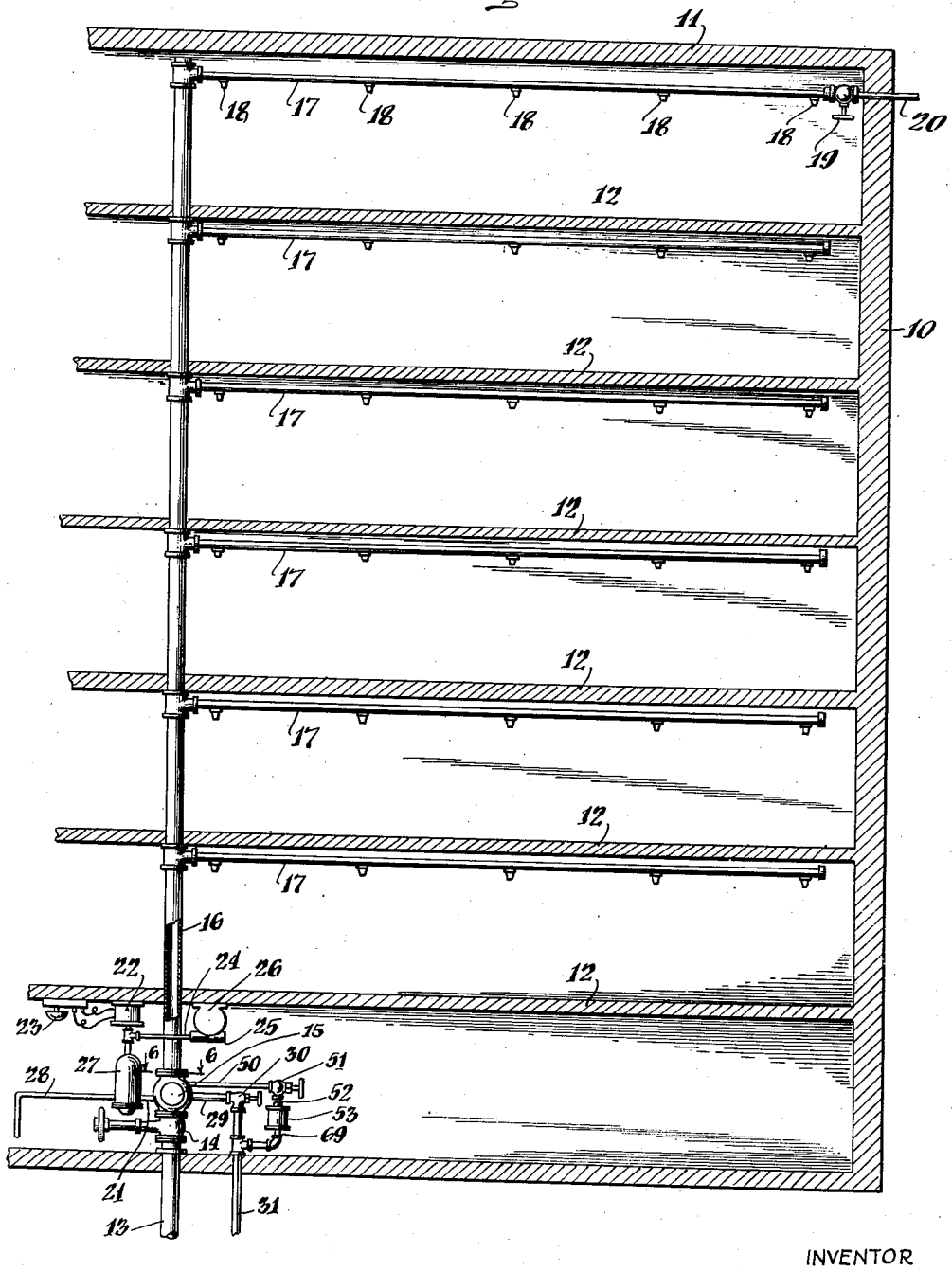
June 26, 1951 R. W. GIESELER 2,558,175

FIRE PROTECTION AUTOMATIC SPRINKLER SYSTEM

Filed Feb. 3, 1947 5 Sheets-Sheet 1

Fig. 1



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FIRE PROTECTION AUTOMATIC SPRINKLER SYSTEM

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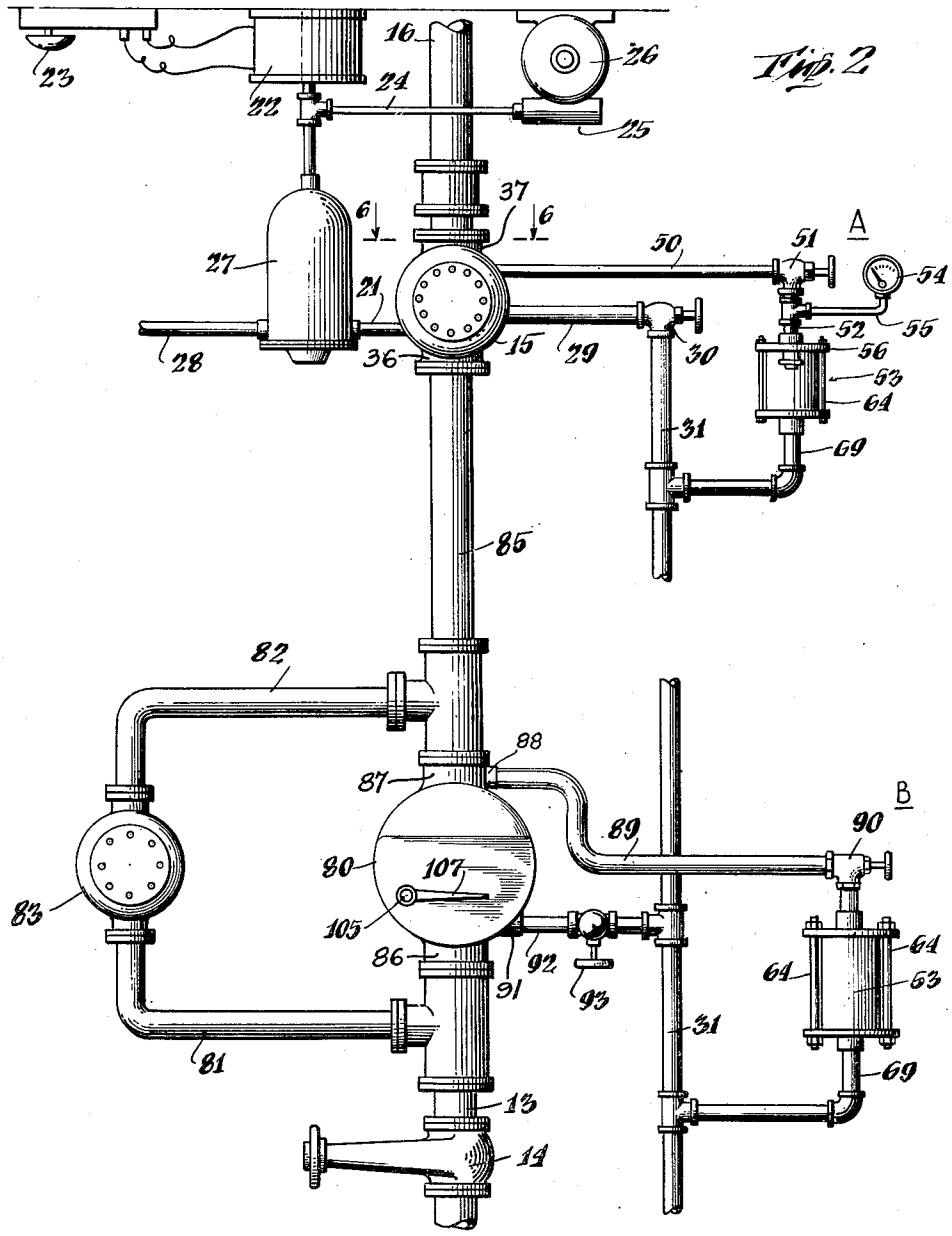


