Nov. 28, 1961 C. S. GILLESPIE 3,010,519

CONTROL SYSTEM FOR FIRE NOZZLES

Filed Aug. 31, 1959 4 Sheets-Sheet 1

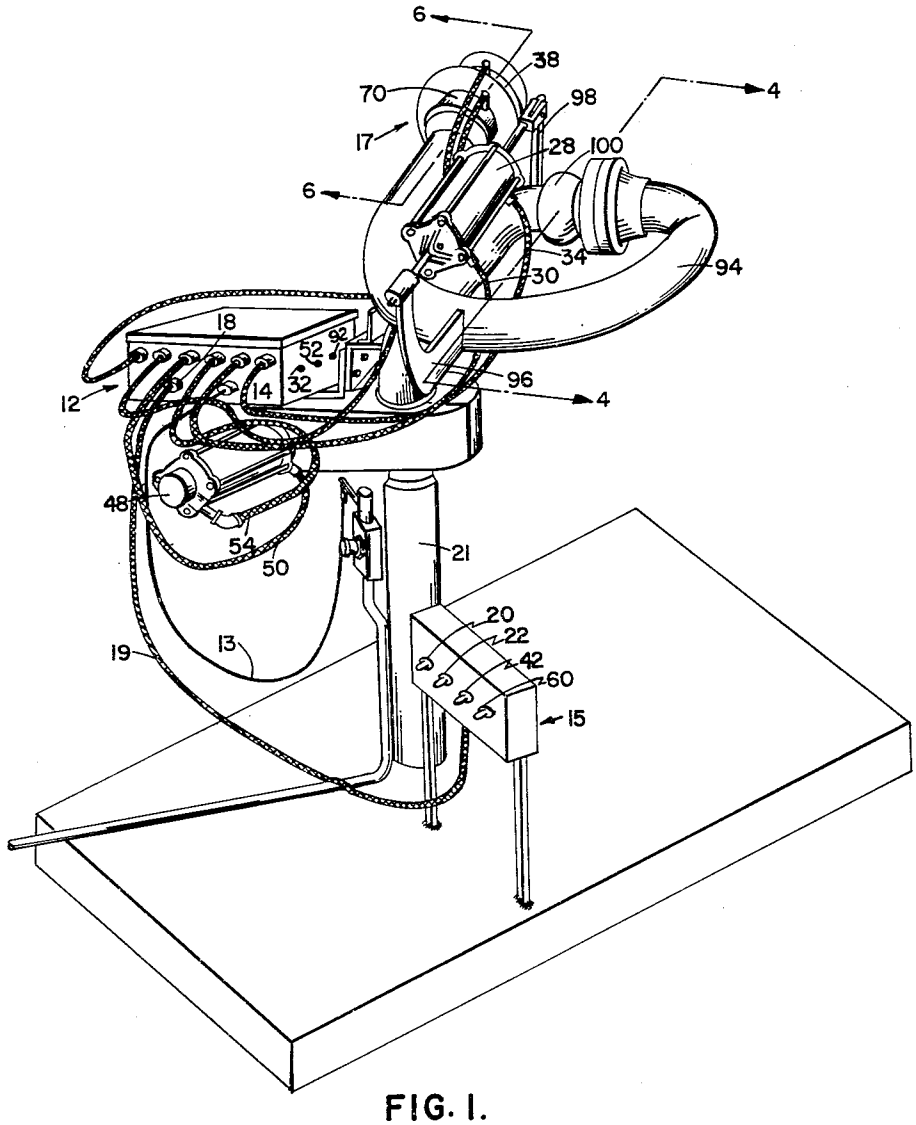

FIG. 1.

