July 14, 1936. J. E. WALLACE ET AL 2,047,719

DRY PIPE VALVE AND ACCELERATOR FOR SPRINKLER SYSTEMS

Filed Oct. 10, 1930 2 Sheets-Sheet 1

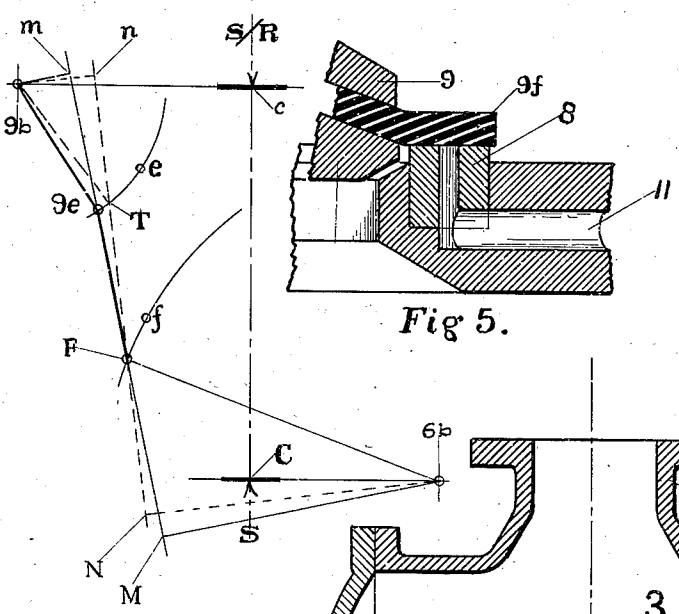


Fig. 3

Fig. 5.

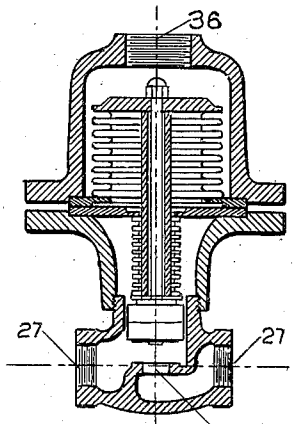


Fig. 4

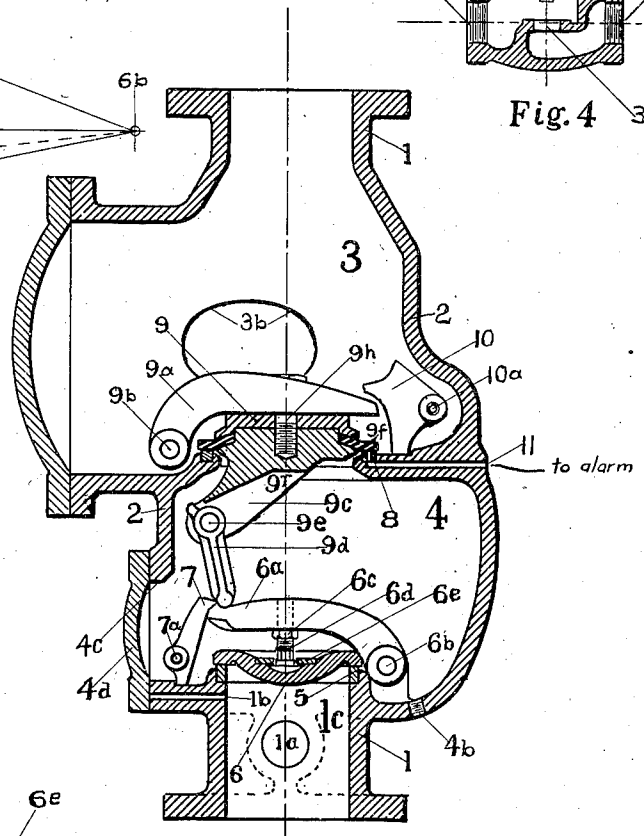


Fig. 1

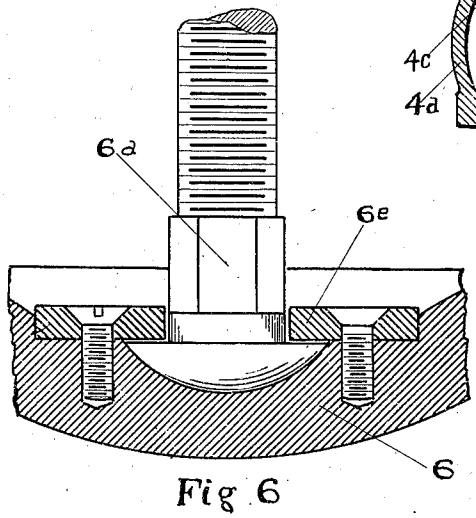


Fig. 6

JOHN EUGENE WALLACE
CHARLES DUMAS
INVENTORS.

