No. 671,149. Patented Apr. 2, 1901.

L. SCHUTTE.

BALANCED VALVE.

(Application filed Apr. 21, 1899.)

(No Model.)

Fig. 1.

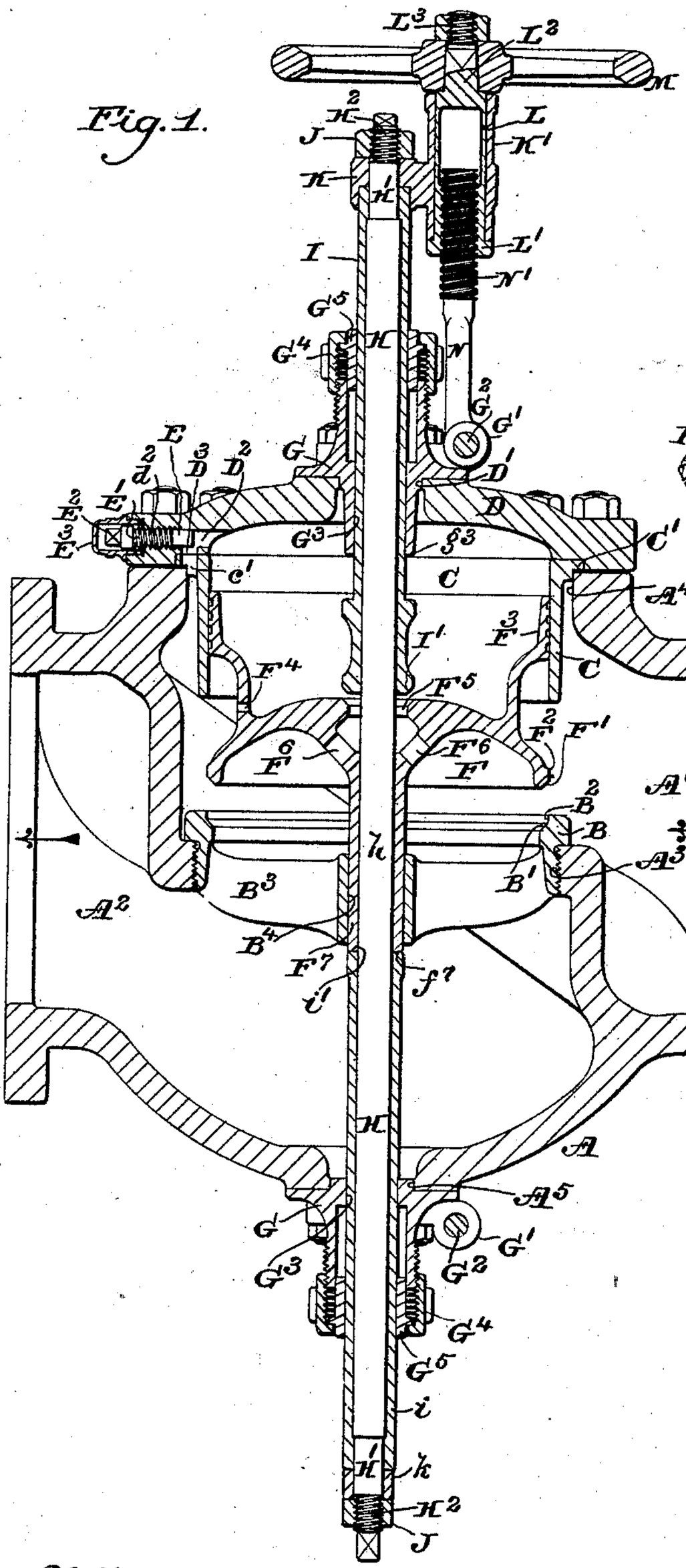


Fig. 4.

