No. 712,485. Patented Nov. 4, 1902.

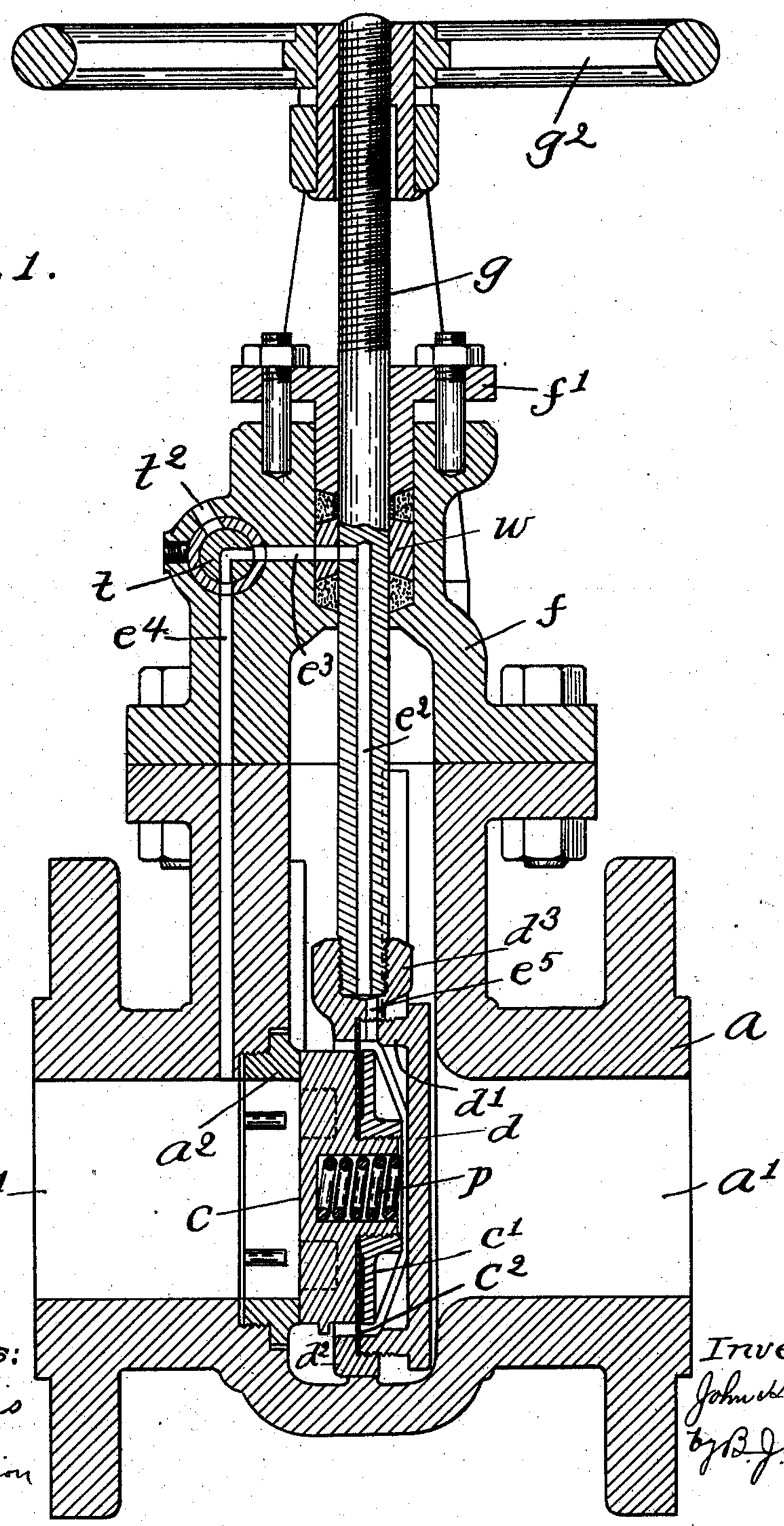
J. H. BICKFORD.

VALVE.

