P. BALL.

Stop-Cock.

No. 162,338. Patented April 20, 1875.

Fig. 1.

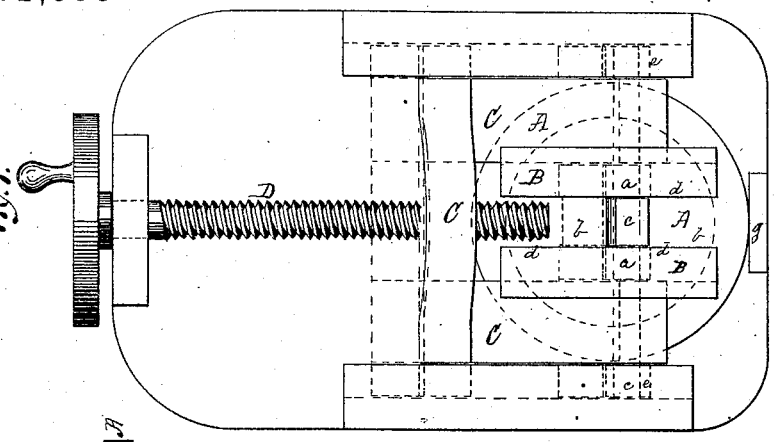


Fig. 4.

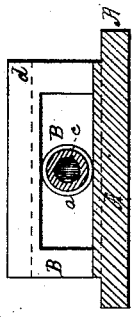


Fig. 2.

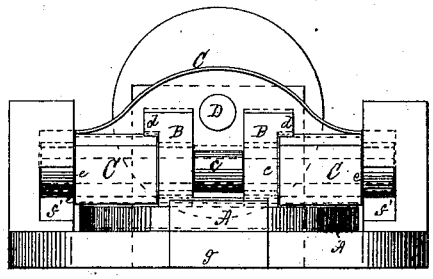


Fig. 3.

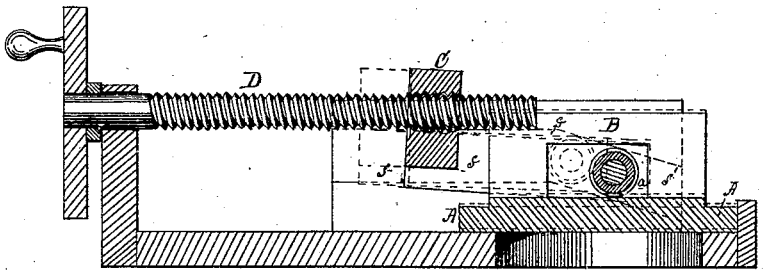


Fig. 6.

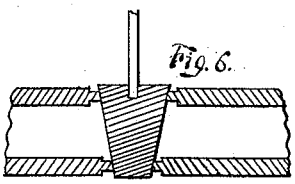
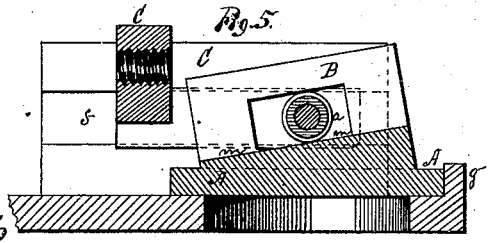


Fig. 5.



Witnesses.
Leo Van Wisswick
D. G. Stuart

Inventor:
Phinehas Ball
per P. Hannay
atty.

THE GRAPHIC CO. PHOTO-LITH. 39 & 41 PARK PLACE, N.Y.

UNITED STATES PATENT OFFICE.

PHINEHAS BALL, OF WORCESTER, MASSACHUSETTS.

IMPROVEMENT IN STOP-COCKS.

Specification forming part of Letters Patent No. **162,338**, dated April 20, 1875; application filed November 21, 1874.

To all whom it may concern:

Be it known that I, PHINEHAS BALL, of Worcester, in the county of Worcester and State of Massachusetts, have invented a certain new and useful Method of Lifting a Valve from its Seat; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification, in which—

Figure 1 represents an elevation of a valve having my improvements applied thereto; Fig. 2, a similar view of the lower end of the valve, and Fig. 3 a vertical section of the same. Fig. 4 represents a sectional elevation of the valve and its loop-connections, and Fig. 5 a similar view of a modified form of the same. Fig. 6 represents a sectional view of the ordinary solid wedge-shaped valve.

My invention relates to a new and improved mode of lifting the valve from its seat, the improvement being more especially designed for use in connection with the valves or gates of water pipes or mains, although equally applicable to valves of hydrants where the normal pressure of the water in the distributing-pipes is great.

