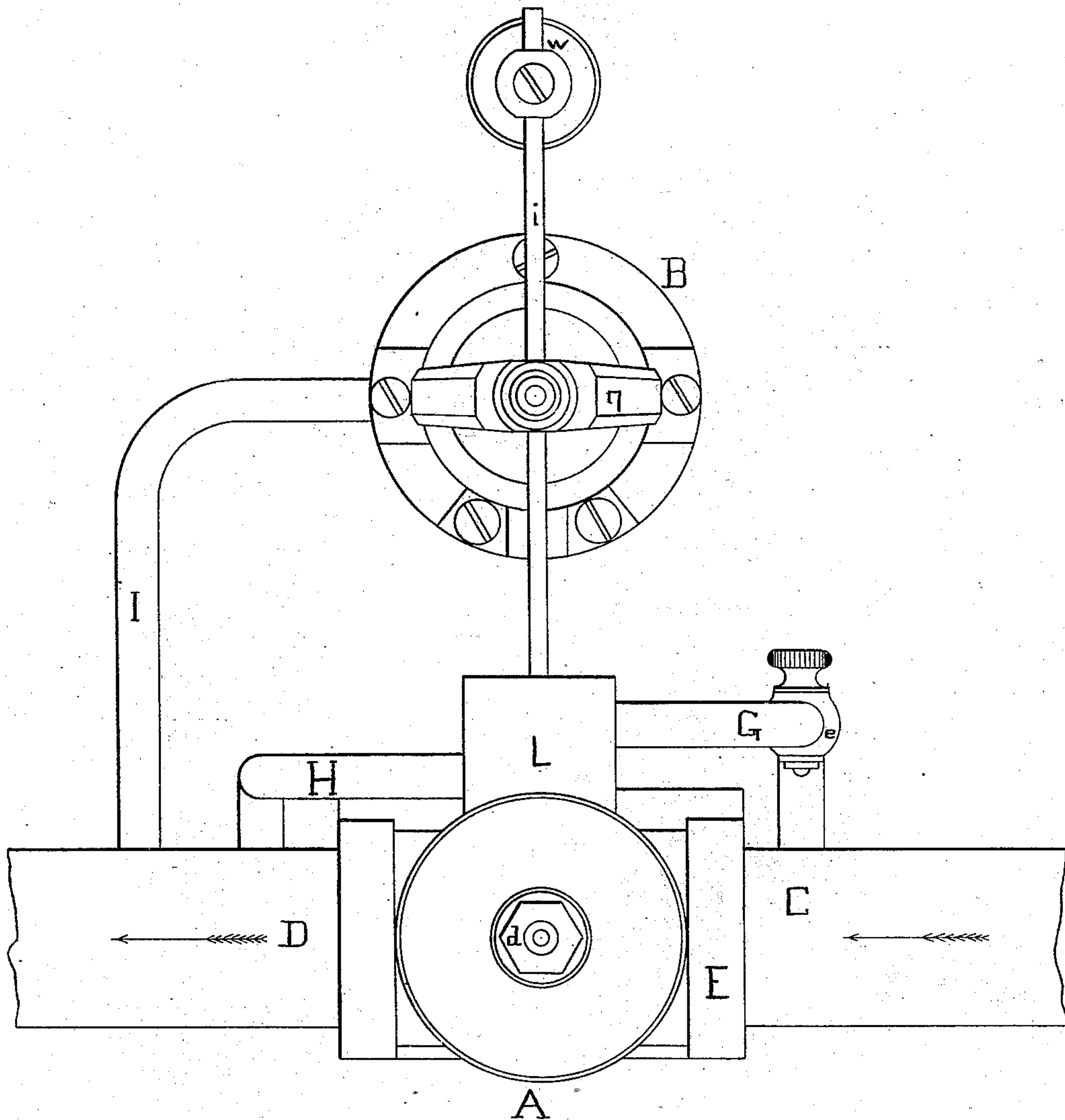


N. C. LOCKE.
Pressure-Regulator.
No. 225,015. Patented Mar. 2, 1880.

Fig. 1.



