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FAUCET

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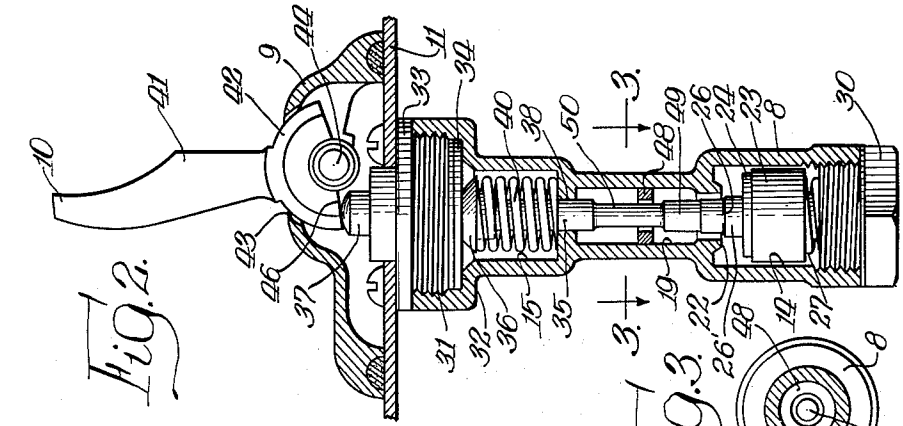


Fig. 2.

Fig. 3.

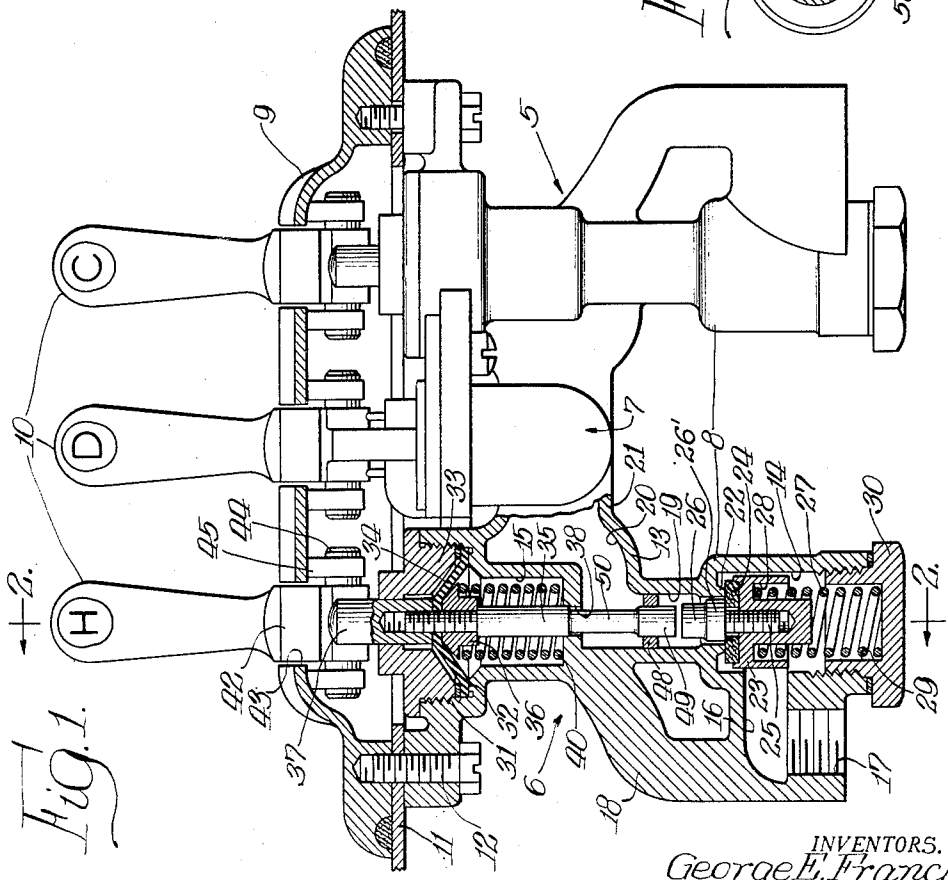


Fig. 1.

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FAUCET

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1

The invention relates generally to faucets and more particularly to faucets having a spring-seated valve.

It is a perfectly natural reaction for any person operating a faucet with a spring-seated valve simply to release the operating handle when the flow through the faucet is to be arrested. The inevitable result of such uncontrolled release of the operating handle is water hammer, this result being inherent from the nature of the construction of the faucet. While water hammer is objectionable wherever it occurs, it is particularly objectionable in ships, trains and the like, where faucets of the spring-seated valve type are customarily employed.

It is therefore a primary object of the invention to perfect a spring-seated valve faucet which does not cause water hammer.