(Application filed Oct. 10, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



Witnesses:
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J. L. Hutchinson

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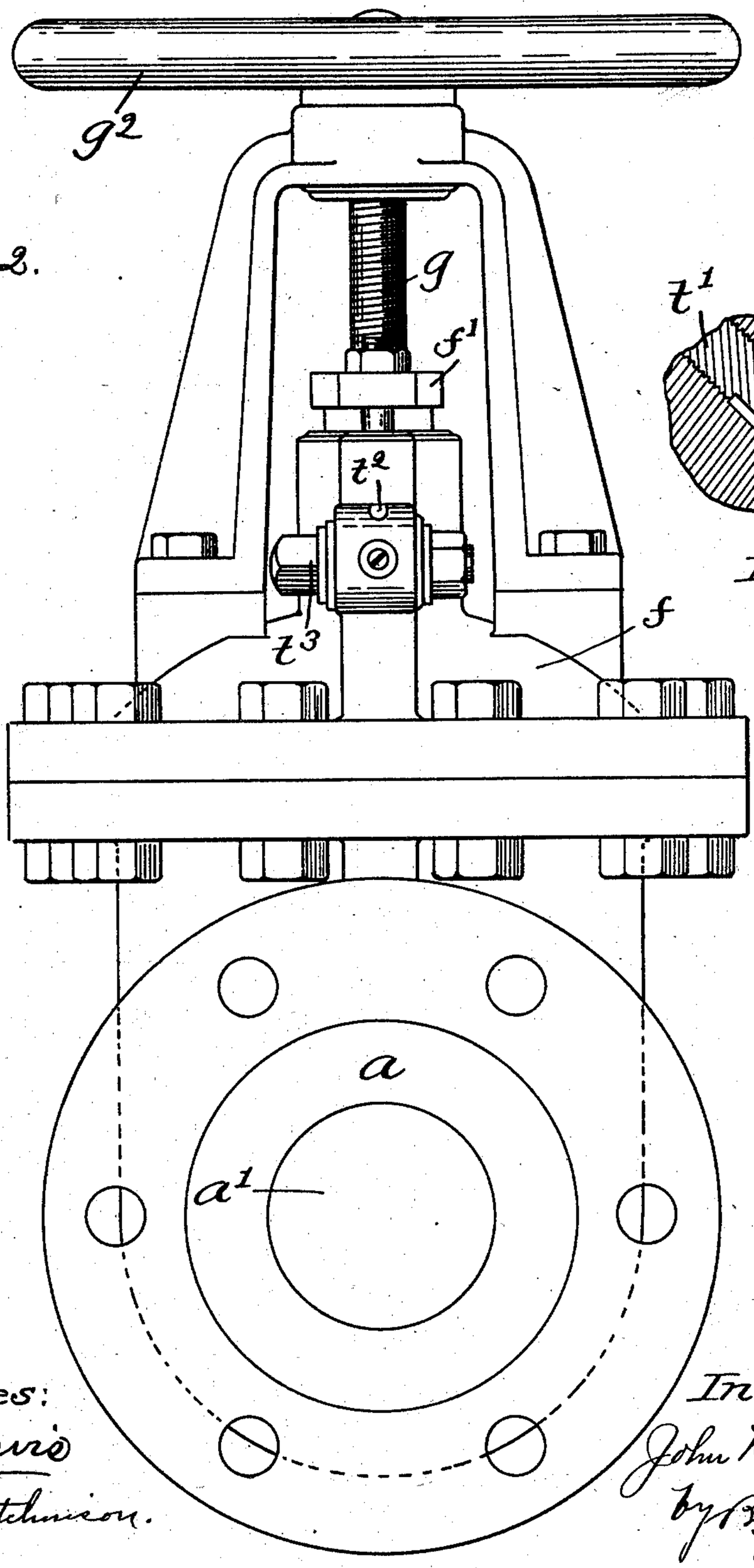
Fig. 2.



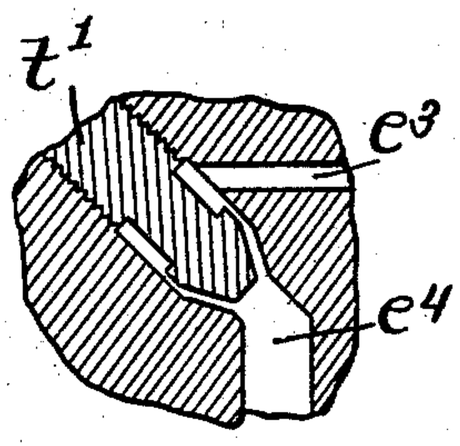


Fig. 3.