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CONTROL SYSTEM FOR FIRE NOZZLES

Filed Aug. 31, 1959 4 Sheets-Sheet 2

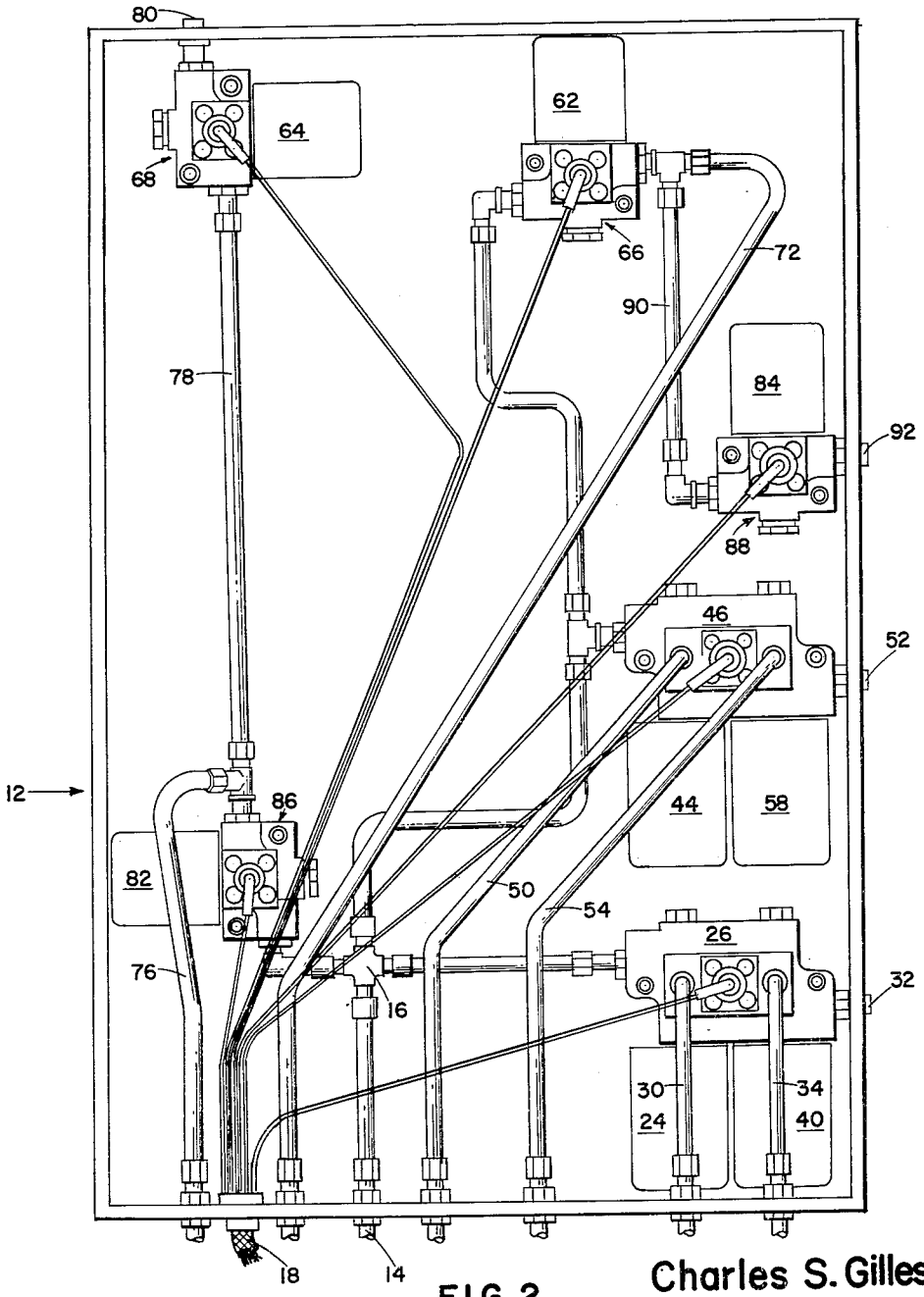

FIG. 2.

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CONTROL SYSTEM FOR FIRE NOZZLES

