

E. F. OSBORNE.

VALVE.

APPLICATION FILED DEC. 30, 1909.

1,061,556.

Patented May 13, 1913.

Fig. 2.

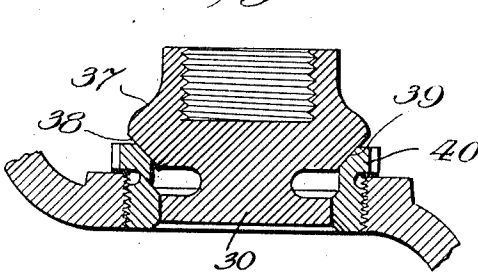


Fig. 1.

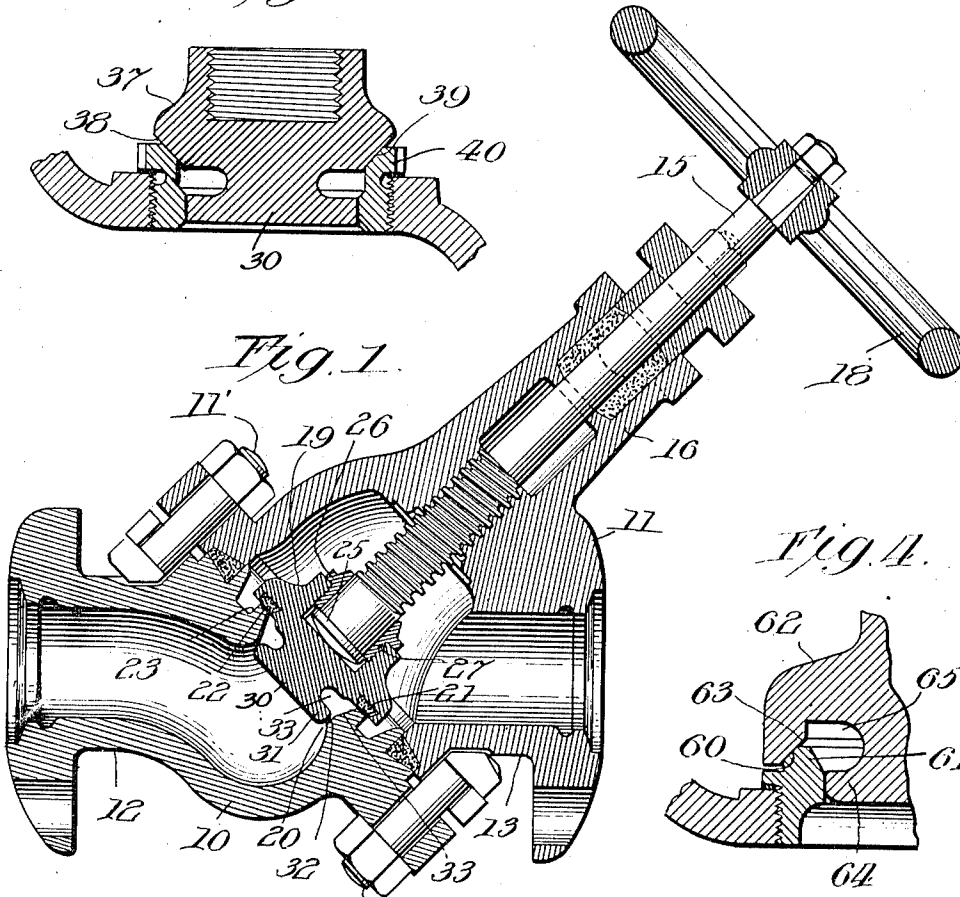


Fig. 4.

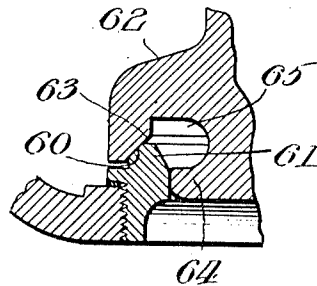


Fig. 3.