BY Francis V. McCarthy

ATTORNEY.

July 14, 1936. J. E. WALLACE ET AL 2,047,719

DRY PIPE VALVE AND ACCELERATOR FOR SPRINKLER SYSTEMS

Filed Oct. 10, 1930 2 Sheets-Sheet 2

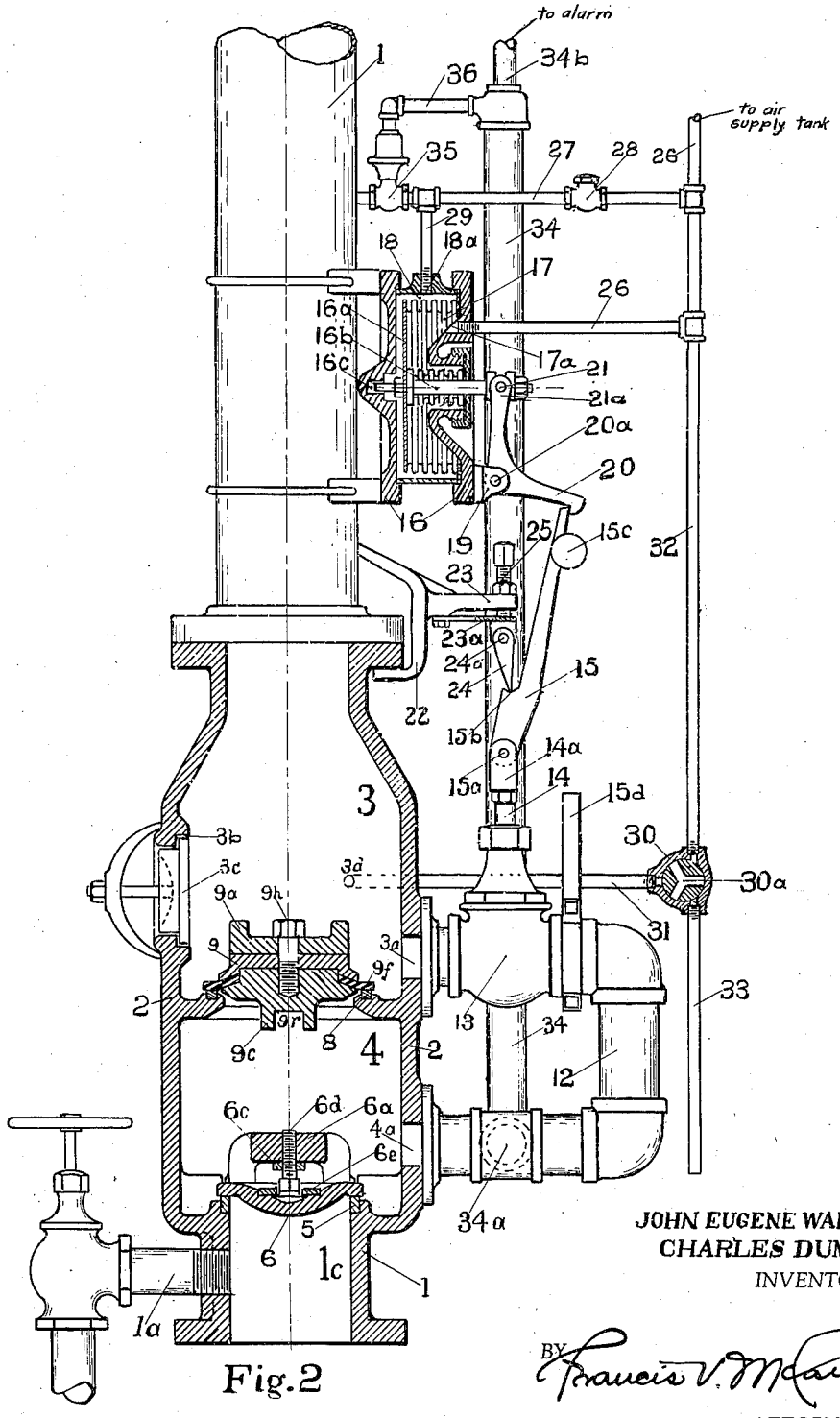


Fig.2

JOHN EUGENE WALLACE
CHARLES DUMAS
INVENTORS.

BY Francis V. McAuley

ATTORNEY.

Patented July 14, 1936

2,047,719

UNITED STATES PATENT OFFICE

2,047,719

DRY PIPE VALVE AND ACCELERATOR FOR SPRINKLER SYSTEMS

John Eugene Wallace, Foxboro, and Charles Dumas, Worcester, Mass., assignors, by mesne assignments, to Francis V. McCarthy, Lynn, Mass.

