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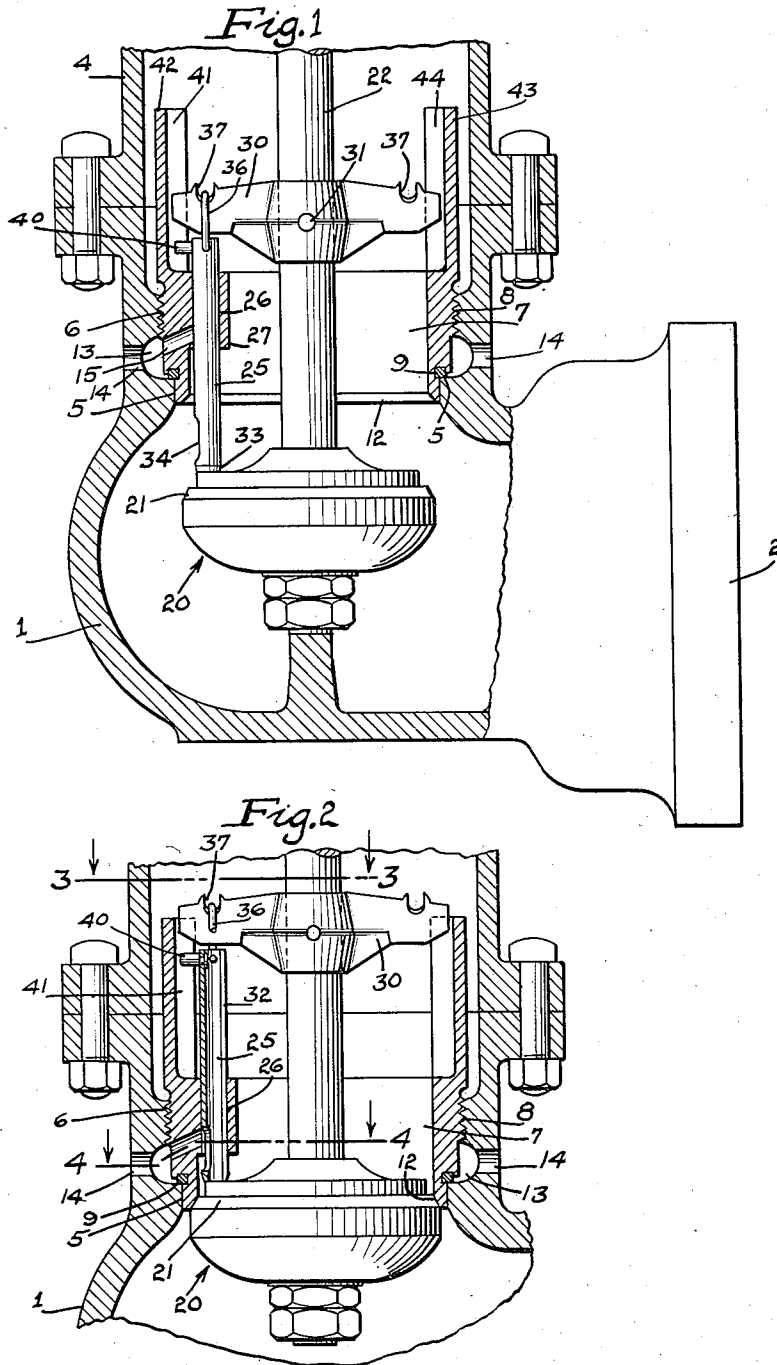
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2,019,515

