J. C. MELOON.

DRY PIPE VALVE.

APPLICATION FILED APR. 8, 1907.

1,198,743.

Patented Sept. 19, 1916.

4 SHEETS—SHEET 1.

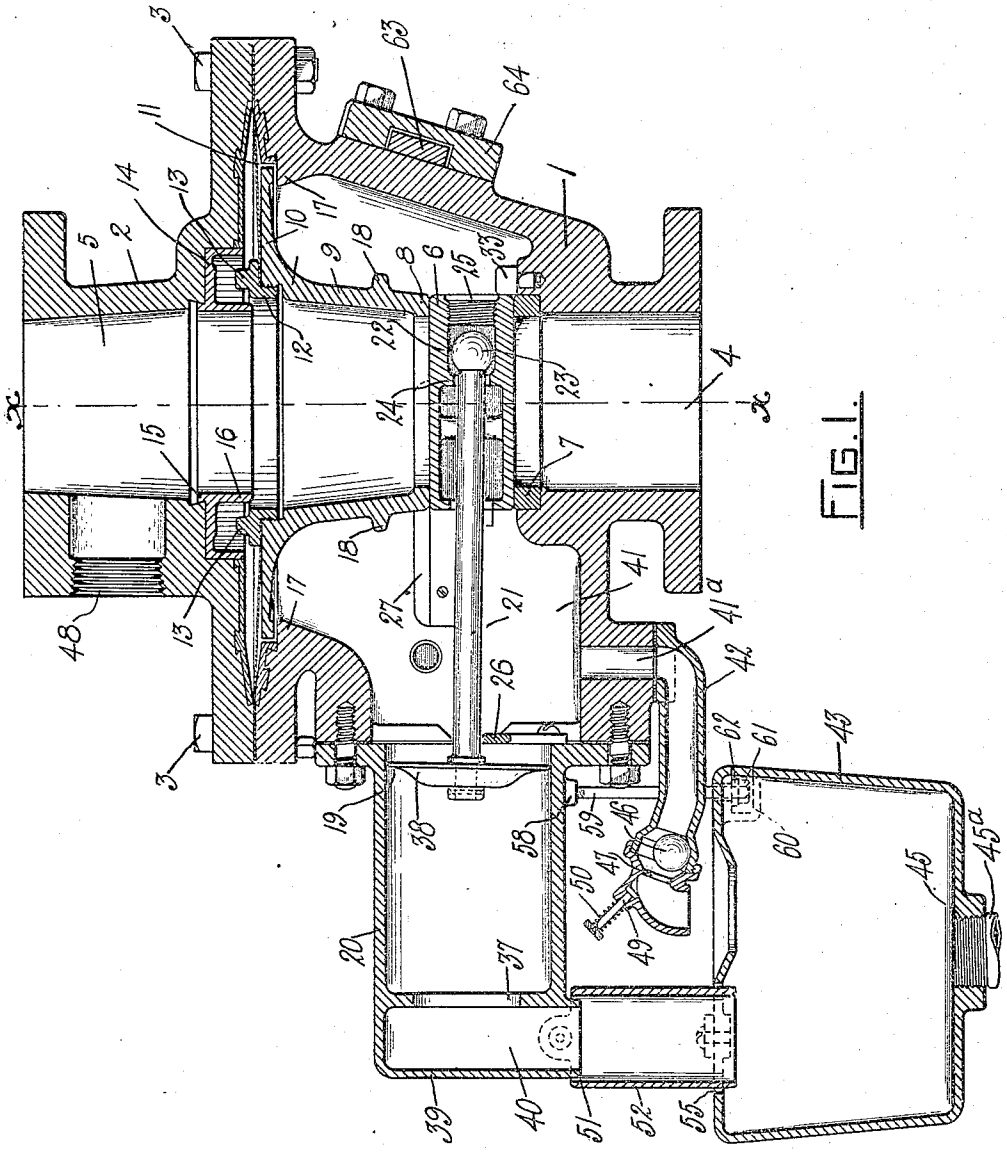


FIG. 1.

WITNESSES.