Application October 10, 1930, Serial No. 487,810

17 Claims. (Cl. 169—21)

Our invention pertains to a sprinkler system used for the protection of buildings from fire and has for an object to provide means whereby any reduction of pressure in the sprinkler system causes a differential action to open the sprinkler system to free flow of water from the source of water supply.

Another object is to provide quicker opening of the flood valve of the system to the opening of a sprinkler head than has been heretofore obtained.

Another object is to provide maintenance of closure of the flood valve by means of lower pressure than heretofore.

Another object is to provide a lower degree of pressure in the sprinkler system when in static action than heretofore and practically instantaneous creation of a differential and resulting opening of the flood valve to service pressure upon the opening of a sprinkler head.

Another object is to provide a means of quick operation of the flood valve in the event that the pressure in the sprinkler system falls below the pressure normally required to maintain the flood valve in closed position.

Other objects are to provide a combination of flood valves which may be changed readily for low or high pressure; to provide a combination of flood valves in which the ratios are stabilized by a toggle system; to provide a combination of flood valves controlled by a toggle system whereby differences in the size of the valves and valve openings is made unnecessary; and to provide a system whereby acceleration of action is created in the operation of the sprinkler system.

Another object is to provide means for giving an alarm immediately upon operation of the system.

Another object is to provide a convertible sprinkler alarm system which may be used interchangeably as a dry or wet system.

Another object is to provide a sprinkler system with an air differential affording adequate protection of the sprinkler system from freezing in cold weather.

Our device may be used either as a dry pipe system or wet pipe system and may be changed from one to the other in the manner hereinafter described. This interchangeable feature is of particular desirability in latitudes where freezing temperatures prevail during a part of the year, for the reason that during such part of the year freezing of the sprinkler system is prevented by using our device as a dry system, thus affording protection from freezing in sprinklered buildings not adequately protected by artificial heat, and also in water curtain pipes on the outside of buildings.

In the drawings that accompany and are made a part of this application for a patent, Figure 1 is a detail showing a valve in section, at right angles to section shown in Figure 2; Figure 2 is a view partly in section; Figure 3 is a diagrammatic representation of the toggle of forces in opposition at 9e of the diagram. Figure 4 is a detail showing construction of valve 35; Figure 5 is a detail (full size) of port 11 and surrounding construction; Figure 6 is a detail (full size) of connection between valve 6 and arm 6a.

Referring to the drawings, 1—1 is the riser leading from the water-main (not shown) to the sprinkler system; 1c is the inlet chamber of the casing into which water first enters from the service main; 1a is a drainage outlet in the inlet chamber 1c threaded for connecting by the use of a pipe nipple any standard shut-off valve of gate or globe construction, as is understood and required by those skilled in the art; 1b is a port leading from the inlet chamber 1c through the casing to the seat of hand hole cover 4d; 2 is the valve casing; 3 is the pressure chamber; 3a is a port in the pressure chamber; 3b is the hand hole and 3c the hand hole cover to pressure chamber 3; 3d is a priming and drip outlet; 4 is the intermediate chamber; 4a is a port in the intermediate chamber; 4b a drip from the intermediate chamber 4; 4c the hand hole and 4d the hand hole cover of intermediate chamber 4; 5 is the water valve seat; 6 is a clapper valve for co-operating with water seat 5, said valve being inclusive of a lever arm 6a pivoted on clapper arm pin 6b whereby the valve is mounted for swinging movement to open and closed position; 6c and 6d an adjusting bolt and lock nut by which clapper 6 and lever arm 6a are flexibly held together; 7 is the water clapper latch mounted on water clapper latch pin 7a; 8 is the air valve seat; 9 the air clapper valve inclusive of an arm 9a mounted on air clapper arm pin 9b; 9c is a downwardly projecting toggle arm under clapper valve 9; 9d is a toggle post on arm 9c mounted thereon by the toggle post pin 9e and adapted to swing into a recess 9r in the arm 9c when the valve 9 is opened; 9f is an apron of rubber or other suitable material affixed to the clapper to insure tight closure of the air valve against its seat; 9h is a bolt threaded into part 9e holding thereto parts 9, 9a, 9d, and 9f rigidly together in a complete assembly as one piece; 10 is the air clapper latch mounted

