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FLOW RESPONSIVE ALARM DEVICE

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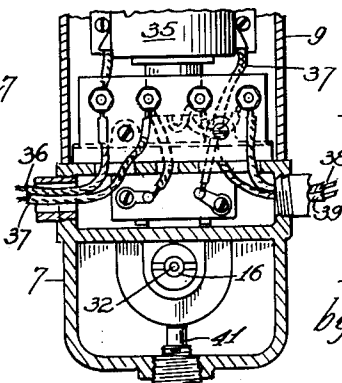
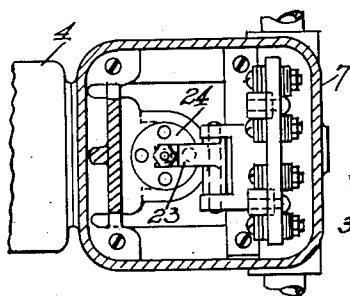
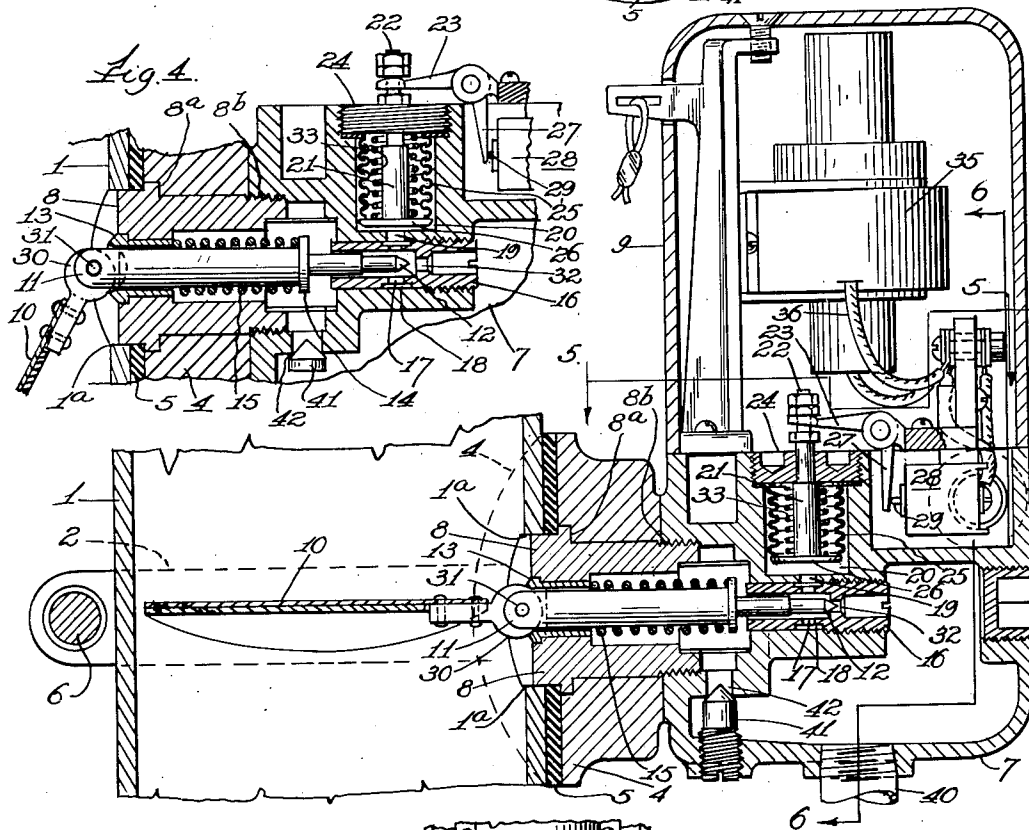
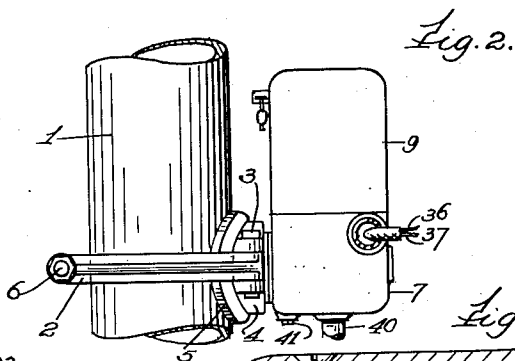
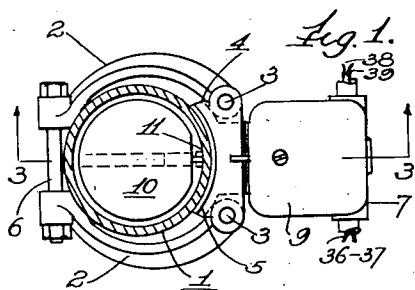
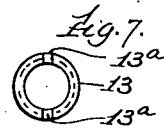


