(No Model.)

J. DE G. BRASSINGTON.

FLUID PRESSURE REGULATOR.

No. 561,370. Patented June 2, 1896.

FIG. 1.

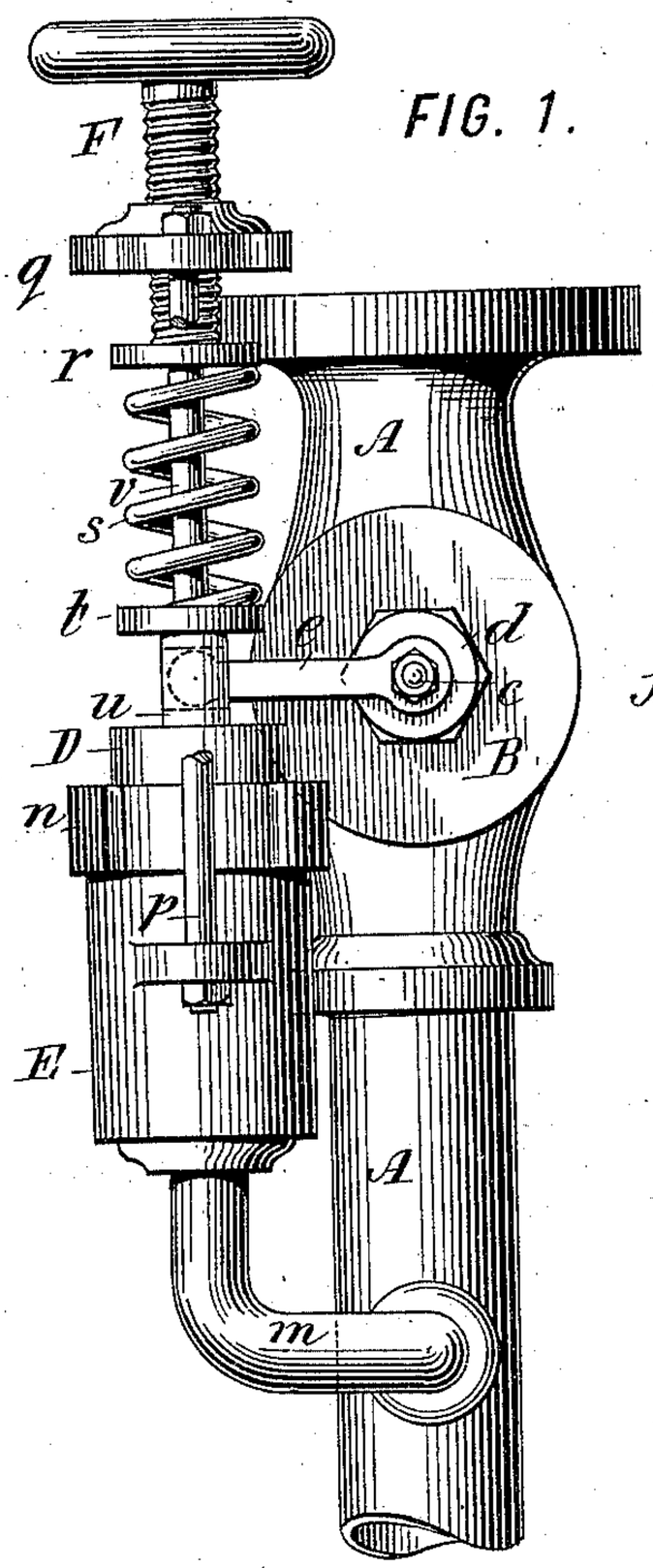


FIG. 2.

