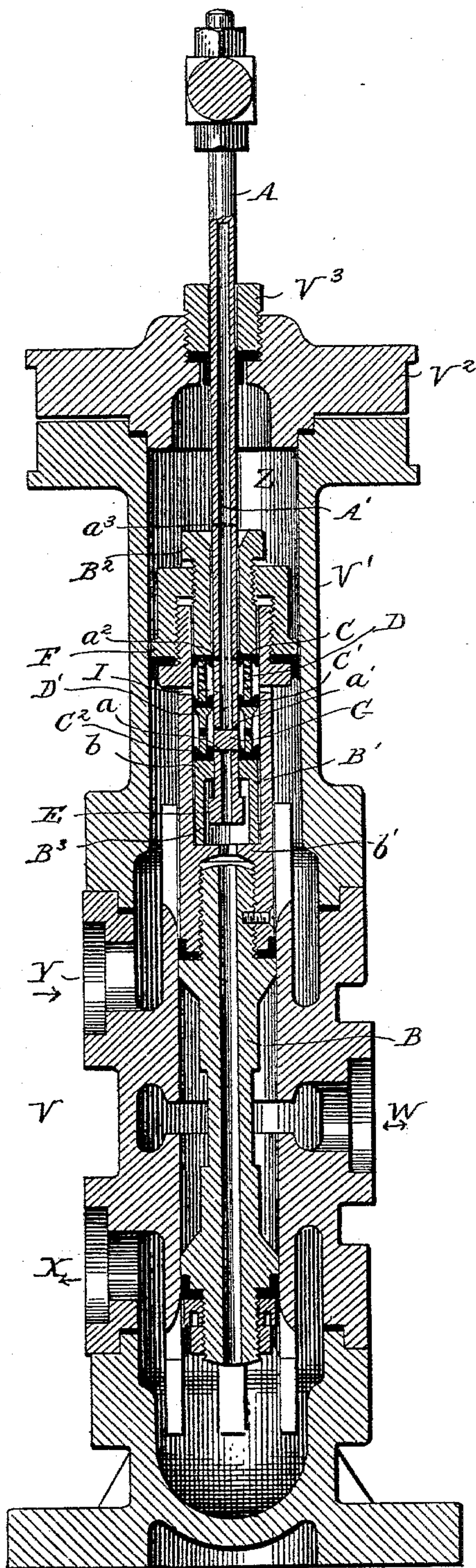


(No Model.)

T. E. BROWN, Jr.  
PILOT VALVE.

No. 597,388.

Patented Jan. 18, 1898.



Witnesses  
Jno. G. Hinkel  
J. A. Fairgrieve

Inventor  
Thomas E. Brown, Jr.  
by Foster & Freeman  
Attorneys



# UNITED STATES PATENT OFFICE.

THOMAS E. BROWN, JR., OF NEW YORK, N. Y., ASSIGNOR TO THE OTIS BROTHERS & COMPANY, OF SAME PLACE.

## PILOT-VALVE.

SPECIFICATION forming part of Letters Patent No. 597,388, dated January 18, 1898.

Application filed August 31, 1894. Serial No. 521,863. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS E. BROWN, Jr., a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Pilot-Valves, of which the following is a specification.

My invention relates to pilot-valves, and more especially to that class of pilot-valves which are adapted to operate in connection with hydraulic lifting devices, although of course the valve may be used in other connections and for other purposes; and the object of my invention is to provide a valve which shall be simple in construction, not liable to get out of order, and which shall be positive in operation, controlling the main valve and causing it to move with the pilot, and which shall be capable of being operated by the ordinary hand-ropes; and to these ends my invention consists in the various features of construction and arrangement of parts having the mode of operation substantially as hereinafter more particularly set forth.

Referring to the accompanying drawing, I have illustrated an embodiment of my invention in connection with a hydraulic valve, in which the figure is a longitudinal vertical section showing the parts in their normal condition with the main valve at rest.