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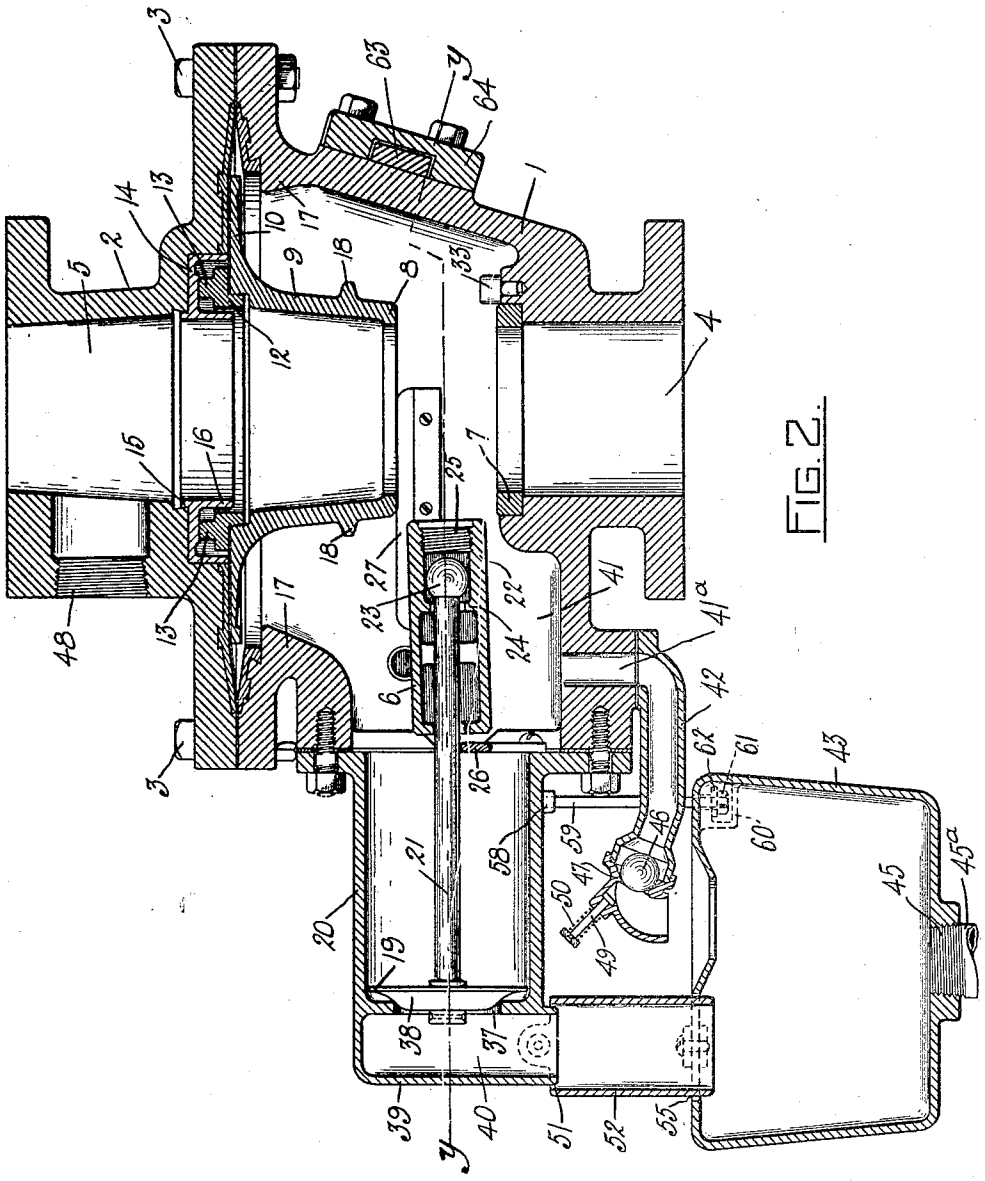


FIG. 2.

WITNESSES.

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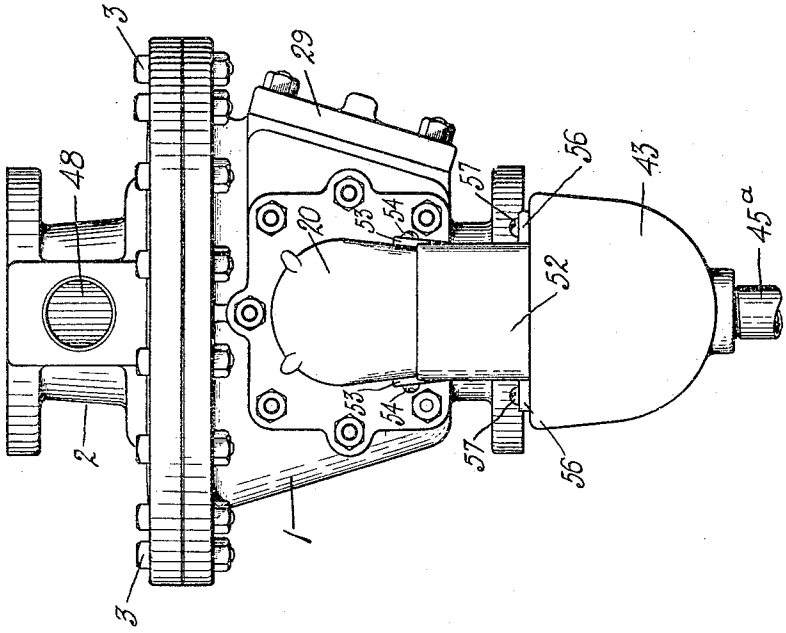


FIG. 4.

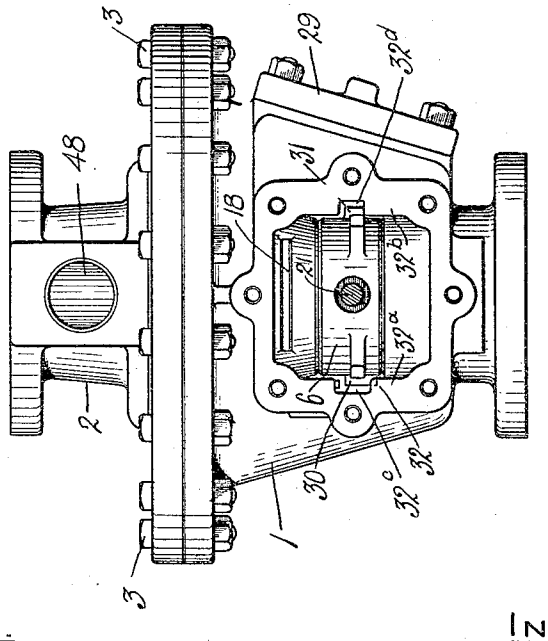


FIG. 3.

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4 SHEETS—SHEET 4.