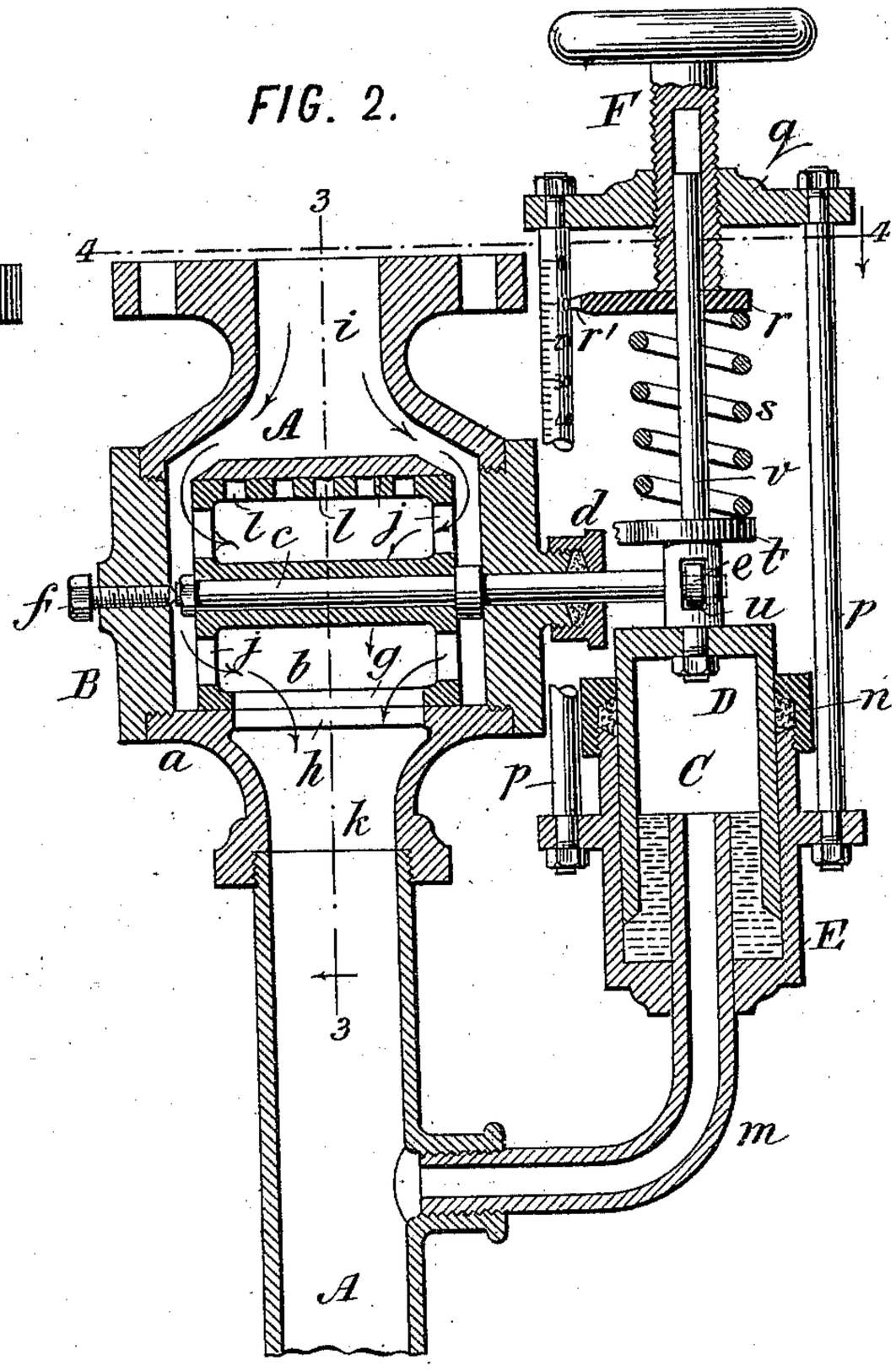


FIG. 3.

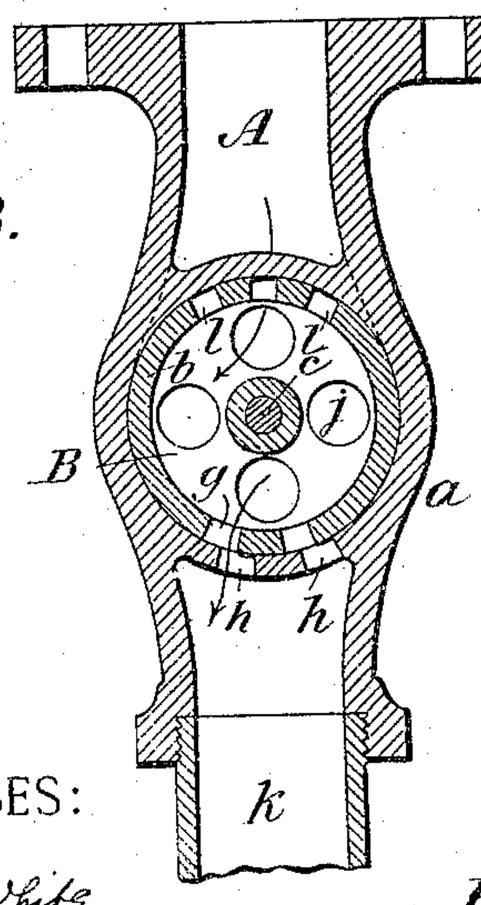


FIG. 4.