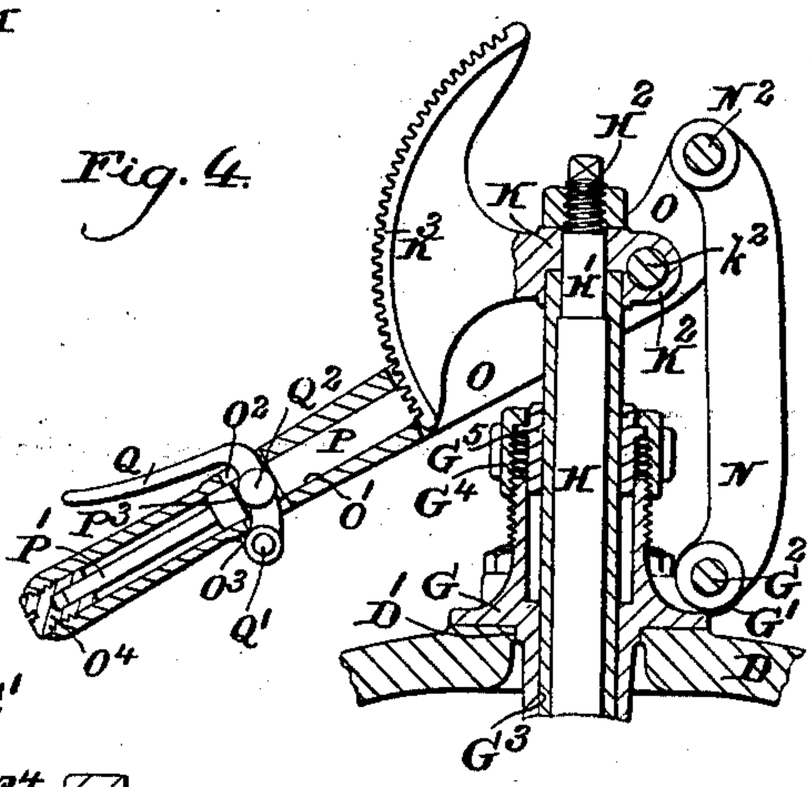


Fig. 2.

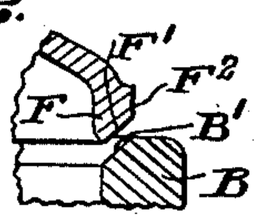
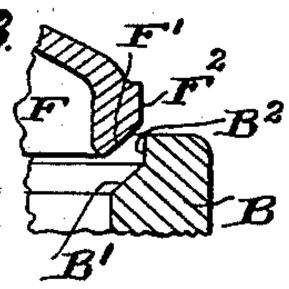


Fig. 3.



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BALANCED VALVE.

SPECIFICATION forming part of Letters Patent No. 671,149, dated April 2, 1901.

Application filed April 21, 1899. Serial No. 713,889. (No model.)

To all whom it may concern:

Be it known that I, LOUIS SCHUTTE, a citizen of the United States of America, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Improvement in Balanced Valves, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to balanced valves such as are used in supply-conduits for steam and other fluids, the object of my invention being to provide a valve of very perfect balance and in general to improve the construction of this class of valves.

The nature of my improvements will be best understood as described in connection with the drawings in which they are illustrated, and in which—

Figure 1 is a central section through a valve-casing and valve formed and provided with my improvements. Fig. 2 is a fragmentary sectional view showing the ordinary construction of the valve-seat and the seat portion of the valve; Fig. 3, a similar view showing my improved construction, and Fig. 4 is a view showing a modification of the device for actuating the valve.

A is the valve-casing, divided in the usual manner into chambers A′ and A^2, connected by a circular opening A^3, the flow of the fluid being from the chamber A′ through the opening A^3 into the chamber A^2. As shown, the valve-casing is formed with a large circular opening A^4, leading into the chamber A′ immediately over the opening A^3, and with a smaller opening A^5, leading into the chamber A^2 opposite to the opening A^4.

B is a valve-seat ring screwing into the opening A^3 and having formed on it the usual conical valve-seat, (indicated at B′.) In addition to this seat, however, I provide a ring B with a parallel-sided cylindrical wall (indicated at B^2) entirely surrounding the seat B′ and adapted to make a comparatively close fit with the outer edge of the valve.

C is a cylinder the internal diameter of which is substantially the same as the external diameter of the valve. This cylinder is provided with an annular flange C′ at its upper end, which rests, as shown, on the top of the wall surrounding the opening A^4 and is formed with a channel (indicated at c') to permit the passage of fluid from the chamber A′.

D is a cover or lid adapted to close the opening A^4, leading into the chamber A′, and to fit down closely over the top of the cylinder C, as shown. This cover is formed with a central opening D′, corresponding in size and proportion with the opening A^5, leading into the chamber A^2. It is also formed with a channel or passage D^2, having an elbow D^3, which connects with the channel c' and has its outer end externally threaded, as indicated at d^2. The channel c', D^3, and D^2 leads, it will be seen, from the chamber A′ into the top of the cylinder C, and its effective area is controlled and regulated by a rod E, a portion of which is threaded and screws into the threaded portion d^2 of the passage D^2, as indicated at E′. The outer end of the rod is squared, as indicated at E^2, so as to permit of the adjustment of the rod by turning the screw and, as shown, is protected against accidental movement and leakage by a screw-cap E^3.