HYDRANT DRAIN VALVE

Filed Dec. 31, 1931

3 Sheets-Sheet 1



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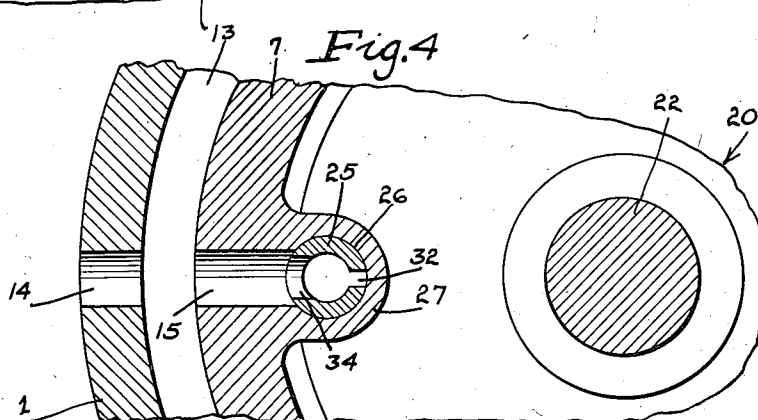
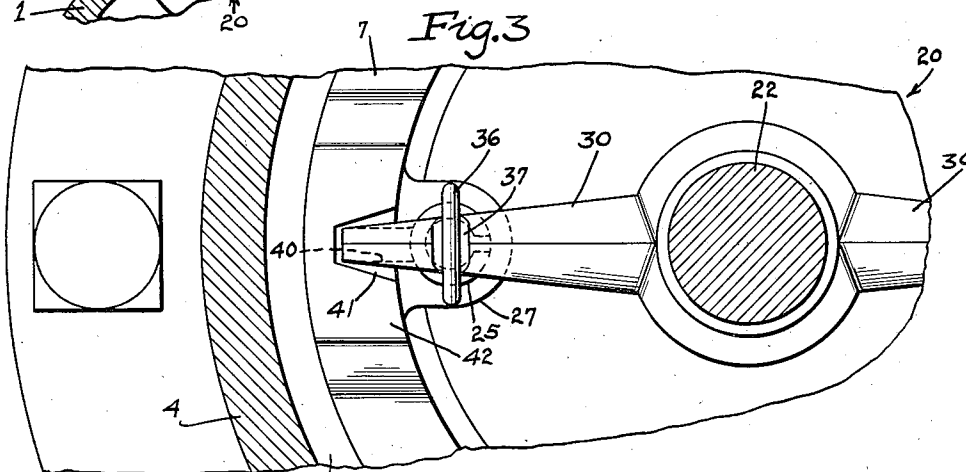
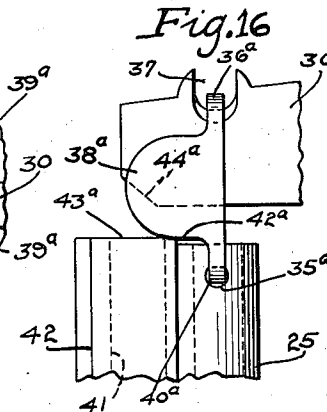
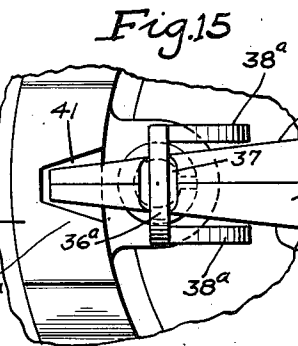
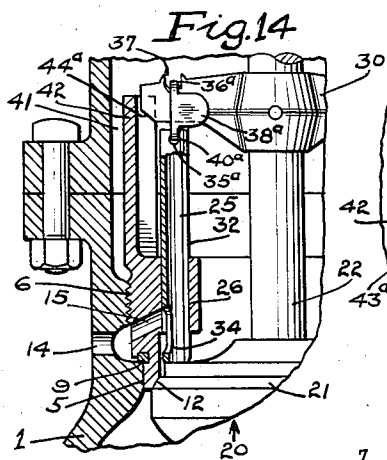
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HYDRANT DRAIN VALVE