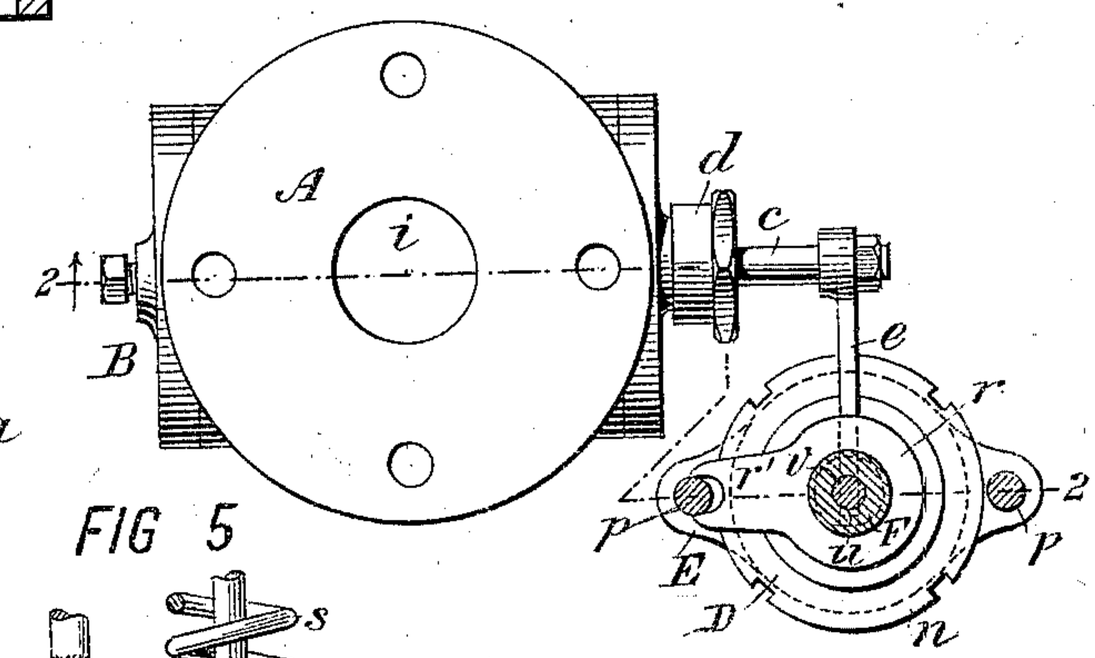
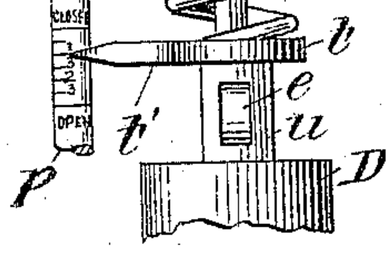


FIG 5



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JOHN DE GROAT BRASSINGTON, OF PORT RICHMOND, NEW YORK.

FLUID-PRESSURE REGULATOR.

SPECIFICATION forming part of Letters Patent No. 561,370, dated June 2, 1896.

Application filed November 24, 1894. Serial No. 529,789. (No model.)

To all whom it may concern:

Be it known that I, JOHN DE GROAT BRASSINGTON, a citizen of the United States, residing at Port Richmond, in the county of Richmond and State of New York, have invented certain new and useful Improvements in Fluid-Pressure Regulators, of which the following is a specification.

This invention relates to valves for controlling the pressure of steam, water, or other fluid in order to maintain a uniform pressure on the eduction side of the valve, independent of variations in pressure on the induction or entering side.

The nature of the invention will be understood from the accompanying drawings, wherein—

Figure 1 is a side elevation of my improved pressure-regulator, the figure being partly broken out to better show the construction. Fig. 2 is a vertical section in two planes, as denoted by the line 2 2 in Fig. 4, the figure being viewed from the left in Fig. 1. Fig. 3 is a vertical mid-section through the valve, as denoted by the line 3 3 in Fig. 2. Fig. 4 is a plan, partly in horizontal section, cut in the plane of the line 4 4 in Fig. 2. Fig. 5 is a fragmentary view, being an elevation corresponding to Fig. 2.