Filed Aug. 31, 1959 4 Sheets-Sheet 3

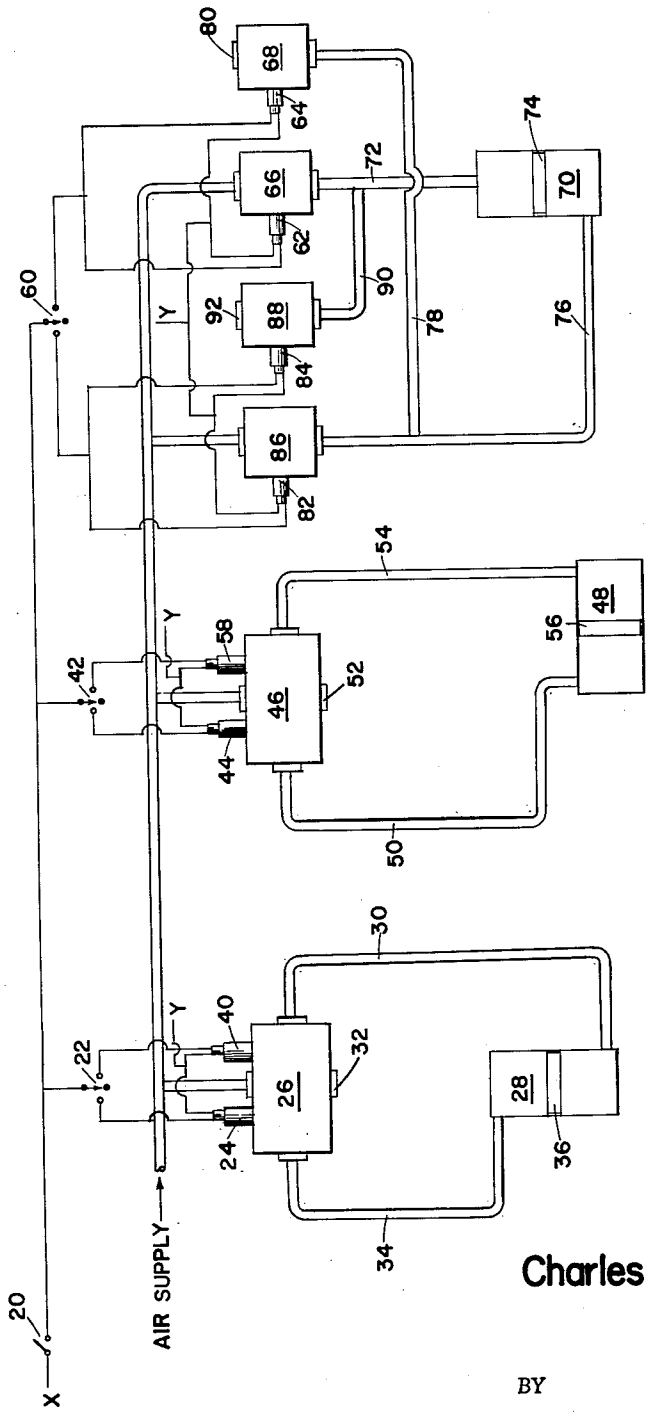

FIG. 3

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CONTROL SYSTEM FOR FIRE NOZZLES

