

(No Model.)

3 Sheets—Sheet 1.

N. C. LOCKE.
REGULATING VALVE.

No. 509,923.

Patented Dec. 5, 1893.

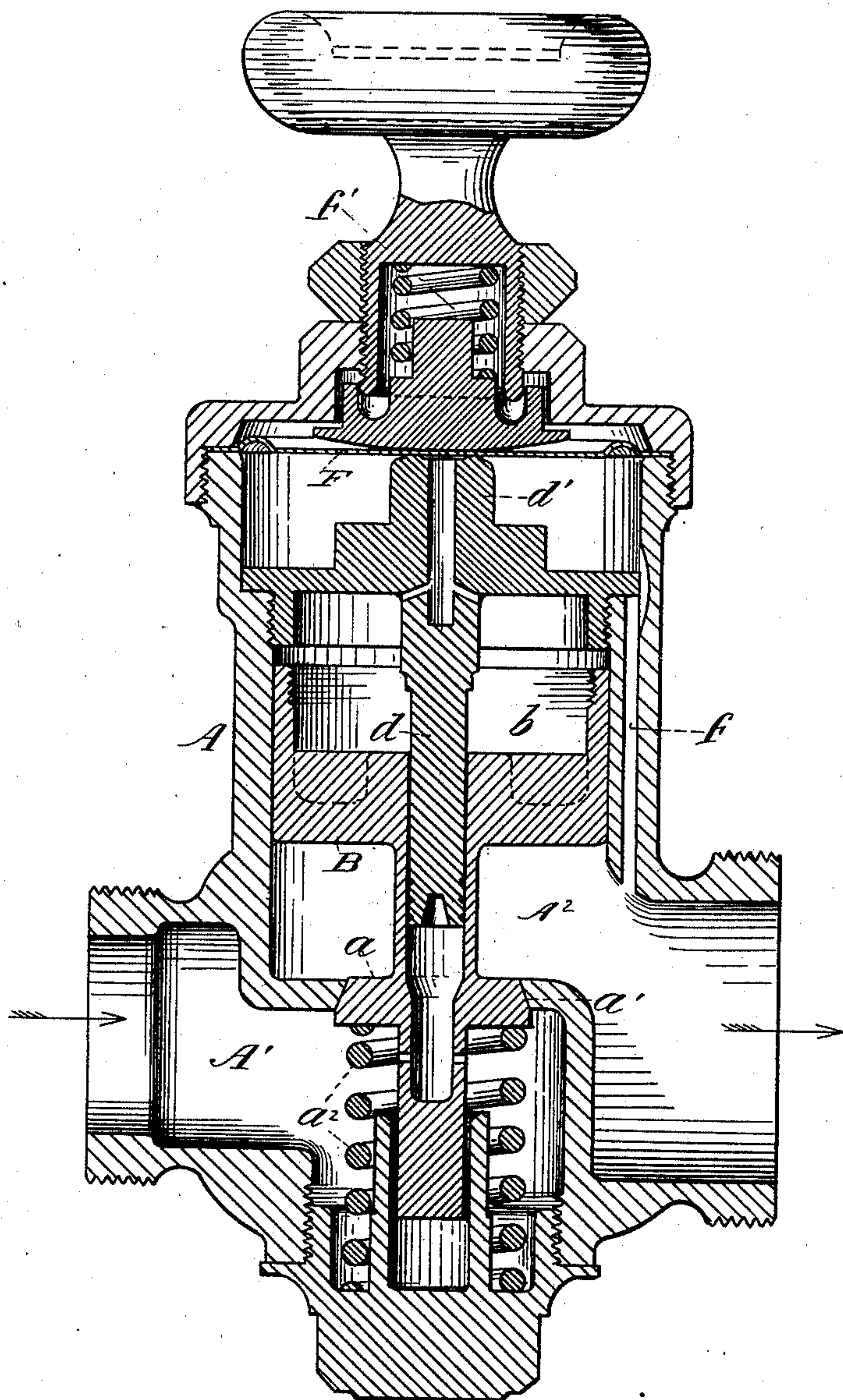


Fig. 1.

Witnesses:
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John Brown

Inventor:
Nathaniel C. Locke
by his attorneys,
Maynard & Beach.

