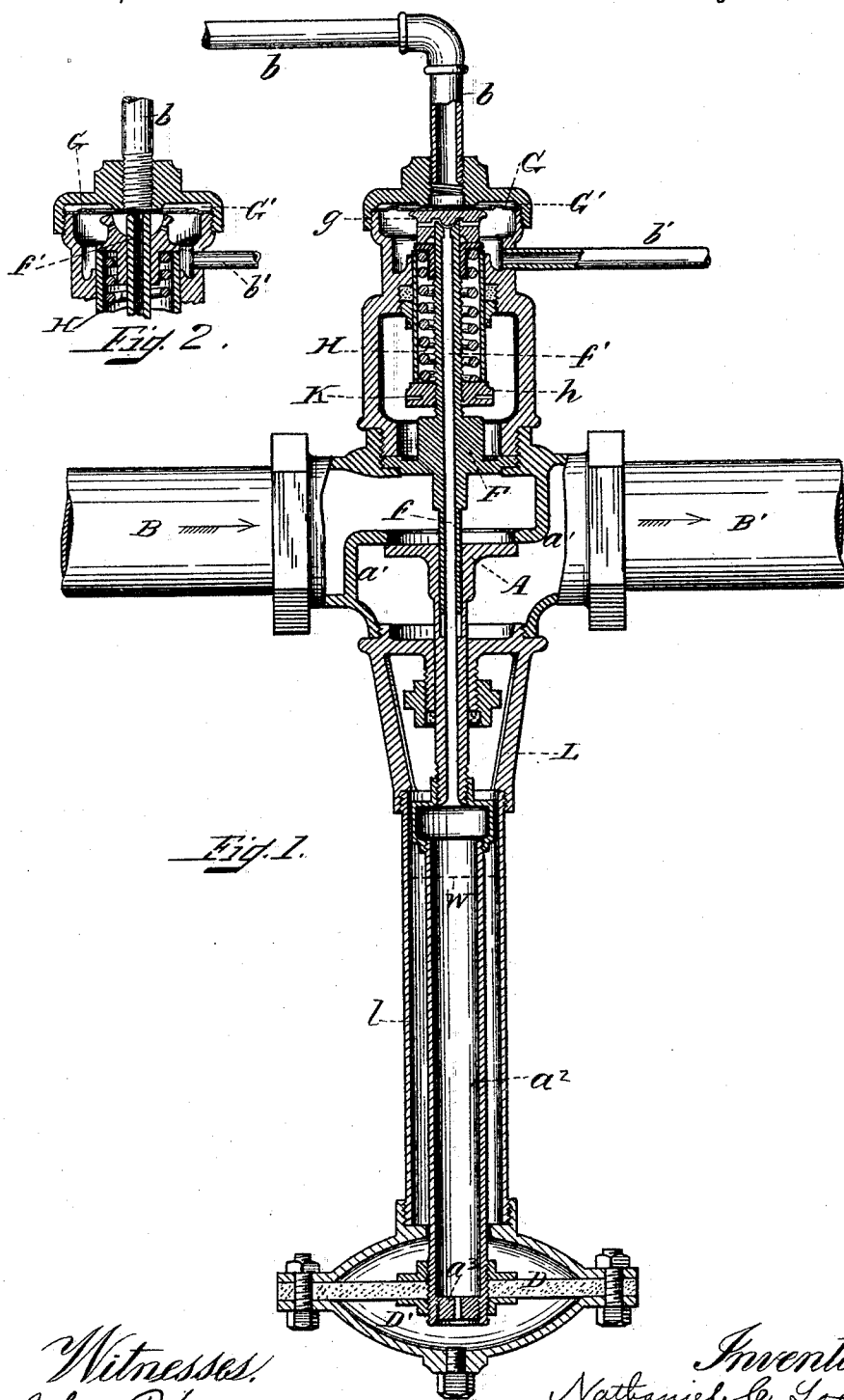


(No Model.)

N. C. LOCKE.
REGULATING VALVE.

No. 497,985.

Patented May 23, 1893.



Witnesses:
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Inventor:
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UNITED STATES PATENT OFFICE.