on latch pin 10*a*; 11 is the alarm port, used when the system is wet, leading to approved wet system mechanical alarm devices, not shown; 12 is a pipe connecting ports 3*a* and 4*a*; 13 is a globe valve in pipe 12; 14 is the valve stem of valve 13; 14*a* is a bearing on valve stem 14; 15 is a lever in bearing 14*a* mounted on lever pin 15*a*; 15*b* is a recess in lever 15; 15*c* is a weight on lever 15; 15*d* is a stop for lever 15; 16 is the air differential action casing; 16*a* is the diaphragm; 16*b* is a rod affixed to diaphragm 16*a* and movably supported in walls of the casing at 16*c*, the diaphragm 16*a* is sustained as shown in the drawings by a metal bellows of the usual type; 17*a* is a port leading from retention chamber 17; 18*a* is a port leading from chamber pressure 18; 19 is a bearing; 20 is a latch movably mounted in bearing 19 by means of latch pin 20*a*; 21 is a yoke pin in yoke 21*a* affixing latch 20 to rod 16*b*; 22 is a bearing arm affixed to valve casing 2; 23 is a bearing mounted on bearing arm 22 and having a flexible member 23*a*; 24 is a toggle lever mounted on flexible member 23*a* by lever pin 24*a*; 25 is threaded bolt for adjusting pressure on toggle lever 24; 26 is a pipe communicating into a closed pressure storage tank (not shown); 27 is a pipe leading from pipe 26 to sprinkler system; 28 is check valve in pipe 27; 29 is a pipe leading from pipe 27 to port 18*a* on sprinkler side of the check valve 28; 30 is a three way valve with ports 30*a* therein; 31 is a pipe leading from priming and drip outlet 3*d* to valve 30; 32 is a drip pipe leading from pipe 26 to valve 30; 33 is a drip pipe leading from valve 30 to open air; 34 is a pipe leading from pipe 12 as at 34*a* through which pressure will reach alarm devices and the automatic shut-off valve 35; 34*b* is a pipe leading from pipe 34 to hydraulically operated alarm gongs of any approved pattern which may be located some distance away, if the system is being operated as a wet system this pipe is closed by a shut-off valve of any approved pattern located therein; 35 is an automatically operated shut-off valve in pipe 27 closing pipe 27 to the passage of pressure should pressure exist in pipe 34; 36 is a pipe leading from pipe 34 to diaphragm chamber in valve 35 so that service pressure in pipe 36 from pipe 34 will cause closing of the valve 35 against pressure passing through pipe 27 to the differential bellows in casing 16.

The inter-relation of the parts shown in Figure 1 are as follows: the water pressure in the inlet chamber 1*c* under the clapper valve 6 transmits itself through the bolt 6*d* to the lever arm 6*a* which bolt is threaded into the lever arm and held at adjustment by the locking nut 6*c*, the lever arm being held fixed at one end by the pin 6*b* a reduced pressure is transmitted to the toggle post 9*d* and through the toggle post to the pin 9*e* affixed in the toggle arm 9*c*; the toggle arm 9*c*, air clapper valve 9 and the air clapper arm 9*a* being rigidly assembled together as one piece by the bolt 9*h*, any pressure transmitted by the post to the pin 9*e* will, in effect, transmit itself to the clapper arm 9*a* at a point on a straight line projected through the point F on the center line of the toggle post and the point at the center of the pin 9*e* to the clapper arm 9*a*; the distance from the center of the pin 9*b* to this projected line, multiplied by the force transmitted by the toggle post constitutes the equivalent turning moment that will act to swing the air valve assembly around the pivot 9*b* and thus clear the valve seat 8, which turning moment is resisted by the air pressure in chamber 3 acting on the air clapper 9, this latter force multiplied by the distance from the center of the clapper 9 to the pivotal point 9*b* makes the moment of resistance against the upward thrust from the toggle post 9*d*, if sufficient pressure does not exist in chamber 3 to make the resisting moment equal to or greater than the overturning moment set up by the thrust from the post 9*d* movement will take place, the water pushing the lever arm 9*a* to rotate around the pin 6*b*, the toggle post 9*d* tilting on the lever arm at F and rotating on the pin 9*e* as the air assembly, carried by the air clapper arm 9*a*, rotates around the pivot 9*b*, clearing valve seat 8; if, however, sufficient pressure exists to make the resisting moment fully equal to or greater than the overturning moment all parts remain stationary. There should be some excess of resisting moment so that the water clapper valve 6 will be held sufficiently tight to prevent leaking.

Adjustment to the purpose that pressure from the pressure chamber 3 shall act to firmly hold clapper valve 6 to valve seat 5 is accomplished through bolt 6*d* threaded into lever arm 6*a* and loosely attached to clapper valve 6, said bolt having a hexagon shank and button head the latter fitting into a recess in the water clapper 6 and being held therein by the ring 6*e*, the ring being firmly attached to the clapper and clearances between the button head of the bolt and the ring 6*e* enables the water clapper 6 to adjust itself to its seat with varying adjustments of the lever arm 6*a*; so, adjustment to apply pressure from chamber 3 to the water clapper valve 6 is effected by loosening check nut 6*c*, applying a wrench to the hexagonal shank and turning bolt 6*d* downward against the clapper and thusly raising lever arm 6*a* which in turn will raise toggle post 9*d* and the latter thrusting against the pin 9*e* will raise the air valve assembly until it tightens against the pin 9*b* to rotate thereabout until all metal contacts are cleared and only the flexible rubber apron 9*f* of the air valve assembly remains in contact with valve seat 8, which rubber apron hanging at a downward angle will seal the opening between the pressure chamber 3 and the intermediate chamber 4 when the lip of the air clapper 9 is considerably above the level of valve seat 8.