Heretofore pilot-valves have been used, and they are generally operated with a hand-lever, it being found practically impossible to operate them successfully with the ordinary hand-rope, as the use of the hand-rope requires that the main valve shall directly follow or move with the pilot-valve and rope. With the ordinary valve, the operator for instance, might pull his lever to the center or to the extreme of one of its movements and then must wait an interval of time for the main valve to follow it, which it will do unless it is obstructed or inoperative for some reason. From this it follows that when the operator places his lever in any position he is not certain that the main valve has reached a corresponding position, and it does not reach such a position until after a certain interval of time, which is objectionable.

It is one of the objects of my present invention to so arrange the pilot and the main

valve that their motions shall be identical or practically identical—that is to say, if the pilot is moved an inch the main valve is moved an inch also, and if the pilot-valve is moved to its central position the main valve is moved to its central position, and the operator will know that it is in the position desired. Furthermore, I so arrange the parts that the main valve may be positively moved by the operator if, perchance, it does not move automatically on the operation of the pilot-valve.

Furthermore, it is the object of my invention to provide a structure in which the parts are simple and can be made exceedingly strong, so as to operate under high pressure, and in other ways to provide an efficient and effective valve, and with these general statements as to the object of my invention I will now proceed to describe the embodiment thereof shown in the accompanying drawing.

The pilot-valve in the present instance is shown in connection with the main valve of a certain construction, which is more particularly pointed out in my application, Serial No. 519,867, filed on the 9th day of August, 1894, and while it is preferably embodied in connection with such a valve it can of course be used in connection with other main valves and accomplish its purposes in substantially the same way.

It is not deemed necessary to describe in detail the construction and operation of the main valve, which consists of a case V, having an inlet-port Y, a working port W, and an exit-port X, and is shown as provided with a valve B, having a piston at each end and operating to control the passage of the water through the valve in a manner well understood. The upper end of the valve-case V is shown as extended at V', forming an extension of the inlet port or chamber Y, and the valve B is also shown as being extended to form an actuating-piston F, this piston being enlarged, preferably, to about double the area of the valve itself, although it may be of any desired relative area, and it will be seen that the under side of the actuating-piston F is always in connection with the pressure fluid through the inlet Y. This actuating-piston may be formed integral with the



valve B; but it is preferably formed in an extension connected to the valve, which extension consists of a pilot-barrel B', screwed or otherwise attached to the valve and carrying the actuating-piston F, as well as the operative parts of the pilot, hereinafter described.

Mounted in the pilot-barrel are three annular leathers C C' C<sup>2</sup>, and between these leathers are the spacing-rings D D', made of brass or other suitable material, which operate to keep the leathers at the proper distance apart, the spacing-rings being perforated or otherwise arranged so as to allow of the passage of fluid through them. These leathers and rings are confined in the pilot-barrel by a suitable plug B<sup>2</sup> at the outer end and a suitable ring B<sup>3</sup> at the lower end, which ring has an inturned flange b for the purpose hereinafter stated.

Mounted to slide or move in the pilot-barrel and through the leathers is the pilot stem or rod A, which is adapted to be operated by a suitable lever or other device connected with the ordinary hand-rope of an elevator or other device, which devices are not shown, as they are well understood by those skilled in the art. This stem passes through a stuffing-box or plug V<sup>3</sup> in the cap V<sup>2</sup> of the extension V', there being formed a fluid-chamber Z in the end of the extension between the actuating-piston and the cap.

The stem A is provided with shoulders or projections E, which work in the flanged ring B' and which serve to limit the motion of the pilot independent of the valve, for, as will be seen, if it is moved a short distance upward the shoulders E come in contact with the inwardly-projecting flange b on the ring, while if it is moved downward a short distance the shoulders come in contact with the projections b' on the pilot-barrel, so it will thus be seen that there is a relatively very small range of independent movement between the pilot-stem and the main valve, in practice being perhaps a quarter of an inch, more or less.