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3 Sheets-Sheet 2



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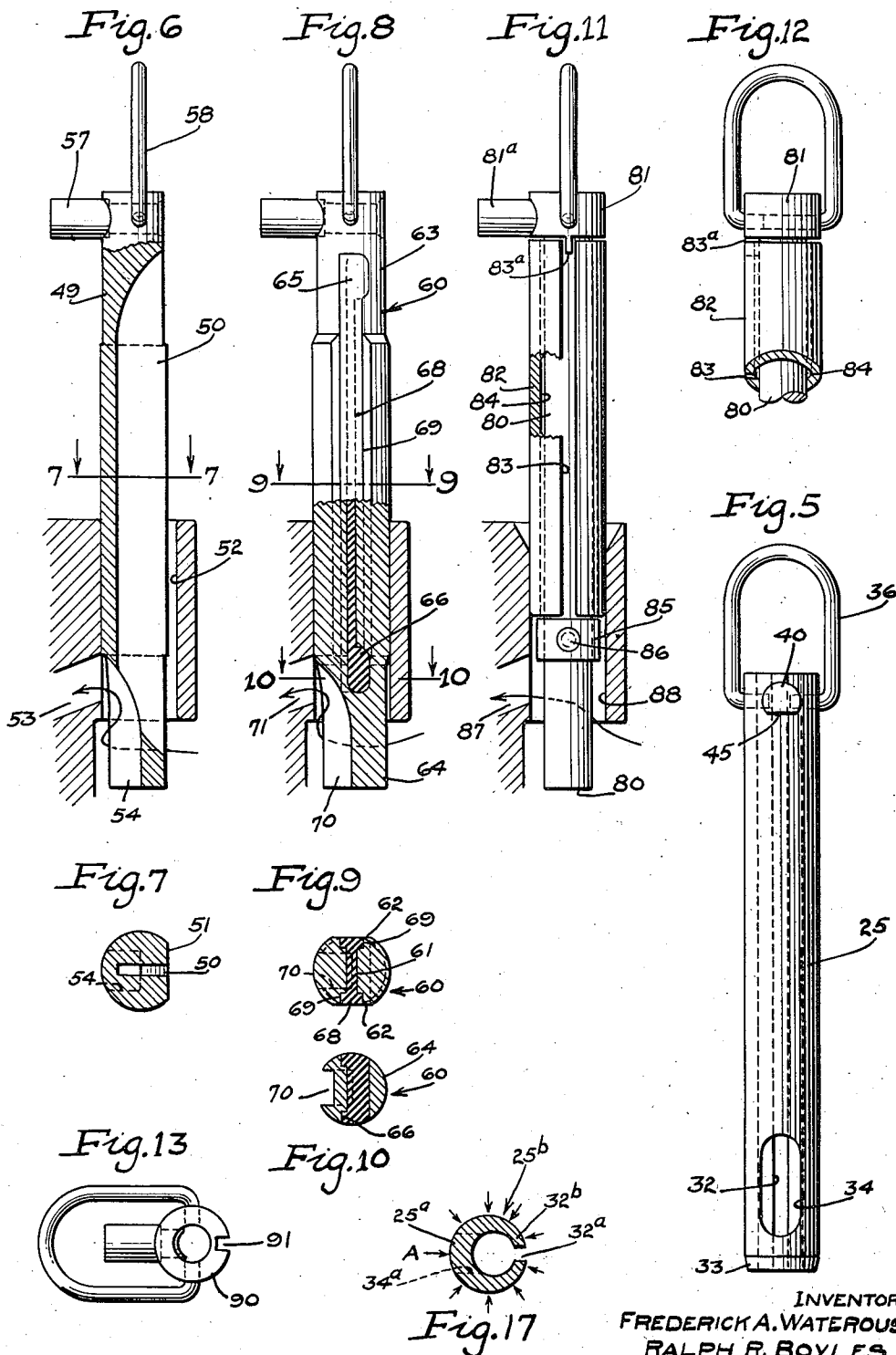
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HYDRANT DRAIN VALVE

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3 Sheets-Sheet 3



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2,019,515

HYDRANT DRAIN VALVE

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18 Claims. (Cl. 137—13)

This invention relates generally to improvements in hydrants and the like, and particularly to an improved drain valve mechanism, and it is an object of this invention to improve that portion of the mechanism known as the "plunger", which, as a valve member, is adapted to slide vertically in a bore of the seat ring, to control the waste water outlet port. The invention is an improvement in drain valve mechanisms of the general type shown in Patent No. 1,605,624 to L. P. Storey, for Hydrant.

The main object of the present invention is to provide means for automatically compensating for changes in the diameter of the drain plunger and/or the seat or bore in which it slides, such changes being occasioned by wear, accretion or corrosion. The practice of the present invention provides a device in which the valving action is properly maintained and in which the plunger does not bind or stick or become loose in its bore or seat.

Features of the invention include the constructional details illustrated, as well as the broader ideas of means by which a plunger of this character is made automatically constructable and expandible for the purposes set forth.

