J. F. BENNETT.

Fluid Pressure Regulator.

No. 209,602. Patented Nov. 5, 1878.

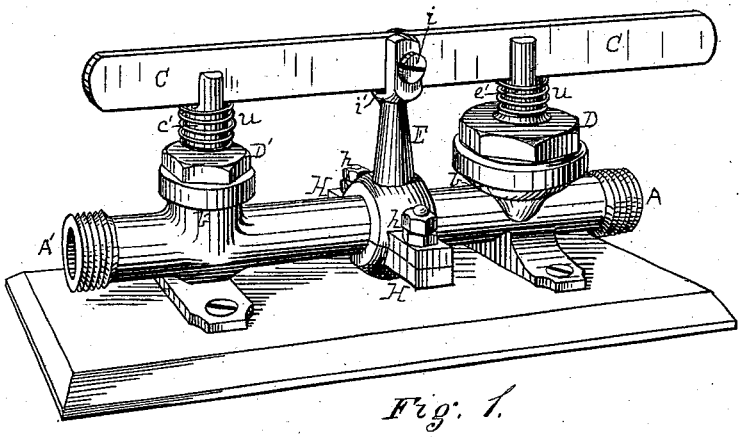

Fig. 1.

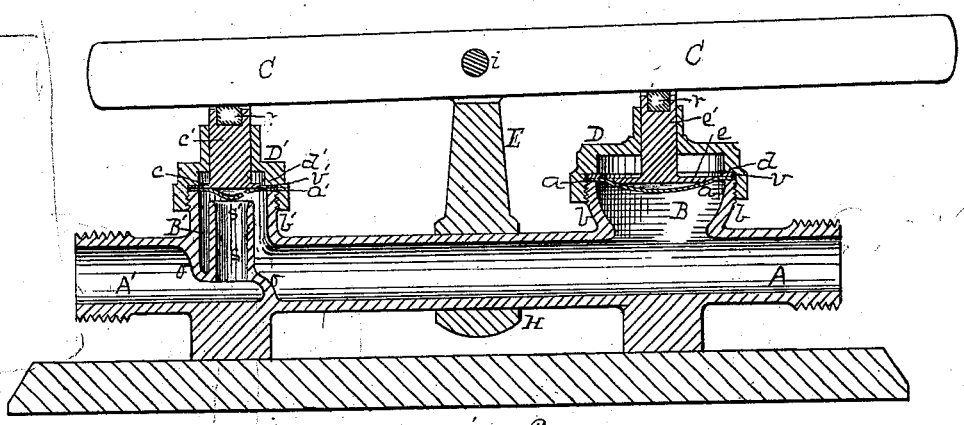

Fig. 2.

Witnesses
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JOHN F. BENNETT, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN FLUID-PRESSURE REGULATORS.

Specification forming part of Letters Patent No. **209,602**, dated November 5, 1878; application filed August 28, 1878.

To all whom it may concern:

Be it known that I, JOHN F. BENNETT, of Pittsburg, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Apparatus for Regulating Pressure of Fluids in Pipes; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawing, making a part of this specification, in which—like letters indicating like parts—

Figure 1 is a perspective view of my improved device for regulating pressure, and Fig. 2 is a vertical central section of the same.

My invention relates to certain improvements in apparatus for regulating pressure in water or gas pipes.

In the drawing, A A′ represents a section of water or gas pipe. At some convenient point on this pipe, toward the outflow or service end A, I make a chamber, B, opening into or communicating with the interior of the pipe, so that the contents of the pipe may flow or pass into the chamber. This chamber is bounded by a circular rim or shell, *b*, formed on the pipe, and by a screw-cap, D, which closes it from above. A flexible diaphragm, *a*, made of rubber or any suitable material, is arranged across this chamber, and is held between the top edge of the shell *b* and a flange or shoulder, *d*, on the inside of the screw-cap D, a collar or washer, *v*, being interposed between the diaphragm and the flange *d* to protect the diaphragm. A follower having an enlarged head or disk, *e*, rests on the upper side of the diaphragm, and the stem *e′* of the follower extends up through a suitable opening in the cap D and clasps the beam C, an open slot being made in the top of the stem, in which the beam loosely rests, as shown in Fig. 1. The follower is thus free to be moved vertically by an increase of pressure on the under side of the diaphragm *a*, and being guided by the stem *e′*, it will, through the stem, impart motion to the beam C.

At some point toward the inflow end A′ of the pipe—say six or eight inches, more or less, from the chamber B—I make another chamber, B′, opening to the interior of the pipe, but preferably smaller in area than the chamber B. This chamber is bounded by a shell, *b′*, and screw-cap D′, and an elastic diaphragm, *a′*, is arranged across it, and secured between the top edge of the shell and flange *d′*, a washer, *v′*, being employed, as before. A follower, *c c′*, rests on this diaphragm *a′*, and extends up through the cap D′ to the beam C, which it clasps, substantially as described, in the follower *e e′*. Thus the parts in the two chambers may be arranged and operated in substantially the same manner.