Filed Aug. 31, 1959 4 Sheets-Sheet 4

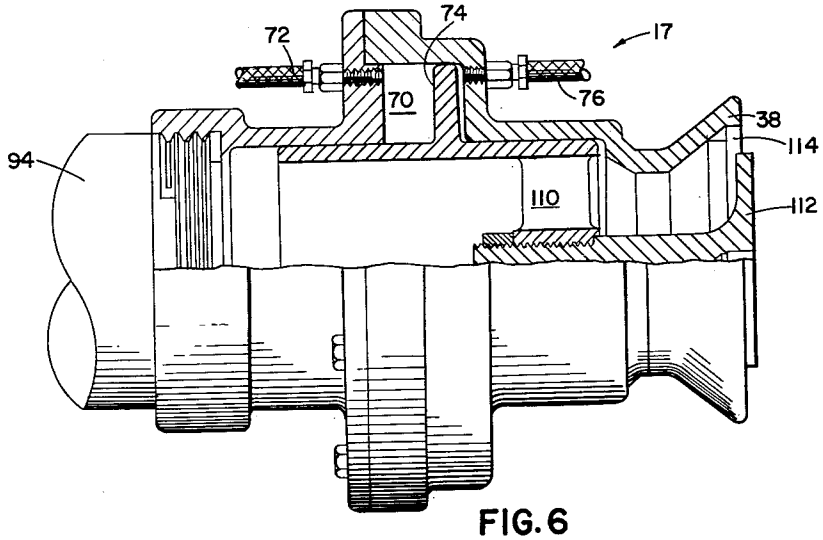

FIG. 6

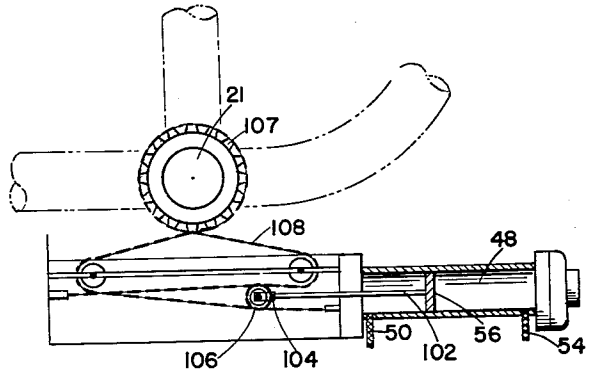

FIG. 5

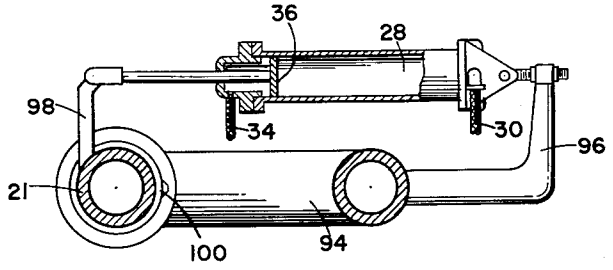

FIG. 4

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United States Patent Office 3,010,519 Patented Nov. 28, 1961

3,010,519

CONTROL SYSTEM FOR FIRE NOZZLES

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Filed Aug. 31, 1959, Ser. No. 837,300
6 Claims. (Cl. 169—25)
(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

My invention relates to water controlled fire nozzles and more particularly to a control for actuating a pneumatic system for such fire nozzles.

When static firings of missiles are taking place it is necessary to provide stand-by fire protection capable of covering all points in the vicinity where fires might break out. In the past this has been provided by hydraulically controlled equipment consisting of nozzles capable of being moved horizontally and vertically.

However, more and more difficulties have been encountered with the operation of the controls. Due to the varying pressure of the water which is used when the controls are hydraulically operated there is a tendency to lose directional control. Also impurities in the water cut up the sealing rings and cause parts of the system to become corroded, thereby impairing efficient movement of the pistons and other movable parts of the system. Water controlled nozzles were also found to have the serious disadvantage of failing in operation under below freezing weather conditions.

Therefore, it is an object of my invention to provide an actuating control for a pneumatic system for fire nozzles to eliminate the above mentioned difficulties.

Another object of my invention is to provide a fire nozzle disposed for more accurate and rapid displacement in the vertical and horizontal planes.

A further object of my invention is to equip fire nozzles with an actuating control in lieu of water operated controls, capable of being operated either at the fire nozzle or from a remote bunker.

Other advantages and objects of my invention will become apparent from the following description of the illustrated embodiment in which,

FIGURE 1 is a perspective view of a fire nozzle stand incorporating my invention;

FIGURE 2 is a view showing the solenoid valves connected in accordance with my invention;

FIGURE 3 shows diagrammatically the penumatic operation of the cylinders through the valve system.

FIGURE 4 is an elevational view partly in section taken along line 4—4 of FIGURE 1 showing the vertical cylinder, piston and component parts necessary for control of the nozzle in the vertical plane.

FIGURE 5 is a plan view partly in section taken along the centerline plane of the horizontal control cylinder shown in FIGURE 1 and which shows the horizontal control cylinder, piston, chain drive system and component parts necessary for control of the nozzle in the horizontal plane.

FIGURE 6 is a view along line 6—6 of FIGURE 1.

In the preferred embodiment shown in the drawings air is received at actuating control valve box 12 through the air line 13 from a source not shown, and enters through the connection 14 and manifold 16 for distribution to the valve system 26, 46, 66, 86, 68 and 88.

The control valve box 12 contains a series of valves connected in accordance with my invention to operate the cylinders 28, 48 and 70 of the nozzle assembly 17 for vertical and horizontal movement of the hydraulic nozzle and control of the orifice of the nozzle respectively.