Objects, features and advantages of the invention appear in the description of the drawings forming a part of this application, and in said drawings:

Figure 1 is a vertical section through the lower portion of a hydrant showing one embodiment of the present invention, with the main valve open and the drain valve closed;

Figure 2 is a view similar to Figure 1, showing the main valve closed and the drain valve open;

Figure 3 is a fragmentary plan section on line 3—3 of Figure 2 illustrating the relation of the valve to the cross arm;

Figure 4 is a fragmentary section on line 4—4 of Figure 2, illustrating the relation of the plunger to the drain opening;

Figure 5 is an elevation of that type of plunger illustrated in Figures 1 and 2;

Figure 6 is a vertical section illustrating a modified form of plunger structure;

Figure 7 is a section on line 7—7 of Figure 6;

Figure 8 is a vertical section illustrating a second modified form of plunger construction;

Figure 9 is a section on line 9—9 of Figure 8;

Figure 10 is a section on line 10—10 of Figure 8;

Figure 11 is an elevation partly in section illustrating a third modification.

Figure 12 is an elevation further illustrating the construction shown in Figure 11;

Figure 13 is a top plan of a fourth modification;

Figure 14 is a section generally corresponding to Figure 1, illustrating a modified form of bail which performs a double function;

Figure 15 is a top plan view showing how the bail cooperates to prevent axial rotation of the plunger;

Figure 16 is a fragmentary side elevation illustrating the action of the bail to prevent improper assembly of the plunger; and

Figure 17 is a cross section of a modified form of tubular plunger.

The drawings illustrate only the lower portion of a hydrant. The numeral 1 indicates the base casting or shoe having the usual flange or bell 2 for connection with the water main. The upper portion of the base is flanged and is connected to the stock or body 4 in the usual manner. The base is provided internally with an annular flange 5, and is threaded as at 6. The valve seat ring 7 is indicated at 7, and has threads 8 cooperating with the threads 6. The ring is provided with packing 9, and by means of the threads, the packing is securely clamped against the flange 5, thereby providing a water-tight joint. An annular valve seat 12 is provided at the lower end of the ring 7. The shoe has an internal annular groove 13 communicating with outwardly leading radial drain passages 14. The ring 7 is provided with a drain passage 15, leading downwardly into the annular groove 13. The groove 13 and passages 14—15 are, of course, above the main valve. Main valve 20 is adapted to cooperate with seat 12 and preferably has a leather seat-engaging portion 21. The valve stem or spindle is indicated at 22.

A very important feature of this invention is the construction of the waste-drain control plunger 25, see Figures 1 to 5. This plunger is vertically reciprocable in a bore 26 provided in a lug 27 integral with the seat ring at the inner side. In this embodiment, the plunger is tubular and is made of any suitable material such as bronze. The stem is raised and lowered by means of the usual "screw" in the top of the hydrant, not shown.

Heretofore there has been no means associated with a hydrant drain valve by which sticking of the valve is unfailingly avoided. In other words, no means by which compensation for wear and corrosion is adequately obtained to assure a valve tightness and to prevent sticking, the latter function being a very important one.

The plunger is operated by the alternate application of force to its opposite ends. For movement

ing the plunger downwardly, a cross arm or bar 30 is provided on the stem. The arm is diametrically related to the axis of the stem, and is secured by pinning as at 31. The lower surface of the arm merely contacts the top end of the plunger. The plunger is raised by means of the valve 29, as a result of contact of the upper surface of the valve with the lower end of the plunger. Consequently the plunger may be said to "float" between its operating elements.

The preferred form of the plunger having compensating means is illustrated in Figures 1 to 5, inclusive. This form well illustrates the compensating means. This plunger 25 has the form of a tube slotted longitudinally and radially at one side as at 32. The slot extends entirely through the tube wall. The tube is tapered at its lower end as at 33 to facilitate introduction into the bore 26. Adjacent the bottom portion of the tube and in diametric opposition to the slot, there is provided an elongated opening 34 which is adapted to register with the drain port 15, when the main valve is closed, see Figure 2. Under these conditions, the water passes through the slot 32 and opening 34 into the passage 15.

The drain plunger 25 is installed in its bore or seat 26 under a slight compression so that it can expand to compensate for wear of itself or of the wall of the bore in which it operates.