Witnesses.

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William D. Dennis

Inventor

Nathaniel C. Locke

N. C. LOCKE.
Pressure-Regulator.

No. 225,015.

Patented Mar. 2, 1880.

Fig. 2.

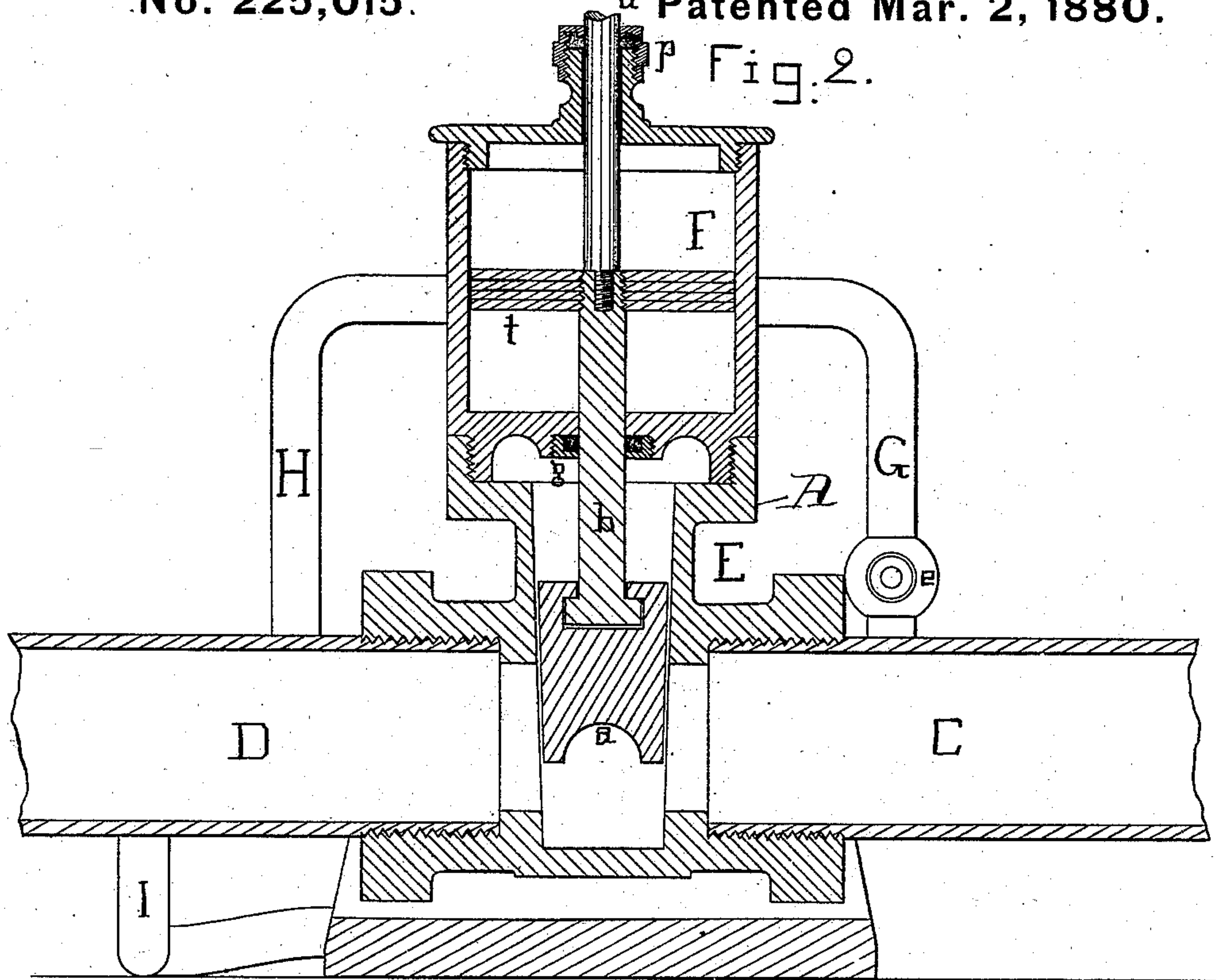
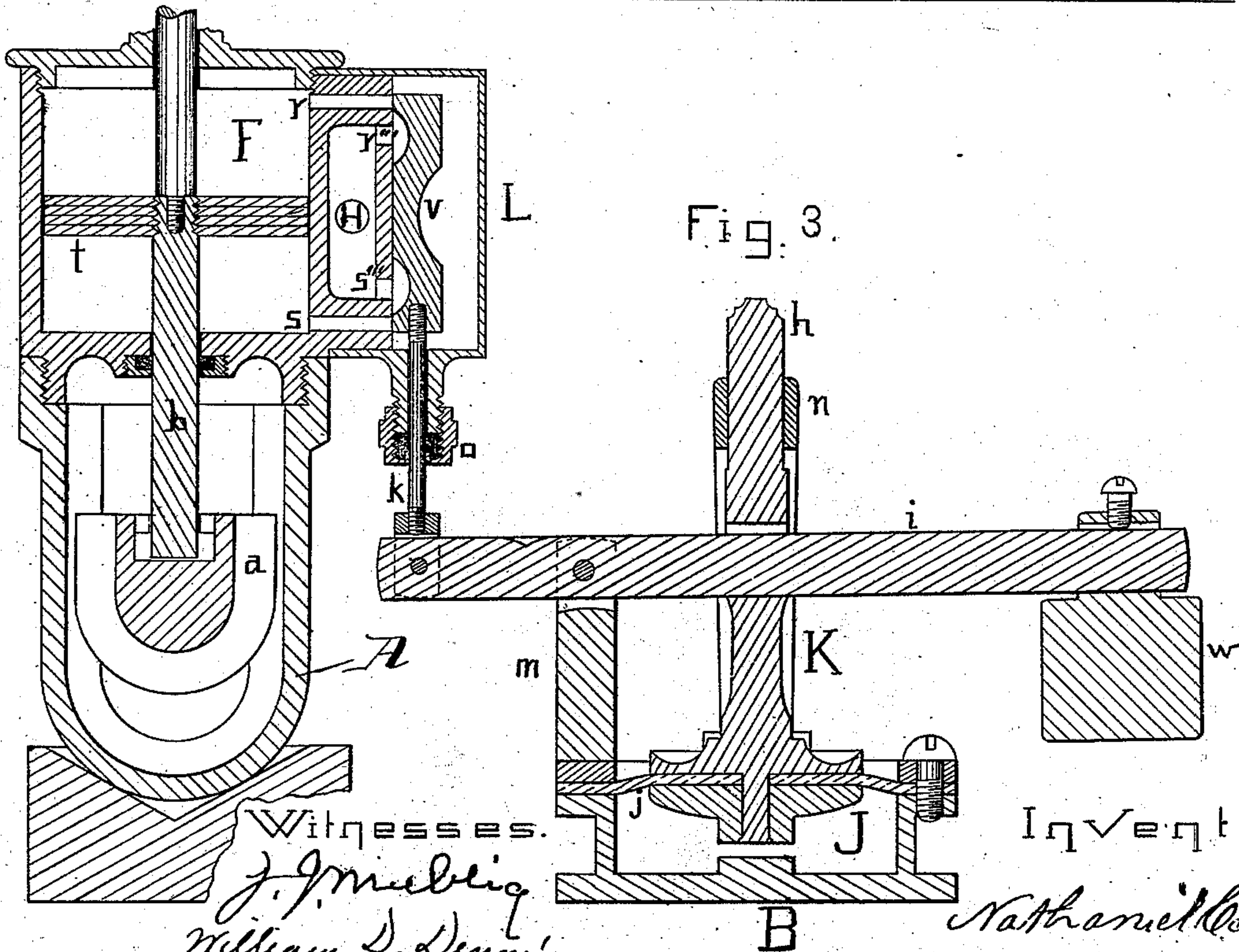


Fig. 3.