Fig. 2

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FIRE PROTECTION AUTOMATIC SPRINKLER SYSTEM

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Fig. 4

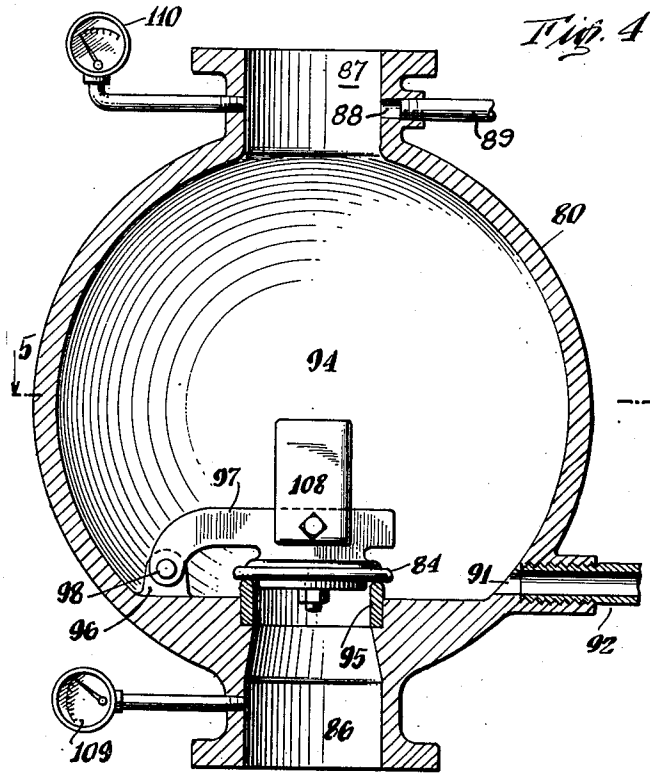


Fig. 3

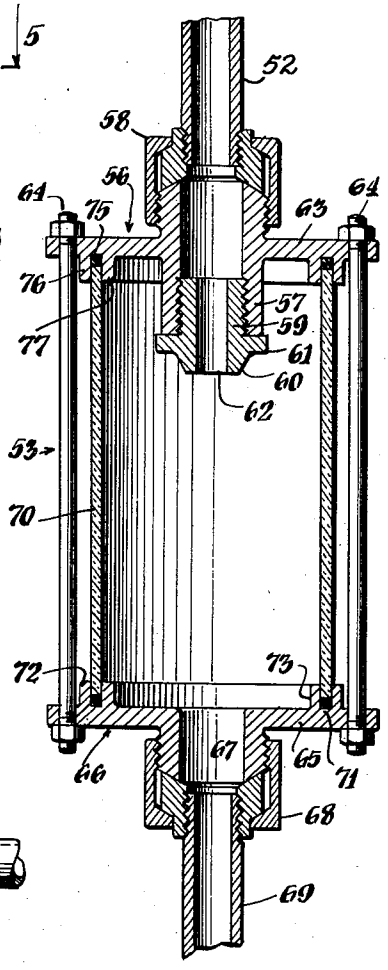
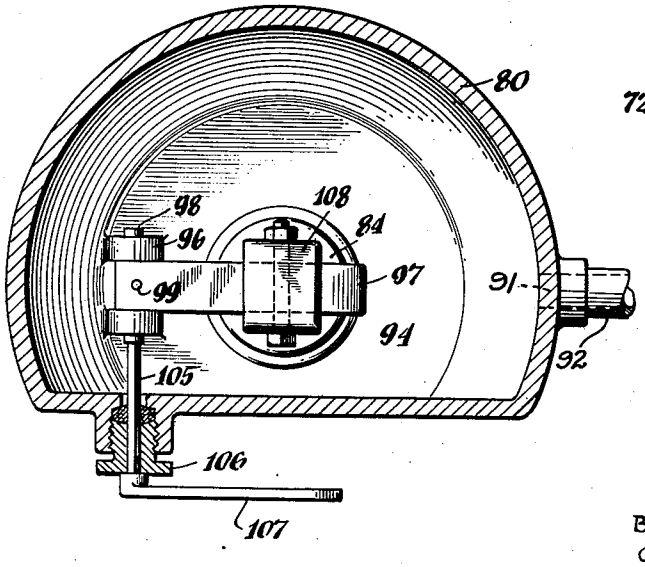