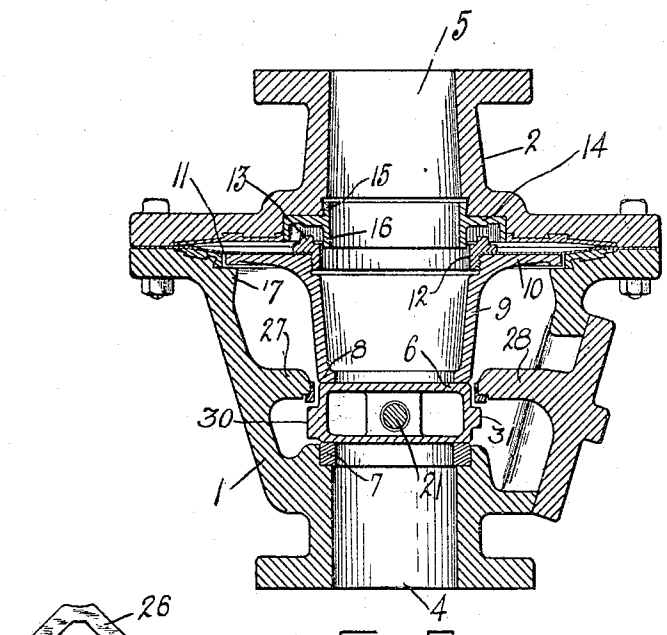


FIG. 5.



FIG. 7.

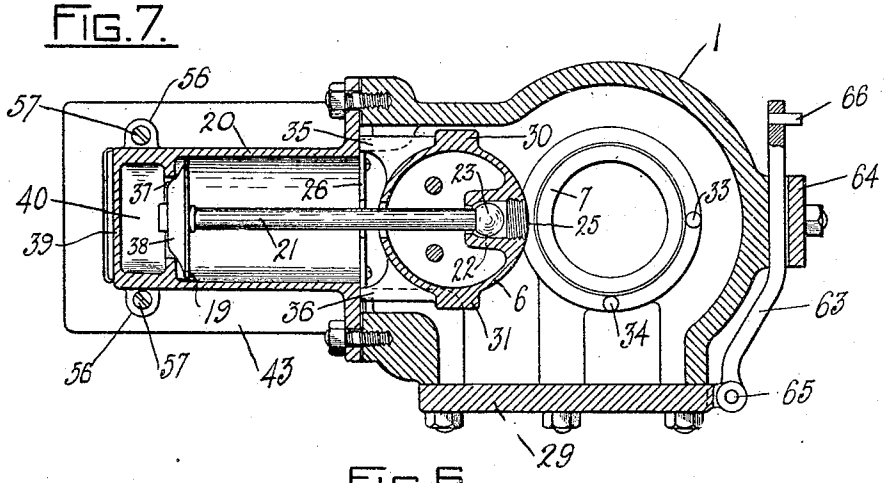


FIG. 6.

WITNESSES.

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UNITED STATES PATENT OFFICE.

JONATHAN C. MELOON, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO GENERAL FIRE EXTINGUISHER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

DRY-PIPE VALVE.

1,198,743. Specification of Letters Patent. **Patented Sept. 19, 1916.**

Application filed April 8, 1907. Serial No. 367,099.

To all whom it may concern:

Be it known that I, JONATHAN C. MELOON, of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Dry-Pipe Valves; and I do hereby declare the following specification, taken in connection with the accompanying drawings and forming a part of the same, to be a full, clear, and exact description thereof.

The invention relates to dry-pipe valves of the character which forms the subject of my pending application, Serial No. 122,983, filed September 11, 1902, in which the valve is held closed by pressure in the system, and in which the valve when released is withdrawn from the water-way.

The present invention is directed to features of construction of such dry-pipe valve, and further has for its object to improve the construction and operation of the several cooperating parts of the structure.

To that end the invention consists in the combinations and arrangements of parts hereinafter described and claimed.

Referring to the drawings, Figure 1 is a vertical section of a dry-pipe valve embodying the invention, and showing the position of the parts with the valve closed, Fig. 2 is a similar vertical section showing the position of the parts when the valve has opened, Fig. 3 is an end elevation of the valve with the connected cylinder removed, Fig. 4 is an end elevation of the valve with said cylinder in place. Fig. 5 is a vertical section of the valve on a smaller scale taken on the line x—x of Fig. 1, and Fig. 6 is a horizontal section on a smaller scale taken on the line y—y of Fig. 2. Fig. 7 is a detail.

The valve-casing comprises two parts 1 and 2, each provided with a suitable flange and secured together by the clamp-bolts 3. The part 1 is provided with the inlet-port 4 communicating with the supply-pipe, and the part 2 is provided with the outlet-port 5 communicating with the riser of the sprinkler system. The valve 6 is a double-seated valve and is normally held in a position to close the water-way by being clamped between a fixed valve-seat 7 and a movable valve-seat 8. The valve-seat 8 is secured to or formed on a tubular member 9 provided with an external flange 10, which tubular member forms a part of the water-way. The tubular member 9 is connected to the casing by a diaphragm 11, preferably formed of sheet metal, the outer edge of said diaphragm being clamped between the flanges of the two parts of the casing, while the inner edge of said diaphragm is clamped between the upper end of the member 9 and the screw-ring 12 which is adapted to be screwed into the member 9, as shown in Fig. 1. The ring 12 is provided with a series of bosses or projections 13 arranged to come in contact with the inner wall of the part 2 of the valve-casing, or with the under surface of the ring 14 secured to said part 2 as shown, and so as to thereby limit the upward movement of the member 9 and the diaphragm secured thereto. The ring 14, which is preferably formed of bronze, is provided with a lip 15, so that said ring may be secured in place in the part 2 of the casing by spinning said lip 15 into a suitable dove-tail recess formed in said part 2. Said ring 14 is also provided with a downwardly depending flange or lip 16 for a purpose to be hereinafter described.