A more particular object of the invention is to provide a spring-seated valve faucet in which the closing movements of the valve are retarded regardless of the speed of return of the operating handle.

Another object is to provide a spring-seated valve faucet having incorporated in the main flow passage an operating handle controlled orifice serving to govern the rate of closing of the spring-seated valve.

Other objects and advantages will become apparent from the following detailed description taken in connection with the accompanying drawing, in which:

Fig. 1 is a view partially in section and partially in elevation of a plumbing unit including a spring-seated valve faucet embodying the features of this invention.

Fig. 2 is a sectional view taken approximately along the line 2—2 of Fig. 1 but showing the valve in open rather than closed position.

Fig. 3 is a transverse sectional view taken approximately along the line 3—3 of Fig. 2.

While the invention is susceptible of various modifications and alternative constructions, it is here shown and will hereinafter be described in a preferred embodiment. It is not intended, however, that the invention is to be limited thereby to the specific disclosure made. On the contrary, it is intended to cover all modifications and alternative constructions falling within the spirit and scope of the invention as defined in the appended claims.

As shown in the drawings for purposes of disclosure, the faucet constitutes part of a larger plumbing unit of the type customarily employed in Pullman cars, ships and the like. Such a unit comprises generally a cold water source, generally designated 5, a hot water source, generally designated 6, and a drain control, generally designated 7. The unit is customarily composed of a lower concealed housing 8 containing the actual fluid flow controlling mechanisms, that is,

2

the faucets and the drain, and an upper exposed housing 9 carrying operating levers 10 for actuating the actual flow controlling mechanisms. The unit is secured to the lavatory proper or to some portion or extension 11 thereof by clamping the portion or extension 11 between the two parts 8 and 9 through the medium of bolts 12.

As seen in Fig. 1, the lower or concealed housing 8 is symmetrical with respect to a vertical plane passing through the drain control or center one of the levers 10, with each half housing a faucet. Inasmuch as the faucets are identical, one only has been shown in detail and one only will hereinafter be described. Herein the body or housing 13 of the faucet is preferably cast and, of course, forms one-half of the lower or concealed housing 8, though it is to be appreciated that it may be formed as a separate unit. Herein the body 13 is formed with a first cylindrical chamber 14, a second cylindrical chamber 15 coaxial with said first chamber 14, and a fluid supplying passage composed of a series of connecting shorter passages having interposed therein the flow controlling valve mechanism. This fluid supplying passage is composed of a first portion 16 terminating at one end in a threaded port 17 for the connection to the fluid supply conduit. The passage portion 16 is formed in one of the lateral extensions 18 of the body 13 and communicates at the other end with the chamber 14 through a side wall thereof over an area spaced slightly outwardly from the inner end of that chamber. Leading from the chamber 14 and opening thereto through one end thereof is an intermediate passage portion 19 coaxial with the chambers 14 and 15, and communicating at the other end with a passage 20 formed in another lateral extension 21 and joining a similar passage leading from the other fluid supply source to mix the fluid supplied by the two sources.

As above stated, chamber 14 has passage portion 19 opening to one end thereof, herein the inner end of chamber 14. Surrounding passage 19 is an annular flange 22 forming a valve seat. Cooperating with the valve seat 22 is a valve means or element 23 in the form of a piston having a loose fit in the chamber 14. The inner end of the valve element is slightly recessed and carries in the recess a disk 24 of suitable leather, fiber or plastic material forming a fluid-tight seal with the seat 23 when urged into seated position. The disk 24 is preferably removably secured by means of a screw 25 provided with an exaggerated head 26 serving as an abutment for the valve opening rod and also serving as an aid in trapping fluid in the passage portion 19, all as will hereinafter be more fully described. The valve is urged toward seated position by means of a compression spring 27 retained at one end in an annular recess 28 formed in the valve element

and received at the other end in a recess 29 of a closure plug 30 threaded into the outer end of the chamber 14.

Chamber 15 has an enlarged portion 31 at its outer end to provide an outwardly facing shoulder 32. The enlarged portion 31 is threaded and receives a plug 33 serving to clamp between it and the annular shoulder 32 the outer periphery of a flexible sealing diaphragm 34.

Extending axially through the chamber 15 is a rod 35 serving to transmit valve opening movement of the lever 10 to the valve 23. The outer end of the rod 35 is threaded and passes through the center of the diaphragm 34. On the inner side of the diaphragm the rod 35 carries a ferrule 36 while there is threaded over the outer end of the rod a thimble 37 that projects outwardly through and beyond the plug 33. The ferrule and the thimble 37 clamp the diaphragm 34 therebetween so as to effect a seal where the rod passes through the diaphragm and the thimble 34 has a loose sliding fit within the plug 33 while the rod 35 has a loose sliding fit with a bore 38 opening to the inner end of the chamber 15 so as to guide the rod for axial reciprocatory movement. A compression spring 40 is housed in the chamber 15 bearing at one end against the inner end wall of the chamber and at the other end against the ferrule 36 thereby constantly urging the rod 35 outwardly.