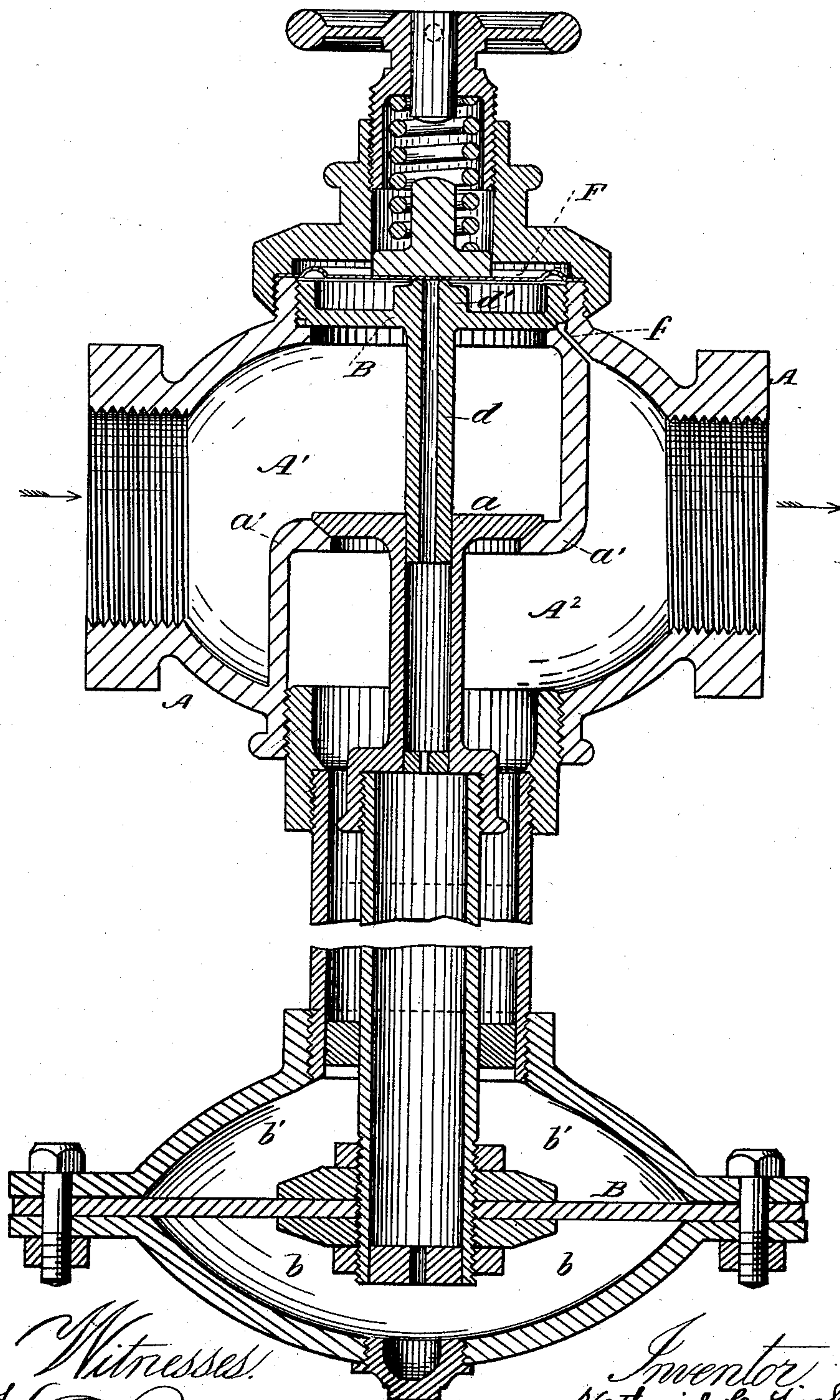
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N. C. LOCKE.
REGULATING VALVE.

No. 509,923.

Patented Dec. 5, 1893.



