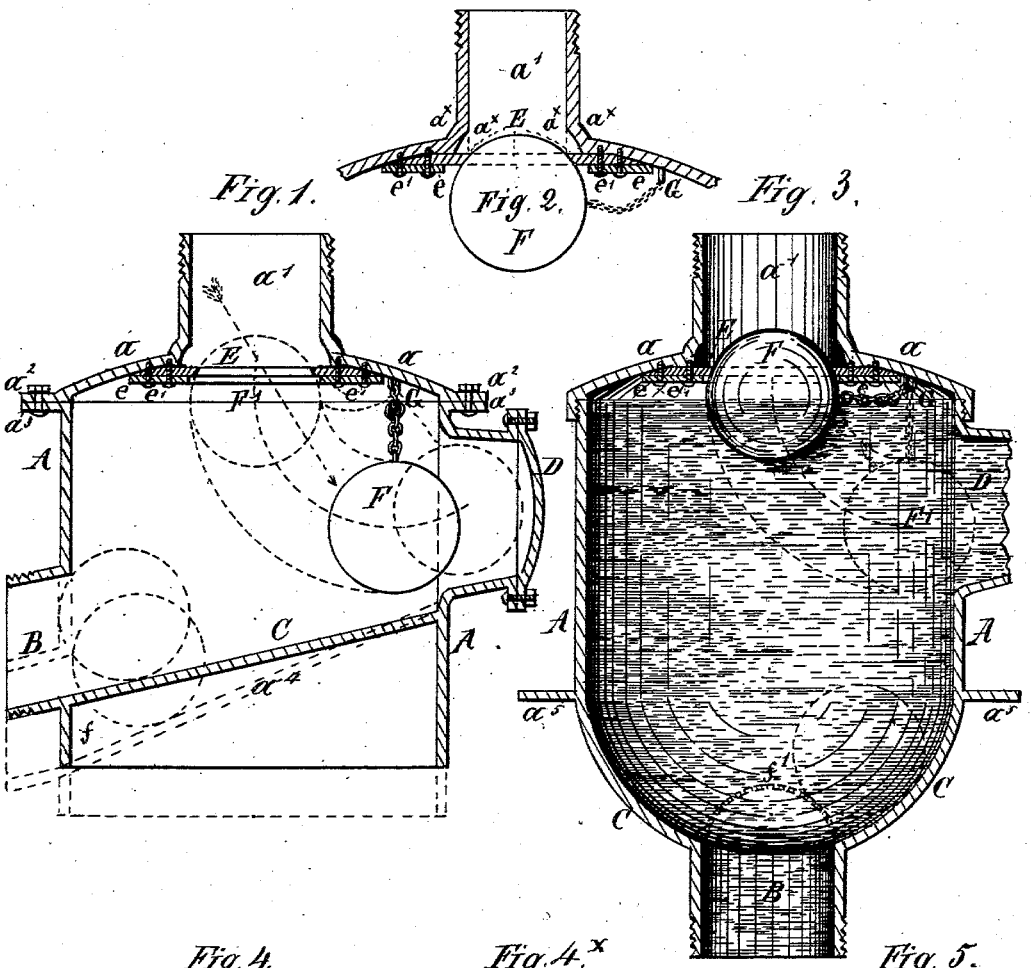
T. BOLDEMANN.

VALVES.

No. 186,533. Patented Jan. 23, 1877.



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UNITED STATES PATENT OFFICE.

THEODOR BOLDEMANN, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN VALVES.

Specification forming part of Letters Patent No. **186,533**, dated January 23, 1877; application filed October 3, 1876.

To all whom it may concern:

Be it known that I, Dr. THEODOR BOLDEMANN, of the city of Washington, in the District of Columbia, have invented certain new and useful Improvements in Valves, of which the following is a specification:

My invention relates to that class of valves commonly called "ball-valves;" from which, however, it differs essentially, both in construction and operation, and is particularly applicable as a back-pressure valve, as will be fully described hereinafter, and shown in the accompanying drawings, in which—

Figure 1 is a vertical transverse section of the valve-casing, showing its construction, and the arrangement and operation of the valve. Figs. 2 and 3 are similar views, showing the arrangement of the seat and a modification of the casing, respectively. Figs. 4, $4^{\times}$, and 5 are transverse sections of the ball-valve.

The ball-valve, as illustrated by the drawings, is especially designed for use in dwellings, and is to be located between the inlet-orifice of a drain-pipe and its outlet orifice into the sewer; though I do not wish to limit myself in the use thereof to that purpose exclusively, as the valve may be employed as a back-pressure valve wherever desired.

Great damage is done to dwellings, as well as heavy losses incurred in other property, by the backing of the sewer-water into the lateral drains, overflowing said drains, and flooding the basements or cellars of such dwellings, either during a heavy rain, when the capacity of the sewer is not sufficient to carry off the surface-drainage, or, as is yearly the case in houses along river or harbor fronts, which are flooded by high tides and strong winds, backing the river-water into the lateral drains, and into such houses. Besides the damages incurred, the receding water invariably leaves an infectious deposit, highly detrimental to the health of the inhabitants of the districts subjected to these periodical floods.