As best seen in Fig. 2, each lever 10 has a finger-like, finger-actuated portion 41 projecting outwardly above the exposed housing 9 and a semi-circular portion 42 concealed within the housing portion 9 save for so much as projects through an aperture 43. The lever 10 is pivoted at its extreme inner end on a shaft 44 journaled in bearings 45 depending from the inner side of the exposed housing 9. The lever is so positioned that the radial surface or shoulder 46 engages the rounded, upper end of the thimble 37 so that rocking of the lever will impart axial movement to the rod 35.

It will be seen from the foregoing, and in so far as the faucet has been described, that to open the valve a person pulls the lever forward, as viewed in Fig. 1 (to the left in Fig. 2). This movement shifts the rod 35 axially causing the inner end thereof to abut the exaggerated head 26 of the screw 25 and to force the valve element 23 away from its seat in opposition to the action of the spring 27. Moreover, the lever 10 must be held if the valve is to remain open. Immediately upon release of the lever 10, spring 40 restores the rod 35 and valve 23 is by spring 27 and by the pressure behind the valve snapped to seated position. This sudden closing of the passage and the sudden arrest of flow of water causes a shock to be transmitted through the entire system, which shock is commonly known as water hammer.

To avoid the sudden seating of the valve element 23 with the resultant water hammer, means is provided herein for retarding the seating of the valve element independently of the mode of release of the lever 10. To that end, there is interposed in the portion 19 of the fluid supply passage an orifice which, in cooperation with the rod 35 and the head 26 of screw 25 produces a dash pot effect in the seating of the valve element 23. Herein this orifice comprises an annular ring 48 fixed in the passage portion 19. This ring has an aperture just slightly larger than the inner tip 49 of the rod 35, this tip functioning as a land in a spool-type valve. Outwardly of the land 49 the

rod 35 has a reduced portion 50 substantially smaller in diameter than the aperture in the ring 48. The relative axial positions of the land 49, the reduced portion 50, and the ring 48 are such that when the valve element 23 is through actuation of the lever 10 held open the reduced portion 50 of the rod 35 occupies the aperture in the ring 48, as shown in Fig. 2. The reduced portion 50 and the aperture in the ring 48 are so proportioned as to provide for the required flow of water. Immediately upon release of the lever 10 the rod 35 is urged outwardly by the spring 40 and the land 49 enters and occupies the aperture in the ring 48. The land 49 and the aperture in the ring 48 are so proportioned that flow therethrough when the land is in the aperture is very materially reduced though not completely cut off. With land 49 in the ring 48 blocking free escape of fluid from the upper end of the passage portion 19, movement of the valve element 23 toward seated position under the influence of the spring 27 tends to trap fluid in the chamber formed in the passage portion 19 between the ring 48 and the valve seat 22. It has been found from experience, however, that the restriction produced by the land 49 in the ring 48 is alone not sufficient to eliminate water hammer in faucets of this type. Unless means is provided for also constricting the passage at the end opposite the ring 48, fluid will not be effectively trapped but will continue to flow out between the valve seat 22 and the washer 24 until there is a firm seating of the valve. This means that the valve still seats abruptly and thus producing water hammer. This is particularly true in installations where the water pressure is substantial for it will be seen that the water pressure adds its force to that of the spring 27 in urging the valve element to final seated position.

To remedy that situation means is herein provided carried by the valve element which serves to constrict the passage and moreover does so well in advance of the contact of the washer 24 with the seat 22. As stated, screw 25 has an exaggerated head 26. As shown in the drawing, the head has a base portion 26' just slightly smaller in diameter than the passage 19 at the seat 22. This base portion 26', as shown in the drawing, constitutes slightly less than half of the head 26, but the relative proportions are not material. Definitely material, however, is the fact that the base portion 26' is of such length relative to the travel of the valve element from closed to open position and vice versa that it enters the passage 19 at a time (speaking of the return of the valve element to seated position) when the valve element still has a major portion of its movement to traverse. The head 26 has an overall length such that even in valve seated position, it does not reach ring 48 though it does extend a considerable distance into the passage 19. This considerable extension into the passage serves to displace a larger quantity of fluid and thus enhances the dash-pot action by causing that much more fluid to be forced through the now restricted passages before the valve can seat.