In order to guard against any injurious buckling of the diaphragm 11, it is desirable that the space between the upper side of the diaphragm and the inner surface of the flanged portion of the part 2 of the casing or the inner surface of the ring 14 shall not be substantially greater than the distance between the ends of the bosses 13 and the portion of said part 2 or ring 14 with which said bosses come in contact, and so that when said bosses, upon the upward movement of the tubular member 9 and the diaphragm 11, come in contact with said part 2 or ring 14, the diaphragm will either come in contact with the underside of the flanged portion of said part 2 or will be brought in contact therewith by the pressure of the water acting upon the underside of the diaphragm without moving the diaphragm any substantial distance away from the supporting flange 10. With such construction the upper side of the diaphragm will be backed by the flanged portion of the part 2 and buckling of the diaphragm will be thereby prevented. With such a limited space between the upper side of the diaphragm and the underside of the flanged portion of the part 2 it has been found that unless some means are provided to prevent it, there is liable to be an accumulation of grit, stones, or other foreign matter, upon

the upper side of the diaphragm, and so that when said diaphragm is forced upward by the water-pressure acting thereon, there is a liability of the upper surface of the diaphragm being injured by its being forced into contact with such foreign matter. Means are therefore provided for preventing the ingress of grit, stones, or other foreign matter, into the space above the upper side of the diaphragm and the under surface of the flanged portion of the part 2, such means consisting of the depending flange or lip 16 hereinbefore referred to. It has also been found that unless means be provided to prevent it, the downward movement of the tubular member 9, which is comparatively heavy, will be sufficiently great to produce a considerable rebound of said member, which said rebound is also liable to result in injury to the diaphragm. To guard against this, means are provided for limiting the downward movement of the tubular member 9, such means consisting of the inwardly projecting bosses 17 formed on the inner wall of the part 1 of the valve-casing, said bosses being arranged as shown in Fig. 1, so that the outer edge of the flange 10 will come in contact therewith, and said bosses being preferably so located as to prevent the downward movement of the tubular member 9 to any material extent below its normal position. For conveniently manipulating the tubular member 9 in reseating the valve, or for any other purpose, said tubular member is preferably provided with lateral projections 18, as shown.

For the purpose of withdrawing the valve 6 from the water-way when said valve is released by the reduction of pressure in the system, a piston 19 is provided, said piston being arranged to work in a cylinder 20, which said cylinder is secured to one side of the part 1 of the valve-casing by clamp-bolts or in any other suitable manner. Said piston 19 is connected to the valve 6 by means of the piston-rod 21. The construction of the piston, piston-rod, and valve, by means of which these three parts are suitably connected together, is as follows: The valve 6 is preferably cored out and is provided with an inwardly projecting hollow boss 22, through which the piston-rod 21 may be passed endwise. One end of the piston-rod 21 is provided with a spherical head or enlargement 23 preferably formed integral with the piston-rod, and the hollow boss 22 is provided with an annular inward projection 24, thereby forming a ball and socket joint between the piston-rod and the valve. The outer end of the boss 22 is closed beyond the ball 23 by means of a screw-plug 25, the relation of the end of said plug to the ball 23 being such as to provide a certain amount of play or lost motion between these two parts. To the other end of the piston-rod the piston 19 is secured in any suitable manner, as by being screwed thereon and held by a riveted pin, as shown, or by means of a clamp-nut or otherwise.

If desired, instead of making the spherical enlargement or ball 22 integral with the piston-rod and the piston separate therefrom, the piston may be made integral with the piston-rod and the ball 22 separate therefrom and so as to be screwed on to the piston-rod, in which case the piston-rod with the ball removed will be passed through the valve from the opposite direction and the ball then screwed upon the end thereof. So also if desired both the ball and the piston may be made separate from the piston-rod and suitably secured thereto. With either of these constructions it will be noted that the piston-rod is made rigid with the piston, instead of being jointed thereto, and this is made possible by the construction next to be referred to.

As shown in the drawings, the peripheral edge of the piston proper is quite narrow as compared with the usual construction of a piston working in a cylinder. This is an important feature of the present invention and is attended with several important advantages, as hereinafter set forth. It has been found that for the proper operation of the valve-apparatus as a whole it is not necessary that the piston should closely fit the cylinder, but that instead there may be a considerable clearance between the periphery of the piston and the wall of the cylinder. As the piston-rod 21 is connected to the valve, and as the valve must move away from the fixed seat 7 in opening, provision must be made for such change of position of the valve with relation to the axis of the cylinder 20, and in the present construction such provision is made by forming the piston 19 with a narrow peripheral edge, as above stated, and providing a clearance between the piston and the wall of the cylinder. With this construction the piston may be tilted within the cylinder without cramping, and thus the necessary movement of the valve may take place, notwithstanding that the piston and piston-rod are rigidly secured together, instead of being jointed one to the other. Furthermore with the construction of piston above described there is practically no liability of the piston becoming stuck in the cylinder, either by reason of adhesion or corrosion, or by reason of the presence of foreign matter, as would be the case if the piston had a large peripheral area in contact with the wall of the cylinder. In the first place there is a small peripheral area of the piston for corrosion or adhesion to act upon. In the next place the tilting of the piston, which is provided for by the construction described, will serve to break or disrupt any adhesion that may occur by reason of cor-

rosion or otherwise, and will also cause the piston as it is tilted to act as a scraper to scrape the wall of the cylinder and thus remove any foreign matter therefrom. As shown in the drawings, the piston when in its normal position, with the valve 6 closed, is slightly tilted or stands at an angle to the axis of the cylinder 20, the arrangement being such that the movement of the valve 6 from its closed to its open position will serve to tilt the piston to or past a position at right angles with the axis of said cylinder. With a narrow faced piston, therefore, such as shown and described, if any foreign matter gets between the peripheral edge of the piston and the wall of the cylinder, the tilting movement of the piston which is given thereto by the opening of the valve will be sufficient to cause the edge of the piston either to pass by such foreign matter or to scrape it away, and there will be practically no liability of the foreign matter becoming wedged between the edge of the piston and the wall of the cylinder.