Witnesses.

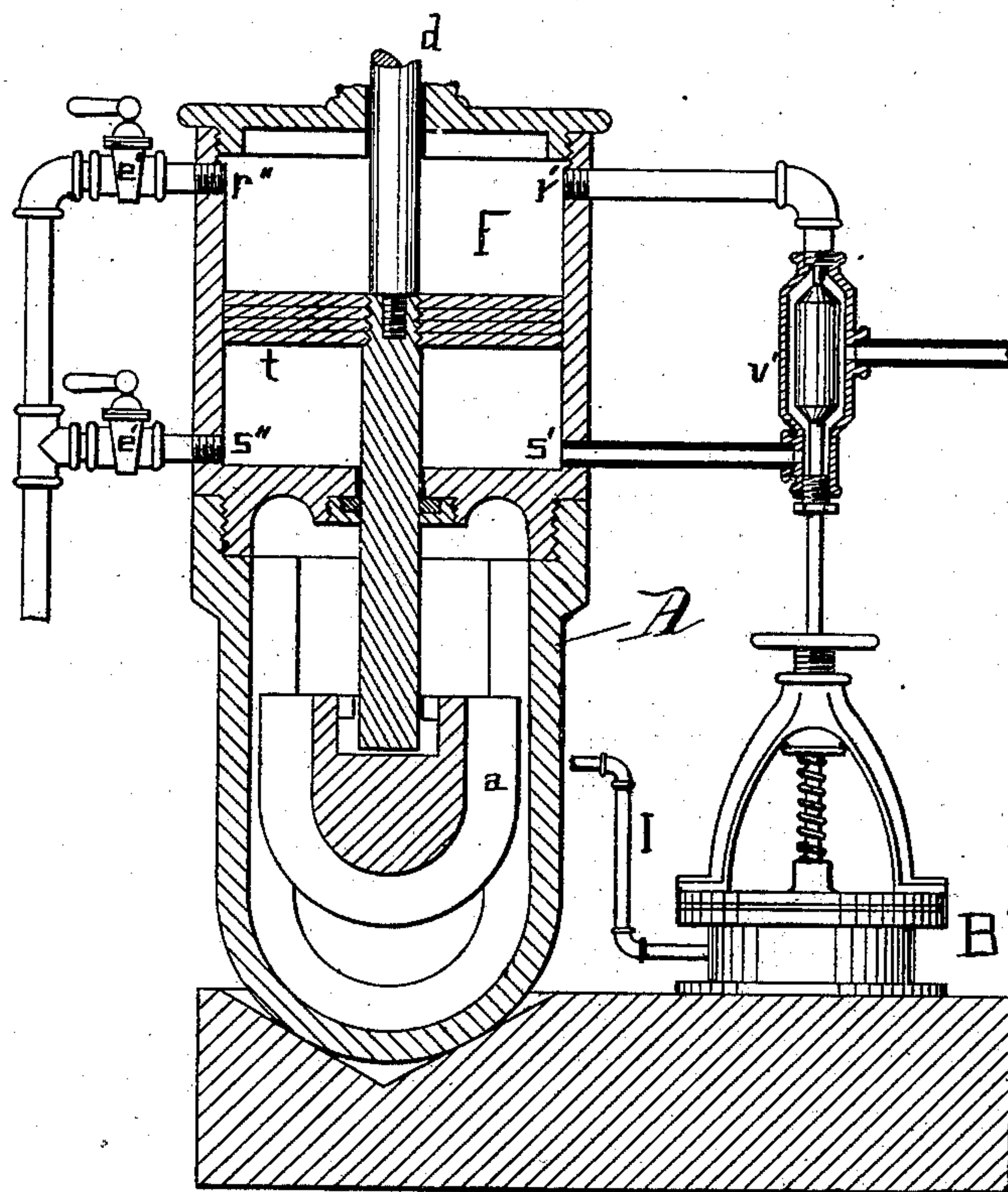
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Pressure-Regulator.
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Fig. 4.