The pilot-stem A has a passage A' extending throughout the greater portion of its length; but at one portion thereof there is a partition G or closed portion to the passage, preventing the fluid flowing therethrough. This passage is connected with the outer surface of the pilot-stem by several series of ports or openings, one, as a, being shown as just below the partition G and communicating with the outlet at the end of the pilot-stem; another, a', just above the partition G and communicating with the opening A' above the partition; another set, a<sup>2</sup>, also communicates with the passage at this place, and still another, a<sup>3</sup>, arranged upon that portion of the stem which is above the actuating-piston and furnishing communication between the passage A' in the stem and the fluid-space Z at the end of the casing. These ports are shown in the form of holes bored through the stem; but of course any other form of opening which will accomplish the same purpose may be

used. The pilot-barrel is also provided with openings I, communicating with the fluid-pressure Y and with the space between the leathers C C', while it will be seen that the partition G is arranged in that part of the stem which is in juxtaposition with the space between the leathers C' C<sup>2</sup>.

In the drawing, as before stated, the pilot is shown in its central position. The main valve is stationary, the ports thereof being closed, and it will be seen that while the fluid-pressure is against the actuating-piston and communicates with the space between two of the leathers, separated by one of the rings, it can get no farther, as the ports a<sup>2</sup> are closed by the ring C. It will further be seen that while the fluid in the chamber Z at the end of the extension can communicate with the passage in the stem through the ports a<sup>3</sup> and with the space between the leathers C' C<sup>2</sup> by the ports a' the ports a are closed by the leather C, so that the fluid cannot escape from said chamber.

Suppose now it is desired to move the main valve so as to open communication between the ports Y and W. The pilot is raised by the operating mechanism, as the hand-rope, its motion independent of the main valve being controlled by the shoulders E, which come in contact with the flange b; but this allows sufficient movement to permit the ports a to communicate with the passage between the leathers C' C<sup>2</sup>, and it will be seen that the fluid in the chamber Z at the end of the extension will pass through the ports a<sup>3</sup> into the passage A' of the stem, out of the ports a' into the space surrounding the stem, and through the ports a into the stem again below the partition G, and thence into the exhaust through the hollow stem of the main valve. This of course relieves the pressure in said chamber Z, and the fluid-pressure against the actuating-piston causes the main valve to rise, following the motion of the pilot-stem, and this motion will continue as long as the port a remains uncovered by the leather C<sup>2</sup>, and it will be seen that the motion of the main valve is identical with the motion of the pilot-valve, and the operator will know to what extent he has opened the main valve. As soon as the pilot-stem stops the fluid-pressure causes the actuating-piston to move sufficient to close the ports a and the valve comes to rest. If, for instance, it is desired to lower the main valve so as to open the ports W X, the pilot-stem is depressed until the shoulders E come in contact, or approximately so, with the projection b', and this causes the ports a<sup>2</sup> to open communication between the space between the leathers C C' and the passage A', and the fluid-pressure passes through the opening I into this space through the ring D, the port a<sup>2</sup> into the stem, and by the port a<sup>3</sup> into the chamber Z at the end of the piston. It will be seen that the area of the actuating-piston exposed to the pressure in the chamber Z is greater than the area on the un-



der side of the actuating-piston exposed to the fluid-pressure on account of the pilot-barrel reducing said area, and on account of this difference of area the fluid in the chamber Z forces the main valve downward to follow the movement of the pilot-valve, and this movement continues until the leathers again cover the ports  $a^2$ , when the main valve comes to rest. It will thus be seen that the motion of the main valve is identical with that of the pilot-valve—that is to say, if the pilot-valve is moved an inch the main valve is moved an inch also. The pilot-valve moves slightly in advance of the motion of the main valve, sufficient to uncover one or the other of the ports, as above set forth, but the main valve continues its movement for the same distance and slightly after the pilot-valve is stopped sufficient to cover the port that was opened, when both come to rest. This is a very important feature, as it enables the operator to know exactly the condition of the main valve. Further, it will be observed that the operator can only move his rope or lever, as the case may be, as fast as the main valve allows him to move it. In other words, the first motion of his rope or lever brings the shoulder E of the pilot-stem into contact with the stops  $b b'$ , as the case may be, and then he can only move the pilot at the rate of speed at which the main valve travels and allows him to move it. Hence when his lever or rope reaches a given position he knows that the main valve must be in a corresponding position. Thus supposing the operator pulls his lever or hand-rope to the central position to stop the valve, for instance, he need not wait for an interval of time for the main valve to follow and then not be sure that it will follow, but the pilot-valve and the main valve will reach the central position at practically the same time. In the worst case at most the main valve can only be behind the lever and pilot by the amount of independent throw allowed to the pilot, which may be, as before indicated, about a quarter of an inch, more or less.