NATHANIEL C. LOCKE, OF SALEM, MASSACHUSETTS.

REGULATING-VALVE.

SPECIFICATION forming part of Letters Patent No. 497,985, dated May 23, 1893.

Application filed February 15, 1892. Serial No. 421,520. (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 a new and useful Regulating-Valve, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is an elevation partly in section of one of my valves, and Fig. 2 a partial section of a modification.

A regulating valve, generally speaking, is a valve which is automatically closed whenever the pressure to be regulated reaches the desired point, and opened automatically when the pressure to be regulated falls below the desired point; and although these valves are more generally used to regulate the pressure of the steam or other fluid flowing past them, yet they are also frequently used to govern the operation of a steam pump, the water pressure from which is to be regulated. That form of my invention shown is more particularly intended for the latter use; but (as will be made clear below) it is also applicable generally.

The main feature of my invention is a controlling valve actuated by a diaphragm which is in a casing one side of which is open to the atmosphere, and the other side forms a diaphragm chamber which is connected by a conduit of small area with the high pressure side of the valve and this chamber has also an exhaust conduit of larger area controlled by a second diaphragm which is exposed on one side to the pressure to be regulated, and on the other side to an adjusting spring, or its equivalent; as will now be more fully explained.

In the form shown, A is a valve controlling the flow of steam through the pipes B B', B connecting with the boiler and B' with the steam pump which is to be so controlled that it will operate only when the water pressure in the pipe *b* falls below the desired amount; the pipe *b* connecting with the system of pipes which is supplied with water by a pump; as for example, a system of pipes leading through the rooms of a factory, and supplied with automatic fire extinguishers, which open only in case of fire or of some accident. But whenever water for any reason escapes from the

system of pipes with which pipe *b* connects, the pressure is, of course, reduced; and steam should at once be admitted past valve A to the steam pump so that the steam pump will supply water to the system of pipes. All these matters, except my new regulating valve, are too well known to require description, and form no part of my present invention, and are here adverted to solely for the purpose of making clear the operation of that form of my invention shown in the drawings.

Valve A is held upon its seat (which is on a partition across casing *a'*, as usual) by diaphragm D to which stem *a*² of valve A is fast. For compactness stem *a*² is hollow so that it may form part of the conduit by which diaphragm chamber D' is connected to the high pressure side of valve A; the bore of stem *a*² extending from end to end. The inlet area of the conduit thus formed is made small by the stud *f* which extends from plug F well into the bore of stem *a*², and a few thousandths of an inch smaller than that bore; such a fit allowing a suitable passage of steam from the high pressure side of valve A, into the bore of stem *a*² so that the water in the lower enlarged end of stem *a*² and in diaphragm chamber D' is under substantially the same pressure as the high pressure in pipe B, when the escape or exhaust conduit is closed by diaphragm G, thereby preventing escape of steam from the conduit formed, for compactness, through plug F and its studs *f f'*. The water level in stem *a*² is indicated by the dotted line *w*.

Valve *g* is forced against diaphragm G and against the pressure in diaphragm chamber G' by spring H, which is adjusted by the nut *h*; so that valve *g* is held away from its seat on stud *f'* until the pressure in pipe *b* and diaphragm chamber G' reaches the desired amount, determined by the adjustment of spring M. Diaphragm G may act itself as a valve, as indicated in Fig. 2, as will be plain without further description. The drip pipe *b'* serves to carry away the steam, or steam and water which escapes from the exhaust conduit *f F f'* when the exhaust conduit is open.

The yoke K aids in holding plug F in place and also supports the casing G' which forms

the chamber for the diaphragm *g*, and is conveniently formed as a cup to form an exhaust chamber from which drip pipe *b'* leads.