Fig. 5



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FIRE PROTECTION AUTOMATIC SPRINKLER SYSTEM

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Fig. 6

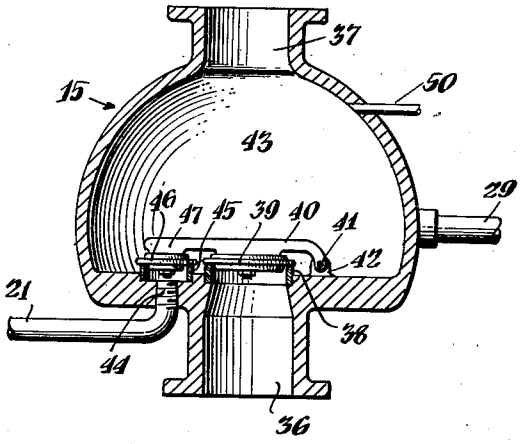
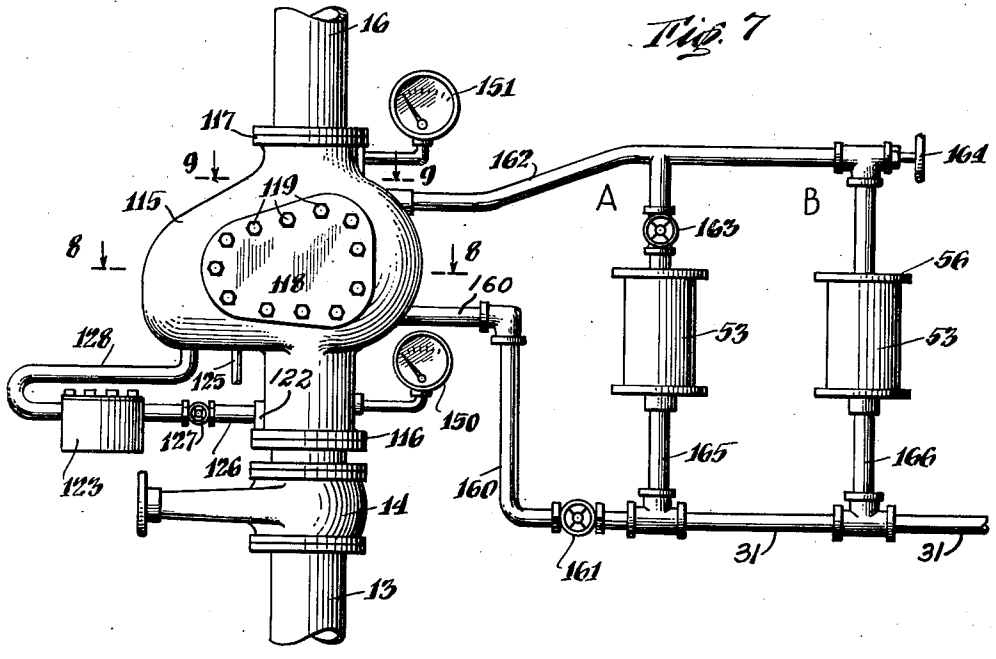


Fig. 7



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FIRE PROTECTION AUTOMATIC SPRINKLER SYSTEM

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Fig. 8

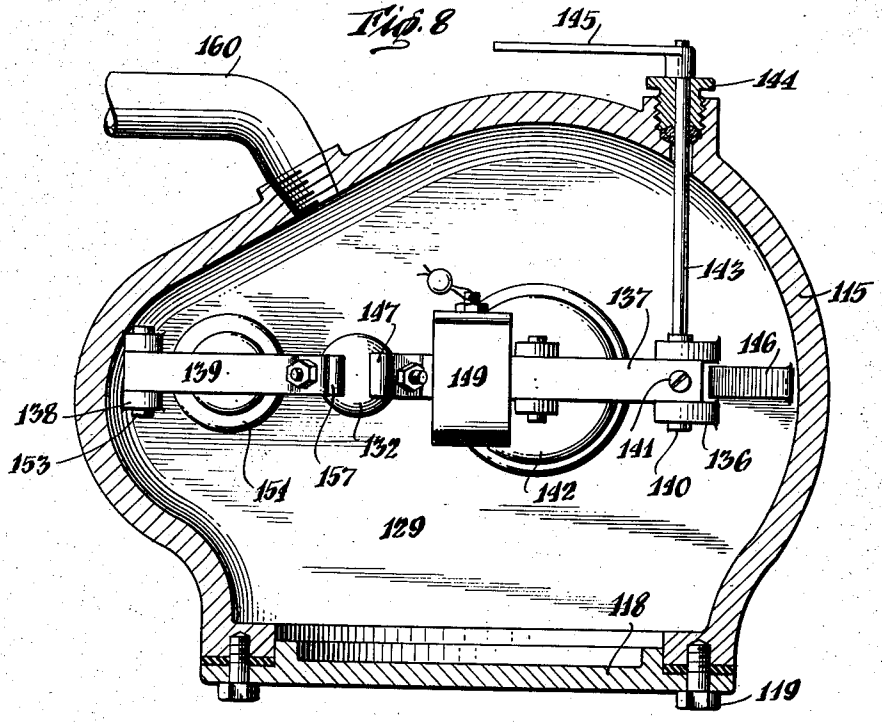
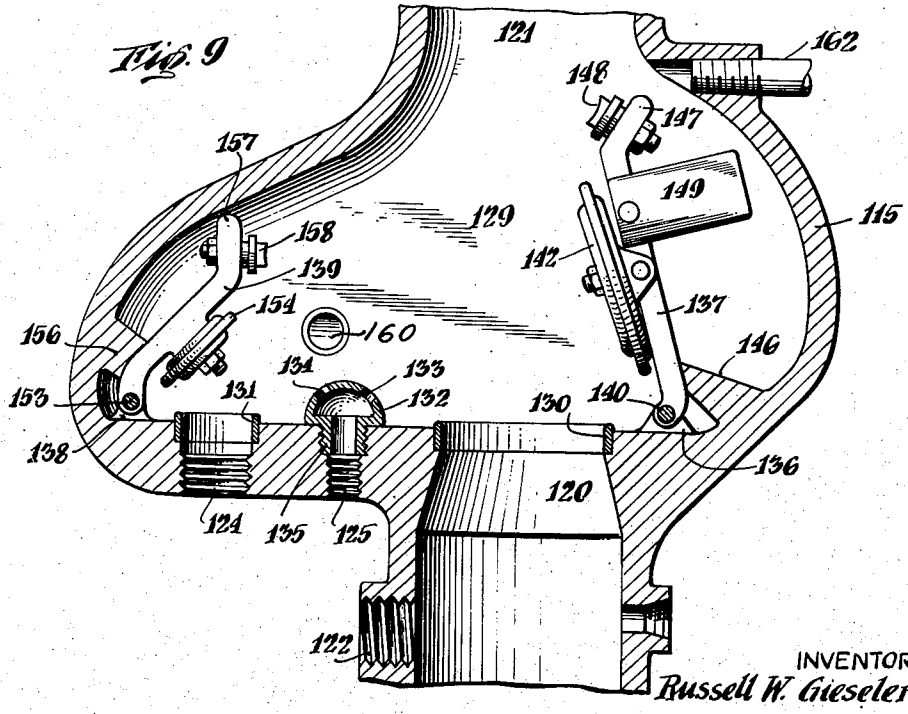


Fig. 9



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UNITED STATES PATENT OFFICE

2,558,175

FIRE PROTECTION AUTOMATIC SPRINKLER SYSTEM

Russell W. Gieseler, Jamestown, N. Y.

Application February 3, 1947, Serial No. 726,031

6 Claims. (Cl. 169—5)

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This invention relates to improvements in fire protection automatic sprinkler systems, and more particularly to certain improvements in such systems designed to facilitate the observation, determination and test of flow conditions through the system, and the adjustment and correction of flow conditions in conformity with the terms of the water supply contract and the applicable fire ordinance and fire insurance requirements.

In automatic sprinkler systems, an inspector's test connection and valve is generally installed in the top floor sprinkler line, and may also be installed in one or more of the sprinkler lines on each floor of the building. These inspector valve connections are designed to be opened by the inspector periodically in order that water flow through the sprinkler line may be observed and deductions made as to whether the sprinkler lines are operating efficiently and properly. The inspector's valve connection is usually equipped with a discharge nozzle having a known discharge orifice equivalent to the discharge orifice in sprinkler heads on the floor where the inspector's valve connection is installed. A skilled inspector is able to determine from the discharge from the inspector's test connection the gallonage flow through the discharge nozzle, the water pressure, and other conditions there existing.