Let A designate a pipe or conduit through which steam or other fluid is caused to flow under any pressure. In this pipe or passage is introduced a valve B of peculiar construction. The valve B consists of a shell or casing *a*, having a cylindrical chamber in which turns an oscillatory valve *b*, which is mounted on a spindle or stem *c*, which passes out at one side of the casing through a stuffing-box *d*, and has fixed at its outer end an arm *e*, by which it may be turned or oscillated. The opposite end of the valve-spindle comes against a screw *f*, by adjusting which any wear may be taken up. The valve *b* is formed at one side, preferably the lower side, with one or more outlet-ports *g* in the nature of slots or holes, which when the valve is open register with similar ports or openings *h* in the valve shell or casing *a* beneath. The steam entering the upper part of the valve shell or casing at *i* flows down therein and passes to one or both ends of the oscillatory valve *b*, entering to the interior of this valve through openings *j* and passing out through the ports *g h* into the eduction-passage *k*. In order to balance the valve and enable it to be turned with the minimum of friction and thereby render the regulator sensitive in operation, I form the oscillatory valve *b* with balancing-openings *l l* in its side opposite the ports *g g*, in order that approximately the same area of the valve may be relieved from the steam-pressure on the upper side as it is by the presence of the ports *g* on the lower side. It results that the steam-pressure within the valve is approximately balanced on both sides and has no action tending to thrust the valve against the upper side of the casing, as would be the result if the balancing-openings *l l* were not provided; but as a perfectly-balanced valve could not be made steam-tight I so proportion the openings, as shown, as to give the balancing-openings a slightly-greater area than the outlet-ports, so as to slightly overbalance the valve and cause the steam to press it slightly downward and thereby maintain a tight closure at the outlet-ports.

The steam is ordinarily more or less throttled and consequently reduced in pressure by its passage through the valve. The eduction side *k* of the steam-passage, containing the steam at the lower pressure, communicates, through a pipe or passage *m*, with the steam-chamber C. This chamber is formed within a hollow cup-shaped piston or plunger D, working within a cylinder E, provided with a stuffing-box *n* at its upper end where the piston passes through it. The cylinder E is connected by rods *p p* or any other suitable connection with a cross-head *q*, having a threaded opening in which turns a screw-threaded pressure-regulating spindle F. This spindle has a hand wheel or disk upon its top by which to turn it and bears at its lower end against a disk or washer *r*, against which is seated a spring *s*, the lower end of which is seated against another disk or washer *t*, which rests upon a slotted block or stirrup *u*, fastened to the top of the piston D. Preferably a piston-rod or stem *v* is employed, constructed integrally with the block *u* and having its upper end entering and guided in a bore formed in the screw-spindle F.

The tension of the spring *s*, which is ad-

justed by screwing the spindle F down more or less, is exerted as a downward pressure against the piston D to resist the pressing up of this piston by the pressure of the steam in the chamber C. As the pressure in this chamber increases it forces the piston upwardly until the compression of the spring is increased sufficiently to reach an equilibrium, and in case the steam-pressure falls a corresponding downward movement of the piston results under the tension of the spring. These movements are communicated to the valve *b* through the medium of the crank-arm *e*, the end of which is received in the slotted block or stirrup *u*, which thereby forms a sort of pivotal connection with the arm. This construction is deemed preferable, although any other mechanical means of connecting these parts may be substituted as an equivalent.

The operation may now be understood. Assume the valve to be set by the proper adjustment of the spindle F to deliver steam on the eduction side at a uniform pressure of, for example, thirty pounds per square inch. If the initial pressure of the steam be, for example, fifty pounds, then with a given rate of consumption of steam the regulator will have adjusted itself so that the valve will throttle the flow of steam just sufficiently to reduce its pressure from fifty pounds to thirty pounds. If, however, the initial pressure should be increased, while the rate of consumption of steam should be diminished, the pressure on the eduction side of the valve will be raised and the increased pressure entering the chamber C will force the piston D upward, thereby oscillating the valve *b* in the direction tending to close communication through the ports *g h*, and consequently further obstructing or throttling the flow of steam, and consequently reducing the pressure on the eduction side, and also in the chamber C, until by its reduction of pressure an equilibrium is reached between the upward pressure of the steam and the downward pressure or tension of the spring, whereupon the movement will cease. In case of any decrease of pressure on the eduction side the contrary operation will take place—that is, the pressure of the spring, being superior to the diminished pressure of the steam in the chamber C, will force the piston downward and oscillate the valve in the contrary direction, thereby further opening the ports and affording a more free passage for the steam.

My improved pressure-regulator affords a very simple and practical means for effecting the regulation of the pressure of steam and other fluids to secure uniformity of pressure. It has the advantage that the valve is perfectly balanced, and the moving parts are constructed to operate with the minimum of friction, so that the movements are very sensitive, and the regulator consequently acts promptly to correct any variation in pressure. At the same time a large area of valve-opening is secured. The regulating-spring *s*, on the uniformity of the tension of which the operation of any pressure-regulator depends, is not inclosed in a casing, as has so often heretofore been done, whereby it is heated and has its temper affected, but is mounted freely in the open air, so that any heat is rapidly radiated and no appreciable heating of the spring results.