When in operation the pressure in pipe *b* will be that desired, for example eighty pounds; and pipe *B* will be filled with steam at the boiler pressure; but as the pressure of eighty pounds to the square inch on diaphragm *G* will be sufficient to hold valve *g* on its seat, in Fig. 1, or to cause diaphragm *G* to press upon and close the upper end of conduit *f'* in Fig. 2, the steam which leaks past stud *f* and fills the bore of stem *a*² and of studs *f* and *f'* will cause a pressure in the casing *D'*, which is the chamber of diaphragm *D*, about equal to boiler pressure; and as diaphragm *D* controls valve *A* through stem *a*², valve *A* will be forced and held against its seat, thus shutting off the supply of steam to the pump through pipe *B'*. But in case the water supplied to the system of pipes with which pipe *b* connects escapes, for any reason, the pressure in pipe *b* falls, and allows spring *H* to move valve *g* from its seat, in Fig. 1, or to lift diaphragm *G* in Fig. 2, when steam escapes from the exhaust conduit through plug *F* and its studs *f f'*, thereby instantly reducing the pressure in stem *a*² and casing *D'*; so that valve *A* opens, and steam flows past it through pipe *B'*, setting the pump in motion; and the pump forces water into the system of pipes with which pipe *b* connects until the pressure is again eighty pounds; when diaphragm *G* forces valve *g* on its seat or is itself forced down on stud *f'*, closing the exhaust conduit when the pressure in the exhaust conduit and the bore of stem *a*² and diaphragm chamber *D'* almost instantly forces valve *A* onto its seat and shuts off the flow of steam through pipe *B'*. The plug *a*³ in stem *a*² serves to prevent sudden motion of the diaphragm *D*, as will be clear.

Were pipe *b* connected directly with pipe *B'* the operation would be the same as in many forms of regulating valve; that is when the pressure in pipe *B'* fell below the desired amount the diaphragm *G* would no longer close stud *f'*; and the escape of steam from the exhaust conduit would allow valve *A* to open thus admitting steam to pipe *B'* and raising the pressure in that pipe to the desired amount; thereby increasing pressure in pipe *b* and closing the exhaust conduit; when valve *A* would also close.

As diaphragm *D* is more durable when covered with water I prefer to make its casing *D'* double as shown, and to connect it with yoke *L* by means of a pipe *l*, which should be kept supplied with water. This also insures a proper water supply in the lower part of stem *a*² and in the lower part of shell *D'*.

The conduit connecting the high pressure side of the main valve with the device for actuating the main valve is an essential ele-

ment in many widely different forms of regulating valves; but I am the first to make that conduit through the main valve itself; and this is an invention of great practical importance but is not here claimed broadly, for the reason that it forms the subject matter of my application, Serial No. 421,392, filed February 13, 1892.

Heretofore in all valves of this class the regulating spring *H* has always acted in a direction opposite to that shown, that is to say, when the force of spring *H* exceeded the force of the fluid pressure on the regulating diaphragm *G* the extra force of spring *H* closed conduit *f'*, instead of opening that conduit as in my apparatus. This is an important feature of my invention, as it makes the operation much more certain by preventing all danger of the valve *g*, in Fig. 1, or of diaphragm *G* in Fig. 2, sticking to stud *f'*.

What I claim as my invention is—

1. In combination a casing divided into two chambers by a controlling valve and its seat; that valve and its seat; a second casing constantly open on one side to the atmosphere and containing a diaphragm; that diaphragm; a connection between the controlling valve and that diaphragm; a conduit connecting the high pressure side of the first casing with the closed chamber of the second casing; an exhaust conduit of larger area than the first conduit; and a second diaphragm controlling the exhaust conduit; all combined and operating substantially as described.

2. In combination a casing divided into two chambers by a controlling valve and its seat; that valve and its seat; a second casing constantly open on one side to the atmosphere and containing a diaphragm; a hollow valve stem passing through the walls of one of the chambers of the first casing and connecting the controlling valve and that diaphragm; a conduit connecting the high pressure side of the first casing with the closed chamber of the second casing; an exhaust conduit of larger area than the first conduit; and a second diaphragm controlling the exhaust conduit; all combined and operating substantially as described.

3. In a regulating valve having an exhaust conduit controlled by a diaphragm, the combination of that conduit; that diaphragm; a fluid pressure chamber the fluid pressure in which forces the diaphragm toward the mouth of the conduit; and a spring to force the diaphragm away from the mouth of the conduit, when the force of the spring exceeds the force of the fluid pressure, all substantially as set forth.

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Witnesses:

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