The alarm valve and other water control devices forming a part of prior systems, are, however usually installed in the basement or first floor of the building, which device must also be inspected and adjusted as conditions require. The inspector is obviously unable to observe the operation of the alarm valve and control devices located on the first or basement floor when he opens the inspector's test connection on the top floor or other floors of the building. In order to observe the functioning of the alarm valve and control devices, the inspector must leave the inspector's test connection in open water discharging condition, return to the location of the alarm and control devices on the first or basement floor to observe whether these devices are operating as intended, make such adjustments to the alarm valve and control devices as conditions may require and then return to the upper floor to close off the inspector's test connection there located.

Proper adjustment is rendered difficult since the inspector is unable to open and close the distant inspector's test connection as may be necessary and desirable to effect proper adjustment of the alarm valve and control devices. Nor is this difficulty entirely overcome by placing one inspector at the inspector's test connection and another inspector at the location of the alarm valve and control devices, since the inspectors are unable to communicate with each other unless a

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phone system is installed between these distant points. Nor can testing of the alarm valve be satisfactorily effected by opening the drain connection at the site of the alarm valve, since the flow through the drain connection cannot be delicately and accurately controlled in a manner to reliably determine whether the valve would be operative under conditions of minimum flow, such as would exist when only sprinkler head at the top most line of sprinklers is open.

In addition to the task of determining whether the feeder and supply lines to the various sprinkler heads on the various floors, and also the alarm and control devices, are functioning and operating properly, the inspector is charged with the further task of making sure that the fire alarm system gives the intended signal when there is a flow of water through the sprinkler system, as for example, when the inspector's test connection is open for discharge. Due to the noise of moving machinery and other plant operations, the inspector often finds it impossible to hear or determine whether the alarm system gives the desired alarm when the inspector's test connection is open for discharge, since the fire alarm bell or gong may be installed at a distant location in the building.

Much time and wasted effort is thus consumed in going to and returning from distant locations in the building. Further, the task of carefully adjusting all instruments in synchronism, without being able to observe instruments or flow conditions at other locations, is therefore extremely difficult, and sometimes insurmountable to accomplish. Substantial water waste during the period of inspection, and inconvenience to and interference with the duties of the personnel in the building, cannot be avoided.

An object of this invention is to provide an improved automatic fire protection sprinkler system having means associated therewith whereby flow conditions from one or more sprinkler heads at any desired level of the sprinkler system may delicately and accurately be duplicated at the site of the alarm valve, and whereby the inspector is enabled to observe the functioning of the alarm valve and alarm devices under minimum flow conditions and under varying conditions of flow through the system.

Another object of this invention is to provide a means whereby the accuracy of meters associated with automatic fire protection sprinkler systems may be tested under varying conditions of flow.

Other objects and advantages of this invention will be made apparent as the disclosure proceeds.

Although the characteristic features of the invention will be particularly pointed out in the claims appended hereto, the invention itself, and the manner which it may be carried out, may be

better understood by referring to the following description taken in connection with the accompanying drawings forming a part hereof, in which

Fig. 1 is a diagrammatic view of one form of this improved fire protection sprinkler system as the same may be arranged as installed in a building.

Fig. 2 is an enlarged elevational view of another form of the control mechanism for the sprinkler system showing the manner in which the improved inspection devices may be associated with the control mechanism here shown which includes a main check valve and associated by-pass metering device and alarm valve with associated alarm devices.

Fig. 3 is an enlarged cross-sectional view of the inspection device forming a part of this improved system.

Fig. 4 is a vertical cross-sectional view of the main check valve forming a part of the control mechanism illustrated in Fig. 2.

Fig. 5 is an enlarged cross-sectional horizontal view of the check valve shown in Fig. 4 as the same appears when viewed along the line 5—5 of Fig. 4.

Fig. 6 is a vertical cross-sectional view of the alarm valve associated with either the control mechanism shown in Fig. 1 or the control mechanism shown in Fig. 2, as the same appears when viewed along line 6—6 of Fig. 1 or Fig. 2.

Fig. 7 is an enlarged side elevational view of an improved form of control mechanism wherein the main check valve and alarm valve are incorporated into a single unit, this view also showing the improved inspector's test connection associated therewith.

Fig. 8 is a horizontal cross-sectional view of the improved control unit shown in Fig. 7 as the same would appear when viewed along lines 8—8 of Fig. 7.

Fig. 9 is a vertical cross-sectional view of the improved control unit as the same would appear when viewed along line 9—9 of Fig. 7.

Similar reference characters refer to similar parts throughout the several views of the drawing and specifications.

To faciliate an understanding of this improved fire prevention automatic sprinkler system there is diagrammatically illustrated in Fig. 1 a typical installation thereof in a 6 story building having an outside wall 10, a roof 11, and a series of floors 12. Water is supplied to the system by a main intake conduit 13, having a gate valve 14, therein, by means of which the flow of water into the system may be shut off when it is desired. The main intake conduit 13 is connected to an alarm valve housing 15, which is in turn connected to the main outlet conduit 16, which extends to the various floors of the building. A plurality of distributor pipes 17, having a plurality of sprinkler heads 18 attached thereto, arranged in the usual manner along the ceilings of floors 12, are connected to and supplied with water by the main outlet conduit 16.

It is customary to provide an inspector's valve 19 in the end of the distributor pipe on the topmost floor, a discharge pipe 20 leading from the inspector's valve 19 being provided to permit the discharge of an observable stream of water either into a drain or to the outside of the building. The inspector's valve 19 has incorporated therein a flow nozzle or aperture of predetermined size so that when the inspector's valve 19 is open, a flow equivalent to that from an adjacent sprinkler head, may be duplicated. It will be appreciated that inspector's valves may also be located on different floors as desired.

Means are incorporated in the system to give an alarm in case of fire, or in event there is a leakage flow in the system. An alarm conduit 21 is connected to the alarm valve housing 15 as shown more particularly in Figs. 1 and 2. The alarm conduit 21 leads to the alarm devices which may comprise a hydrostatic switch 22 which operates an electric bell 23. The alarm conduit 21 may be connected to a branch conduit 24 which in turn is connected to a water motor 25 and gong 26 being actuated by a flow of water through the branch alarm conduit 24. Preferably the alarm conduit 21 is provided with a retarding device 27 so that no alarm will be given in case of water hammer or a water surge which does not constitute a natural operating flow of water to the hydrostatic switch 22 or the water motor 25. A suitable drain pipe 28 is connected to the retarding device 27 through which surge water may escape.

A drain conduit 29 may be connected to the alarm valve housing 15 so that water may be drained from the system when it is desired to effect repairs. The drain conduit 29 may be fitted with a suitable globe or gate valve 30 to control the drainage through the drain conduit 29 and into the waste line 31.