The slotting (in this instance extending the full length of the plunger) permits sufficient circumferential collapse or expansion to compensate for changes due to causes above mentioned. Insofar as we are aware, the principle of automatic compensation has never been applied in a device of the present character and we, therefore, claim broadly any and all means of compensation to allow for changes in the outside diameter of the drain plunger and/or in the inside diameter of the seat or bore in which the plunger operates, such changes in diameter resulting from deposit, corrosion, wear, or other chemical and/or mechanical causes. This device further assures a water-tight valving action and at the same time provides a drain plunger that will always be free-sliding in its seat or bore.

The plunger 25 is provided at its upper end with a bail 36 which engages in a slot 37 of the cross arm 30, to act, during assembly, to prevent the plunger from accidentally dropping into the shoe, as may occur if the valve stem is canted too much.

The plunger is provided at its upper end with a radially extending pin 40 operating in a guide slot 41 provided in an upstanding arm 42 of the ring 7. A second up-standing arm 43 has a similar guide slot 44 diametrically related to the guide 41, and disposed at the opposite side of the stem 22. The guides 41-44 slidably and guidingly receive the cross arm 30. The cross arm 30 prevents rotation of the stem 22 inasmuch as it is connected thereto by pin 31.

It is conceivable that there are other ways in which the plunger can be made collapsible or contractible for the purposes mentioned, and although the preferred embodiment of the invention is shown in Figures 1 to 5, inclusive, other modifications of the invention applied to solid plungers (as distinguished from tubular plungers) are herebelow described.

The plunger must be formed from a material having sufficient resilience to automatically expand after forced constriction during assembly, so that the valving action is properly maintained.

We have found that by slotting a solid rod, con-

strictability and expansibility can be obtained, and Figures 6 and 7 show a modified structure of this nature. The solid plunger 49 is slotted longitudinally and diametrically as at 50 with the slot extending partly therethrough, and beyond the longitudinal axis, but not extending the full length of the plunger. The slot is conveniently formed by milling. By inspection of Figure 7, it will be seen that the slot is comparatively narrow. The plunger is ordinarily flattened as at 51, the surfaces being perpendicular to the slot as shown in Figure 7. This somewhat reduces the amount of contact between the valving surface and its cylindrical seat 52. The drain passage is indicated at 53.

The lower end of this plunger is slotted as at 54 and this slot communicates with the slot 50 and is formed preferably by milling. The relation is such that the slot 54 intersects the slot 50 and, therefore, communication between the two slots is provided. The slot 50 is parallel with and faces the stem 22, while the slot 54 faces away from the stem. The slot 54 is also wider than the slot 50, as indicated in Figure 7. In this way, the cross-sectional area of the slot is made more nearly equal to that of the drain passage 53. When the drain valve is open, water enters through the slots 50-54. The plunger 49 also has a radial guide pin 57, and a bail 58, as for the first described form of the invention.

In Figures 8 to 10, inclusive, a modification is shown in which the solid plunger 60 is slotted diametrically all the way through, as indicated at 61, see Figure 9. The sides of the tube are flattened as at 62 to somewhat reduce the valve surface. The slot does not face the stem in this instance, but is perpendicular to a horizontal line drawn from the stem axis to the plunger axis. Opposite ends of the plunger are reduced respectively as shown at 63-64, and the opposite ends of the slot are enlarged respectively as at 65-66. The enlargements are for the purpose of obtaining a more uniform degree of constriction of the plunger within the slotted zone. The slot is preferably filled with rubber indicated at 68 and this rubber is vulcanized, and is flush with the outside surface of the plunger. Counter-grooves, indicated at 69, see Figure 9, are provided and the rubber fills the main slot and these counter-grooves as shown. The plunger is also slotted as at 70 (a miller being ordinarily used for this purpose) and this slotting creates a drain passage, registrable with the drain passage 71 so that the liquid is discharged generally in direction of the arrow. The lower, more solid, end of the plunger is reduced in diameter as at 64 to prevent sticking, by allowing for an increase in diameter due to accretive effects (chemical or mechanical).