A control panel 15 may be located adjacent to the penstock 21 or, as is frequently desired, remotely therefrom and connected to the valve box by means of cable 19. On the control panel is a series of toggle switches 20, 22, 42 and 60 for manual control of the nozzle by the operator. Toggle switch 20 is a two-way switch and when turned on supplies electrical energy from an outside source through the cable 19 to the cannon plug 18.

When it is desired to move the nozzle 38 vertically toggle switch 22, which is a three-way switch, is moved to its uppermost position activating solenoid 40 and admitting air from the manifold 16 to a normally open four-way pressure valve 26. As shown in FIGURE 3 this valve is connected by tubes 30 and 34 to rearward and forward ends respectively of the cylinder 28. When air is admitted to the valve 26 it passes through the tube 30 into the rearward end of cylinder 28 against the piston 36 thus forcing air out through the forward end of cylinder 28 and through the tube 34 and venting through the opening 32 to the atmosphere.

Similarly when the toggle switch 22 is moved to its lowermost position the solenoid 24 is activated to admit air to the valve 26 which air passes through the tube 34 into the forward end of the cylinder 28 against the piston 36 forcing air through the rearward end of cylinder 28 and through the tube 30 which is vented through the opening 32 to the atmosphere thus moving the piston 36 in a forward direction.

In order to stop the piston 36 in any one position manipulation of the toggle switch 22 to its central or middle position operates the solenoids 24 and 40 to close the vent and permit air to pass through both tubes 30 and 34, thus applying equal pressures to both sides of the piston.

As shown in FIGURE 4 the vertical control cylinder 28 is mounted on barrel 94 by means of a rigid arm 96. The piston rod of piston 36 slidably mounted in vertical control cylinder 28 is pivotally secured to one end of arm 98. The other end of arm 98 is rigidly secured to penstock 21. Penstock 21 and barrel 94 are connected by means of a swivel joint 100.

Movement of piston 36, caused by the admission of air in either the forward or rearward ends of vertical control cylinder 28, causes barrel 94 to rotate in swivel joint 100 until a vertical positioning of nozzle 38 is reached responsive to movement of piston 36.

To move the nozzle 38 in the horizontal plane the toggle switch 42 is manipulated in a manner similar to the switch 22 as described above, activating the solenoids 44 and 58 of the four-way valve 46 causing air to pass through the tubes 50 and 54 respectively, moving the piston 56 in the cylinder 48 rearwardly and forwardly as desired and venting the exhausted air through vent port 52 of valve 46.

As shown in FIGURE 5 piston 56 is slidably mounted in horizontal control cylinder 48. One end of piston rod 102 is connected with a gear 106 rotatably mounted therein. A gear 107 is secured to penstock 21 and communicates by means of a chain 108 with gear 106 of piston rod 102. Movement of piston 56, caused by the admission of air in either the forward or rearward end of horizontal cylinder 48 through tubes 50 and 54, respectively, rotates penstock 21 for horizontal traverse of nozzle 38 responsive to movement of piston 36 and gear 106 of piston rod 102.

An additional cylinder 70 is provided to change the size of the opening of the nozzle 38 and operation of this cylinder is controlled by the toggle switch 60 connected through the cannon plug 18 to energize the solenoids 62, 64, 82 and 84 for operation of the corresponding normally closed valves 66, 68, 86 and 88 respectively.

When the toggle switch 60 is moved to its uppermost position both solenoids 62 and 64 are energized. Since

valve 66 is a normally closed two-way pressure valve energization of solenoid 62 opens the valve to permit air to pass from the manifold 16 through the valve 66 to the tube 72 entering the forward end of the cylinder 70. Simultaneously the solenoid 64 opens the normally closed two-way vent valve 68 thus permitting air exhausted from the rear of cylinder 70 by the movement of piston 74 to pass through the tubes 76 and 78 for venting through the vent 80 in the valve 68.

Similarly when the toggle switch 60 is moved to its lowermost position the solenoids 82 and 84 are energized opening the pressure valve 86 and vent valve 88, whereupon air is permitted to pass from the manifold 16 through the now open pressure valve 86 to the tube 76 to enter the rearward end of the cylinder 70. Placing the switch 60 in its lowermost position also energizes the solenoid 84 to open the normally closed two-way vent valve 88 to permit venting of the air exhausted from the forward end of the cylinder 70 by the forward movement of the piston 74. Air is then vented through vent port 92 of vent valve 88.