As shown in Fig. 2, when the valve in opening is withdrawn from the water-way, it is withdrawn to such a position that the right-hand edge of the valve as shown in the drawings rests upon and is supported by the valve-seat 7 or by the surrounding metal of the valve-casing. It is desirable to provide means for supporting the opposite or left-hand edge of the valve, and means is provided for this purpose, which means consists of a bridge-piece 26 secured to the inner end of the cylinder 20 and with the upper edge of said bridge-piece arranged in line with the lower edge of the piston-rod, and so that said piston-rod rests and slides thereon. When now the piston has been moved to the opposite end of its cylinder and the valve 6 has been withdrawn from the water-way, as shown in Fig. 2, the bridge-piece 26, as will be seen, will underlie the piston-rod 21 in proximity to the left hand edge of the valve 6, and so that said bridge-piece will thus serve to support the piston-rod at that point, while the piston-rod will in turn support the valve.

For the purpose of limiting the upward movement of the valve 6, and also for guiding the valve as it is being withdrawn from the water-way by the movement of the piston 19 in its cylinder 20, projections 27 and 28 are provided, as shown in Fig. 5. The projection 27 is formed integral with the part 1 of the casing and projects inwardly therefrom, while the projection 28 is formed integral with the hand-hole cover 29 and projects inwardly therefrom. The valve 6 is provided with lateral projections 30 and 31, the projection 30 being arranged to underlie and engage the projection 27, and the projection 31 being arranged to underlie and engage the projection 28. With the construction shown the hand-hole which is closed by the cover 29 is arranged at the front of the valve-casing and in such position as to give easy access to the valve and its coöperating mechanism.

It is desirable to provide means for insuring that the valve when placed in position shall always be inserted in the same position relatively to the valve-seats, and to prevent it from being inserted upside down. While the valve is a double-faced valve, one face is preferably ground to fit the valve-seat 7, while the other face is ground to fit the valve-seat 8, and this makes it desirable that the valve should always be inserted in the same position with relation to said valve-seats. In order to prevent the valve from being inserted upside down the projection 30 is provided with a downward extension 32. The opening into the valve-casing where the cylinder 20 is attached to said casing is provided on each side with inwardly projecting fins 32^a 32^b. The fin 32^a is provided with a slot 32^c and the fin 32^b is provided with a slot 32^d. The slot 32^c is made longer than the slot 32^d, and so that the upper edge of the fin 32^a stands in a plane below the upper edge of the fin 32^b, thus permitting the passage of the downward extension 32 above the upper edge of said fin 32^a. If now it should be attempted to place the valve in position upside down, this would bring the projection 30 at the right in Fig. 3 and as will be seen, the total length of the projection 30 with its downward extension 32 is greater than the length of the slot 32^d, and so that said extension 30 cannot pass by the upper edge of the fin 32^b, and it will therefore be impossible to pass the valve through the opening in the valve-casing.

For the purpose of properly locating the valve upon the valve-seat 7, a stop-pin 33 is provided, said pin serving to limit the movement of the valve to the right, as shown in the drawings and to properly locate the valve in that direction, while the guide-projection 27 serves to guide and locate the valve laterally. If desired, another pin 34 may be employed located opposite to the guide-projection 27 and acting in conjunction therewith to guide and locate the valve laterally, but such additional pin has been found in practice to be unnecessary.

It is desirable to prevent undue strain upon the piston-rod 21 when the valve is withdrawn from the water-way, and it is for this purpose that the lost motion between the ball 23 on the piston-rod and the inner face of the screw-plug 25 heretofore referred to is provided. With such lost motion, when the piston 19 brings up at the outer end of its cylinder 20, the valve is capable of further movement to the extent of such lost motion. For the purpose of arresting this further movement of the

valve and preventing the same, under the momentum which it may have acquired, from striking the ball end of the piston-rod, which might result in bending said rod or otherwise injuring the piston-rod or piston, the valve is provided with two projecting stops 35 and 36 arranged to come in contact with the inner wall of the flanged end of the cylinder 20, as shown in Fig. 6. With this construction it has been found in practice that the withdrawal of the valve from the water-way is effected without any jar or shock and without any liability of injury to any of the parts.

The outer end of the cylinder 20 is provided with an opening 37 to permit the escape of air and thus prevent the formation of an air-cushion on the backside of the piston and also to permit the escape of the water which may pass by the piston during the movement thereof from one end of the cylinder to the other, and thus prevent back-pressure on the piston. When, however, the piston has been moved to the outer end of its cylinder and the valve has thereby been withdrawn from the water-way, it is desirable that this opening 37 should be closed to prevent the further escape of water therethrough, and for this purpose the piston 19 is provided with an enlargement 38 upon its rear side in line with and adapted to close the opening 37, as shown in Fig. 2.

For the purpose of covering and protecting the opening 37 in the end of the cylinder 20, and for preventing the introduction of any foreign matter into the cylinder through said opening, and also to direct downward the water which escapes through said opening, a hood 39 is provided at the outer end of said cylinder, as shown in Figs. 1 and 2, said hood forming a downwardly extending passage 40 communicating with the opening 37.