Fig. 6.



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FLOW RESPONSIVE ALARM DEVICE

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14 Claims. (Cl. 177—311)

This invention relates to a fluid flow indicator which may be in the nature of an alarm device, and which is particularly adapted for use in connection with a water distribution system such as that employed in fire extinguishing sprinkling installations. It will be readily understood that when a flow starts in such a system it may be occasioned either by a fire causing the opening of a sprinkler head or by the occurrence of a leak or accidental breakage of a sprinkler head through some other cause which might result in considerable damage if there were no fire, and that, accordingly, it is desirable that the commencement of such flow be promptly indicated. It is also important in a system of this character that the supply pressure be maintained at a predetermined value, ready for service at all times, and to include in the system a low pressure alarm device adapted to indicate promptly any reduction of the pressure below a safe minimum.

One object of the present invention is to provide a simple and reliable mechanism operable by fluid flow and adapted to actuate an alarm device to give notice of such flow.

Another object of the invention is to provide a fluid flow actuated alarm in which the normal pressure in the flow passage cooperates with the mechanism to render it inactive, and the relief or lowering of such pressure actuates the alarm mechanism.

It is a further object of the invention to simplify the structure so as to require only a single opening in the flow passage communicating with the alarm mechanism for transmitting the fluid pressure in the passage thereto and for also accommodating a mechanical connection operable by the flow in the passage to relieve such pressure as applied to the mechanism.

Other objects and advantages of the invention will appear from the following description taken in connection with the drawing, in which:

Figure 1 is a top plan view of the flow responsive device, showing the securing means by which it is applied to a flow passage, the passage itself being shown in section.

Figure 2 is a side elevation of the same.

Figure 3 is a vertical sectional view taken as indicated at line 3—3 on Figure 1, but on a larger scale and showing a portion of the flow passage together with the flow-responsive mechanism as normally disposed in absence of flow.

Figure 4 is a fragmentary sectional view similar to Figure 3 but showing the parts in flow-responsive position.

Figure 5 is a transverse section taken as indi-

cated at line 5—5 on Figure 3 but on a smaller scale.

Figure 6 is a vertical section taken as indicated at line 6—6 on Figure 3.

Figure 7 is a detail view showing the end of a bushing on which the flow-responsive vane is fulcrumed.

While there is shown and described herein certain specific structure embodying the invention, it will be manifest to those skilled in the art that various modifications and re-arrangements of the parts may be made without departing from the spirit and scope of the invention, and that the same is not limited to the particular form herein shown and described, except in so far as indicated by the appended claims.

The flow passage to which the alarm device embodying this invention is applied is indicated at 1 as a vertically extending section of pipe which may be a supply line for a fire extinguishing sprinkler system. At one side an opening 1^a is cut in the wall of the pipe 1, and an alarm device is secured in place by a clamping ring composed of two arms 2, 2 each secured by a pivot 3 to a pad 4 which is formed to fit snugly against the outer surface of the pipe 1 with suitable packing 5 interposed. A clamping bolt 6 completes the securing means, and the alarm mechanism, with its supporting base 7, is attached to the pad. A plug 8, fitted snugly in a bore in the pad 4, is formed with a head which enters the opening 1^a in the pipe 1 and which includes a flange 8^a serving to press the packing 5 firmly against the surface of the pipe 1 to insure a water-tight joint, and also cooperating with threads 8^b at the other end of the plug to clamp the pad 4 to the base 7 which carries the alarm actuating mechanism. A cover 9 surmounting the base 7, encloses the working parts and electrical connections.