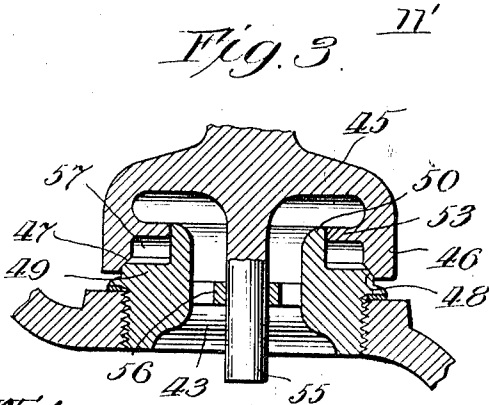
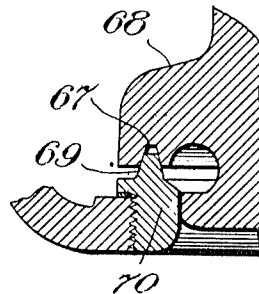


Fig. 5.



Witnesses:

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UNITED STATES PATENT OFFICE.

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VALVE.

1,061,556.

Specification of Letters Patent.

Patented May 13, 1913.

Original application filed October 1, 1909, Serial No. 520,487. Divided and this application filed December 30, 1909. Serial No. 535,548.

To all whom it may concern:

Be it known that I, EUGENE F. OSBORNE, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Valves; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in valves of that kind which is provided with an extension arranged to enter and fit closely within a portion of the passage which connects the two sides of the valve in such manner as to relieve the body seat and the valve piece seat from wear due to the wire drawing action of the fluid passing through the valve at times when the valve piece is approaching or moving away from its seat.

My improvements are herein shown as applied to that type of valve shown in my prior application for United States Letters Patent, Serial Number 520,487, filed October 1st, 1909, of which this application is a division. The invention is capable however of being applied to valves of other and various designs as indicated by the illustrated modified structures herein.

Among the objects of the invention is to provide, in a valve of this character, a pressure reducing chamber between the valve piece extension and the seating face of the valve piece so arranged and shaped with respect to the extension and valve piece seat as to, not only equalize the pressure on both sides of the body and valve piece seats when the valve begins to open, but also to prevent the stream of fluid issuing from the restricted passage around the valve piece projection into said chamber from being directed against the seating face of the valve piece in a manner to injure the same, and also to cause the stream of fluid to be broken up by a swirling action and thereby minimize its effect on the parts against which it impinges.

A further object of the invention is to provide a swivel valve piece of the construction described, wherein the engagement of the valve piece projection with the wall of the fluid passage holds the valve piece from ro-

tation as it approaches and leaves its seat, and thereby avoid the grinding action between the body seat and the seating face of the valve piece, such as would occur if the swiveling action be not present.

Other objects of the invention will appear from the following description, and the invention consists in the matters hereinafter set forth and more particularly pointed out in the appended claims.

In the drawings,—Figure 1 is an axial section of one form of valve embodying my invention. Fig. 2 is a fragmentary section of a valve, showing a modified form of valve piece and body seat. Figs. 3, 4 and 5 are views illustrating further modifications.

The casing of the valve herein shown is composed of two principal parts, to wit, the valve body 10, on which is formed the body seat and the bonnet 11, said parts being fastened together by bolts 11'. The former is provided with a branched passage 12 and the latter is provided with a branched passage 13 adapted for connection with pipes in which the valve is connected. The branched passages are generally parallel with each other when the valve is connected in a straight line of piping, to provide a through valve. It may be converted into an angle valve, in the manner described in my aforesaid application. The valve stem 15 extends through the neck 16 of the bonnet and said stem is screw-threaded at its inner end to engage interior screw threads of the bonnet whereby it may be moved toward and from the body seat. The valve stem is provided at its outer end with a hand wheel 18 and carries at its lower end a swivel valve piece 19 having a seating face which is arranged to engage the body seat to close the passage 20 that connects one side of the valve to the other; the seating face 21 of the valve piece engaging a body seat 22 formed on the valve body. Said body seat 22 shown in Fig. 1 is formed on the upper margin of an annular lip 23 surrounding the upper end of said passage 20. The swivel connection of the valve piece to the stem comprises, in this instance, an upwardly opening recess in the valve piece, into which extends the lower headed end 25 of the stem, and a nut 26 surrounding the stem and having an annular, exteriorly screw-threaded flange which engages interior screw threads in the recess of

the valve piece. The said nut is locked to the valve piece by a pin 27.