My invention has for its object to prevent the above-enumerated detrimental results of these periodical floods. I am aware that various valves have been designed to effect this purpose, but none of them, as far as I know, embody the necessary qualities requisite for their general use. These qualities may be briefly enumerated as follows: A valve of this character should be compact, so as to adapt it to be located upon lateral drains having comparatively little fall from the cellar or basement to the sewer. They should also be simple in construction, so as not to be liable to get out of order; and especially should they be automatic in their operation—ready to act whenever necessary—and so constructed as to offer no impediment to the passage of any solid substances by which the valve may become choked, and its efficiency impaired or destroyed; and, to that effect, my invention consists of a valve-casing, A, preferably of a cylindrical form, though it may be made square, hexagonal, octagonal, or semi-cylindrical, having a perfectly flat back, as preferred, or as the locality where the valve is employed may require. The casing A has a dome-shaped head, *a*, provided with a short induction-nozzle, a^1, to which the inlet drain-pipes from the dwelling are connected, either by means of a screw-thread or other suitable or preferred means. I prefer to employ a dome-shaped head, as it will more properly guide the valve into its seat. The head *a* is secured to the casing by means of bolts passing through the flanges a^2 a^3, formed on said head *a* and the casing A, respectively; or the head *a* may have a downwardly-projecting flange, provided with a screw-thread, to fit a corresponding thread upon the periphery of the casing, as shown by Fig. 3. The casing A is further provided with a discharge-nozzle, B, to which the drain-pipes leading into the sewer are connected.

I prefer to employ cast-iron pipes to connect the valve-casing with the sewer, instead of the terra-cotta pipes usually employed, as I have found by experience that the cemented joints of the sections of such terra-cotta pipes cannot withstand the pressure of the backing water when impeded by the valve.

C is the bottom of the casing, on a line with that of the discharge-nozzle B. This bottom may be perfectly flat when the valve is employed for pure fluids; but, when it is employed for the purposes stated, I prefer to give the bottom C an inclination, to avoid the formation of a deposit of semi-liquid or viscous matter apt to be backed into said casing, and

thereby effect the automatic removal of such deposit by the receding water. The casing A projects some distance below the bottom, to form a recess, a^4, for the purpose of setting it firmly in the ground.

The bottom of the casing may also be made dome-shaped or conical, and have the discharge-nozzle on a line with that of the inlet-orifice, and in this case the casing A is provided with an annular flange or rim, a^5, to adapt it to be firmly set in the ground or upon a suitable foundation. This form of casing (fully shown in Fig. 3) would be preferable; but in many localities it cannot be employed on account of the want of the necessary fall of the drain-pipes between the basements or cellars and the sewers, because this form of casing requires increased height, and with the usual goose-neck connection this height would be such as to preclude its employment, but in all localities where the fall is sufficient I prefer the dome or conical top and bottom casing. D is a hand-hole, having a removable lid or cover tightly bolted or screwed thereto, and serves the purpose not only to inspect the valve or the interior of the casing, but also as a recess for the valve to swing in, as will be more fully described hereinafter. The walls of the casing and hand-hole at the point of junction of the two should be curved, as shown in the drawings, so as to avoid sharp angles, against which the valve may be jammed or solid substances may lodge. E is the seat for the valve, consisting of a flexible annular disk of rubber, felt, or similar yielding material, held in position by means of a metallic ring, e, and bolts e', or this seat may be arranged in any approved manner. In valves of this character, where a perfect air and water tight joint is essential, I prefer to form the neck of the casing immediately above the seat for the valve—that is to say, at its junction with the dome-shaped head—of curvilinear form, as shown at a^x, Fig. 2. The arc of the circle described by this curve is a section of an arc of the same diameter as that of the ball-valve, and, of course, of greater diameter than that of the inlet-orifice. This construction admits of the employment of a flexible seat having within certain limits an extensive superficial area without projecting beyond the line of the inlet-nozzle a^1, as such projection would form a ledge upon which solid substances may lodge; and it also insures, whatever the pressure upon the valve may be, that such valve cannot be pressed too far into its seat and become wedged therein, while the contact area between the seat and valve is also considerably increased, as it will be evident that so soon as the pressure becomes such as to force the valve tightly into its seat the latter will bulge outward or upward, owing to its flexibility, and lay itself against the curvature of the neck, and prevent the ball-valve from being farther driven into its seat.

By this arrangement of seat the valve cannot become wedged into the seat, as the elasticity of the latter is constantly acting as a spring, and so soon as the water recedes the ball-valve will be ejected from its seat, thus avoiding all danger of its functions being impaired. The circumference of the seat relatively to that of the ball-valve, should be such that not more than one-third of the circumference of the latter can enter into said seat to form a perfect contact between the two before the fluid by which the valve is actuated reaches the orifice of the seat.