Witnesses.

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UNITED STATES PATENT OFFICE.

NATHANIEL C. LOCKE, OF SALEM, MASSACHUSETTS.

PRESSURE-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 225,015, dated March 2, 1880.

Application filed July 21, 1879.

To all whom it may concern:

Be it known that I, NATHANIEL C. LOCKE, of Salem, in the county of Essex and State of Massachusetts, have invented new and useful Improvements in Pressure-Regulators, of which the following is a specification.

The invention relates to valves for reducing and regulating the pressure of water, especially those of large size, such as are used in street-mains. Heretofore it has been practically impossible to successfully operate regulating-valves of large size for want of sufficient power to overcome friction and promptly move the valve to meet slight changes of pressure.

The invention consists, essentially, in combining a main supply-valve having cylinder, piston, and inlet and outlet ports above and below said piston for the supply and exhaust of water, with a pressure-regulator having a suitable valve, with double ports, for controlling the supply of water to said cylinder for moving and controlling said main supply-valve.

It also consists in so constructing a main supply-valve having cylinder, piston, and inlet and outlet ports that the water operating and controlling the same shall be drawn from the high-pressure side of the main supply-valve.

In the accompanying drawings, in which similar letters of reference indicate like parts, Figure 1 is a plan view of the apparatus embodying my invention. Figs. 2 and 3 are sectional views of same. Fig. 4 is a sectional view of main supply-valve like that shown in Fig. 3, but combined with a differently-constructed pressure-regulator and valve.

A is the main supply-valve chamber, connected with a water-pipe, of which C is the high-pressure or inlet side and D is the low-pressure or outlet side. *a* is the movable gate, connected by rod *b* to piston *t*, moving in cylinder F, and having suitable packing. Attached to cylinder F is a water chest, L, having inlet-pipe G for conducting water from pipe C, and provided with stop-cock *e*. Chest L has also exhaust or outlet pipe H, by which the exhaust or waste water is conducted into pipe D. Ports *r* and *s* of chest L communicate with cylinder F, and are opened and closed by slide-valve *v*, which is operated by rod *k*, passing through stuffing-box *o* and connected with the short arm of lever *i* of the pressure-regulator

B. Lever *i* is pivoted on post *m*, and, passing through a slot in plunger K, is loaded with movable weight *w*. Plunger K rests on a water-tight flexible diaphragm, *j*, which forms the top of receiver J, which is connected by the back-pressure pipe I to main pipe D on the low-pressure side of main supply-valve A.

The operation is as follows: Water is admitted into pipe C at a pressure of, say, one hundred pounds per square inch, which it is desired to reduce to, say, forty pounds per square inch, movable weight *w* on the lever of pressure-regulator B being so placed as to exert, by means of plunger K, the said pressure of forty pounds per square inch on diaphragm *j*. Now, the water from pipe C, passing through gate *a* into pipe D, is also conducted by back-pressure pipe I into receiver J, exerting its pressure upon flexible diaphragm *j*, as well as upon plunger K. Cock *e* of small pipe G being suitably open, the water from pipe C will be admitted to chest L. Now, when the pressure of the water in pipe D shall reach forty pounds per square inch, the same being communicated by pipe I to receiver J will just balance weight *w* on lever *i*; but if the pressure in pipe D tends to rise above said forty pounds it will overcome weight *w*, raise the long arm of the lever, at the same time depressing the short arm, and, by means of rod *k*, moving downward valve *v*, opening port *r*, and admitting the high-pressure water into cylinder F, and forcing down piston *t*, and, by its connection with gate *a* by piston-rod *b*, moving downward main gate *a* and arresting the flow of water through the same until the pressure in pipe D shall be reduced to the required forty pounds per square inch, when weight *w* will bring down the long arm of lever *i* to a horizontal position, closing port *r*. Now, if by draft of water from pipe D the pressure in the same shall fall below the required limit of forty pounds, the long arm of lever *i* will be depressed by weight *w*, raising the short arm and moving valve *v* in an upward direction and opening port *s*, and at the same time opening port *r'''* for the escape of the water remaining above piston *t*, which will now pass off through pipe H into the low-pressure pipe D, while the high-pressure water in pipe C is now admitted into cyl-