In Figures 11 and 12, another modification has been shown in which a solid bar 80 is provided at its upper end with a head 81. The shank portion 80, in this instance, is surrounded by a tubular member 82 slotted its full length longitudinally as at 83. Normally, the outer diameter of this tube is such as to perform a valving action. The inner diameter 84 of the tube is slightly greater than the diameter of the shank 80, so that the tube or sleeve 82 is compressible or collapsible, as well as expansible to change its outside diameter. The sleeve 82 is held in position at the bottom by a collar 85 suitably secured by pin 86. The diameter of the collar is less than that of the bore 88. Inasmuch as the diameter of the rod 80 is substantially less than the diameter of the bore 88, from which the drain pas-

sage 87 leads, the waste water can easily reach the drain passage 87, when the plunger is properly positioned.

The head 81 is provided with a guide pin 81^a, to prevent axial rotation of the bar 80, and in order to prevent such rotation of the sleeve 82 on the bar as would permit the slot 83 to register with the drain opening 87, the head and shank are provided with a fin 83^a which extends into the slot 83 as shown in Figure 11. The width of this fin is less than the width of the slot so as not to prevent proper constriction of the sleeve, during introduction into the bore, and so as to thereafter permit additional compensatory constriction.

In Figure 13, another modification has been shown in which a tubular member 90 is used, the wall of the tube being rather thick. This tube is slotted as at 91 and the slot extends the full length of the tube. It is thus weakened so that automatic constrictive action can occur. In Figure 13, it will be understood that an opening is provided at the bottom, which corresponds to opening 34, see Figure 5.

From the foregoing it is apparent that this device is automatic and positive in its actions. The valving action is maintained, in the presence of wear or deposit from chemical and/or mechanical causes. The device can be very cheaply manufactured. We believe it broadly new in this art to provide any means for preventing excessive looseness or tightness of a valve of this kind, where such looseness or tightness results from chemical and/or mechanical causes growing out of its conditions of use. The present invention provides a valve which is reasonably water-tight regardless of its age or condition. Furthermore, this device provides a compressible and expandable metallic drain valve, which does not deteriorate and become inoperative as is the case when the conventional leather, rubber and other composition drain valves are used.

Figure 14 shows a modification of a bail which performs the double function of preventing mis-assembly of the plunger, as well as such axial rotation thereof, after proper assembly, as will prevent proper drain, or permit a constant drain when the hydrant is in use. To prevent this mis-assembly, and to positively maintain proper drainage relations of the parts after proper assembly, and in order to accomplish these results without the use of a guide pin, the following device, which is a feature of the invention, is employed: The upper end of the tube is bored to provide two diametrically related openings 35^a, only one of which is shown in the drawings. The openings are arranged on a diameter which is perpendicular to a diameter cutting opening 34 and slot 32. The bail is formed from a single piece of metal bent into U form, and provides an arch portion 36^a arranged in the slot or notch 37 of the cross arm 39. The U-shaped element is provided on each side with plate-like enlargements 38^a which are substantially parallel with the long axis of the cross-arm, and which are so related to the sides 39^a of the cross-arm that the bail cannot rotate on a vertical axis. The lower ends of the bail are bent inwardly as at 40^a and engaged with the openings 35^a to provide a pivotal connection permitting the bail to be swung on a horizontal axis. Complete and proper assembly of the plunger can only be made when the extensions 38^a point in a direction away from the arm 42 or toward the stem 22, see Figure 14. The plate-like extensions or wings 38^a

are of sufficient horizontal length, see Figure 16, so that when an assembling attempt is made, with the opening 34 facing toward the stem, the lower edges 42^a of the extensions engage the upper surface 43^a of the left hand guide extension 42, and further downward motion is prevented. The end of the cross-arm is beveled as at 44^a so that the top of the plunger will clear the arm in assembly or disassembly when the bail is swung about the loop or arch portion 36^a as a center. The above device provides a very simple and efficient means for preventing mis-assembly, and after proper assembly, for preventing such axial rotation of the plunger as would prevent proper registration between the opening 34 and the drain passage 15, when the valve 20 is closed.

If a plunger of the preferred form, shown in Figure 14, is inserted in such manner that the slot 32 is arranged at the left, and, therefore, in direct and constant registration with the drain passage 15, a constant drain leakage will take place while the hydrant is in use. On the other hand, with a plunger of the form shown in Figure 8, if the plunger were so assembled that the slot 32 faced to the right instead of to the left, there would be no proper draining action.