F indicates the valve, having a conical seat F′, adapted to fit on the seat B′ of the ring B and its outer edge (indicated at F^2) adapted to fit nicely in the cylindrical wall B^2 of the ring. The valve is also provided with a piston extension (indicated at F^3) which fits in the cylinder C and, as shown, is formed with a contracted opening F^4, by which the chamber A′ and the cylinder C are placed in communication, as well as through the regulable channel heretofore described as leading into the top of the cylinder. In the center of the valve F is formed a valve-seated passage F^5, of greater diameter than the valve-rod which passes through it and arranged to connect with the under side of the valve, as shown, through passages F^6. The valve is also provided with a downwardly-extending sleeve F^7, the lower edge of which is indicated at f^7.

Before going further with the description of the apparatus I would state that in the ordinary construction of valves and valve-seats, such as is indicated at F^2, the consequence of the first motion of the valve away from its seat is that the steam or other fluid enters the narrow space between the valve and its seat on the outside and before escaping is forced to move through what is, in ef-

fect, a contracting orifice, the result of which is at times that the full or nearly full steam-pressure is maintained under the seat with a tendency to move the valve upward. This is not appreciable when the valve is opened to, or nearly to its full extent but in the act of opening not infrequently gives rise to a thumping, which is highly undesirable. This tendency I overcome by providing the valve-seat with the surrounding wall, as indicated at B^2, which keeps the valve closed against the passage of any considerable amount of steam or other fluid until the seat F′ of the valve has passed to such a height above the seat B^2 as to render the effect of the concentration of the fluid in passing beneath the seat unappreciable.

Returning to the construction of the device as illustrated in Fig. 1, G G are stuffing-boxes of usual construction, one arranged to close the opening D′ in the lid D and the other to close the opening A^5 in the casing A. Both of these stuffing-boxes are provided with a gland G^5 and screw-ring G^4 and are formed with portions (indicated at G^3) seated inside of the packing-holding chamber, making a fit of the usual character with the rod passing through. As in the case of the upper stuffing-box, I have indicated an inwardly-extending sleeve g^3, which serves as a stop to limit the motion of the valve-rod, as will be hereinafter explained. While my valve-rod may be actuated by any convenient mechanism, I prefer to connect the actuating mechanism with the stuffing-box casting, and for this purpose provide the casting with lugs, such as are indicated at G′ and which are arranged to support a pivot-pin G^2.

H is a valve-actuating rod or spindle, which, as shown, is shouldered at top and bottom, as indicated at H′, and provided with terminal threaded portions, (indicated at H^2.) Fitting over the upper end of the rod H is the sleeve I, which extends through the upper stuffing-box and has formed on its end a valve I′, adapted, when the rod is forced down, to fit upon and close the valve-seated opening F^5 in the center of the valve F. As shown, the sleeve I is held in position by the casting K, which fits against its end, and the nut J, screwing on the threaded end H^2 of the spindle proper.

i is a sleeve similar to the sleeve I, fitting over the lower portion of the valve-rod and passing through the stuffing-box at the bottom of the valve-casing. It is held in position by a ring *k* and a nut J, screwing over the threaded portion H^2 of the lower end of the rod H. The upper end of the sleeve *i* is indicated at *i′*, and the distance between the end *i′* of the sleeve *i* and the lower end of the valve I′, attached to the rod I, is slightly greater than the distance from the top of the valve F to the bottom of its sleeve extension F^7, leaving a portion *h* of the rod H uncovered by the fixed sleeves, upon which portion fits the sleeve extension f^7 of the valve F. In effect the sleeves I and *i* may be considered as parts of the valve-actuated spindle, from which point of view the portion *h* would be simply a portion of lesser diameter. The building up of the valve-spindle of the parts specified is, however, preferable for obvious reasons.

As shown in Fig. 1, the casting K has formed at one side a tubular extension K′, in which is secured a plug L, the lower portion of which is hollow and threaded, a flange L′ serving as an abutment against the lower end of the tube K′ and a squared extension L^2 serving to hold the hand-wheel M, which is secured in place by means of a nut screwing on a threaded projection L^3. N may be called a "link," pivotally secured to the pin G^2 and having, as shown in Fig. 1, a threaded upper end N′, screwing into the threaded end of the plug L. In the modification illustrated in Fig. 4 the link L is of somewhat different shape, and instead of having its upper end provided with a thread it is provided with a pin, (indicated at N^2.) The casting K in this modification has on one side lugs, such as are indicated at K^2, for holding the pivot-pin k^2, and on the other side a rack-segment, as indicated at K^3. O is a lever pivotally attached to the pivot-pin N^2 and k^2. Its outer end is made hollow, as indicated at O′, transverse openings O^2 and O^3 being formed through its walls and its outer end threaded and closed by a plug, as indicated at O^4. P is a reciprocating toothed arm moving in the hollow portion O′ of the lever O, with its outer end P′ held in alinement in the plug at the end of the lever and a transverse opening P^3 formed in it, so as to register with the openings O^2 and O^3 in the hollow end of the lever O. Q is a bent lever secured to a pivot-pin Q′ on the under side of the lever O and passing through the transverse slots O^3, P^3, and O^2, so that its free end will lie within easy finger-grip of the hand of the operator holding the end of the lever O. A roller Q^2 may be conveniently supplied to fit in the opening P^3 of the toothed rod P.