The alarm housing 15 is provided with a water entry port 36 and a water discharge port 37 as shown more particularly in Fig. 6. The water entry port 36 is equiped with a valve seat 38 designed to be closed by a closure member 39 attached to a clapper arm 40 fixed to a stud shaft 41 pivotally supported by spaced fulcrum blocks 42 which may be formed as an integral part of the valve housing 15. A predetermined differential pressure between that existing at the entrance port 36 and that existing within the chamber 43 of the valve housing 15, will cause the clapper arm 40 to swing into open position and permit flow of water into the chamber 43 and through the outlet port 37 of the valve housing.

The valve housing 15 is also equipped with a bleeder port 44 into which the alarm conduit 21 is connected. The bleeder port 44 is equipped with a valve seat 45 designed to be closed by a closure member 46 secured to an extension 47 of the clapper arm 40. When the clapper arm 40 swings into open position, the closure member 46 which closes the seat 45 of the bleeder port 44 is also swung into open position, permitting a flow of water from the chamber 43 of the valve housing 15 through the alarm conduit 21.

An important feature of this invention is the provision of an inspector's test connection A positioned adjacent to the site of the alarm valve 15. As shown more particularly in Figs. 2 and 3, this inspector's test connection A comprises an inspection conduit 50 which is connected to the alarm valve housing 15, and supplied with water from the valve chamber 43 thereof. The conduit 50 is provided with a gate or globe valve 51 which can be opened and closed to control the flow through the conduit 50. A conduit section 52 leads from the valve 51 to an inspector's device 53. A pressure gauge 54, connected as by a conduit connection 55 to the conduit section 52, provides a means whereby the water pressure flowing through the inspector's device 53 may be measured during tests.

The inspector's device 53 as shown in Figs. 2 and 3 comprises essentially a coupling member

56 having a body section 57 designed to be connected to the conduit section 52 by means of a pipe coupling 58. The lower end of the body section 57 of the coupling member 56 is threaded to receive the threaded body section 59 of an inspector's nozzle 60. The body section of the nozzle 60 has a laterally extending flange portion 61 designed to abut against the lower end of the body section 57 of the coupling member 56 and which is preferably polygonal in shape so that the nozzle 60 may be tightly screwed into the body section 57 as by means of a wrench. The inspector's nozzle 60 is provided with a bore 62 providing a flow passage of predetermined area. The nozzle 60 is removable and replaceable so that inspector's nozzles having predetermined bores of different diameters may be selectively attached to the body section 57 of the coupling member 56. The manner of use and the functional purpose of the inspector's nozzle 60, will be more fully explained hereafter.

The inspector's nozzle 60 as attachably secured to the coupling member 56 may, if desired, be protected by a cage construction as more fully shown in Fig. 3. This protective cage may be formed by providing a laterally extending flange 63 extending laterally from the body section 57 of the coupling member 56. The outer periphery of the flange section 60 may be generally circular in outline and is designed to support two or more bolts 64 suspended therefrom. The lower ends of the suspension bolts 64 are connected to the flange section 65 of a collar member 66, collar member 66 having a conduit section 67 which is preferably of generous diameter and serves in effect as a discharge conduit. The conduit 67 may be connected as by a nozzle forming coupling 68 to a lead conduit 69 to the main waste line 31 of the system.

The flange section 65 of the collar member 66 may support a cylindrical shell 70 formed of suitably strong transparent material such as transparent glass or transparent resin plastic. The lower end of the shell fits into a cylindrical groove 71 between spaced concentric ring elements 72 and 73 formed on the upper face of the flange section 63 of the collar member 62. The upper end of the shell 70 may be fitted into a cylindrical groove 75 formed by spaced concentric ring elements 76 and 77 on the lower face of the flange section 63 of the coupling member 56.

Fig. 2 illustrates the inspector's test connection *a* associated with a system having an alarm valve 15 through which both large and small flows through the system must pass, whether such flows be of five hazard proportions or due merely to line leakage. In the event that the water supplier requires the owner of the automatic fire protection sprinkler system to pay for wastage, leakage and water consumption due to the opening of a limited number of sprinkler heads, the water supplier assuming the cost when flows of serious fire hazard proportions occur, a by-pass metering system arrangement may be installed directly below the alarm valve 15 as diagrammatically illustrated in Fig. 2. In this arrangement the water supply from the main supply conduit 1 passes through a main check valve housing 80 and into the alarm valve 15 only when a flow of fire hazard proportions occurs, small flows such as are due to leakage, wastage, or the opening of a small number of sprinkler heads, usually not more than three, being by-passed through by-pass conduits 81 and 82 and duly metered by a water meter 83, the check valve closure element

84 as shown in Fig. 4 remaining closed until a differential pressure between the intake and outlet sides of the check valve housing 80, sufficient to open the main check valve closure element 84 occurs.

The by-pass meter assembly is more particularly illustrated in Figs. 2, 4, and 5. A by-pass conduit 81 leads from the main intake conduit 13, to a water meter 83, water flowing through the water meter 83 being returned to a conduit connection 85, by means of a by-pass conduit 82. The conduit connection 85 serves to connect the outlet port 87 of the check valve housing 80 to the alarm valve housing 15. The intake port 86 of the check valve housing 80 is connected to the main intake conduit 13. The main check valve 80 may also have an inspector's test connection B associated therewith comprising a port 88 through which water can flow through a conduit 89 to the inspection device 53, the conduit 89 being provided with a gate or globe valve 90, by means of which flow to the inspection device 53 may be controlled. It is also provided with a port 91 through which water may flow to the waste line 31, through a conduit 92, the conduit 92 being provided with a gate or globe valve 93.

At the point where the main intake port 86 enters the main chamber 94 of the check valve housing 80 there is provided a valve seat 95 which is preferably of bronze or some similar tough but easily machined metal. The valve housing 80 contains a pair of spaced fulcrum blocks 96 upon which the main intake check clapper arm 97 may swing, as shown in Figs. 4 and 5.

The check valve assembly comprises the clapper arm 97 which is fixed to a stud shaft 98 as by a set screw 99. The ends of the stud shaft 98 extend through bearing openings in the spaced fulcrum blocks 96. The closure member 84 is suitably fixed to the clapper arm 97 and is designed to seat snugly on to the valve seat 95 when the main intake check valve is closed. As more particularly illustrated in Fig. 5, a shaft extension 105 extends from one end of the stub shaft 98 and passes through the valve housing 80 through a water tight bearing 106. A pointer arm 107, which may be associated with a counter device, is attached to the projecting end of the shaft extension 105, which extends substantially at right angles thereto and is normally in an approximately horizontal position. When the clapper arm 97 rises due to the opening of the main check valve the pointer arm 107 also rises and permits the inspector to visually check the action of the valve.