Figure 17 is a cross section of a modified form of tubular drain plunger in which the thickness of the wall varies. In this instance, the axes of generation respectively of the inner and outer surfaces of the tube are eccentrically related. The thickest wall portion 25^a of the tube 26^b is that which is directly opposed to that side of the bore from which the drain opening 15 leads. The slot 32^a is made in the thinnest wall portion 32^b of the tube. The opening 34^a is also in the thickest wall portion of the tube. The object here is to provide means whereby the outside circumference of the drain plunger is caused to retain its true circular or cylindrical shape, notwithstanding changes due to variations in diameter in either the plunger or in its seat or bore, from any cause either physical or mechanical. In this device, the sum of the radial forces (for the purpose of illustration indicated by the arrows) becomes greatest at the point A, and least at the slotted portion. The cross-section of the tube may be likened to a beam, and in order to have a uniform compressibility or expansibility or deflection, the thickness of the wall must be in direct proportion to the sum total of the forces at any particular point. It can be easily seen, therefore, that by the use of a tube of the cross-sectional shape shown, the plunger will retain a true circular shape.

We claim as our invention:

1. A hydrant having a waste water drain passage and a valve, a metal plunger reciprocable to control the drain passage, said plunger having a slot so formed and positioned as to permit it to compensate for changes in diameter, and having a passage communicating with the slot and positioned to be registered with the drain passage when the valve is closed, and means by which force is applied to the plunger to reciprocate it in correspondence to valve motions.

2. A hydrant having a waste water drain passage and a valve and valve stem, a tubular plunger reciprocable to control the drain passage and substantially axially parallel with the axis of the stem, said plunger having a longitudinally extending slot therein, facing the stem, and having a passage in that side opposite the slot positioned to be registered with the drain passage when the valve is closed, and means by which force is ap-

plied to the plunger to move it in correspondence to hydrant valve motions.

3. A device of the class described, having a waste water drain passage and a valve arranged below said passage, means for operating the valve, a plunger reciprocable to control the drain passage and having a longitudinal bore, and an opening on the drain passage side communicating with the bore and adapted to register with said drain passage and further having a longitudinal slot to permit it to compensate for changes in diameter, means connecting the plunger for motion with the valve operating means and acting to prevent axial rotation of the plunger, and having means adapted to prevent complete assembly of the plunger if said opening is not properly aligned for registration with the drain opening.

4. A device of the class described having a waste water drain passage, a valve seat and a valve cooperating with the seat, a stem for the valve having a cross arm, means for guiding the cross arm, a plunger reciprocable to control the drain passage, including an opening which is capable of registering with the drain opening, means connecting the plunger with the cross arm, said means having portions engageable with the arm for preventing substantial axial rotation and said portions being so related to the guide means that if the opening of the plunger is not properly aligned for registration with the drain opening, the portions engage said guide means to prevent complete assembly of the plunger.

5. A hydrant having a valve and a waste water drain passage above the valve, a tubular plunger having a slot extending through its wall and longitudinally thereof at one side, and having an opening at the opposite side piercing the wall of the tube and adapted to be registrable with the drain passage, and means by which movement of the valve correspondingly moves the plunger to cause registration of the openings with the drain passage.

6. A device of the class described having a valve, a guide, a waste water drain passage, a plunger having an opening registrable with the drain passage, means by which movement of the valve correspondingly moves the plunger, and means associated with the last mentioned means and said guide to prevent axial rotation of the plunger.

7. A hydrant having a waste water drain passage and a valve, a tubular metallic plunger reciprocable to control the drain passage and having a slot so arranged as to weaken the plunger sufficiently to permit it to compensate for changes in diameter, said plunger being tubular and having a wall which varies in thickness, a thicker portion of the wall having an opening which registers with the drain passage and a thinner wall portion having a slot which extends therethrough.

8. A hydrant having a waste water drain passage and a valve, a tubular metallic plunger reciprocable to control the drain passage and having a slot so arranged as to weaken the plunger sufficiently to permit it to compensate for changes in diameter, said plunger being tubular and having a wall which varies gradually in thickness, the thickest portion of the wall having an opening which registers with the drain passage and the thinnest wall portion having a slot which extends therethrough.

9. A hydrant having a waste water drain passage and a valve and valve seat, and also having

a plunger guide passage communicating with said drain passage and hydrant, a tubular plunger operative in the guide passage to normally close said drain passage, the wall of the plunger being slotted on that side remote from the drain passage, and having an opening on that side nearest the passage adapted to register therewith only when the hydrant valve is closed, and means by which said plunger is operated by hydrant valve motion respectively to move to draining and non-draining position.