The annular space within the part 1 of the valve-casing surrounding the valve-seat 7, valve 6 and tubular member 9 constitutes the intermediate chamber 41 of the dry-pipe valve, which chamber is normally open to the atmosphere through the drip opening 41^a with which is connected the drip-pipe 42.

43 represents a receiver so constructed and located as to receive the drip both from the pipe 42 leading from the chamber 41 and from the passage 40. Said receiver is provided with an opening 45 connecting with a pipe 45^a for taking away the water which enters said receiver.

While the pipe or passage 42 leading from the intermediate chamber 41 requires to be normally open, and to remain open so long as the valve 6 remains closed, for the purpose of taking away the drip and maintaining atmospheric pressure in the chamber 41, said passage 42 requires to be closed to prevent the escape of water therethrough when the valve 6 is opened. Means are provided for automatically closing said passage 42 whenever the valve 6 is opened, such means consisting of a ball-valve 46 arranged substantially as shown in the drawings. When the valve 6 opens and there is a flow of water through the passage 42, such flow will produce a suction which will suck the ball-valve 46 up against its seat 47, thereby closing that portion of the passage 42 which leads to the receiver 43, said ball-valve 46 being then held to its seat by the pressure of water behind it.

When the dry-pipe valve has operated and the distributing system has thereby become filled with water, it becomes necessary for the purpose of resetting the valve and re-establishing the dry-pipe system to drain the water from the distributing system. For this purpose the drain-opening 48 is provided in the part 2 of the valve-casing. The draining of the valve-casing itself, or that portion thereof which is below said opening 48, is effected through the drip-passage 42. As at the time when the valve-casing is to be thus drained the valve 46 is held closed by the pressure of the water thereon, means are provided for opening said valve in order to drain said casing, such means consists of a plunger 49 provided with a spring 50 and arranged as shown in Figs. 1 and 2. By pressing on said plunger 49 the ball-valve 46 may be forced away from its seat, and held in its open position until the valve-casing has been drained, when the ball-valve 46 will remain in its open position, while the spring-plunger 49, when released, will be returned to its normal position by the spring 50.

The receiver 43 is preferably supported and connected with the valve-structure in the following manner: The hood 39 extends somewhat below the wall of the cylinder 20, and so as to form a projecting lip 51, adapted to enter the upper end of a hollow casing or short pipe 52, as shown. This hollow casing or short pipe 52 is preferably rectangular in cross-section and is provided with upwardly projecting ears 53, 53. Screws 54, 54, pass through these ears and thereby connect the part or pipe 52 to the hood 39. The lower end of the part or pipe 52 extends through an opening 55 in the top of the receiver, and said part 52 is provided near its lower end with ears 56, 56. Screws 57, 57, pass through these ears and thereby connect the part or pipe 52 with the receiver 43. Near the other end of the cylinder 20 a downwardly projecting boss 58 is formed, which is tapped to receive a bolt 59. In the corresponding upper corner of the receiver is cast a boss 60 which is cored out to form a slot 61 which extends through the wall of the receiver,

said slot serving to receive the head 62 of the bolt 59. With this construction the receiver may be readily attached to the valve-structure so as to be portable therewith, and will be firmly supported thereby. The drip-pipe 42 from the intermediate chamber is preferably not connected to the receiver, but is arranged so that the outlet therefrom will be located above an opening 43^a formed in the top of the receiver. It is also preferred to provide means for connecting the hand-hole cover 29 with the valve-casing and so that said cover will remain connected with said casing when removed from the hand-hole. Such means consists of a sliding arm or bracket 63, one end of which is arranged to slide in a slotted plate 64 secured to the outside of the valve-casing, and the other end of which is hinged at 65 to the hand-hole cover 29. Said arm 63 is provided at or near its outer end with a cross-pin 66. With this construction when the hand-hole is to be opened, the cover 29 may be moved outward from the valve-casing for a sufficient distance to clear the stud-bolts, being guided in this movement by the arm 63 sliding in the plate 64, and then the cover may be turned upon its hinge so as leave free access to the hand-hole. The pin 66 serves to prevent the arm 63 from being withdrawn from the plate 64, and the cover 29 thus remains connected with the valve-casing.

The operation of the dry-pipe valve construction above described is as follows: With the parts in their normal position the valve 6 is held closed by being clamped between the fixed valve-seat 7 and the movable valve-seat 8, said movable valve-seat being held down upon the valve 6, and the valve 6 in turn held against the fixed seat 7, by the air-pressure in the system acting on the diaphragm 11, such air-pressure also having access through the tubular member 9 to the upper surface of the valve 6. When now the air-pressure in the system and on the diaphragm 11 is reduced, as by the opening of one or more of the automatic sprinklers connected therewith, the water-pressure acting upon the underside of the valve 6 will serve to lift said valve from the fixed seat 7, the lifting of said valve being accompanied with a corresponding lifting of the movable valve-seat 8, tubular member 9, and the diaphragm 11 attached thereto. When the water flowing between the underside of the valve 6 and the valve-seat 7 enters the chamber 41, the water-pressure will have access to, and will act upon, the piston 19, and will serve to move said piston to the opposite end of the cylinder 20, thereby withdrawing the valve 6 from the waterway, as shown in Fig. 2. The water-pressure when thus admitted to the chamber 41 will also have access to the underside of the diaphragm 11, and will thus serve to move said tubular member, together with the movable valve-seat 8 and the diaphragm 11, upward until the projections or stops 13 come in contact with the ring 14 which will serve to limit the upward movement of said tubular member and diaphragm.