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UNITED STATES PATENT OFFICE.

JOHN H. BICKFORD, OF SALEM, MASSACHUSETTS.

VALVE.

SPECIFICATION forming part of Letters Patent No. 712,485, dated November 4, 1902.

Application filed October 10, 1901. Serial No. 78,273. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. BICKFORD, of Salem, county of Essex, State of Massachusetts, have invented an Improvement in Valves, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to valves, and is intended as an improvement upon the valve shown and described in my application for Letters Patent, Serial No. 64,831, filed June 17, 1901. In my said application the valve-plate is borne by a carrier and is movable laterally toward and from its seat, and the movement of said valve-plate toward and from its seat is controlled by a pressure-chamber, also borne by said carrier and which is connected with the pressure-supply, and means are provided for controlling the pressure in said chamber. The means shown in said application for controlling the pressure in the pressure-chamber is operated by the means employed for moving the carrier, and, as shown in the drawings, the valve-plate incidentally slides on its seat a short distance at the beginning and also at the end of its movement. For large valves it is important that the valve-plate be moved away from its seat or the pressure upon it relieved or reduced before it is raised, so that the friction due to sliding upon its seat during its upward movement or downward movement will be avoided, and providing means for accomplishing this result constitutes the essential object of this invention.

The invention consists, essentially, in a carrier bearing a valve-plate and also bearing a pressure-chamber having a flexible element as a part of it, means for moving said carrier, means, as a passage, connecting said pressure-chamber with the pressure supply, said pressure-chamber controlling the movements of said valve-plate laterally toward and from its seat as the pressure therein is controlled, and a valve for controlling the pressure in said chamber operated independently of the carrier. Thus operating the valve controlling the pressure of the pressure-chamber independently of the carrier constitutes the essential feature of this invention.

Figure 1 shows in vertical section a valve embodying this invention. Fig. 2 is a side elevation of the valve shown in Fig. 1. Fig. 3 is a detail of a modified form of valve which may be employed for controlling the pressure of the pressure-chamber.

a represents the valve-case, which is made of any suitable shape, having ports a' a', which are preferably made circular, and having a bonnet f, containing a stuffing-box, through which the valve spindle or stem passes.

The valve-case a is formed or provided interiorly with a valve-seat a^2, surrounding or inclosing the port a'. The valve-seat a^2 may be made circular or of any other suitable shape. The valve-plate, which coöperates with the valve-seat, as herein shown, consists of a disk c, having an externally-screw-threaded boss, on which is screwed a follower-plate c', and a spring p, to be described, is contained in a recess provided in the boss on the disk c, which is held in place by bearing against the inner wall of a shell d, which is herein shown as the essential element of the carrier which carries the valve-plate. The shell d of the carrier consists of a circular plate having an annular flange d', which is externally screw-threaded and is screwed to a ring d^2, formed or provided with a boss d^3, which is socketed to receive the lower screw-threaded end of the valve spindle or stem g, yet so far as my present invention is concerned any other form of carrier may be employed. The valve-plate is herein shown as connected to the carrier by a metallic or other flexible diaphragm c^2, and any suitable means may be employed for securing said diaphragm to the valve-plate—as, for instance, it may be firmly clamped in position between the disk c and the follower-plate c'—and also any suitable means may be employed for securing said diaphragm to said carrier—as, for instance, it may be firmly held in place between the shell d and ring d^2. The diaphragm c^2 serves as and constitutes a flexible element, and the follower-plate c', which is located back of it, serves as a reinforcing-plate for said flexible element. Any other suitable flexible element may be employed in lieu of a diaphragm.

By connecting the diaphragm c^2 to the shell d it will be seen that a chamber is produced, of which said flexible element forms a part, and said chamber is herein employed to re-

ceive the pressure from the pressure-supply, as will be hereinafter described, and consequently will be herein referred to as the "pressure-chamber," although so far as my invention is concerned this pressure-chamber may be constructed in other ways, yet having a flexible element as a part of it which is adapted to serve as an actuator for or means for moving the valve-plate when its movement is controlled, as will be hereinafter described, by the pressure in the pressure-chamber.