In operating what may be termed open-way valves—that is to say, valves which, on being opened or closed, are made to slide or move in a plane at right angles to the line of the length of the pipes, that free passage may be given to the water when fully open—many difficulties have been experienced in making them work smoothly and easily. The principal of these difficulties lies in the friction to be overcome in moving the valve from and to its seat, arising from the sliding of one metal surface, ground water and air tight, over another under high pressure, and which is intensified by the action of the fine sand and silt deposited between them from the water, which speedily causes the primarily finely-finished surfaces to be eroded and destroyed. Another and scarcely less disastrous evil arises from what is technically termed a "water-hammer," and is produced by a too sudden closing of the valve or gate, which not unfrequently results in the bursting of the pipes or mains.

The object of my invention is to remedy these defects—first, by substituting rolling for sliding friction; and, secondly, by so operating the gate or valve that, in opening it, it shall be first slowly and gradually lifted from its seat in a lateral direction before moving it in any degree in a vertical or angular direction to the line of the pipes, and in closing it, that it shall be first depressed vertically its entire length, or nearly so, and then slowly and gradually forced home laterally against its seat.

My improvement for these purposes consists in a novel and improved mode of connecting a disk-valve with the screw or other device that operates it, whereby, in applying the power to open or close the valve, rolling friction can be applied or substituted for sliding friction, and whereby the valve can be first lifted from its seat laterally before being raised vertically when being opened, and first depressed vertically before being forced laterally to its seat in closing.

To enable others skilled in the art to make, construct, and use my improvement, I will now proceed to describe its parts in detail.

The general construction of the valve-chamber and the mode of securing it to the water pipes or mains may be the same as that now in general use, it simply being adapted to receive my valve and its adjuncts. The valve-disk A itself may also be made and fitted to its seat in the usual manner. To its back a loop, B, is firmly secured, in which a friction-roll, *a*, works, whose spindle is mounted in a spider-frame, C. Instead of a single loop, B, two may be used, they being connected together at the bottom by a web or plate, *b*, and then firmly bolted or riveted to the back of the disk. The double form of loop is the plan illustrated in the drawing. When made on this plan the spindle *c* carries two friction-rolls, *e*, one for each loop, and is the preferable mode, as it serves to keep the valve laterally in a plane parallel with that of its seat; or, if desired, the valve-disk A and loop or loops B may all be cast in one piece. On the outer edge of the back of each loop B is

formed a flange, *d*, between which and the back of the disk the spider-frame loosely plays, the two forming a guide-channel, as it were, for the latter, so as to keep the valve to a certain extent in a vertical plane. The loop B forms a yoke, in which the disk A is loosely suspended on the friction-rolls *a* of the spindle *c* of the spider-frame. The spider-frame moves on two rolls, *e*, one on each end of the same spindle *c*, and travels in grooves *f*, made one in each of the opposite sides of the gate frame or box. The lower ends of the grooves *f* are inclined inward toward the face of the valve-seat, as shown in Fig. 3, for a purpose hereafter to be described. Thus arranged and constructed, the spider-frame is connected, in the usual manner, directly to the operating-screw D of the gate or valve. In small gates or valves a single spindle, *c*, with its friction-rolls *a* and *e*, will be found sufficient to perform the required operations; but in large gates two or more spindles, *c*, each carrying its complement of rolls *a* and *e*, may be required, in which event a corresponding series of double inclines, similar to those shown as forming the lower extremity of the grooves *f*, may be used for each, in order that the face of the valve may be kept in a plane parallel with its seat while being forced home or lifted therefrom. These series of inclines should be arranged at a distance apart corresponding to the distance between the centers of the repective shafts or spindles *c*, so that each of the latter may be simultaneously brought opposite their respective inclines or grooves. With such purpose in view the lower spindle, if desired, may be made longer than the middle one, and the latter longer than the upper one, and the grooves *f* correspondingly deepened, in order to avoid the possibility of the one dropping into the inclined grooves *f'* of the other. In either case, whether one, two, or more spindles are used, the connection of the screw with the spider-frame can, if desired, be so modified as to allow the latter to move transversely across the line of the former in lifting or forcing the valve home to its seat—as, for instance, by the application of a suitably-formed slide or hinged screw-socket, through which the power of the screw may be imparted to the spider-frame.