The seating face 21 of the valve piece shown in Fig. 1 is formed by a soft metal ring which is wholly or partially inserted or embedded in an annular groove in the lower end face of the valve piece. As herein shown the face ring is flush with the lower face of the valve piece and the groove is of triangular cross section to hold the face ring in place. The face ring is made somewhat wider at its lower side than the body seat 22 so that upon wear of the face ring the valve piece will follow such wear in a manner to insure a close fit of the face ring and seat.

Referring now to the construction whereby is avoided wear on the body seat and the seating face of the valve piece, due to the high velocity of the fluid passing through the valve, said parts are made as follows: The said swivel valve piece shown in Figs. 1 and 2 is provided with a projection 30, preferably made integral therewith, which extends downwardly into the passage 20 a distance below the body seat 22 when the valve is closed. The projection is provided at its lower end with a cylindric flange 31 which closely fits and fills a cylindric portion 32 of the passage 20, the fit being a close slip fit. Said portion 32 constitutes the smallest diameter of said passage and is located a distance below the plane of the body seat 22 somewhat less than the distance between the plane of the seating face of the valve piece and the plane of the flange or enlargement 31 of said projection. The said flanged portion of the projection fits closely in the restricted portion of the passage when the valve is closed, it entering said restricted portion of the passage before the valve piece is seated and leaving the said restricted passage after the valve piece has been lifted a substantial distance from its seat and the restricted area for the fluid flow between the cylindric projection and the passage in which it closely fits is maintained constant while the projection is within said restricted portion of the passage, due to the cylindricity of the parts. Thus when the valve piece is removed from the body seat, either when the valve is being opened or closed, the area between said projection and the wall of the restricted passage is so much smaller than that between the valve piece and the body seat that the flow of the fluid will be slow through the larger area, as compared to the smaller area, and the projection of the valve piece and surrounding wall of the restricted passage will receive the wear, due to the high velocity of the fluid passing through the valve. There is provided between the valve seat and the restricted portion of the passage an equalizing chamber 33, which may be formed in the valve piece

above the flanged or enlarged part of the projection 30, and which may be augmented by tapering outwardly or enlarging the wall of the passage above the restricted part thereof, as indicated at 35. The presence of such chamber operates to equalize the pressure at the inner and outer sides of the body seat when the valve piece is a distance away from its seat, and at a time while the projection 30 is still within the restricted portion of the passage 20, thus bringing the wear, due to the wire drawing action of the fluid, wholly on the projection and the wall of the passage surrounding the same.

When the projection 30 is an integral part of the valve piece, the valve piece, as a whole, may be readily and economically made, and there are no loose parts which are likely to become deranged or to change the relative distance between the larger part of the projection and the seating face of the valve piece. The said projection may be hardened so as to resist the wear due to the wire drawing action of the fluid, and the wall of the passage which surrounds said projection may be likewise hardened or formed on a removable hardened piece or ring.

My invention is equally adaptable for use in a valve having a ground, metal to metal, seat for steam, hydraulic and like work. As shown in Fig. 2 the valve piece 37 has a ground seating face 38 adapted to seat against a ground body seat 39 on the valve body. In this instance the seat is shown as formed on a removable screw-threaded ring 40 that is screw-threaded in the passage 20 of the valve body, the inclined or tapered seat being shown as formed on the upper, inner side of the ring. Said ring is indicated as being supported on the interior partition of an ordinary form of globe valve, to which latter type of valve my invention may be equally well applied.