A fixed diaphragm, *o*, closes the passage in the interior of the pipe. It is arranged, by preference, immediately under the chamber B′, and communication between the parts of the pipe is had by means of a tube, *s*, which extends up from the diaphragm *o*, and opens into the chamber B′ immediately under the diaphragm *a′*, and within its range of motion, so that the mouth or port *s′* of the tube may be wholly or nearly closed by the diaphragm when it is depressed. The diaphragm *a′* thus serves a double purpose—that is, it operates as a valve to open and close the port *s′*, and it also imparts motion to the follower *c c′*, thus actuating the beam C. The beam C is pivoted by a pin and socket, *i i′*, to a post, E, so that it is free to vibrate in a vertical plane as pressure is exerted on either end of it through the followers *e e′* and *c c′*. The height of the post E is such that the under edge of the beam may rest on the bottom of the slots in the upper ends of the follower-stems and prevent lost motion.

In order to prevent pounding or violent movements of the beam when the pressure on the diaphragms *a a′* is suddenly changed, I arrange springs *u*, Fig. 1, around the stems *e′* and *c′*, one end of the springs resting upon their respective caps D D′, and the other end against the under edge of the beam at either end. I prefer to employ springs of equal, or nearly equal, power, and so arrange them that when the beam is in place both springs may not only be under tension or compression, but also so that the range of motion of the beam shall be within the acting distance of the springs. In this way the springs will be practically balanced in their action upon the beam, and while they will operate to prevent violent motion in the beam by causing it to move more slowly in its changes, yet the apparatus

will remain nearly or quite as sensitive to slight changes of pressure as though such springs were not employed. When a single spring is used which acts upon one end of the beam only, the power of such spring must be overcome before the beam can be moved in the direction opposed to the action of the spring, and such apparatus is thus rendered less sensitive to slight changes of pressure. Springs may be arranged in other ways, however, which will in effect furnish an elastic seat or seats for the ends of the beam—as, for example, rubber or other elastic blocks *r*, Fig. 2, may be set in recesses in the bottoms of the slots which receive the ends of the beam; or elastic bands may bind, with the desired degree of tension, both ends of the beam to some fixed part of the device; but such modifications whereby an elastic seat or seats is secured at both ends of the beam I consider as coming within my invention.

The post E is made adjustable along the pipe A A′, to which it is secured by means of a two-part clasp or clamp, H, and bolts *h*. By loosening these bolts the post may be set at the desired position between the two followers *e′* and *c′*, and there secured. In this way the relative acting distances between the fulcrum or pivot *i* and the bearing-points on the followers may be varied at pleasure; and the relative sizes of the diaphragms *a* and *a′* being known, the post E may be so set that the devices in the two chambers will be held in equilibrium for a given pressure in the supply-pipe A′, and the desired pressure in the service-pipe A, which may be less than the pressure in the supply-pipe.

The operation of this device is as follows: The desired pressure in the service-pipe A being determined, the post E is so set that such pressure, acting upon the diaphragm *a*, and through it upon one end of the beam C, as described, shall balance the pressure in the main or supply pipe A′, acting through the diaphragm *a′* upon the other end of the beam. These devices will thus be held in equilibrium, and the contents of the pipes will be passed along as required with any desired pressure—as, for example, fifty pounds in the service-pipe, and perhaps a much greater pressure, as one hundred pounds, in the main or supply pipe.

If, then, the pressure in the service-pipe be increased from any cause—as, for example, by the sudden closing of some discharge—such increase, acting in excess upon the larger diaphragm *a*, will cause the smaller diaphragm *a′* to close the port *s′*, and cut off the supply and pressure from the main pipe sufficiently to maintain the desired uniform pressure in the service-pipe. By making the diaphragm *a′* perform the service of a valve as well as a motor, I greatly increase the utility of the device, as all unnecessary weight is dispensed with, and the apparatus rendered more sensitive to slight changes in pressure, which is especially desirable when used to regulate illuminating-gas. I also avoid the necessity of perforating such diaphragm, and thus injuring it, in order to attach a valve to the follower, as has heretofore been done. Also, by making the fulcrum or pivoting point *i* of the beam adjustable with relation to the bearing-points on *e′* and *c′*, I obviate the necessity of using a movable weight on the beam, and by further cushioning the beam in its bearings on the followers, I obviate the objectionable pounding or hammering of the beam caused by sudden changes of pressure in the pipes, which, with gas, causes a flickering or uneven flame.

I claim herein as my invention—

1. In a device for regulating fluid-pressure in pipes, a flexible diaphragm arranged to operate as a valve to open and close the passage through the pipe, in combination with a flexible diaphragm arranged in a separate chamber or part of the pipe, both diaphragms being exposed on one side to the contents of the pipe, and connected by mechanical means, substantially as described, whereby the motion of one diaphragm will be communicated to the other.

2. In combination with the beam C and followers *e e′* and *c c′*, elastic springs arranged, one on each side of the pivot-post E, to cushion the bearings of the beam upon the followers, substantially as set forth.

3. The combination of diaphragms *a a′*, followers *e e′* and *c c′*, beam C, and an adjustable fulcrum or pivot post, E, substantially as and for the purposes set forth.

In testimony whereof I have hereunto set my hand.

JOHN F. BENNETT.

Witnesses:
J. J. McCORMICK,
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