Means are provided whereby the pressure is admitted to the pressure-chamber, which latter, as herein shown, is located at the back side of the valve-plate, and said means, as herein shown, consists of a fluid-passage or other connection, which leads from the inlet of the valve, meaning the pressure-supply, to said pressure-chamber, which when open affords a free and unobstructed passage for the fluid which is being controlled. This fluid-passage from the inlet of the valve—*i. e.*, the pressure-supply—to the pressure-chamber may be made in many different ways more or less circuitous, yet coming within the scope of this invention.

As shown in Fig. 1, the spindle *g*, which is attached to the carrier, is made tubular for a portion of its length, thereby providing a passage e^2, and at the upper end of said passage e^2 the spindle *g* has a side opening normally communicating with a recess in a gland *w* of the stuffing-box when the carrier is in its lowermost position and the valve-plate consequently closed on its seat, and the bonnet *f*, containing said stuffing-box, in which said spindle moves up and down, is cut away or formed to provide a passage e^3, which is in open communication with the recess in said gland *w*, and said bonnet and the valve-case are provided with a passage e^4, leading from the passage e^3 to the inlet of the valve—*i. e.*, the pressure-supply. As shown in this figure of the drawings, the passages e^2 and e^4 are substantially in parallelism, while the passage e^3 is at right angles thereto and connects them at the top when the carrier is in the position shown in Fig. 1. A passage e^5 passes through the carrier, which connects the passage e^2 with the pressure-chamber. When said fluid-passages e^5 e^2 e^3 e^4 are open, as shown in said figure, the pressure in the pressure-chamber and acting back of the valve-plate will be the same per square inch as the pressure on the front side of the valve-plate; but as the area of the back side of the valve-plate acted upon by the pressure in the chamber is greater than the area of the front side of the valve-plate in contact with the pressure by the area of the seat it is obvious that the valve-plate will be moved laterally toward and held hard upon its seat by the pressure in said chamber acting back of it.

The carrier bearing the pressure-chamber and valve-plate may be raised and lowered by turning the hand-wheel g^2 on the spindle or stem *g*. The spindle *g* passes up through the stuffing-box contained in the bonnet *f*, and a driving-gland *f'* is preferably provided.

To control the pressure in the pressure-chamber in the construction herein shown, a valve is provided which is adapted to open and close said fluid-passage connecting the pressure-chamber with the pressure-supply and also open and close an outlet-passage to thereby admit or withdraw the pressure. The valve shown in Figs. 1 and 2 for thus controlling the fluid-passage consists of a three-way cock *t*, located at the junction of the passages e^3 e^4, and through the wall of the case an exit t^2 is provided, with which said three-way cock also coöperates. Whenever the three-way cock is turned into the position shown in Fig. 1, communication is established between the passages e^3 e^4 and the pressure is admitted to the pressure-chamber and acts back of the flexible element to thrust the valve-plate against its seat. By turning said three-way cock into another position the fluid-passage will be closed and the pressure in the pressure-chamber will immediately begin to fall, (if steam,) and when the pressure has been reduced to a point where the pressure per square inch in the pressure-chamber is materially less than the pressure of the pressure-supply then the valve-plate will tend to fall away from its seat. By turning the three-way cock into still another position the fluid-passage will not only be closed, but its closed portion will be opened to the atmosphere by way of the outlet-passage t^2, and as soon as the controlling-valve thus opens the outlet-passage t^2 the accumulated pressure in the pressure-chamber will escape, which operation causes the valve to move laterally away from its seat.

As before stated, the fluid-passage leading from the pressure-supply to the pressure-chamber may be constructed in many different ways, so, also, the outlet-passage leading from the pressure-chamber may be constructed in many different ways, all within the scope of this invention.

The outlet-passage leading from the pressure-chamber is quite as important in controlling the pressure in said pressure-chamber as the inlet-passage which leads from the pressure-supply, as it is by opening said outlet-passage that the pressure is relieved, so as to cause the valve-plate to move away from its seat.