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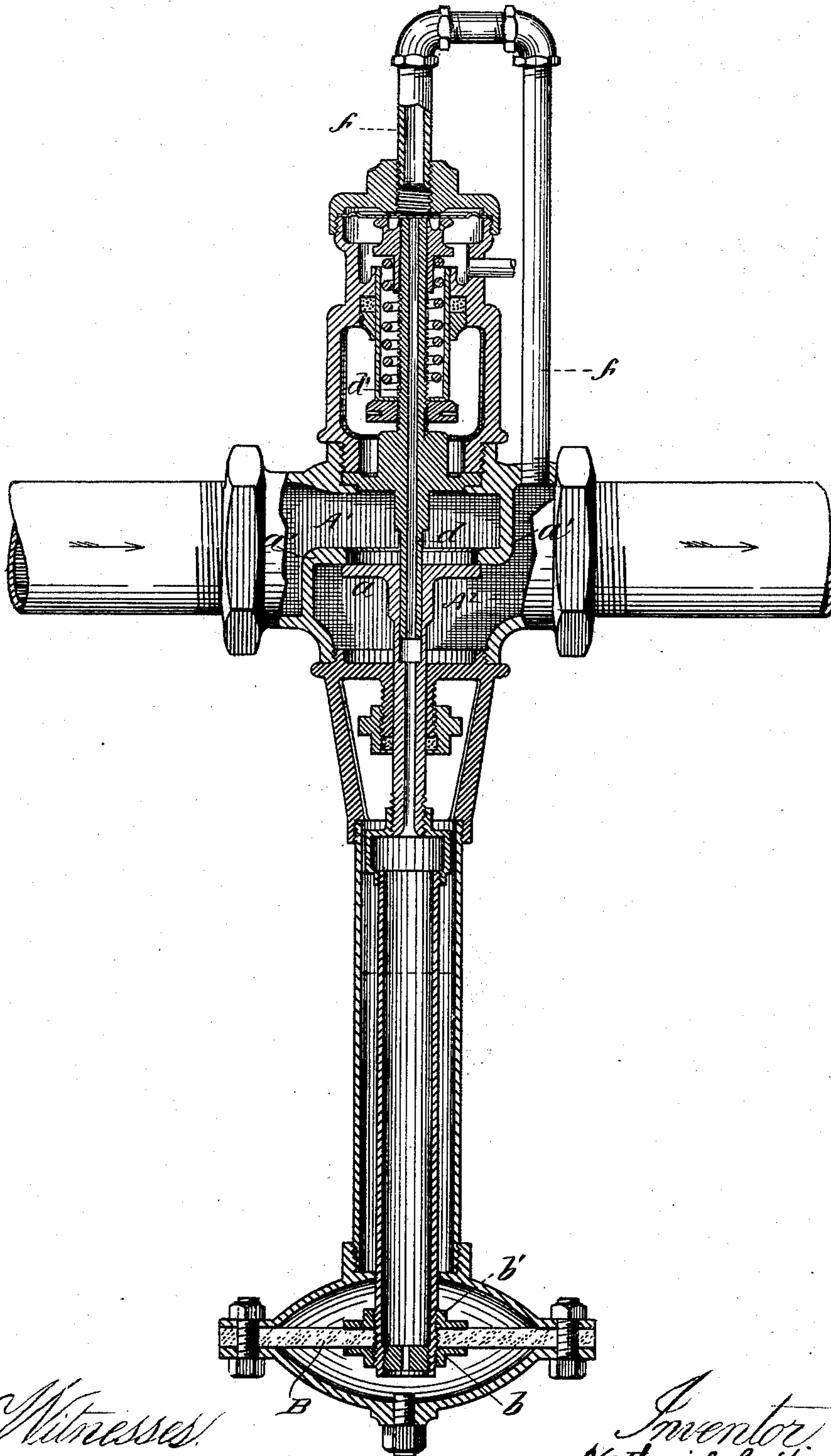
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3 Sheets—Sheet 3.

N. C. LOCKE.
REGULATING VALVE.

No. 509,923.

Patented Dec. 5, 1893.



Witnesses:
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Fig. 3.

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UNITED STATES PATENT OFFICE.

NATHANIEL C. LOCKE, OF SALEM, MASSACHUSETTS.

REGULATING-VALVE.

SPECIFICATION forming part of Letters Patent No. 509,923, dated December 5, 1893.

Application filed February 13, 1892. Serial No. 421,392. (No model.)

To all whom it may concern:

Be it known that I, NATHANIEL CHASE LOCKE, of Salem, in the county of Essex and State of Massachusetts, have invented an Improvement in Regulating-Valves, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional elevation illustrating one form of apparatus with my improvement; Fig. 2 a like elevation of a second form of apparatus with my improvement; and Fig. 3 a like elevation of a third form of apparatus with my improvement.

In many forms of regulating valves the main valve is controlled by a motor which is supplied with steam or other fluid under pressure, through a conduit which is of such small area, or otherwise so restricted, that the pressure tending to actuate the motor can be widely varied by opening or closing an exhaust passage from the motor; and my invention consists in forming that conduit through the main valve, and reducing its area by a stud as will now be more fully explained by reference to the drawings.

In all the figures A is the casing, *a* the main valve and *a'* a partition (in which is the seat of valve *a*), dividing the casing A into a high pressure chamber A' and a low pressure chamber A² in the usual way and as will be fully understood without further description.

In order to insure the desired difference of pressure on opposite sides of partition *a'* and valve *a* (which is in general the office of this class of apparatus) the main valve *a* is controlled by a motor B, which is connected to valve *a* and which is automatically moved in a direction to open valve *a* when the pressure in the low pressure chamber falls below the desired amount, but in a direction to close valve *a* when the pressure in the low pressure chamber exceeds the desired amount. Motion is given to motor B by steam, (or water or gas as the case may be) which flows from the high pressure chamber A' through a conduit and actuates motor B to move valve *a* against the force of spring *a*², in Fig. 1, the motion of main valve *a* in Fig. 1 caused by the motor carrying valve *a* away from its seat, and the motion of main valve *a* in Fig. 1 caused by its spring *a*² carrying valve *a* to-

ward its seat. In Fig. 2 both motions of main valve *a* are caused by the motor B. In Fig. 3 the motor B tends to move valve *a* toward its seat. These three examples, in one of which the main valve is moved away from its seat by the motor and toward its seat by a spring, in the second of which the main valve is moved in both directions by the motor, and in the third of which the main valve is moved only toward its seat by the motor, are all well known in other forms of this apparatus, and are here shown for the reason that my invention is applicable to all of them.