A vane 10 extends into the flow passage or pipe 1 and is pivotally carried at the end of the valve stem 11 of a valve 12, as seen in Figure 3. The stem 11 extends loosely through a bushing 13 in the plug 8 and is formed with a flange 14 and provided with a spring 15 reacting between the flange 14 and the bushing 13 to hold the valve 12 normally seated.

The reduced portion of the stem 11 which includes the valve 12 extends loosely into a bushing 16 which is provided with lateral ports 17 and an annular passage 18 affording communication with a port 19 leading to a chamber 20. A headed plunger 21 in the chamber 20 has a stem 22 extending outside the chamber and connected to

one arm 23 of a bell crank lever for actuating an electric switch to operate an alarm device. The opening through which the stem 22 extends is formed in a straight threaded cap 24 for the chamber 20, and to seal the opening there is clamped in position by the cap a collapsible, corrugated cylinder of sheet metal, commonly known as a Sylphon, indicated at 25, and having its opposite end sealed to the head 26 of the plunger 21.

Thus the pressure of the liquid in the flow passage 1 is transmitted to the chamber 20 by way of the clearance around the valve stem 11 and around the valve portion 12 in the bushing 16, and thence through the ports 17, channel 18 and port 19, leading into the chamber 20. While the valve 12 remains in closed position, as shown in Figure 3, this pressure operates against the head 26 of the plunger 21, holding the plunger at its upper limit of movement in the chamber 20, and supporting the lever arm 23 so as to hold the other arm 27 of the bell crank away from the switch unit 28 so that the stem 29 of the switch mechanism protrudes therefrom, and the switch mechanism of the unit stands at open or inactive position.

The end of the valve stem 11 which projects into the flow passage is bifurcated to receive a flat, circular lug 30 to which the vane 10 is attached. But the pivot 31, which connects the lug 30 to the stem 11, extends eccentrically with respect to the circular outline of the lug 30 so that when the vane 10 is swung away from its normal position in which it extends across the flow passage to an oblique position, such as that indicated in Figure 4, the edge of the lug 30 fulcrums against the rim of the bushing 13, and the pivot 31 is rocked outwardly into the flow passage, drawing with it the valve stem 11 and opening the valve 12, all as shown in Figure 4. The length of the vane 10 is several times as great as the distance from the axis of the pivot 31 to the point on the rim of the bushing 13 at which it fulcrums; hence, the liquid flowing in the passage 1 is provided with considerable leverage or mechanical advantage which is opposed only by the spring 15. And since the spring 15 need be only heavy enough to balance the weight of the vane at its normal position shown in Figure 3, the mechanism may be made quite sensitive in responding to flow in the passage 1.

When such flow occurs, causing the vane 10 to swing away from its normal position in the general direction of the flow, and causing valve 12 to be opened, the pressure of the liquid acting in the chamber 20 is relieved by way of the port 32 which is controlled by the valve 12 and which has a considerably greater flow capacity than the restricted inlet passage provided by the clearance around the stem 11, and the spring 33 is permitted to move the plunger 21 downwardly in the chamber 20 to the position shown in Figure 4. The arm 23 of the bell crank lever is thus rocked downward, and the arm 27 is swung toward the switch unit 28, pressing the switch actuating stem 29 inwardly and closing the switch for completing suitable electrical connections to operate an alarm device of any desired character. In the drawing the cover 9 is shown as enclosing a relay 35 having feed wires 36 and 37 leading from any suitable source of current supply, and provided with outleading wires 38 and 39 which may be understood as extending to an alarm signal.

The base or housing 7 which carries the valve and switch mechanism is provided with a drain

pipe 40 which may lead to any suitable point of discharge for carrying away the small quantity of liquid which escapes into the housing by way of the port 32 when the valve 12 is open. As soon as the flow in the passage 1 ceases, the spring 15 will act to return the parts to their normal position with the valve 12 closed, and with the vane 10 extending across the flow passage. For occasionally flushing the clearance space between the stem 11 and the bushing 13 there is provided a threaded vent valve 41 normally closing a port 42 which connects the space around the stem 11 with the lower portion of the housing 7 so that when the valve 41 is temporarily opened it permits the liquid to flow from the passage 1 around the valve stem 11, escaping by way of the port 42 and drain pipe 40 without actually moving the vane 10 or opening valve 12. This treatment may be desirable to prevent any accumulation of sediment in the clearance space of the bushing 13 which might otherwise interfere with sensitive operation of the alarm in the event of flow in the passage 1. Preferably, as shown in Figure 7, the rim of the bushing 13 is formed with diametrically disposed notches 13' for seating the circular lug 30 of the vane 10 and maintaining it in proper position.