It will be seen that by properly controlling the pressure in the pressure-chamber the valve-plate is operated, being moved laterally toward its seat by the pressure in said pressure-chamber and held in contact with its seat by the pressure in said pressure-chamber and then moved laterally away from its seat by a decrease or absence of pressure in said pressure-chamber, all being controlled by the valve controlling the pressure of the pressure-chamber. It is designed and intended that this controlling-valve shall be operated previous to raising the carrier, so

as to relieve or reduce the pressure of the pressure-chamber before said valve-plate starts on its upward movement and also after the carrier has been restored to its normal position, so as to admit the pressure to the pressure-chamber after the valve-plate has ceased its downward movement, and hence is herein shown as adapted to be operated by means independent of the carrier—that is, independent of the movement of the carrier. As herein shown, the three-way cock is provided with a squared end t^3, (see Fig. 2,) adapted to be engaged by any suitable tool, and thereby turned. By operating the valve t independently of the movement of the carrier it will be seen that the pressure of the pressure-chamber may be relieved or reduced before the valve-plate is raised, and consequently said plate will be removed from its seat, so as not to slide on its seat when raised or move thereon with excessive friction. In lieu of this particular form of valve I may employ a screw-threaded plug, as t', (see Fig. 3,) which is located at the junction of the passages e^3 e^4, although such a plug, however, is not adapted to open an exit to the atmosphere when the fluid-passage is closed, or I may employ any other suitable form of valve.

The spring p serves to seat the valve-plate normally, as it might happen that when the valve-plate is away from its seat and there is a pressure back of it, as well as in front of it, said valve-plate would be balanced, so far as the pressure is concerned. Hence the employment of this spring.

To prevent the spring p from thrusting the valve-plate laterally against the interior wall of the valve-case, so that when lowered it will strike the projecting valve-seat a^2, two ribs are provided on said interior wall, one on each side of the seat, on which the valve-plate rides by means of lugs on either side as it rises, being thereby held in a proper plane to move correctly on the valve-seat when lowered.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a valve, a carrier bearing a valve-plate and also bearing a pressure-chamber having a flexible element as a part of it, means for moving said carrier, means, as a passage, connecting said pressure-chamber with the pressure-supply, said pressure-chamber controlling the movements of said valve-plate laterally toward and from its seat as the pressure therein is controlled, and a valve for controlling the pressure in said chamber operated independently of the carrier, substantially as described.

2. In a valve, a carrier bearing a valve-plate and also bearing a pressure-chamber having a flexible element as a part of it, means for moving said carrier, means, as a passage connecting said pressure-chamber with the pressure-supply, said pressure-chamber controlling the movements of said valve-plate laterally toward and from its seat as the pressure therein is controlled, and a manually-operated valve for controlling the pressure in said chamber operated independently of the carrier, substantially as described.

3. In a valve, a carrier bearing a valve-plate and also bearing a pressure-chamber having a flexible element as a part of it, means for moving said carrier, means, as a passage connecting said pressure-chamber with the pressure-supply, said pressure-chamber controlling the movements of said valve-plate laterally toward and from its seat as the pressure therein is controlled, an outlet-passage leading from said pressure-chamber through which the pressure therein is released, and a valve for controlling said outlet-passage operated independently of the carrier, substantially as described.

4. In a valve, a carrier bearing a valve-plate and also bearing a pressure-chamber having a flexible element as a part of it, means for moving said carrier, means, as a passage connecting said pressure-chamber with the pressure-supply, said pressure-chamber controlling the movements of said valve-plate laterally toward and from its seat as the pressure therein is controlled, an outlet-passage leading from said pressure-chamber through which the pressure therein is released, and a valve for controlling the pressure in said chamber operated independently of the carrier constructed and arranged to close said passage connecting said pressure-chamber with the pressure-supply and also open said outlet-passage, substantially as described.

5. In a valve, a carrier bearing a valve-plate and also bearing a pressure-chamber having a flexible element as a part of it, means for moving said carrier, means, as a passage, connecting said pressure-chamber with the pressure-supply, said pressure-chamber controlling the movements of said valve-plate laterally toward and from its seat as the pressure therein is controlled, an outlet-passage leading from said connecting-passage, through which the pressure in said chamber is released, and a valve for controlling said outlet-passage operated independently of the carrier, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN H. BICKFORD.

Witnesses:
B. J. NOYES,
H. B. DAVIS.