It is preferred to so construct and arrange the parts that the final extent of opening between the valve 6 and the fixed valve-seat 7 and the extent of opening between the movable valve-seat 8 and the valve 6 shall be substantially equal. This is provided for by making the distance between the stops 13 and the ring 14 twice that of the distance between the stops 30, 31 on the valve and the stops 27, 28. Thus if the distance between the stops 13 and the ring 14 be three-eighths of an inch, and the distance between the stops 30, 31 and the stops 27, 28 be three-sixteenths of an inch, the valve 6 and the movable valve-seat 8 will both move upward three-sixteenths of an inch and until the stops 30, 31 come in contact with the stops 27, 28, and then the movable valve-seat 8 will move upward and away from the valve three-sixteenths of an inch and until the stops 13 come in contact with the ring 14. If, however, it should be deemed desirable to throttle to a greater or less extent the flow of water through the chamber 41 for any purpose, as for instance to insure that under all conditions there shall be sufficient water-pressure acting on the piston 19 to withdraw the valve 6, this may be done by so proportioning the distance between the stops 13 and the ring 14 with relation to the distance between the stops 30, 31 and the stops 27, 28, or vice versa, that the area of opening between the movable valve-seat 8 and the valve 6 will be less than the area of opening between the valve 6 and the fixed valve-seat 7. The upward movement of the valve 6 will, as hereinbefore explained, cause a certain amount of tipping or tilting of the piston 19, which will serve to disrupt any adhesion there may be between the edge of said piston and the wall of the cylinder 20 and also to scrape away any foreign matter that may have accumulated, and so that the piston will be free to be moved by the water-pressure acting thereon. When the piston reaches the opposite end of the cylinder 20 the projection 38 on the piston will serve to close the opening 37 and thus close the drip-passage 40, while the flow of water through the drip-passage 42 will be automatically closed by the ball-valve 46 and close said drip-passage.

When it is desired after the dry-pipe valve has operated to reset the valve 6 and to reëstablish the dry-pipe system, the distributing system is drained through the opening 48 and the valve-casing is drained through the drip-passage 42 by opening the

ball-valve 46 by means of the spring-plunger 49. The hand-hole cover 29 is then opened in the manner above explained, giving free access to the interior of the valve-casing and the valve 6 is returned to its seat, drawing the piston 19 with it back to normal position, the pins 33 and 34 in connection with the guide projection 27 serving to guide the valve and properly locate the same upon its seat.

In assembling the parts the piston-rod 21, with the piston removed, is passed through the hollow boss 22 in the valve, and the piston 19 is then secured in place thereon. The piston is then inserted in the cylinder 20, which is at this time disconnected from the valve-casing. The piston may be thus inserted in the cylinder by simply tipping either the piston or the cylinder, or both, so that the piston will pass on the top of the bridge-piece 26. The valve may then be inserted through the opening in the valve casing and placed in position upon the fixed valve-seat 7. The cylinder 20 is then secured in position on the valve-casing by suitable clamp-bolts or by stud-bolts and nuts as shown. So also if it is desired at any time to remove the valve from the valve-casing, the cylinder is removed and the piston and valve are withdrawn and removed from the valve-casing with the cylinder. Then the piston may be removed from the cylinder by tipping either the piston or the cylinder or both, so that the piston will pass over the top of the bridge-piece 26 as before.

In resetting the valve after it has operated it is not necessary ordinarily to remove the valve from the valve-casing or to remove the cylinder 20, but after the valve and valve-seats have been properly wiped and cleaned the valve may be replaced in position on the valve-seat 6 by opening the hand-hole cover 29 and reaching through the hand-hole. The replacing of the valve upon its seat will serve to draw the piston 19 back to its normal position.

When the valve has been removed from the valve-casing and is to be replaced therein, the downward extension 32 on the projection 30, in connection with the fin 32^b, will serve, in the manner above explained, to prevent the valve from passing through the opening in the valve-casing, if the valve be upside down, while the pin 33, in connection with the guide-projection 27, will serve to guide the valve to its proper position and to locate the same upon the valve-seat 7. When the parts have been replaced in position and the hand-hole cover 29 secured in place, or whenever the valve is to be re-set, the air-pressure is pumped up in the distributing system, which air-pressure acting upon the diaphragm 11 will operate to clamp the valve 6 in its closed position between the fixed valve-seat 7 and the movable valve-seat 8.

The dry-pipe valve above described is simple in construction and efficient in operation and the parts may be readily assembled or reset. Whenever the valve 6 is opened it is completely withdrawn from the water-way, thereby leaving a free and unobstructed passage for the water and preventing all liability of the valve being water columned after it has once opened. Furthermore the various features of construction hereinbefore described serve to meet all the varying conditions that are liable to arise in the use or operation of the valve.

In order to still further guard against injury to the diaphragm 11, by reason of corrosion or otherwise, it is preferred to face the underside of the flanged portions of the parts 1 and 2 of the valve-casing, with which the diaphragm comes in contact, with Babbitt metal or other non-corrosive material, as indicated in the drawings.

What I claim as my invention and desire to secure by Letters Patent is:

1. In a dry pipe valve, the combination of a double seated valve, a fixed seat for said valve, a diaphragm adapted to be acted upon by the pressure in the system, a movable member connected to said diaphragm and carrying a valve-seat, means for limiting the movement of the valve away from said fixed seat, and means carried by said movable member and independent of said diaphragm for limiting the movement of the diaphragm and movable valve-seat away from said valve.