An important feature of my invention is the means whereby I am enabled to use a cupped piston or plunger D and maintain it steam-tight with a packing so loose and open as to permit of free movement of the piston. The stuffing-box *n* does not require to be steam-tight, but only water-tight, since the bottom of the cupped piston D is sealed in water, due to the pipe *m* being extended up within the cylinder E above the bottom edge of the piston, even when the latter is in its highest position. Hence the water of condensation from the steam quickly fills the chamber C up to the level of the pipe, as shown in Fig. 2, so that the lower portion of the piston is constantly immersed in water, and it is this water alone which can leak around the piston to the stuffing-box *n*, which, being water-tight, prevents its escape. It is well known that a stuffing-box may work much more freely and with less friction if it is merely water-tight than if it is steam-tight under a like pressure.

Another important feature of my invention is the simple construction by means of which an index is afforded of the pressure to which the regulator is set. The plate or washer *r* is prolonged at one side to form an arm or pointer *r'* and is brought to a point or index where it engages with one of the upright rods *p*, this rod being graduated with a scale corresponding with the pressures to which the steam will be regulated with different adjustments of the controlling screw-spindle F. Such a scale is shown marked on the left-hand rod in Fig. 2.

Another feature consists of means for indicating on the exterior the extent to which the valve is open. This feature is shown in Fig. 5. The same rod *p* somewhat lower down is marked with a scale, such as shown in Fig. 5, indicating the closed and open positions and any desired intermediate positions of the valve. Against this scale travels a pointer or index *t'*, formed as a continuation of the plate or washer *t* by a construction exactly similar to that by which the upper pointer is formed. This lower pointer, however, travels with the piston D, and hence has a movement exactly corresponding to the movement of the valve. This scale is chiefly useful in enabling the operator to determine whether the regulator responds to adjustments of the spindle F designed to vary the eduction-pressure. For example, on screwing down the regulating-spindle F the pressure shown on a steam-gage communicating with the eduction side of the valve should rise with the steam-pres-

sure, as indicated by the pointer r' on the scale. If it fails to do so, then the operator should examine the lower pointer, and if he finds that the valve is already fully open he may know that it is useless to further screw down the spindle, for either the initial pressure of steam is too low or the consumption of steam is too great to render it possible to reach as high a pressure on the eduction side as that for which he is attempting to adjust the regulator. This lower scale also will indicate whether the valve is working freely or has become clogged or stuck in its casing, as may possibly occur with any regulator.

I claim as my invention the following-defined novel features, substantially as hereinbefore specified, namely:

1. The combination with a controlling-piston, of an oscillatory valve comprising a cylindrical casing with steam admission at its end and a side outlet-port, and a hollow cylindrical valve mechanically connected to said piston to be oscillated thereby, open at its end to receive steam into its interior, having a port on one side communicating with said outlet-port, and a balancing-opening of approximately equal area on the opposite side in communication with the imperforate wall of the casing, to substantially the effect specified.

2. The combination with a controlling-piston, of an oscillatory valve comprising a cylindrical casing with steam admission at its end and a side outlet-port, and a hollow cylindrical valve mechanically connected to said piston to be oscillated thereby, open at its end to receive steam into its interior, having a port on one side communicating with said outlet-port, and a balancing-opening of approximately equal area on the opposite side in communication with the imperforate wall of the casing, proportioned as specified so that the steam by pressing through said opening against the casing and against the opposite side of the valve acts to maintain a tight closure at the outlet-port.

3. In a steam-pressure regulator, the combination with a valve, of a cylinder E having an open upper end and communicating on its interior with the eduction side of the valve, ports p connected to said cylinder, a cross-head q connected to said ports opposite the open end of said cylinder, a cupped piston D working in said cylinder and having a closed upper end projecting beyond the open end of the latter, a water seal in said cylinder for immersing the lower part of the piston, and a stuffing-box applied to said cylinder embracing the exterior of the cup where the latter passes out of the cylinder, having a packing material, and adjustable to compress the packing material against the cup, whereby the water seal intervenes between the steam and the stuffing-box, and the latter requires only close enough adjustment to be watertight instead of requiring to be steam-tight, a stem fixed to the closed end of said piston and guided by said cross-head, an arm engaging said stem, moved thereby, and connected to said valve to move it, and a spring surrounding said stem beyond said arm and reacting against said cross-head and said stem to resist outward movement of the piston, substantially as and for the purpose set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JOHN DE GROAT BRASSINGTON.

Witnesses:
GEORGE H. FRASER,
THOMAS F. WALLACE.