 12 and 11, and as the regulating valve 18 is closed the pressure in the chamber 11 will be equal to that in valve chamber 7. The spring 22 being adjusted to the desired degree of outlet pressure to be maintained presses on diaphragm 20 and opens regulating valve 19, so that fluid which leaks around piston 13 to chamber 12 is released or permitted to flow through chamber 21 and passage 33 to the outlet passage 9. The main valve then remains wide open and fluid flows rapidly through port 8 to the outlet 9 communicating with the compartment or pipe in which it is desired to maintain a certain maximum degree of pressure. As the pressure rises in this outlet passage, and consequently in the diaphragm chamber 21, to nearly equal that for which the spring 22 is adjusted, the diaphragm 20 is moved out against its spring thereby permitting the regulating valve 19 to close. The pressure then accumulates in chamber 12 to equal that in the valve chamber 7, but the valve 6 remains in its open position until the valve 18 begins to open. The length of the stems 23 and 28 may be such that the valve 18 is just beginning to open as the valve 19 closes, or both valves may be entirely closed at this instant and a slight increase in pressure in chamber 21 be required to open regulating valve 18. Pressure in chamber 11 is then released by venting to the atmosphere around the stem of regulating valve 18 and the predominating pressure on the opposite face of the piston acts to move the slide valve 6 to close the supply port 8.

As long as the pressure upon the outlet side and on the diaphragm remains at the desired maximum degree, there is a slight flow of compressed fluid from chamber 11 to the atmosphere, so that the greater pressure on the opposite face of the piston holds the main valve closed. As soon as the outlet pressure is diminished by leakage or otherwise, the spring 22 moves the stem 23 to permit the valve 18 to close. The pressure will then equalize around the piston 14 and the spring 17 will tend to open the main valve. Should there be any tendency of the main valve and pistons to stick and not open promptly, a very slight further movement of the diaphragm under spring 22 acts to open the regulating valve 19, causing a venting of the pressure from chamber 12 on the outer face of piston 13 and a prompt and positive opening movement of the main valve. It will be apparent, therefore, that my improved device will operate quite well without the spring 17 and that the same may be dispensed with, if desired.

By the use of the diaphragm and regulating valve mechanism for controlling the pressure upon the outer faces of the movable abutment or piston heads 13 and 14, a prompt and positive action of the main valve is insured in both its opening and closing movements.

When used as a feed valve in air brake systems, it is often desirable to adjust the spring 22 from one certain pressure to another, as for a train pipe pressure of 70 pounds per square inch in ordinary braking and 110 pounds per square inch in braking for high speed trains, and in order to define the two corresponding positions to which the nut 24 must be adjusted to give these desired pressures, I have shown a mechanism in Figs. 1, 2 and 3, comprising two friction bands 29 and 30, mounted on the casing 34 and having projections 31 and 32 respectively. The adjusting nut 24 is provided with polygonal head, preferably eight sided, to allow for small angular adjustments, on which is mounted a small wrench 25 having a bent handle 26 for engaging the projections or stops 31 and 32 on the friction bands. A nut 27 may hold the wrench in place.

The friction bands are clamped onto the casing sufficiently tight to prevent accidental displacement, but may be shifted around by tapping the projections with a hammer or other implement, to such positions as to give the desired adjustment to the spring 22 when the handle 26 is turned to engage one or the other of said projections 31 or 32 of the respective friction bands.

Other means may be devised for limiting the adjustment of nut 24 to either of two positions, as shown, for instance, in Figs. 4 and 5 of the drawings. According to this construction, the wrench is made in the form of a hand wheel 37 and is adapted to engage an adjustable stop ring 35 having lock nut 36 mounted on casing 34, and in the opposite direction may engage a stop pin 38 adjustably supported on the valve casing and having a lock nut 39. It will now be evident that the adjustable stops may be readily set in such positions as limit the adjustment of nut 24 in its extreme positions to give the desired maximum degree of pressure on the outlet side of the fluid pressure regulator for either class of service.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent is:—

1. A fluid pressure regulator comprising a main valve, a movable abutment having its faces normally subject to a constant pressure for operating said valve, and means governed by the fluid on the outlet or low pressure side for controlling the release of fluid from opposite faces of said movable abutment.

2. A fluid pressure regulator comprising main valve means, a piston normally subject on opposite sides to equal pressures for opening and a piston normally subject on opposite sides to equal pressures for closing said valve means, and mechanism governed by the outlet pressure for controlling the pressure acting on said pistons.

3. A fluid pressure regulator comprising main valve means, a piston for opening and a piston for closing said valve means, said pistons having means for normally equalizing the fluid pressure on opposite sides and regulating valve mechanism governed by the outlet pressure for controlling the release of fluid from one face of each of said pistons, to actuate said valve means.

4. A fluid pressure regulator comprising a main valve, pistons subject to fluid pressure on one of their faces for operating said valve, and regulating mechanism governed by the outlet pressure for controlling the release of fluid under pressure from the opposite faces of said pistons, to thereby actuate said main valve.

5. A fluid pressure regulator comprising a main valve, pistons subject on one side to the pressure of the valve chamber for operating said valve, means for permitting a slow leakage of fluid past said pistons, and regulating mechanism for controlling the release of fluid from the chambers on the opposite faces of said pistons.

6. A fluid pressure regulator comprising a main valve, pistons subject on one side to the pressure of the valve chamber for operating said valve, means for permitting a slow leakage of fluid past said pistons, a regulating valve for venting fluid from the opposite side of one piston to the low pressure compartment, another regulating valve for venting fluid from the opposite side of the other piston to the atmosphere, and means governed by the outlet pressure for actuating the regulating valves.

7. In a fluid pressure regulator, the combination with a main valve and movable abutment for operating the same, of a regulating valve for controlling the pressure on one face of said abutment, another regulating valve for controlling the pressure on an opposite face of said abutment, and a diaphragm subject to the outlet pressure for actuating said regulating valves.

8. A fluid pressure regulator comprising a main slide valve normally held to its seat by the inlet pressure, a movable abutment subject to the inlet pressure for operating said slide valve, and regulating valve mechanism governed by the outlet pressure for controlling the release of fluid from opposite faces of said abutment.

9. A fluid pressure regulator comprising a main valve, pistons subject to the inlet pressure for operating said valve, regulating valves for controlling the release of fluid from the opposite faces of said pistons, a diaphragm subject to the outlet pressure for actuating said regulating valves, an adjustable spring, and adjustable stops for limiting the range of adjustment of said spring.

10. A fluid pressure regulator comprising a valve for controlling the flow of fluid, means subject to the fluid pressure on one side of an adjustable spring on the other for controlling the action of said valve, a casing and adjusting nut for said spring, two friction bands mounted on the casing and each having a projection or stop, and an arm carried by the adjusting nut for engaging said stops.

11. A fluid pressure regulator comprising a main valve, a movable abutment for operating said valve means tending to maintain the fluid pressure on said abutment in equilibrium, valve means governed by the outlet or low pressure for controlling the pressure on one side of said abutment to actuate the same, and additional means, operated by said pressure controlling means, for also actuating said abutment.

12. A fluid pressure regulator comprising a valve for controlling the flow of fluid, means, subject to the fluid pressure on one side and an adjustable spring on the other, for controlling the action of said valve, and adjustable stops, having a relative movement to each other, for limiting the range of adjustment of said spring.

In testimony whereof I have hereunto set my hand.

WALTER V. TURNER.

Witnesses:
R. F. Emery,
J. B. MacDonald.