When it is desired to hold the piston 74 in any given position it is merely necessary to move the toggle switch 60 to its central or middle position thus closing the valves 66, 68, 86 and 88 preventing air from venting to the atmosphere and maintaining the existing pressure on the faces of a piston 74.

As shown in FIGURE 6 a nozzle assembly 17 is secured to barrel 94 for passage of water therethrough. Nozzle assembly 17 comprises a nozzle control cylinder 70, a piston 74 slidably mounted in the nozzle control cylinder, a nozzle 38 and related parts for control of flow intensity of water through nozzle 38. Piston 74 is secured by means of four support arms 110, spaced 90° apart for passage of water therethrough, to a slidable plug 112. Said plug is disposed for control of opening and closing of orifice 114 thereby controlling intensity of flow through nozzle 38. Plug 112 moves forwardly or rearwardly responsive to movement of piston 74. Piston 74 is made to move forwardly or rearwardly by the admission of air in cylinder 74 through tubes 72 and 76, respectively.

It will be readily seen from FIGURE 2 that the venting portions 32, 52, 80 and 92 of the valves 26, 46, 68 and 88 respectively, extend through the wall of the control box 12. The orifices on these vent ports may be varied in size to control speed of discharge of air from these respective cylinders, thus providing means for regulating the speed of operation of the nozzle.

Many obvious advantages of my invention will become apparent to those skilled in the art requiring the operation of nozzles under various conditions such as, for example, from harbor fire boats, etc., and although a particular embodiment of my invention has been described in detail herein, various changes and modifications will be apparent after a study of the present disclosure. Hence the disclosure is to be taken in an illustrative rather than in a limiting sense, and it is my desire and intention to reserve all modifications within the scope of the subjoined claims.

I claim:

1. An actuating control for use in a fire fighting device including a penstock connected to a water supply having a nozzle assembly including a nozzle having an adjustable opening at its outer end and an elongated arcuate barrel rotatably connecting said penstock and said nozzle assembly, said actuating control comprising an air manifold connected to a source of air, a plurality of cylinders with corresponding pistons slidably disposed therein, a pair of said pistons each operably connected to said nozzle assembly for movement thereof in the vertical and horizontal planes, a pair of pressure and vent valves each connected to said manifold and respectively connected to the opposite ends of one of said cylinders and disposed for selective distribution of air thereto to

control the movement of said nozzle, another of said cylinders secured in said nozzle and provided with a piston operably connected to said nozzle, a pair of pressure valves each connected to said air manifold and to opposite ends of said cylinder, a pair of vent valves each communicating with one of said pressure valves, said pressure valves disposed for selective distribution of air to one of said ends of said cylinder for movement of said piston to control the opening of said nozzle; panel control means remotely located from said penstock and electrically connected to each of said pressure valves and said venting means for selective actuation thereof to effect horizontal and vertical movement of said nozzle assembly and to adjust the opening of said nozzle.

2. An actuating control as in claim 1 wherein said piston of one of said pair of cylinders is provided with a rod having one end secured to said piston, a yoke secured to the other end of said rod, a gear rotatably mounted in said yoke, a second gear secured to said penstock, means operably connecting said gears, whereby said penstock rotates responsive to movement of said piston.

3. An actuating control as in claim 1 wherein the piston of one of said pair of cylinders is provided with a rod having one end secured to said piston, an arm secured to the other end of said rod, said arm secured at its other end to said penstock, swivelling means connecting said penstock and said nozzle assembly, a second arm secured to said barrel and one of said ends of said cylinder, whereby said nozzle is made to move vertically responsive to movement of said piston.