In all forms a conduit which connects the chamber of motor B with the high pressure chamber is essential, but in my invention that conduit is through the main valve and restricted by a stud, as will now be explained in detail. In Fig. 1, the bore through the main valve extends well down the stem, and a side opening in the stem allows the fluid under pressure to flow from the high pressure chamber through the bore in main valve *a* and its stem; but this flow is greatly restricted by the stud *d* which almost fills the bore through valve *a*, so that all the steam which actuates motor B is compelled to leak past stud *d* on its way through main valve *a*. Stud *d* must not of course fit the bore in valve *a* so tightly as to prevent motion of valve *a* from and toward its seat, but with this in mind stud *d* may be made as snug a fit as possible; for in practice it is difficult to make stud *d* too close a fit, so long as valve *a* will move properly on stud *d*. The steam which thus leaks through valve *a* past stud *d* fills the chamber *b* in which motor B reciprocates provided the exhaust conduit through stud *d'* from that chamber is closed by the diaphragm F; but when that exhaust conduit is opened the escape of steam through the exhaust is more rapid than its flow through the conduit through valve *a*, restricted as that conduit is by stud *d*; and consequently the pressure tending to move motor B can be varied greatly by the motion of diaphragm F. When steam or other fluid under pressure is let on to the apparatus of Fig. 1, it leaks past stud *d* and through bore of valve *a*, and almost instantly fills the chamber *b* of motor B, (for diaphragm F then closes the exhaust conduit) and motor B moves to open main valve *a*, thus supply-

ing the low pressure chamber. Consequently the pressure in the low pressure chamber rises and as the low pressure chamber is open through conduit *f* to the chamber of diaphragm F, that diaphragm will be lifted from stud *d'* as soon as the pressure in the low pressure chamber is sufficient; and as this motion of diaphragm F opens the exhaust conduit through stud *d'* the pressure in the chamber *b* of motor B will fall and the force of spring *a*² aided by the low pressure against motor B, in Fig. 1, will close main valve *a*. Should the low pressure then fall below the desired amount diaphragm F will be forced by its spring *f'* down upon stud *d'* to close the exhaust conduit, when the pressure in the chamber *b* of motor B will increase, thus opening valve *a* and supplying more pressure to the low pressure chamber; but acting as before, as soon as the low pressure is brought back to the desired amount. This operation is the usual and familiar operation, in substance, of this class of apparatus, as will be plain to all skilled in the art; but the new principle involved in my invention is a conduit through the valve of ample area but restricted by a plug which nearly fills it, and this is a valuable improvement for it not only greatly simplifies the construction of this class of apparatus; but is a far better and more practical plan of obtaining the restricted area of the conduit than any heretofore known.

In Fig. 2, the fluid from the high pressure chamber A' leaks past the stud *d* and fills the chamber *b* of motor B when diaphragm F is pressed upon stud *d'*; thereby causing sufficient pressure under motor B to force valve *a* off its seat, and allow steam to flow from high pressure chamber A' to low pressure chamber A². But when the pressure in low

pressure chamber A² reaches the desired amount, it acts, through conduit *f*, to lift diaphragm F and open the exhaust conduit; whereupon the low pressure, always in chamber *b'* of motor B, causes motor B to close valve *a*.

In Fig. 3 the fluid in high pressure chamber A' forces valve *a* off its seat, and supplies low pressure chamber A²; but when the low pressure reaches the desired amount it acts through conduit *f* to force diaphragm F down upon stud *d'*, and thus closes the exhaust conduit; whereupon the fluid which leaks past stud *d* causes pressure in chamber *b* of motor B sufficient to force valve *a* to its seat, and hold it there, until the low pressure falls, when diaphragm F opens the exhaust conduit, and reduces the pressure in chamber *b* of motor B, so that the high pressure acting directly on valve *a* again forces valve *a* off its seat, restoring the low pressure to the desired amount. The chamber *b'*, of motor B, acts simply as a dash pot.

The subject matter of this application is limited to the conduit through the main valve restricted by a stud, the other inventions shown herein being described and claimed in my patents, No. 475,585, dated May 24, 1892, and No. 497,985, dated May 23, 1893.

What I claim as my invention is—

In a reducing valve comprising a main valve and a motor controlling it, a conduit leading from the high pressure chamber to the motor chamber through the main valve, and a stud restricting that conduit, combined and operating substantially as described.

NATHANIEL C. LOCKE.

Witnesses:

J. E. MAYNADIER,
EDWARD I. BEACH.