Latches 7 and 10 serve to prevent closing of the flood valves if a low service pressure fails to throw them wide open in the event of operation, otherwise the system could not be drained by opening the shut-off valve at drainage outlet 1*a*.

To prepare the sprinkler system for operation as a dry pipe system the water is shut off in the water main in the usual manner and the water in the system is drawn off by opening the shut-off valve at drainage outlet 1*a*; hand hole covers having been removed the valve seats 5 and 8 and clapper valves 6 and 9 are cleaned through the hand holes 3*b* and 4*c*, after which the clapper valves are swung on their seats and latches 7 and 10 and the toggle post 9*d* are positioned properly, as shown in Figure 1; globe valve 13 is then closed and lever 15, latch 20 and toggle lever 24 positioned properly as shown in Figure 2; priming water is then put in chamber 3 to the level of port 3*d*, hand hole cover 3*c* is then put in place as shown in Figure 2 and vents in the chamber closed, air from some source of pressure supply is then admitted to a predetermined pressure into the riser above valve casing 2 filling the sprinkler system, the pressure chamber 3 and

the differential system, entering the latter through pipes 27, 29, and 26, check valve 28 in pipe 27 being open to the passage of air to pipe 26 but closed to such passage in the opposite direction; pressure in chamber 3 now holds clapper valve 6 tightly closed ready to prevent the passage of water under pressure from the inlet chamber 1c and service main and, in the event of the shut-off at outlet 1a having been properly closed, except for the existence of port 1b from the inlet chamber 1c such pressure could be admitted into the inlet chamber ready for operation, in which event the sprinkler system, in case of operation, would be ineffective due to the great venting of pressure through hand hole 4c in the intermediate chamber 4, hence port 1b serves as a safeguard to warn workmen, should they forget, that hand hole cover 4d is not in place to properly close the hand hole 4c and incidentally the port 1b.

The pressure in the system, through pressure chamber 3, excludes pressure water from the intermediate chamber by means of the mechanical adjustment of the toggle (Figure 1) as previously described and the ratios indicated in Figure 3 show that low pressure in chamber 3 will maintain closure of the valve 6 against service pressure and that slight alteration in the toggle will greatly change the pressure required in pressure chamber 3.

The operation of the differential system is as follows: in the event that one or more sprinkler heads open because of fire or any other reason the air pressure in the sprinkler system immediately reduces and communicates such reduction to the riser and reaches the pressure chamber 18 through pipes 27 and 29 and port 18a, the check valve 28 in pipe 27 holds the air pressure in pipe 26 with the result that no reduction takes place in the retention chamber 17 and a differential pressure is created on the two sides of diaphragm 16a in a manner that will be understood readily by those skilled in the art, whereupon the diaphragm 16a is forced towards and into pressure chamber 18 and the accumulated pressure in the tank passes through pipe 26 and port 17a to maintain practically the predetermined pressure in retention chamber 17 as the diaphragm moves toward pressure chamber 18. This movement of the diaphragm taking place with small reduction of pressure in the sprinkler system pulls rod 16b with it and releases latch 20 from lever 15; the consequent pressure of weight 15c in combination with the toggle lever 24 causes lever 15 to swing outwards and downward to a contact with stop 15d, accelerating the action on valve stem 14 thus increasing the speed of opening valve 13. Upon the opening of valve 13 the priming water and air in pressure chamber 3 pass through pipe 12 into intermediate chamber 4 to equalize the pressure in the two chambers which in effect removes the force holding valve 6 closed with a resulting opening of valves 6 and 9 to the passage of pressure water to the sprinkler system and to pipe 34 and mechanical alarm attached thereto. Pressure water entering pipe 36 from pipe 34 closes automatic shut off valve 35 to passage of pressure water from riser to pipe 27, thusly preventing injury to the differential bellows. Any reduction of pressure coming from slow seepage or the opening of a sprinkler head will eventually reduce pressure in chamber 3 permitting valves 6 and 9 to open as hereinbefore described and admit pressure water, regardless of the operation or inoperation of the air differential device hereinbefore described.

In changing a system in accordance with our invention from a dry system to a wet system this may readily be effected as follows: The latch 10 is blocked up so that it will not interfere with the closing of the air clapper 9. The water clapper valve 6 is thrown back into the casing wide open where it will remain. Any of the usual types of wet alarm devices may be connected with the port 11 which leads from the valve seat 8 out through the casing. This port 11 is closed by the clapper valve 9 when that valve is seated by gravity. The pipe 34b leading to the dry valve alarm is closed off. The system may then be operated as a wet system and flooded in the usual way.