In the usual contract with a water supplier, small amounts of flow such as occur when a small number of sprinkler heads are open, or which are due to leakage in the system, are required to be metered, the usual contract providing that flows through the system up to those flows which would occur when the three sprinkler heads on the topmost distributor pipe are open should be metered. In order to give effect to such a provision, means are provided to retain the closure member 84 in valve closing position until a predetermined differential in pressure exists between the inlet and outlet side of the closure member 84. As shown more particularly in Figs. 4 and 5, a weight block 108 of the weight necessary to give effect to the terms of the contract with the water supplier is attached to the clapper arm 97. These weight blocks may be formed of a solder material which may be added to or subtracted from the main body of the weight block so as to vary its weight

The check valve housing 80 is provided with pressure gauges 109 and 110 located respectively above and below the closure member 84. By reading pressure gauges 109 and 110 the pressure conditions in the valve housing 80 when a predetermined number of sprinkler heads are open may be readily determined. With such pressure differential readings at hand, the inspector may make use of tables prepared by the manufacturer of these valves, which tables would indicate the proper weight to apply to the clapper arm 97 to retain the valve closure member 84 in closed position when a predetermined number of sprinkler heads are open, and to permit opening of the closure member 84 when one more than the predetermined number of sprinkler heads are open. With a little experience, an inspector can quickly determine and sense the correct weight to apply the clapper arm 97. For convenience, the inspector may carry an assortment of weight blocks of indicated varying weights suitable to satisfy almost any pressure condition which he may encounter.

It will be observed that the closure member 84 and its associated weight blocks 108 will not rise to permit unmetered passage of water through the valve housing 80 until frictional resistance to the passage of water in the by-pass conduits 81 and 82 and the meter 83 has built up sufficient differential in water pressure between that on the intake side and the outlet side of the closure member 84 to raise the clapper arm 97 and its associated weight 108. It is obvious that the greater the weight 108, the greater will be the maximum gallonage per minute passed through the by-pass conduits 81 and 82 and the meter 83 before the clapper arm 97 moves into open position.

In place of the separate by-pass metering device and alarm valve illustrated in Fig. 2 the system may be provided with a combination alarm meter valve of the type described in my Patent No. 2,505,761, dated May 2, 1950, and more particularly illustrated in Figs. 7, 8, and 9.

This multiple purpose valve assembly consists of a valve housing 115 fitted with flanges 116 and 117 by means of which a connection can be made with the main conduit 13 and the main outlet conduit 16 respectively. The valve housing 115 is fitted with a removable plate 118 by means of a plurality of bolts 119, thus affording easy access to the interior of the housing for repairs and adjustments. The valve housing is provided with a main intake port 120, a main outlet port 121, a by-pass outlet port 122 through which water may flow to a water meter 123, a by-pass intake port 124 through which water passing through the meter 123 may re-enter the main valve housing 115, and a bleeder outlet port 125, through which water may flow from the valve housing 115 to actuate the alarms 22 and 26.

A by-pass conduit 126 leads from the by-pass outlet port 122 in the base of the valve housing 115 to the water meter 123. The by-pass conduit 126 is provided with a gate valve 127 so that the meter 123 may be removed for inspection or repair without interrupting the flow of water into the main valve housing 115 through the main intake 13 in case of fire when the meter is removed. Water flowing through the water meter 123 is returned to the system through the port 124 in the valve housing 115 through a conduit 128. The valve housing 115 connects with the alarm conduit 21 via the bleeder port 125.

At the point where the main intake port 120 enters the main chamber 129 of the main valve housing 115, there is provided a valve seat 130, which is preferably of bronze or some similar tough but easily machined metal. Similarly, at the point where the by-pass inlet port 124 from the water meter 123 enters the main chamber 129 of the valve assembly, there is provided a similar but smaller valve seat 131.

The bleeder outlet port 125 is provided with a hollow semi-spherical cap 132, in which are bored two port holes 133 and 134 and which are provided with valve seats. The cap 132 is provided with a threaded neck 135 so that a water-tight connection may be made with the valve housing 115. This, of course, is merely a preferred exemplification of this detail, since the cap 132 may be welded to the valve housing 115 over the port 125, or there may be two separate ports, each provided with valve seats, leading to the alarm conduit.

The valve housing 115 contains a fulcrum block 136 upon which the main intake check clapper arm 137 may swing, and a fulcrum block 138 upon which the by-pass intake check clapper arm 139 may swing.

The main check value comprises the clapper arm 137 which is fixed to a stud shaft 140 as by set screw 141. The ends of the stud shaft extend into bearing openings in the paired fulcrum blocks 136, whereby the clapper arm 137 is free to pivot with a minimum of friction. A closure disc 142 is suitably fixed to the clapper arm 137 and is designed to fit snugly into the valve seat 130 when the main intake check valve is closed. As shown more particularly in Fig. 8, a shaft extension 143 extends from one end of the stud shaft 141 and passes through the valve housing 115 through a water-tight bearing 144. A pointer arm 145, which may be associated with a counter device, is attached to the projecting end of the shaft extension 143, which extends substantially at right angles thereto and is normally in approximately horizontal position. When the clapper arm 137 rises, due to the opening of the main check valve, the pointer arm 145 will also rise, and permit the inspector to visually check the action of the valve.

The valve housing 115 is provided with a stop 146 against which the clapper 137 rests when in fully open position. The clapper 137 carries an arm extension 147 to which is secured a closure disc 148. The closure disc 148 is designed to fit snugly onto the seat in the port 133 of the alarm cap 132 when the main check valve is in the closed position, forming a water-tight connection therewith.

Means are provided to retain the closure member 142 in valve closing position until predetermined differential in pressure exists between the inlet and the outlet side of the closure member 142. As shown more particularly in Figs. 8 and 9, a weight block 149 of the weight necessary to give effect to the terms of the contract with the water supplier is attached to the clapper arm 137.

The main check valve housing is provided with pressure gauges 150 and 151, located respectively above and below the closure member 137. By reading pressure gauges 150 and 151, the pressure conditions in the valve housing 115 when one or more sprinkler heads are opened may be readily determined and the size of the weight block 149 to be used may be easily determined as described above.

The valve housing 115 is provided with a stop 156 against which the clapper 139 rests when in fully open position. The clapper 139 carries an arm extension 157 to which, secured a closure disc 158 is designed to fit snugly onto the seat in the port 134 of the alarm cap 132 when the by-pass intake check valve is in the closed position, forming a water-tight connection therewith.

The by-pass check valve comprises the clapper arm 139 which is fixed to a stud shaft 153. The ends of the stud shaft 153 extend into openings in the paired fulcrum blocks 138, whereby the clapper arm 139 is free to pivot with a minimum of friction. A closure disc 154 is suitably fixed to the clapper arm 139 and is designed to fit snugly into the valve seat 131 when the by-pass check valve is closed.