inder F below piston *t*, and, having a pressure of a hundred pounds per square inch, moves the piston upward against the pressure of forty pounds still exerted on its upper side
 5 with a force of sixty pounds per square inch, which, with a piston having an area of twenty square inches, gives an aggregate force, minus friction, of twelve hundred pounds. Thus the gate *a* is operated automatically with cer-
 10 tainty and without waste of water.

It will be perceived that, other things being equal, varying the size of cylinder and piston will, in corresponding ratio, vary the working power of gate *a*.

15 By the proper adjustment of weight *w* on lever *i* the pressure in pipe D will be maintained at a higher or lower pressure, as may be desired. The same effect will be produced although the pressure in pipe C should vary
 20 considerably from the one hundred pounds per square inch.

Stop-cock *e* in pipe G is for the purpose of controlling the flow of water into cylinder F, and thus regulate the movement of piston *t*, which
 25 should be quite slow.

Rod *d* should be of sufficient length to always extend above stuffing-box *p*, and will at all times indicate the position of gate *a*.

It is not my purpose to confine myself to
 30 any particular form of gate *a*, as my invention is equally applicable to any style of gate or valve having a sliding movement.

In carrying into effect my invention, instead of pressure-regulator B, Fig. 3, any style of
 35 regulator may be employed to control the flow of water into cylinder F which is capable of being operated by the pressure of water in pipe D. For instance, B' in Fig. 4 represents a pressure-regulator applicable to my improve-
 40 ment. Neither do I restrict myself to the precise form of valve *v*, as shown in Fig. 3, but may use any style of two-way valve, as *v'*, shown in Fig. 4, controlling inlet-passages *r'* and *s'*, outlet-passages *r''* and *s''* being con-
 45 trolled by stop-cocks *e' e'*, which are perma-

nently set to allow a small stream of water to pass through them.

This combination of gate *a* and regulator B may also be used as a shut-off valve for street-
 mains by reversing pipes to cylinder F, so that
 50 if, from break of main pipes or other cause, the pressure in pipe D shall be reduced below a given point at which it may be set, then the long arm of lever *i* will be depressed, raising the short arm and admitting water on top of
 55 piston *t*, thus closing gate *a* and preventing loss of water and damage.

The waste-water from cylinder F can, if desired, be allowed to run to waste instead of being conducted into pipe D, thereby reliev-
 60 ing piston F of all back-pressure.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of a main supply-valve having cylinder F, piston *t*, and ports *r r'''*
 65 and *s s'''* with a pressure-regulator, when so combined for operation that said regulator shall be acted upon by the pressure of water in pipe D, thereby moving and controlling
 70 valve *v*, for admission of water above or below piston *t*, as the changes of pressure in pipe D may require, all substantially as shown and described.

2. A combination, with a pressure-regulator having receiver J, diaphragm *j*, plunger K,
 75 and lever *i*, of a valve so constructed for operation that the increase or decrease of pressure in the receiver shall alternately open or close communication with cylinder F either above or below piston *t*, all substantially as
 80 shown and described.

3. The combination of valve *a*, cylinder F, and piston *t* with pipes G and H, where pipe H is connected with pipe D, for returning the
 85 exhaust or waste water to the main pipe D on the low-pressure side of valve *a*.

NATHANIEL C. LOCKE.

Witnesses:

WM. S. MESSEROY,
 JOHN O'REGAN.