4. An actuating control for use in a fire fighting device including a penstock connected to a water supply having a nozzle assembly including a nozzle having an adjustable opening at its outer end and an elongated arcuate barrel rotatably connecting said penstock and said nozzle assembly, said actuating control comprising an air manifold connected to a source of air and disposed for selective distribution of air therethrough; a first means to rotate said assembly horizontally, said first means including a first pressure valve communicating with said manifold, venting means associated with said first valve, solenoid actuating means associated with said first valve and disposed for selective actuation thereof, a first cylinder having rearward and forward ends, tubing communicating between each of said ends and said valve and disposed for passage of said air therethrough, a piston slideably mounted in said cylinder, a rod having one end secured to said piston, a yoke secured to the other end of said rod, a gear rotatably mounted in said yoke, a second gear secured to said penstock, means operably connecting said gears to effect horizontal movement of said penstock responsive to the movement of said piston; a second means disposed to move said assembly vertically including a second pressure valve communicating with said manifold, venting means associated with said second valve, solenoid actuating means associated with said second valve and disposed for selective actuation thereof, a second cylinder having rearward and forward ends, tubing secured to each of said ends and to said valve for passage of air therethrough, a second piston slidably mounted in said second cylinder, a second rod having one end secured to said second piston, an arm secured to the other end of said rod, said arm secured at its other end to said penstock, swivelling means connecting said nozzle assembly and said penstock, a second arm secured to said nozzle assembly and said second cylinder; a third means for control of the nozzle opening including a pair of pressure valves communicating with said manifold, a pair of vent valves connected with said pressure valves, solenoid actuating means associated with each of said pressure valves and each of said vent valves, means for selective simultaneous actuation of either of said pressure valves with either of said vent valves, a third cylinder having rearward and forward ends mounted in said nozzle assembly, tubing secured to said ends and to each of

said pressure valves and said vent valves and disposed for passage of air therethrough, a third piston slidably mounted in said cylinder, a plug slideably mounted in said nozzle, means operably connecting said piston and said plug, whereby, responsive to the movement of said piston said plug is made to move to regulate the size of the orifice of said nozzle.

5. An actuating control for use in a fire fighting device including a penstock connected to a water supply having a nozzle assembly including a nozzle having an adjustable opening at its outer end and an elongated arcuate barrel rotatably connecting said penstock and said nozzle assembly, said actuating control comprising a first pneumatically operated means including a first cylinder having a piston slideably disposed therein to rotate said assembly horizontally, a second pneumatically operated means including a second cylinder having a piston slideably disposed therein to move said assembly vertically, and a third pneumatically operated means including a third cylinder having a piston slideably disposed therein to adjust the opening of said nozzle, means associated with each of said pneumatically operated means for selective actuation thereof including an air manifold connected to an air supply under pressure, pressure valves connected to said air manifold and to opposite ends of each of said cylinders, venting means associated with each of said pressure valves, said third pneumatically operated means comprising a third cylinder associated with said nozzle assembly and having tubing secured at opposite ends of said cylinder, said tubing communicating with said pressure valves and disposed for passage of air therethrough, a plug disposed in said nozzle and operably connected to said piston of said third cylinder, panel control means remotely located from said penstock and electrically connected to each of said pressure valves and said venting means for selective actuation thereof to effect horizontal and vertical movement of said nozzle assembly and to adjust the opening of said nozzle.

6. An actuating control for use in a fire fighting device including a penstock connected to a water supply having a nozzle assembly including a nozzle having an adjustable opening at its outer end and an elongated arcuate barrel rotatably connecting said penstock and said nozzle assembly, said actuating control comprising a first pneumatically operated means including a first cylinder having a piston slideably disposed therein to rotate said assembly horizontally, a second pneumatically operated means including a second cylinder having a piston slideably disposed therein to move said assembly vertically, and a third pneumatically operated means including a third cylinder having a piston slideably disposed therein to adjust the opening of said nozzle, means associated with each of said pneumatically operated means for selective actuation thereof including an air manifold connected to an air supply under pressure, a pair of pressure valves communicating with said air manifold, a pair of vent valves connected with said pressure valves, a separate solenoid for actuating each of said pressure valves and each of said vent valves, means for selective simultaneous actuation of the solenoid associated with either of said pressure valves with the solenoid associated with either of said vent valves; and wherein said third pneumatically operated means comprises a third cylinder having forward and rearward ends and mounted in said nozzle assembly, tubing secured to said ends and to each of said pressure valves and said vent valves and disposed for passage of air therethrough, a third piston slideably mounted in said cylinder, a plug slideably mounted in said nozzle, means operably connecting said piston and said plug, whereby, responsive to the movement of said piston said plug is made to move to regulate the size of the orifice of said nozzle.

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