In the modification shown in Fig. 3, the projection on the valve piece which receives the wearing action of the fluid is located radially outside of the passage 43, (corresponding to the fluid passage 20 of the valve heretofore described) but is within the fluid passage embraced by the valve seat. In said latter construction the valve piece 45 is formed with an annular cylindric flange 46, at the lower side of which is formed a beveled seating face 47 which engages a body seat 48 formed on the outer side of a ring 49 that is screw-threaded in the valve body. Radially within said seat, and embraced thereby, is an annular, upstanding flange 50, and the valve piece is provided above its seating face 47 with a radial flange 53, constituting a projection, that fits closely upon the outer side of said flange 50 near its top. The annular projection 53 and the outer wall of the flange 50 receive the severe

wear, due to the high velocity of the fluid passing through the valve when the valve piece is approaching or when it begins to move away from its seat, the passage between said flanges being still restricted when the valve piece is removed a distance from its seat, as in the first described construction, and with a like effect. The valve piece may have a guide stem 55 that guidingly engages a suitable aperture in a spider 56 within the passage 43. The flange 53 constitutes a projection of the valve piece which coöperates with the flange 50 to provide a restricted passage controlled by said projection in a manner to avoid the injurious wire drawing action of the fluid on the body seat and seating face of the valve piece. Between said projection and the seat the seat ring and valve piece are formed to provide an equalizing chamber 57, the function of which is to equalize the pressure at the inner and outer sides of the body seat and across the seating face of the valve piece, as in the constructions before described.

In the construction shown in Fig. 4 the body seat 60 is formed on the exterior upper end of the ring 61 and the valve piece 62 fits outside of said ring and is formed with a seat 63 for engagement with said body seat. The said valve piece is provided with a central projection 64 that fits closely within a restricted portion of the passage of the ring 61, and there is located between said projection and valve piece seating face an equalizing chamber 65 formed principally in the valve piece.

In the construction shown in Fig. 5 the seating face 67 on the valve piece 68 is V-shaped in cross-section and the body seat 69 on the seat ring 70 is correspondingly tapered to be engaged thereby. In other respects the arrangement is like that shown in Fig. 4.

It will be observed that in all the constructions shown the pressure reducing or equalizing chambers and valve piece projections are so shaped and related to the valve piece seat that the fluid which escapes through the restricted passages between the valve piece extensions or projections and the walls of the passages (when the fluid flow through the valve is in the direction of the opening movement of the valve piece) strikes a part of a surface of the valve piece constituting no part of the seat, and at a point radially removed from the seating faces of the valve piece and body seat; the chamber being principally radially within the circumference of the valve piece projection. This arrangement is important because all the wear brought upon the valve piece by the impingement of the stream of fluid which passes around the projection is limited to an area in which it cannot injure the body seat or the seating face of the valve

piece. By reason of the fact that such stream of fluid is made to strike such surface at a point radially removed from the valve seat, the reaction set up has the effect to break up the stream or to cause it to eddy or swirl in the equalizing chamber, and thus to a greater extent decrease the cutting effect of the fluid on the valve and body seat when the fluid passes across the same. This effect is heightened by the special shape given to said chambers in Figs. 4 and 5. In case, by reason of a soft spot or other defect at one side of the valve piece projection, such side of the projection would become quickly worn away and a stream of fluid of appreciable size, (as compared to the thin, annular film like jet which escapes around the closely fitting projections) would be projected with great force on the valve piece, when the valve piece begins to move away from the body seat or approaches it, and if the seating face of the valve piece be in the path of such jet it would receive the direct wear of the jet and would soon be destroyed. However, in the present construction such accidental wear falls upon a part of the valve piece not constituting its seating face, and the destructive wear on the seat is not manifested. Likewise in the normal wear of the projection the annular area surrounding the projection becomes gradually larger and the projection performs its function with a gradually decreasing efficiency until said area equals the area of the valve opening at the time when the valve begins to open. During the use of the valve when the area surrounding the projection is normally enlarging the effect of the annular stream of fluid on the valve piece to wear away the latter will gradually increase, but inasmuch as this force is not impinged directly against the seating face of the valve piece or body seat, the seats will remain practically intact until the projection is worn to its limit of effective use. After such projection has, by reason of wear, thus become ineffective for the purpose intended, the seating face of the valve piece is in practically the same condition as in a new valve without such valve piece projection.