The length of the slot of the loop B on the back of the valve-disk must be sufficient that, when the latter has reached the end of its downward vertical travel, the spider-frame C, which carries the spindle or spindles and friction-rolls, shall afterward have sufficient downwardly-vertical travel for the rolls *e* to descend the inclined planes *f'* at the lower end of the grooves *f* before the rolls *a* reach the end, or, if desired, the middle of the slots in the loops B, so that the valve, after vertical travel has ceased, may be slowly and gradually forced laterally home to its seat to close the valve, and vice versa—that is to say, the length of the slot of the loop must be sufficiently great to allow the spindle or spindles *c* and their friction-rolls *e* to move up the inclined planes of the lower end of the grooves *f*, so as to lift the valve A laterally from its seat before the rolls *a* in the loop B shall act on the upper end of the latter, so as to raise the valve in a vertical direction or plane, and give free passage to the water through the gateway. By this plan no metal is slid over metal, while all the working-bearings are made to move on rolls mounted on suitable axles, thus substituting rolling for sliding friction. Again, as the side rolls *e* move in proper guides, they maintain the disk or valve, after it has been lifted from its seat, in a proper position, free from the seat, so that the fitted faces of each are not injured by its upward and downward movement.

In closing, the valve-disk first touches the stop *g* at the bottom of the seat, and, by the forward movement of the spider-frame on its downward travel on the inclined plane, forces the valve powerfully home to its seat in a direction at right angles to the faces. This lateral motion is very important, as it admits of the use of any soft material for a facing of the valve-disk, such as lead, Babbitt, leather, rubber, wood, prepared packing, or any of the usual compositions now employed for facing valves. The use of soft substances, such as leather or rubber, is particularly desirable in gritty or muddy water, as the particles of sand will be forced into those substances, thereby preventing injury to the seat. Moreover, this plan enables a valve-disk to be re-covered with any of these or analogous substances, and thus continue to do good service for a long time by simply removing the disk from the valve-chamber and replacing it when the repair is effected. The guides *d* on the back of the yokes B, as before stated, serve to keep the valve in position on small gates; but on valves of large size, where two or more sets of rolls, *a* and *e*, and spindles *c* are used, the side slots or grooves *f* may then form the guides to the exclusion of the others. The operating-inclines *f'*, that give the lateral motion to the valve-disk A, may either be applied as a continuation of the grooves *f*, as already described, or may be placed upon the back of the valve-disk itself, under the yoke, as shown in Fig. 5, in which case the rolls *a* will be the means of lifting the valve from or forcing it home to its seat, while groove *f* will be a simple straight groove. Either arrangement may be made as may be deemed best to suit the case or wishes of the builder. One advantage of the latter plan is, that all valves may be made to operate well, either with a single or with double disks; as, should the latter mode be preferred for any purpose or reason whatsoever, they may be used without materially increasing the size of the valve-chamber by making a suitable combination of the two plans—that is to say, by operating the one disk by means of the inclines *f'* at the lower end of the grooves *f*, and the other by inclines *m* on the back of the valve-disk

itself. In order that the valve may always close, even if the disk does not reach the bottom stop *g* in its descent before the compressing-wheels *e* commence the closure of the valve, a proper proportion in the construction of the valve must be preserved between the vertical travel of the spider-frame in the yoke and the length of the valve, so that the latter shall always cover the opening under any circumstances before the full measure of the closing force is exerted. A valuable feature of this improvement consists in the direct application of the power of the screw to the valve to force it home in order to seat and hold it there.

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

1. A valve combined with operative mechanism, wherein the former, through the instrumentality of grooves in the walls of its chamber, on being opened, is first lifted from its seat in a line at right angles to the plane of the latter before it is moved in a line parallel therewith, and, on being closed, is first moved in a line parallel with the plane of its seat until it has fully covered the latter, and is then slowly forced home thereto by a lateral movement at right angles to the former, and there held, in the manner substantially as and for the purposes set forth.

2. A valve combined with its seat and shell, wherein the valve is raised from and forced home to its seat at an expense of rolling friction between the valve and its support, substantially as set forth.

3. The combination of the spider-frame C, spindle *c*, and friction-rolls *e e* with the rolls *a a*, grooves *f f*, and double inclines *f' f'* in the walls of the valve-chamber, or their equivalents, substantially as described, the whole operating in the manner substantially as and for the purpose set forth.

4. The combination of a spider-frame, C, with the disk A and yoke B, substantially as set forth.

5. The combination of the spider-frame C and its sets of friction-rolls *a a* and *e e* with the disk A and yoke B, all operating in the manner substantially as and for the purposes set forth.

6. The combination of the screw D with the frame C and valve-disk A, the two latter being looped together, in the manner and for the purpose substantially as set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

PHINEHAS BALL.

Witnesses:

GEO. F. FARMER,

CHARLES W. PAINE.