2. In a dry-pipe valve, the combination of a double seated valve, a fixed seat for said valve, a movable member carrying a valve-seat, means for limiting the movement of said movable seat away from the valve, and means carried by said movable member for limiting the movement of said movable seat in the opposite direction.

3. In a dry-pipe valve, the combination, with the valve-casing, of a double seated valve, a fixed seat for said valve, a movable seat for said valve, said movable seat being carried by a tubular member provided with a flange, and projections on the interior of the valve-casing adapted to be engaged by said flange to limit the movement of said movable seat toward the fixed valve-seat.

4. In a dry-pipe valve, the combination of a valve-casing composed of two parts, a movable member carrying a valve-seat, a diaphragm having its outer edge clamped between the two parts of the valve-casing, a screw ring for clamping the inner edge of said diaphragm to the movable member, said ring being provided with lugs or projections adapted to engage the valve-casing and limit the movement of said movable member.

5. In a dry-pipe valve, the combination of a valve-casing provided with a flange, a movable member provided with a flange arranged opposite to the flange on the valve-casing, and a lip on the valve-casing overlying the entrance to the space between said flanges.

6. In a dry-pipe valve, the combination of a valve-casing composed of two parts, one of said parts being provided with an annular flange, a movable member provided with an annular flange arranged opposite to the flange on the valve-casing, a diaphragm connected to said casing and to said movable member, and an annular lip on the valve-casing overlying the entrance to the space between said flanges.

7. In a dry-pipe valve, the combination, with the valve-casing, of a valve, means for holding said valve closed by pressure in the system, a cylinder communicating with the interior of said casing, a piston in said cylinder, and a piston rod rigidly connected to said piston and loosely connected to said valve, whereby said valve will be withdrawn from the waterway by the water-pressure acting on said piston when said valve is released.

8. In a dry-pipe valve, the combination, with the valve-casing and the water-valve therein, of a cylinder communicating with the interior of said casing, and a piston in said cylinder connected with said water-valve, said piston having a narrow peripheral edge and adapted to be rocked or tipped in said cylinder.

9. A dry pipe valve having in combination a valve-casing, a water-valve therein, a cylinder communicating with the interior of said casing, a piston in said cylinder, a piston-rod rigidly connected to said piston and loosely connected to said valve.

10. The combination, with the valve-casing and the water-valve therein, of a cylinder communicating with the interior of said casing, and a piston in said cylinder connected with said valve and having a narrow peripheral edge, said piston when the valve is closed standing at an angle to the axis of said cylinder, but adapted to be rocked or tipped by the movement of the valve in opening.

11. The combination, with the valve-casing and the water-valve therein, of a cylinder communicating with the interior of said casing, a piston in said cylinder having a narrow peripheral edge, a piston-rod connecting said piston and valve, said piston and piston-rod when the valve is closed standing at an angle to the axis of said cylinder, but adapted to be moved by the movement of the valve in opening to rock or tip the piston in said cylinder.

12. The combination, with the water-valve, of a piston for withdrawing said valve from the water-way, said valve being provided with an opening therethrough and with a shoulder in said opening, and a piston-rod adapted to pass through said opening and provided at one end with an enlargement to engage said shoulder, said piston being rigidly secured to said piston-rod at its opposite end.

13. A dry pipe valve having in combination a water-valve, a piston for withdrawing said valve from the water-way, and a piston-rod connecting said piston and valve, the connection between said piston-rod and valve being provided with lost motion to permit a movement of the valve relatively to the piston.

14. The combination, with the valve-casing and the water-valve therein, of a cylinder communicating with the interior of said casing, said cylinder being provided with a central opening at its outer end, and a piston in said cylinder connected with said valve, said piston being provided with an enlargement upon its rear side adapted to close the opening in said cylinder.

15. The combination, with the valve-casing and the water-valve therein, of a cylinder communicating with the interior of said casing, a piston in said cylinder, a piston-rod connecting said piston and valve, and a bridge-piece or support located at or near the entrance to said cylinder.

16. The combination, with the valve-casing and the water-valve thereon, of means for holding said valve closed, means for withdrawing said valve from the water-way when released, a hand-hole cover secured to said casing, lugs on said valve, projections adapted to be engaged by said lugs one of said projections being on the casing, and the other being on said hand-hole cover.

17. The combination, with the valve casing, of a double seated valve, a fixed seat for said valve, and a movable seat for said valve, said valve and casing being provided with means for preventing the valve from being inserted in place wrong side up.

18. The combination, with the valve-casing and the water-valve therein, of a seat for said valve, and a guide and a stop for properly locating said valve on said seat when the valve is moved to position thereon.

19. A valve casing having a cylinder communicating with the interior of said casing and provided with an opening at its outer end, and having a hood extending over said opening and adapted to direct downward any flow from said opening and also to prevent direct access to the interior of the cylinder through said opening.

20. The combination of a valve-casing, an intermediate chamber in said casing, a cylinder communicating with said intermediate chamber, a drip-pipe connected to said cylinder, a receiver connected at one end to

said drip-pipe, and a bolt connecting said receiver at its other end with said cylinder.

21. The combination of a valve-casing, an intermediate chamber therein, a drip-pipe communicating with said intermediate chamber, a ball-valve in said drip-pipe normally open, but adapted to be automatically closed by a substantial flow through said pipe, and means for opening said ball-valve against a pressure in said pipe.

22. The combination of a valve-casing provided with a hand-hole, a cover for said hand-hole, and a sliding arm to which said cover is hinged, said arm being arranged to have a limited sliding movement with relation to said valve-casing.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."