The diagram illustrated in Figure 3 represents an upward thrust along the line M—*m* resolving itself into components producing pressure against 9b and torque around 9b which in its turning moment can be represented by a force along the line *c*—C of force times the distance 9b—*c*. The actuating power to move the valves comes from the service pressure in the lowest chamber 1c of Figure 1, which pressure will be represented by S, therefore, the force along the line *c*—C is S times the valve area and the component thrust along M—*n* is the force times distance 6b—C divided by 6b—M. Letting R represent the ratio of pressure difference at which valves of this character operate, the pressure in the top chamber 3 of Figure 1 becomes S/R and the force along *c*—C becomes S/R times the valve area and the turning moment is as just above described.

The full line diagram in Figure 3 shows the moment of force in balance from the air pressure in chamber 3 at 1/R of the pressure in the service main, R being the ratio of pressure difference between water in the service main and air in the sprinkler system. The pressure in the service main exerts a lift to raise the water clapper 6, shown in Figure 1, which lift can be expressed as $P=A.S$ where P represents the lifting force and A represents the area in square inches of the water clapper valve and S represents the pressure per square inch in the service main. The force exerted through 9e of the toggle, along the line M—*m* in the diagram of Figure 3, equals P times 6b—C divided by 6b—M of the diagram. $P_1=A_1.S/R$ is the force downward from pressure in chamber 3 holding the air clapper closed against its seat, A_1 representing the area of the air clapper and P_1 representing force as aforesaid; therefore, P_1 times 9b—*c* divided by 9b—*m* equals the force along the line M—*m* and opposed to the force set up by P on the same line. Pressure in the pressure chamber 3 at S/R makes the two forces equal (and opposed) when the distances 6b—M and 9b—*m* co-ordinate in accordance with the diagram of Figure 3 to make A.S times 6b—C divided by 6b—M equal to $A_1.S/R$ times 9b—*c* divided by 9b—*m*. A greater pressure than S/R should be maintained to insure no leakage at the water clapper valve 6. In case of the air pressure in the pressure chamber 3 falling below S/R movement will take place, the pivotal point 9e traveling along the arc to *e* and similarly F traveling along the arc around 6b to *f* and relatively the movement will continue until F slips on the lever arm 9a and swings up through the valve port carried by the toggle arm 9c to come to rest in the recess 9r of the said arm. The ratio of balancing

pressures heretofore in common use has been 6 to 1 because of the great size of the air clappers required to make the ratio greater and thus reduce the pressure of air required to keep the system closed. Such increase of air pressure offers two evils: slowing up the delivery of water to quench fire and aggravating the fire with the greater volume of air blown upon it. The dotted lines in the diagram at Figure 3 show the angles of a toggle that balance at a greater air pressure, $1/R_1$ of that in the service main. It will be noted that the dotted line swings on the focal point F and passes through the point T on the arc *a* around point 9*b*. To change the operation of the valve and obtain other ratios it is required to substitute for parts 9*c* and 9*d* other parts in which the point 9*e* coincides with a proper point T in the diagram, whereupon the moments of force become A.S times 6*b*—C divided by 6*b*—N equal $A_1.S/R_1$ times 9*b*—*c* divided by 9*b*—*n*. Other ratios can be obtained by changing in a similar manner the angle through the focal point F.

We claim:

1. A valve for use in a sprinkler system comprising a casing having an inlet for connecting with a source of water supply under pressure and an outlet for connecting with water distributing pipes, partition means dividing said casing into separate chambers located between said inlet and said outlet, said partition means having a port, an inlet controlling valve pivoted to one side of the inlet for inward swinging movement to an open position, a port controlling valve pivoted outside of the projected area of the port for swinging movement to an open position in the direction of the outlet, and means whereby pressure exerted on the port controlling valve maintains the inlet controlling valve against a higher pressure, said means comprising an arm rigid with the port controlling valve and extending through the port, and a strut pivoted at one end to said arm outside the projected area of the port and to the same side of the port as the pivot of the port controlling valve, said strut at its other end engaging the inlet controlling valve at a point to the opposite side of the axis of the inlet from the pivot of the inlet controlling valve, when both valves are closed.