A further advantage of the construction described, embodying the valve piece swiveled to its actuating stem and provided with the projection which closely fits the restricted wall of the passage, is that the engagement of the projection by the passage wall prevents the valve piece from turning, so that the said valve piece approaches the body seat and is moved away therefrom by an axially direct, non-rotative movement. In this manner considerable wear is saved on the body seat and the seating face of the valve piece, as compared to a construction where no swivel action is present, or where the area of contact between the projection

and wall of the passage is not sufficient to hold the valve piece from turning. The lower headed end 25 of the stem is rounded to engage the bottom wall of the socket in the valve piece so as to lessen the friction between the stem and valve piece and thus in a greater measure bring out the advantage last described.

Another advantage of chambering the valve piece, as to produce the equalizing or pressure reducing chamber described, when used in a piping system for hot fluids, is that thereby the valve piece is permitted to slightly flex between its marginal portion and its center when the valve piece is closed tightly against the body seat so as to thereby maintain the seating faces in effective contact when the valve is closed. When the closing stem subsequently cools and contracts, therefore, and the valve piece or disk straightens to its normal position, the seating face of the valve piece is held tightly against the body seat to maintain the valve tightly closed. Moreover the guiding engagement between the projection and wall of the passage in which it fits, serves to hold the valve piece centrally in place for re-grinding purposes.

The ground seats and seating faces of the valve piece shown in the last described figures may be replaced by soft metal seats if desired and where practicable. Moreover the valve seats shown in said last mentioned figures may in some instances be formed on parts integral with the valve body.

I claim—

1. A valve having an annular body seat, a movable valve piece having a seating face to engage the body seat, and a cylindric projection on the valve piece in advance of the seating face adapted to enter and closely fit a like shaped part of the fluid passage to maintain a substantially constant restricted area for fluid flow between the same and the wall of the passage in which it fits during a substantial extent of movement of the valve piece from the body seat, there being formed between the inner end of the said projection and said seating face an equalizing chamber, arranged principally radially within the circumference of said projection.

2. A valve having an annular body seat, a movable valve piece having a seating face to engage the body seat, and a cylindric projection on the valve piece in advance of the seating face adapted to enter and closely fit a like shaped part of the fluid passage beyond the body seat, there being formed between the inner end of said projection and

said seating face an equalizing chamber, said chamber and projection being arranged to direct a jet issuing from the space around said projection upon a part of the valve piece radially within said seating face.

3. A valve having an annular ground body seat, a movable valve piece having a ground seating face to engage the body seat, and a cylindric projection on the valve piece arranged to enter and closely fit a part of a fluid passage embraced by the body seat, said projection being of a length or thickness slightly greater than the distance between the restricted part of the passage, and the body seat, there being formed between the inner end of said projection and seating face of the valve an equalizing chamber arranged relatively to the projection to direct fluid passing between said projection and the wall of said passage, when the projection occupies the restricted part of the passage, against a non-seating portion of the valve piece.

4. A valve having an annular body seat, a movable valve piece having a seat to engage the body seat, a projection integral with the valve piece comprising a neck and a relatively wide cylindric flange, the latter adapted to enter and closely fit a part of the fluid passage adjacent to said seat, and the projection being of a length slightly greater than the distance between the body seat and the restricted part of the passage.

5. A valve comprising a casing having an annular body seat surrounding a passage connecting the two sides of the valve, a movable valve piece having a seat to engage the body seat, a stem having swivel connection with the valve piece and screw-threaded to the casing to move the valve piece toward and from the body seat, the valve piece being provided with an extension which fits closely in a restricted part of said passage to prevent wire drawing action of the fluid on the valve seat, the frictional contact between the projection and passage wall being greater than that between the stem and valve piece, whereby when said projection enters the passage the valve piece is held from turning while it is being seated.

In testimony, that I claim the foregoing as my invention I affix my signature in the presence of two witnesses, this 24th day of December, A. D. 1909.

EUGENE F. OSBORNE.

Witnesses:

W. L. HALL,

GEORGE R. WILKINS.