10. A fire hydrant having a valve seat, and a valve and an operating stem therefor, and a waste water port, a cross arm on the stem, guides for the cross arm, a plunger for controlling said waste water port and having a drain opening registrable with the port, a connector pivoted to the plunger and detachably engaging the cross arm, and having means engageable with one of the guides to prevent assembly of the plunger, if the opening in the plunger is not in position to be registered with the port.

11. A hydrant having a waste water drain passage, and having a valve and a valve seat, said valve having a stem, and said stem having a projection, a structure providing a drain passage and a cylindrical valve seat passage communicating therewith, a tubular plunger axially slidable in said valve seat passage and constantly having both ends projecting beyond the structure to provide a scraping engagement with said passage to remove products of corrosion, said plunger being slotted and having a passage communicating with the slot and drain passage, the plunger being so positioned as to be moved by the valve and projection of the stem in correspondence to hydrant valve motions.

12. A hydrant having a waste water drain passage and a main valve, means for operating the valve, a hollow plunger reciprocable to control the drain passage and having means establishing fluid communication between the interior of the hydrant and the drain passage and normally adapted for drainage registration with the drain passage, means connecting the plunger for motion with the valve operating means, and means associated with the plunger and cooperable with the valve operating means for preventing complete assembly of the plunger if said fluid communication establishing means is not positioned for registration with the drain opening.

13. A hydrant having a valve and a waste water drain passage, a one piece hollow plunger slotted so as to be self expansible, said slot serving to establish lateral communication with a plunger opening which is adapted to register with the drain passage, and means by which movement of the valve correspondingly moves the plunger to cause registration of the opening with the drain passage.

14. A hydrant having a waste water drain passage and a main valve, means for operating the valve, a plunger reciprocable to control the drain passage and having an opening establishing fluid communication between the interior of the hydrant and the drain passage and normally adapted for drainage registration with the drain passage, means connecting the plunger for motion with the valve-operating means and means adapted to prevent complete assembly of the plunger if said opening is not positioned for proper registration with the drain openings.

15. A hydrant having a valve, a waste water drain passage and a bore associated with said passage, a plunger reciprocable in said bore and

adapted to control the drain passage, said plunger being weakened by a slot to make it constrictable and being forcibly constricted by assembly introduction into said bore, whereby it is conditioned to automatically change its diameter to insure water tightness and wear takeup, to compensate for changes due to mechanical and chemical causes, said plunger having an aperture intersecting the slot and positioned to register with the drain passage, and means by which force is applied to the plunger to reciprocate it in correspondence to valve motion.

16. A hydrant having a valve, a waste water drain passage and a bore associated with said passage, a plunger reciprocable in said bore and adapted to control the drain passage, said plunger being weakened to make it constrictable and being forcibly constricted by assembly introduction into said bore, whereby it is conditioned to automatically change its diameter to insure water tightness and wear takeup to compensate for changes due to mechanical and chemical causes, said plunger being tubular and having an inner wall which is eccentric to the outer wall, one portion of the wall having a passage which registers with the drain passage, and means by which force is applied to the plunger to reciprocate it in correspondence to valve motion.

17. A fire hydrant having a valve seat and valve, and an operating stem for the valve, a

waste water port, a cross arm on the stem, a guide for the cross arm, a plunger for controlling the waste water port and having a drain opening registrable with the port, said plunger having a connector detachably engaging the cross arm and having means engageable with the guide to prevent assembly of the plunger if the opening in the plunger is not in position to be registered with the port.

18. A hydrant having a valve, a waste water drain passage and a bore associated with said passage, a plunger reciprocable in said bore and adapted to control the drain passage, said plunger having a slot for weakening it to make it constrictable, said slot being filled with a compressible material and said plunger being forcibly constricted by assembly introduction into said bore, whereby the plunger is conditioned to automatically change its diameter to insure water tightness and wear takeup to compensate for changes due to mechanical and chemical causes, said plunger being slotted to provide a passage adapted to establish drain communication between the hydrant and the drain passage when the plunger is in a predetermined position, and means by which force is applied to the plunger to reciprocate it in correspondence to valve motion.

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