F is the ball-valve, differing from those ordinarily employed in the fact that it does not operate by gravity, but, on the contrary, is actuated by the fluid itself, said ball acting as afloat. Its specific gravity, therefore, must be regulated according to the density of the liquid, and this specific gravity should be such as not to immerse the ball to more than one-half of its diameter at any time. This will insure a perfect contact between the valve and seat before the fluid can reach the latter, the diameter thereof being one-third only of that of the valve, as already stated. The diameter of the seat relatively to the diameter of the valve may be varied, but should always be regulated according to the degree of immersion of the ball, and vice versa. The ball F may consist of a hollow sphere of wood, Fig. 4, or a hollow metallic sphere, Fig. 4^x, or a solid sphere of cork, Fig. 5, or other light material; and, to further insure an air and water tight joint between the valve and seat, I prefer to cover them with india-rubber or other water-proof flexible and yielding material, which, in conjunction with the flexible seat, prevents all danger of an imperfect contact between the two.

It will also be understood that the degree of resistance of the valve must be regulated according to the pressure exerted thereon by the fluid, and where this pressure is not very great hollow rubber spheres may be employed with advantage, which, however, would not answer the purpose as well when the valve is employed upon drain-pipes, as the pressure of the water becomes such sometimes that it would introvert a hollow rubber sphere or crush it into and through its seat, and for this reason I employ, by preference, a hollow wooden sphere covered with rubber.

The valve F, when employed with pure fluids, may be left free in its casing, and the angle of inclination of the bottom increased, as shown at f, to increase the space between said ball and its outlet-orifice, and when a flat-bottomed casing, or a casing having a dome-shaped or conical bottom, is employed a suitable guard or grating or wire netting may be placed above the outlet-orifice, to prevent the valve from closing it up, as shown at f', Fig. 3; but in all cases where solid substances pass through the valve-casing I prefer to suspend the valve in such a manner that the arc of the circle described by the periphery of said valve at right angles to its line of suspension will intersect the plane of

its seat, as shown by dotted lines at F′, Figs. 1 and 2, and as the circumference of the seat is but one-third that of the ball, it is evident that the chain or other means of suspension employed will be sufficiently long to allow the valve to enter its seat, and be firmly and securely pressed therein before said chain becomes taut—or, in other words, before the ball reaches the limit of its path, and be prevented by said chain from forming a perfect contact, as shown by dotted lines, Fig. 1.

I prefer as a means of suspension a chain having open (preferably round) links, as it is not so liable to become twisted or entangled, thereby shortening the chain or other means of suspension, and thus prevent the valve from entering its seat; and to further guard against this, I suspend the chain from its eye or staple G by means of the ordinary swiveled hook, or a link having a swivel-head, so as to allow the ball to rotate freely.

Should, by any possibility, a solid substance, such as a stick of wood of sufficient length to strike the ball, pass into the casing, it is evident that the moment such substance comes in contact with said ball the latter will be caused to recede either in a direction around the casing or into its recess or hand-hole D, and the substance, gliding off, will fall to the bottom and out of the casing.

It will be understood that I do not wish to limit myself to any particular material employed in the construction of the ball-valve, as any other light material than those spoken of above, such as yarn or other fibrous substance formed into balls and covered with rubber, may be used.

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

1. A valve especially adapted as a back-pressure valve, consisting essentially of a casing the inlet-orifice of which forms the seat, and a spherical float-valve suspended within said casing, substantially as described, for the purpose specified.

2. A ball-valve suspended in its casing, in such a manner that the arc of a circle described by the periphery of said ball at right angles to its line of suspension will intersect the plane of the seat for such valve, substantially as described, for the purpose specified.

3. A ball-valve incased in a flexible covering of rubber or its equivalent, in combination with a flexible seat for such valve, substantially as described, for the purpose specified.

4. The casing A, having an inclined bottom on a line with the line of the discharge-orifice, and a cylindrical recess below such bottom, substantially as described, for the purpose specified.

5. The casing A, provided with a recess or hand-hole, D, in combination with the suspended float-valve, substantially as described, for the purpose specified.

6. The casing A, the neck a^1 of which is of curvilinear form at the point of junction of such neck with the dome-shaped head a, in combination with the flexible seat E and a ball-valve, substantially as described, for the purpose specified.

7. The flexible seat E, having an extensive superficial area sufficient to serve the purposes of a spring to eject the valve from such seat as soon as relieved from pressure, in combination with a ball-valve, substantially as described, for the purpose specified.

In witness that I claim the foregoing I have hereunto set my hand this 3d day of October, 1876.

DR. THEODOR BOLDEMANN.

Witnesses:

HENRI GUILLAUME,

HENRY ORTH.