We claim as our invention:

1. A faucet comprising, in combination, a body having therein a cylindrical chamber and a passage for the flow of fluid therethrough, said passage opening to said chamber through a side wall and through one end thereof, an annular valve seat formed in said chamber in surrounding relation to the portion of the passage opening to said chamber through the end thereof, a valve

element having a portion loose in said chamber cooperating with said seat to control the flow of fluid through the passage and a reduced portion receivable with a close fit within the portion of said passage opening to the end of said chamber, a spring urging said valve element to seated position, operating mechanism for moving said valve element off said seat having a normal and an actuated position and including a lever and an axially movable rod disposed concentrically of said chamber, said rod at the end adjacent said valve element having a land-like tip and a portion of reduced diameter inwardly of the tip, means urging said operating mechanism to normal position independently of said valve element seating spring, an annular ring in the passage on the discharge side of said valve seat spaced therefrom by a distance greater than the length of the reduced portion to form an elongated chamber and having said rod passing therethrough, the land-like portion and the portion of reduced diameter being so positioned relative to said ring and so dimensioned that the land is in said ring when said operating mechanism is in normal position while the portion of reduced diameter is in the ring during the time that said operating mechanism is in actuated position, the land of said rod having a diameter just slightly less than that of the orifice in said ring materially reducing the possible flow through the orifice when positioned in said ring.

2. A faucet comprising, in combination, a body having therein a passage for the flow of fluid therethrough including an enlarged cylindrical portion forming a valve chamber, said passage opening to one end of said valve chamber and over a portion adjacent that end being concentric with said valve chamber, an annular valve seat formed in said chamber in surrounding relation to the portion of the passage opening to said chamber through the end thereof, the passage also extending laterally of said chamber and opening thereto through a side wall with the inner margin of the opening in the side wall being spaced from said annular valve seat, a valve element having a main portion loose in said chamber cooperating with said valve seat to control the flow of fluid through the passage and having immediately adjacent the seat-engaging portion a reduced portion receivable with but slight clearance in the concentric portion of said passage, said reduced portion being of an axial length such that it is received in the passage at approximately the same time that the inner end of the main portion of said valve element passes the inner margin of the opening in the side of said valve chamber, a spring urging said valve element to seated position, operating mechanism for moving said valve element off said seat having a normal and an actuated position and including a lever and an axially movable rod disposed concentrically of said chamber, said rod at the end adjacent said valve element having a land-like tip and a portion of reduced diameter inwardly of the tip, means urging said operating mechanism to normal position independently of said valve element seating spring, an annular ring in the passage on the discharge side of said valve seat spaced therefrom to form an elongated chamber and having said rod passing therethrough, the land-like portion and the portion of reduced diameter being so positioned relative to said ring and so dimensioned that the land is in said ring when said operating mechanism is in normal position while the portion of reduced

diameter is in the ring during the time that said operating mechanism is in actuated position, the land of said rod having a diameter just slightly less than that of the orifice in said ring materially reducing the possible flow through the orifice when positioned in said ring.

3. A faucet comprising in combination, a body having therein a passage for the flow of fluid therethrough, an annular valve seat surrounding the passage, an independent valve element cooperating with said seat to control the flow of fluid through the passage, a spring urging said valve element to seated position, operating mechanism for moving said valve element off said seat having a normal and an actuated position, means for returning said operating mechanism to normal position independently of said valve element, means forming an orifice located in said passage on the discharge side of said valve seat and spaced therefrom to form an elongated chamber therewith in which fluid may be trapped, a part movable with said operating mechanism and cooperating with said orifice to enlarge the passage therethrough when said operating mechanism is in actuated position and restricting the passage therethrough when in normal position, and a reduced portion projecting axially from the valve seat engaging end of said valve element adapted to extend through said valve seat and into the chamber formed between the orifice and said valve seat and having a base portion of a diameter effectively restricting the outer end of the chamber when received in said passage.

4. A faucet comprising in combination, a body having therein a passage for the flow of fluid therethrough, an annular valve seat surrounding the passage, an independent valve element cooperating with said seat to control the flow of fluid through the passage, a spring urging said valve element to seated position, operating mechanism for moving said valve element off said seat having a normal and an actuated position, means for returning said operating mechanism to normal position independently of said valve element, means forming an orifice located in said passage on the discharge side of said valve seat and spaced therefrom to form an elongated chamber therewith in which fluid may be trapped, a part movable with said operating mechanism and cooperating with said orifice to enlarge the passage therethrough when said operating mechanism is in actuated position and restricting the passage therethrough when in normal position, and means on said valve element restricting the end of said chamber opposite said orifice during the major portion of the closing movement of said valve element.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
702,383	Tyson	June 10, 1902
976,908	Payne	Nov. 29, 1910
1,144,753	Desmond	June 29, 1915
1,821,260	Dobrick	Sept. 1, 1931

FOREIGN PATENTS

Number	Country	Date
281,488	Italy	of 1931