2. A valve for use in sprinkler systems comprising a casing having an inlet for connecting with a source of water supply under pressure and an outlet for connecting with water distributing pipes, partition means for dividing said casing into separate chambers located between said inlet and said outlet, said partition means having a port, an inlet controlling valve pivoted to one side of the inlet for inward swinging movement to an open position, a port controlling valve pivoted outside the projected area of the port for swinging movement to an open position in the direction of the outlet, the said pivoting being at points oppositely located from the axis of the valves, and means whereby pressure exerted on the port controlling valve maintains the inlet controlling valve closed against a higher pressure, said means comprising an arm rigid with the port controlling valve and extending through the port, and a strut pivoted at one end to said arm and at its other end engaging the inlet valve at a point to the opposite side of the axis of the inlet valve from the pivot of the inlet controlling valve, the pivot between said arm and said strut being located in toggling reference to a straight line passing through the point of engagement of the strut with the inlet controlling valve and the pivot of the port controlling valve when both valves are closed.

3. A valve as set forth in claim 1 in which the inlet and the port and their controlling valves are axially alined.

4. A valve as set forth in claim 2 in which the inlet and the port and their controlling valves are axially alined.

5. A valve as set forth in claim 1 in which the inlet and the port and their controlling valves are axially alined and in which the valves are pivoted to opposite sides of their common axis, respectively.

6. A valve as set forth in claim 1 in which the arm and the strut are provided with cooperating formations to limit pivotal movement of the strut relative to the arm under the influence of opening swinging movement of the inlet controlling valve.

7. A valve for use in sprinkler systems comprising a casing having an inlet for connecting to a source of water supply under pressure and an outlet for connecting with water distributing pipes, partition means dividing said casing into separate chambers located between said inlet and said outlet, said partition means having a port, an inlet controlling valve pivoted to one side of the inlet for inward swinging movement to an open position, a port controlling valve pivoted to one side of the port for swinging movement to an open position in the direction of the outlet, the said pivoting being at points oppositely located from the axis of the valves, and means whereby pressure exerted on the port controlling valve to close the same holds the inlet controlling valve closed and whereby opening of the inlet controlling valve affects opening of the port controlling valve, said means comprising an arm rigid with the port controlling valve and extending towards the inlet controlling valve, a strut pivoted at one end to said arm, and a seat on the inlet controlling valve accommodating the other end of said strut, the pivot between said strut and said arm being disposed outwardly of a straight line passing through the adjacent side of the port and the point of seating of the strut on the inlet valve when both valves are closed.

8. A valve for use in sprinkler systems comprising a casing having an inlet for connecting with a source of water supply under pressure and an outlet for connecting with water distributing pipes, partition means dividing said casing into separate chambers located between said outlet and said inlet, said partition means having a port, an inlet controlling valve pivoted to one side of the inlet for inward swinging movement to an open position, a port controlling valve pivoted for swinging movement to an open position in the direction of the outlet, the said pivoting being at points oppositely located from the axis of the valves, and means whereby pressure exerted on the port controlling valve maintains the inlet controlling valve closed against a higher pressure, said means comprising an arm rigid with the port controlling valve and extending through the port, a strut pivoted at one end to said arm on the side of the axis of the port adjacent to the pivot of the port controlling valve, said strut when the valves are closed engaging at its other end the inlet controlling valve at a point to the opposite side of the axis of the inlet from the pivot of the inlet control valve, said inlet control valve including a rigid lever arm and an adjusting screw flexibly connecting said lever arm and inlet valve whereby the port controlling valve and said arm rigid thereto extending through the port transmits a pressure through the said strut to the lever

arm to hold the valve closed, said pressure being transmitted by the adjustment of the said screw connecting the lever arm and inlet valve, as aforesaid.

9. A valve for use in sprinkler systems comprising a casing having an inlet for connecting with a source of water supply under pressure, and an outlet for connecting with water distributing pipes, partition means for dividing said casing into separate chambers located between said inlet and outlet, said partition means having a port approximately alined with said inlet, inlet and port controlling valves pivoted to opposite sides of the inlet and the port, respectively, for inward swinging movement to open position, and means between said valves whereby pressure exerted on the port controlling valve maintains the inlet valve closed against a higher pressure and whereby, for any given opening force applied to the inlet valve, the power applied thereby to the port controlling valve to open the same progressively increases with opening movement of the valves, said means comprising an arm rigid with the port controlling valve extending towards the inlet valve, and a strut pivoted at one end to said arm and having its other end free and seating against said inlet valve.

10. A valve for use in sprinkler systems comprising a casing having an inlet for connecting with a source of water supply under pressure and an outlet for connecting with water distributing pipes, partition means dividing said casing into separate chambers located between said inlet and outlet, said partition means having a port approximately alined with said inlet, inlet and port controlling valves pivoted to opposite sides of the inlet and the port, respectively, for inward swinging movement to open position, and means between said valves whereby pressure exerted on the port controlling valve maintains the inlet valve closed against a higher pressure and whereby, for any given opening force applied to the inlet valve, the power applied thereby to the port controlling valve to open the same progressively increases with opening movement of the valves, said means comprising an arm rigid with the port controlling valve extending towards the inlet valve, and a strut pivoted at one end to said arm and having its other end free and seating against said inlet valve, the center line of the strut extending, when both valves are closed, in divergent relationship to the axis of the port from the point of engagement of the strut with the inlet valve towards the strut pivot, and the strut pivot being disposed between the axis of the port and a straight line passing through the pivot of the port controlling valve and the point of engagement of the strut with the inlet valve, whereby the connection under closing pressure exerted on the port valve acts in the nature of a toggle to hold the inlet valve closed, and whereby the pivot approaches the axis of the port during opening of the valves thus to progressively increase the power applied to the port controlling valve by the inlet valve as the valves are opened by a predominating opening pressure exerted against the inlet valve.