When the system is placed in operation, all pipes are filled with water with the exception of the alarm water line 21. When a leak occurs in the system, or if a permitted limited number of sprinkler heads 18 are open, the resulting reduced pressure in the valve chamber 129 will cause the by-pass intake clapper 152 to rise, and water will flow through the by-pass outlet port 122 and by-pass conduit 126 to the meter 123, where the consumption of water is recorded, and thence through the by-pass conduit 128 and through the inlet by-pass port 124 into valve chamber 129. When the by-pass intake clapper arm 139 rises, it will be seen that the closure disc 158 covering the alarm bleeder port 134 is also raised, allowing water to flow into the conduit 21 and thence to alarm devices 22 and 26, and thus cause an alarm to be sounded

The main check valve housing 115 may be provided with a drain conduit 160 which leads to the main drain line 31. The drain conduit 160 is provided with a suitable valve 161 to close off the flow.

The main check valve housing 115 is also preferably provided with two inspector's test connections and A and B, each comprising an inspector's device 53 constructed as heretofore explained, the inspector's devices being supplied with water from the main check valve housing 115 by a conduit 162, and the conduit 162 may be provided with suitable globe or gate valves 163 and 164 to shut off the flow of water to the inspector's devices 53. The coupling members 56 of the inspector's devices 53 are connected to suitable discharge conduits 165 and 166 which may lead into the main drain conduit 31, or to other suitable places of safe discharge.

When the inspector wishes to test the operation of the alarm devices 22, 23 and 26 connected to the alarm valve 15 under minimum flow conditions, such as the flow which would occur when one sprinkler head 18 is open in the top most distributor line 17, he opens the gate valve 51 to permit discharge of water through the inspection nozzle 60 of test connection A, the diameter of the bore 62 of the nozzle 60 of test connection A being such as to allow the passage of the same gallonage therethrough under the higher pressure conditions existing at the site of the alarm valve 15 as would flow through one sprinkler head 18 in the topmost distributor pipe 17 to be tested. This correct diameter of the bore 62 would have been predetermined by the insurance carrier, fire protection engineer, or other authority having jurisdiction in conformity with conditions existing at the site, and a nozzle 60 having a bore 62 of the correct diameter would be supplied for use in the inspection device 53 of test connection A. By this inspector's test connection A at the site of alarm valve 15, it is evident that the inspector can duplicate the desired flow conditions, and be in a position to easily observe and if necessary correct the function of the alarm valve 15 and associated alarm devices under the desired duplicated flow conditions.

The inspector's test connection B associated with the main drive 80 also provides a means for accurately checking and controlling the amount of weight 108 which should be placed on the clapper 97, in accordance with the pressure characteristics of the system at the site of the main check valve 80, and the pressure characteristics of the system at the sprinkler heads 18. An inspection nozzle 60 with a bore 62 which will pass, under the pressure conditions existing at the main check valve 80, a flow of water equivalent to that which would flow through a specified number of sprinkler heads 18 such as, for example, three sprinkler heads, may be provided in the inspector's test connection B.

By opening test connection B the inspector may observe the action of the pointer arm 107 associated with the valve closure 84 of main valve 80, and see whether or not arm 107 rises when there is a flow of water through the system equivalent to that which would flow through the system when a predetermined number of sprinkler heads are open. If it is found that the valve closure 84 opens under flow conditions at which it should remain closed, sufficient weight can be added so that the valve arm 97 remains in closed position. The inspector then opens the valve 51 at the test connection A associated with the alarm valve 15 in order to observe whether or not the closure element 84 will rise when the flow through the system is equivalent to that which would flow when one more than the predetermined number of sprinkler heads are open. If it does not, he may delicately adjust the weight 108 until the valve remains closed under the conditions of flow equivalent to that which would flow when the predetermined number of sprinkler heads are open, and will open under conditions of flow which would occur when one more than the predetermined number of sprinkler heads are open.

The accuracy of the meter 83 associated with the check valve 80 may also be tested by means of the inspector's test connection B. Since the rate of flow from the inspector's test connection B is known, it may be opened for a timed period and the gallonage flow may be calculated. Readings taken on the meter before and after the timed flow should indicate a gallonage flow equal to that calculated if the meter is in proper adjustment.

The two inspector's test connections A and B associated with the dual purpose valve housing 115 shown in Figs. 7, 8 and 9 are used in a similar fashion. The inspector's test connection B being fitted with a nozzle 60 having a bore 62 which will pass, under conditions existing at the site, a flow equivalent to that flowing when a predetermined number of sprinkler heads are open, the other test connection A having a nozzle 60 with a bore 62 which will pass under conditions existing at the site a flow equivalent to that which would occur when one sprinkler head is open. Thus by opening one or the other, or both, of the inspector's test connections A and B, the inspector can observe the action of the valves or the alarm devices under conditions equivalent to

those which would exist when one, a predetermined number, or one more than the predetermined number of sprinkler heads 18 on the topmost row of distributor pipes 17 are open. Adjustments of the alarm devices may then be made, and the weight 149 attached to the clapper arm 137 may be accurately adjusted to give effect to the true intent of a water contract calling for the metering of all wastage, leakage, and other sprinkler head flows, below a predetermined maximum, yet permitting unmetered flows in excess of the predetermined maximum to be metered.

It will be appreciated that various modes and arrangements may be provided for the practice of the invention as herein disclosed. For example in certain systems where no flows or all flows are to be metered, the by-pass metering devices may be dispensed with, and the inspector's test connection A used only in connection with the alarm valve as illustrated in Fig. 1. Where wastage and leakage flows, and minimum sprinkler head flows only are to be metered, a by-pass metering device may be used in connection with an alarm valve as illustrated in Fig. 2, in which case the inspector's test connections A and B would be used in connection with both the alarm meter and the by-pass metering device.

It should also be pointed out that it is not necessary that there be two inspector's test connections A and B used in connection with the combination alarm meter illustrated in Fig. 7, since the inspector may carry with him a kit containing various sizes of nozzle 60 which he may interchangeably insert in the threaded section 59 of the body section 57 of the coupling member 56, so as to duplicate any desired condition of flow through the system, using only one inspector's test connection A. For convenience and speed in inspection, however, the use of two test connections is preferred.

This improved inspection connection is simple and sturdy in construction, with a minimum of parts requiring attention, and is easy to keep in repair. It is low in cost, and well adapted for installation on any automatic fire protection sprinkler systems. It permits inspection of the functioning of all valves and alarm devices in a sprinkler system at the side of the various valve and alarm devices, under varying conditions of flow as may be selected by the inspector, so that the devices and valves may be tested under both minimum and extreme conditions of flow.

While certain novel features of the invention have been disclosed herein, and are pointed out in the annexed claims, it will be understood that various omissions, substitutions, and changes may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. In a fire protection sprinkler system having a water distribution and sprinkler head system supplied by a primary outlet conduit which in turn is supplied by a main intake conduit, said system including in combination, a control valve housing connecting said outlet conduit and main intake conduit, a check valve having a closure member contained within said valve housing for controlling the flow from said intake conduit to said outlet conduit, a by-pass conduit connected to receive water from said main intake conduit below said check valve and connected to discharge water into the system at the outflow side of said check valve, a variable weight device operably connected to the closure member of said check valve whereby the opening movement of said closure member may be variably controlled, and an inspector's test connection installed in the immediate vicinity of said control valve whereby flow conditions at various selected localities in the sprinkler system may be duplicated at the locality of said control valve and whereby the inspector may observe at the site of said control valve the functioning of said control valve and make adjustment and corrections thereof as conditions may require, said inspector's test connection including an inspector's nozzle connected into the system adjacent the discharge outlet of said control valve, said inspector's nozzle having a discharge bore designed to discharge a water volume per minute equivalent to the volume of water discharge per minute from a predetrmined number of sprinkler heads located at a selected distant location in the system.