Should any obstruction or retardation occur to the motion of the main valve or should the valve fail to follow the pilot automatically for any reason, it can be pulled or forced to the desired position by the operator through the medium of the pilot-valve, the shoulder of which acts positively on the main valve and causes it to follow the pilot, and this can be done within the limits of the strength of the operator. Of course it will be understood that the pilot-stem should be stiff enough and of sufficient strength to move the main valve bodily in case of emergency, and in large-sized valves the stem may be made relatively larger, or an extra rod or tube surrounding the pilot-stem having corresponding openings or ports may be provided.

It will further be seen that in my valve, as above described, not only are the above results accomplished, but the construction of

the valves is exceedingly simple, being easily made, and are so arranged that they are not liable to get out of order or subjected to excessive wear, and the whole can be readily combined with an ordinary valve of the construction shown or of a different construction, and it forms a compact and practical commercial valve.

What I claim is—

1. The combination with the pilot-barrel, of the leathers arranged therein, the spacing-rings between the leathers forming chambers in the barrel, an opening through the barrel communicating with one of the chambers, a hollow spindle passing through the leathers and having the ports  $a, a', a^2$ , arranged to be closed by the leathers, and the port connecting the passage in the barrel with the space outside the barrel, substantially as described.

2. The combination with the main-valve case and valve mounted therein, of a pilot-barrel connected to the main valve and having stops, chambers in said pilot-barrel separated by leathers, and a hollow stem passing through said leathers and having ports communicating with the chambers and provided with shoulders engaging the stops in the pilot-barrel, substantially as described.

3. The combination with the main-valve case and valve, of a pilot-barrel connected to the valve, an actuating-piston mounted thereon, leathers arranged in the pilot-barrel, spacing-rings between the leathers forming chambers, an opening in the barrel communicating with the main case, a hollow stem passing through the leathers and having ports as  $a, a', a^2$  communicating with said chambers, and a port  $a^3$  communicating with the main-valve chamber, substantially as described.

4. The combination with the main-valve case and valve, of a pilot-barrel connected to the valve, a limiting-ring in the barrel, leathers and spacing-rings also in the barrel, a plug closing the barrel, a hollow pilot-stem communicating with the chambers in the barrel and with the main-valve chamber, and shoulders on the pilot-stem engaging the plug in the barrel, substantially as described.

5. The combination with the main-valve casing and valve therein, of a pilot-barrel having a passage communicating with the main-valve casing, leathers arranged in the barrel, rings for separating the leathers forming chambers, a hollow pilot-stem having a partition, a port below the partition arranged to communicate with one of the chambers, two ports above the partition arranged to connect the chambers, and openings at the ends communicating with the main-valve chamber, substantially as described.

6. The combination with the main-valve casing and valve, of a pilot-barrel connected to the end of the main valve, an actuating-piston connected to the pilot-barrel, a limiting-ring in the barrel, leathers and separating-rings in the barrel and a plug for secur-



ing them therein, a hollow pilot-stem having  
a partition, ports controlled by the leathers  
and communicating with the chambers in the  
barrel and with the main-valve chamber, and  
5 shoulders on the pilot-stem engaging the lim-  
iting-ring, substantially as described.

In testimony whereof I have signed my

name to this specification in the presence of  
two subscribing witnesses.

THOS. E. BROWN, JR.

Witnesses:

C. S. LEHIGH,

CHAS. L. DUENKEL.