11. A valve for use in a sprinkler system comprising a casing having an inlet for connecting with a source of water supply under pressure and an outlet for connecting with water distributing pipes, partition means dividing said casing into separate chambers located between said inlet and said outlet, said partition means having a port, an inlet controlling valve pivoted for inward swinging movement to an open position, a port controlling valve pivoted for inward swinging movement to an open position, and means whereby pressure exerted on the port controlling valve maintains the inlet controlling valve closed against a higher pressure, said means comprising an arm rigid with the port controlling valve and extending through the port, and a strut pivoted at one end to said arm and at its other end engaging the inlet controlling valve when both valves are closed, the arm having a recess into which the strut is swung when the valves are opened.

12. A valve for use in a sprinkler system comprising a casing having an inlet for connecting with a source of water supply under pressure and an outlet for connecting with water distributing pipes, partition means dividing said casing into separate chambers located between said inlet and outlet, said partition means having a port, an inlet controlling valve pivoted to one side of the inlet for inward swinging movement to open position, a port controlling valve pivoted to one side of the port for swinging movement to an open position in the direction of the outlet and means whereby pressure exerted on the port controlling valve maintains the inlet controlling valve closed against a higher pressure, said means comprising an arm rigid with the port controlling valve and extending through the port, and a strut pivoted at one end to said arm and at its other end engaging the inlet controlling valve at a point to the opposite side of the axis of the inlet from the pivot of the inlet controlling valve, the said pivoting between the arm and strut and the said point of engagement of the strut with the inlet controlling valve being both located away from the axis of the valves on the side adjacent to the pivoting of the port controlling valve when both valves are closed.

13. A valve as set forth in claim 2 including, the said arm and attached strut moving through and out of the port when the valves swing to open position.

14. A valve as set forth in claim 12 including, the said arm and attached strut moving through and out of the port when the valves swing to open position.

15. A valve as set forth in claim 12 including, the said pivot attaching the arm and the strut and the said point of engagement of the strut with the inlet controlling valve being in a correlation that slight moving of the pivot attaching the arm and the strut produce great change in the required pressure exerted on the port controlling valve to maintain the inlet valve closed against a higher pressure.

16. In a device of the class described, a valve casing for use in a sprinkler system comprising an inlet chamber communicating with a source of water supply under pressure, an outlet communicating with a riser leading to water distributing pipes, an intermediate chamber between the inlet and outlet, ports between the chambers, valves for controlling the passage of water from the inlet to the outlet, means whereby pressure in the outlet against atmospheric pressure in the intermediate chamber maintains the valves closed against pressure from the inlet, communicating means between the outlet and the intermediate chamber and having therein a globe valve, the combination of a housing, a lever flexibly attached to the stem of the globe valve, a latch flexibly attached to the housing, a strut with one end pivoted to a fixed arm and the other end free, the

said lever held in position by the latch creating an interlocking with the free end of the strut to hold the globe valve closed, a rod flexibly attached to the latch and actuated by a diaphragm within the housing to release the lever and interlock holding the valve closed whereby the globe valve will open and pressure will equalize between the outlet and the intermediate chamber with result that the controlling valves will open for the passage of water as aforesaid.

17. In a device of the class described, a casing having an inlet chamber communicating with a source of water supply under pressure, an outlet chamber communicating with distributing pipes constituting a fire extinguishing system, an intermediate chamber between the inlet chamber and outlet chamber with ports and port controlling valves controlling the passage of water under pressure from the inlet chamber through the intermediate chamber to the outlet chamber, means whereby pressure in the outlet chamber against atmospheric pressure in the intermediate chamber maintains the port controlling valves closed against pressure in the inlet chamber, a hand hole in the intermediate chamber, a cover to close the hand hole and means for indicating that the cover is not in position closing the hand hole, the said means comprising a port leading from the inlet chamber to the seat of the cover, the said port closed when the cover is in position and open when the cover is not in position whereby water under pressure admitted to the inlet chamber will pass through the said port and cause discomfort to workmen if the hand hole in the intermediate chamber is not closed.

J. EUGENE WALLACE.
CHARLES DUMAS.