2. In a fire protection sprinkler system having a water distribution and sprinkler head system supplied by a primary outlet conduit which in turn is supplied by a main intake conduit, said system including in combination, a control valve housing connecting said outlet conduit and main intake conduit, a check valve having a closure member contained within said valve housing for controlling the flow from said intake conduit to said outlet conduit, a by-pass conduit connected to receive water from said main intake conduit below said check valve and connected to discharge water into the system at the outflow side of said check valve, a water meter in said by-pass conduit designed to measure the flow therethrough, a variable weight device operably connected to the closure member of said check valve whereby the opening movement of said closure member may be variably controlled in accordance with a predetermined pressure differential existing between the intake and outlet side of said closure member, and an inspector's test connection installed in the immediate vicinity of said control valve whereby flow conditions at various selected localities in the sprinkler system may be duplicated at the locality of said control valve and whereby the inspector may observe at the site of said control valve the functioning of said control valve and make adjustments and corrections thereof as conditions may require, said inspector's test connection including an inspector's nozzle connected into the system adjacent the discharge outlet of said control valve, said inspector's nozzle having a discharge bore designed to discharge a water volume per minute equivalent to the volume of water discharge per minute from a predetermined number of sprinkler heads located at a selected distant location in the system.

3. In a fire protection sprinkler system having a water distribution and sprinkler head system supplied by a primary outlet conduit which in turn is supplied by a main intake conduit, said system including in combination, a control valve housing connecting said outlet conduit and main intake conduit, a check valve having a closure member contained within said valve housing for controlling the flow from said intake conduit to said outlet conduit, a variable weight device operably connected to the closure member of said check valve whereby the opening movement of said closure member may be variably controlled, an inspector's test connection installed in the immediate vicinity of said control valve whereby flow conditions at various selected localities in the sprinkler system may be duplicated at the locality

of said control valve and whereby the inspector may observe at the site of said control valve the functioning of said control valve and make adjustment and correction thereof as conditions may require, said inspector's test connection including an inspector's coupling connected into the system adjacent the discharge outlet of said control valve, said inspector's coupling having a replaceable inspector's nozzle whose discharge bore is designed to discharge a water volume per minute equivalent to the volume of water discharged per minute from a selected sprinkler head located at a predetermined distant location in the system.

4. In a fire protection sprinkler system having a water distribution and sprinkler head system supplied by a primary outlet conduit which in turn is supplied by a main intake conduit, said system including in combination, a control valve housing connection to said outlet conduit and main intake conduit, a check valve having a closure member contained within said valve housing for controlling the flow from said intake conduit to said outlet conduit, a variable weight device operably connected to the closure member of said check valve whereby the opening movement of said closure member may be variably controlled, an inspector's test connection installed in the immediate vicinity of said control valve whereby flow conditions from the sprinkler head installed at the point of minimum pressure in the sprinkler system may be duplicated at the locality of said control valve and whereby the inspector may observe at the site of said control valve the functioning of said control valve under conditions simulated when said minimum pressure sprinkler head is open for discharge and thereupon make adjustment and correction to the functioning of said control valve as conditions may require, said inspector's test connection including an inspector's nozzle conected into the system adjacent the discharge outlet of said control valve, said inspector's nozzle having a discharge bore designed to discharge a water volume per minute equivalent to the volume of water discharged per minute from the minimum pressure sprinkler head in the system.

5. In a fire protection sprinkler system having a water distribution and sprinkler head system supplied by a primary outlet conduit which in turn is supplied by a main intake conduit through a control valve having a normally closed closure member which is designed to move into open position when a predetermined number of sprinkler heads located at selected distant locations in the system are open for discharge, a metering by-pass conduit connected to receive water from said main intake conduit below said control valve and designed to permit metered flow of a predetermined restricted volume therethrough without disturbing the closed position of said control valve closure member, said system including in combination, inspector's test connections installed in the immediate vicinity of said control valve whereby flow conditions at a selected locality in the sprinkler system may be duplicated at the locality of said control valve and whereby the inspector may observe at the site of said control valve the functioning of said control valve and make adjustment and correction thereof as conditions may require, said inspector's test connections including an inspection conduit connected into the system adjacent the discharge outlet of said control valve, a first test connection including an inspection nozzle connected to said inspection conduit having a discharge port designed to discharge a water volume equivalent to the maximum intended water flow per minute through said by-pass conduit without disturbing the closed position of said control valve closure member, a second test connection including an inspection nozzle connected to said inspection conduit having a discharge port therein designed to discharge a water volume per minute equivalent to the volume of water discharge per minute from a selected sprinkler head located at a predetermined distant location in the system, and means for selectively closing off the flow to each of said inspection nozzles.

6. In a fire protection sprinkler system having a water distribution and sprinkler head system supplied by a primary outlet conduit which in turn is supplied by a main intake conduit through a control valve having a normally closed closure member which is designed to move into open position when a predetermined number of sprinkler heads located at a selected distant locality in the system are open for discharge, a metering by-pass conduit having a water meter connected to receive water from said main intake conduit below said control valve and designed to permit metered flow of a predetermined restricted volume therethrough without disturbing the closed position of said control valve closure member, a variable weight device operably connected to the closure member of said check valve whereby the opening movement of said closure member may be variably controlled in accordance with a predetermined pressure differential between the intake and outlet sides of said closure member, said system including in combination, inspector's test connections installed in the immediate vicinity of said control valve whereby the inspector may observe at the site of said control valve the functioning of said control valve and make adjustment and correction thereof as conditions may require, said inspector's test connections including an inspection conduit connected into the system adjacent the discharge outlet of said control valve, a first test connection including an inspection nozzle connected to said inspection conduit having a discharge port designed to discharge a water volume equivalent to the maximum intended water flow per minute through said by-pass conduit without disturbing the closed position of said control valve closure member, a test connection including a second inspection nozzle connected to said inspection conduit having a discharge port therein to discharge a water volume per minute equivalent to the volume of water discharged per minute from a selected sprinkler head located at a predetermined distant location in the system, and a series of valves for selectively closing off the flow to each of said inspection nozzles.

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

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Certificate of Correction

Patent No. 2,558,175 June 26, 1951

RUSSELL W. GIESELER

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 9, lines 4 and 5, for "which, secured a closure disc 158 is" read *which is secured a closure disc 158*,; column 10, line 10, for "drive 80" read *valve 80*;

and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 18th day of September, A. D. 1951.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.