It will be obvious in the case of the construction shown in Fig. 1 that the turning of the hand-wheel M will draw the rod H and its attachments up or down, as may be desired, and it is equally obvious that the rod H and its attachments may be moved up or down by moving the lever O and held in any desired position by permitting the engagement of the toothed rod P with the segment K P.

As shown in Fig. 1, the valve is partly open. Assuming that it is closed and the valve I′ seated in the opening F^5, it will be obvious that all flow of fluid from the chamber A′ to the chamber A^2 is cut off, also that the fluid having access to the inside of the cylinder C through the opening F^4 and the channel *c′* D^3 D^2, the valve will be held to its seat not only by the direct action of the spindle, but by the pressure of the fluid in the chamber A′. When

it is desired to open the valve, the rod H is moved upward, the first effect of which is to raise the valve I′ from its seat, permitting the escape of the fluid contained in the cylinder C with much greater rapidity than it can be supplied through the restricted orifices leading into the cylinder. The fluid-pressure is therefore lessened above from the top of the valve, and as soon as the upward motion of the rod H brings the top i' of the sleeve i into contact with the lower end f^7 of the valve-sleeve F^7 the valve will be raised from its seat with little more resistance than its own weight. It will also be obvious that if at any time the pressure on the lower face of the valve exceeds that on its upper face, acting in the cylinder C, the valve will move up until it is stopped by the valve I′ and its opening F^5 thereby closed, whereupon pressure will rapidly accumulate in the cylinder C until it exceeds the pressure on the under side of the valve, thus returning it to normal position—to wit, a position in which it rests on the upper end of the sleeve i. This same action will occur in closing the valve in case, for any reason, it does not move freely down. The downward motion of the valve-rod closes the opening F^5, and the rapidly-accumulating pressure in the cylinder C, which is necessarily in excess of that on the under side of the valve, will tend to push it downward, assisting the force applied to the spindle.

By carrying up the valve-spindle entirely through the casing, as shown, I effectively balance it, so that when the valve is opened, the steam or other fluid has no tendency whatever to move the spindle. On the other hand, when the valve is closed there is a slight excess of pressure on the valve I′, tending to hold it to its seat.

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

1. A valve-casing as A having a valve-seat as B in combination with a valve, as F, having a piston extension, as F^3, and a valve-seated opening, as F^5, a cylinder C in which the piston extension F^3 fits and which is provided with means for admitting fluid from the casing above the piston and with regulated flow, a valve-stem working through a stuffing-box in the casing and connected with the valve by means as described allowing it a slight freedom of longitudinal movement and a valve, as I′, secured to the stem in position to close the opening F^5 when the stem is moved to close the valve F and to open it in advance of a movement of valve F when the stem is moved to open the said valve.

2. A valve-casing, as A, having a valve-seat, as B′, with a substantially parallel-sided wall B^2 in combination with a valve, as F, having a seat F′ and a cylindrical extension F^2 adapted to fit in wall B^2, having a piston extension as F^3, and a valve-seated opening, as F^5, a cylinder C in which the piston extension F^3 fits and which is provided with means for admitting fluid from the casing above the piston and with regulated flow, a valve-stem working through a stuffing-box in the casing and connected with the valve by means as described allowing it a slight freedom of longitudinal movement and a valve, as I′, secured to the stem in position to close the opening F^5 when the stem is moved to close the valve F and to open it in advance of a movement of valve F when the stem is moved to open the said valve.

3. A valve-casing, as A, having a valve-seat, as B, in combination with a valve, as F, having a piston extension, as F^3, and a valve-seated opening, as F^5, a cylinder C in which the piston extension F^3 fits and which is provided with means for admitting fluid from the casing above the piston and with regulated flow, a valve-stem working through stuffing-boxes arranged on opposite sides of the casing and having a narrowed neck, as h, on which a somewhat shorter extension F^7 of the valve F fits and moves and a valve, as I′, secured to the stem in position to close the opening F^5 when the stem is moved to close the valve F and to open it in advance of a movement of valve F when the stem is moved to open the said valve.

4. In combination with a valve-casing, a valve working therein and a valve-stem extending from the valve through the casing, a laterally-projecting casing, as K′, secured to the top of the valve-stem, a threaded plug secured to and turning in casing K′ and a threaded projection, as N, secured to the valve-casing and in engagement with the threaded plug.

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