It will be understood that in order to insure operation of the alarm device upon opening of the relief port 32, the flow capacity of this port must be somewhat greater than the flow capacity of the clearance around the valve stem which affords comparatively restricted communication with the pressure responsive chamber 20. Preferably, the control of this clearance will be accomplished in dimensioning the reduced portion of the valve stem between the valve 12 and the shoulder 14 as related to the bore in the bushing 16 which accommodates this portion of the stem; then the clearance in the bushing 13 can be somewhat greater to insure easy operation of the larger portion 11 of the valve stem.

With the construction shown, since the chamber 20 is in constant communication with the flow passage of the pipe 1, a sufficient pressure must be normally maintained in the passage to hold the plunger 26 and its connected switch actuating mechanism at inactive position. If the pressure should fall below a predetermined value the strength of the spring 33, working against the correspondingly reduced pressure in the chamber 20, will shift the plunger 21 to its lower limit, even though there is no flow in the passage 1 and no movement of the vane 10 or its connected valve 12. Thus the mechanism will operate as a low pressure alarm so as to give notice that the water supply is not being properly maintained, and in addition, it will function to give the alarm whenever actual operation of the sprinkler system causes flow in the passage 1.

I claim as my invention:

1. A flow indicator comprising a flow responsive member extending into a flow passage and mounted to swing in response to flow therein, means forming a chamber having constant restricted communication with said passage, a pressure responsive device in said chamber including an alarm actuating member extending outside the chamber, said chamber having a relief port of greater capacity than said restricted communication, a valve normally closing said port, and means operatively connecting said flow responsive member to said valve to effect the opening of the valve when said member swings in response to flow in the passage.

2. A flow indicator for actuating an electrically controlled alarm, said indicator including a flow responsive member extending into a flow passage and mounted to swing in response to flow therein, means forming a chamber having constant restricted communication with said passage, pressure responsive means in said chamber including a switch actuating member extending outside the chamber and a switch for the alarm operatively connected to said member, said chamber having a relief port of greater capacity than said restricted communication, a valve normally closing said port, and means operatively connecting said flow responsive member to said valve arranged to open the valve when said member swings in response to flow in the passage.

3. A flow indicator comprising a flow responsive member extending into a flow passage and mounted to swing in response to flow therein, means forming a chamber having constant restricted communication with said passage, a flexible diaphragm constituting a wall of said chamber, an alarm actuating member connected to said diaphragm and extending outside the chamber, said chamber having a relief port of greater capacity than said restricted communication, a valve normally closing said port, and means operatively connecting said flow responsive member to said valve to effect the opening of the valve when said member swings in response to flow in the passage.

4. A flow indicator comprising a vane extending into a flow passage and mounted to swing in response to flow therein, means forming a chamber having restricted communication with said passage, a pressure responsive device in said chamber including an alarm actuating member extending outside the chamber, and normally held at inactive position by the pressure in said chamber said chamber having a relief port of greater capacity than said restricted communication, a valve normally closing said port, said valve having a stem, a guideway for said valve stem providing clearance around the stem which affords the said restricted communication between the flow passage and the chamber, and means operatively connecting the valve stem to said vane arranged to effect the opening of the valve when the vane swings in response to flow in the passage.

5. A flow indicator comprising a vane extending into a flow passage and mounted to swing in response to flow therein, means forming a chamber having restricted communication with said passage, a pressure responsive device in said chamber including an alarm actuating member extending outside the chamber, said chamber having a relief of greater capacity than said restricted communication port, a valve normally closing said port, and means positively connecting said vane to said valve to effect the opening of the valve when the vane swings in response to flow in the passage, together with means normally holding the valve yieldingly closed and yieldingly maintaining the vane in a plane transverse to the direction of flow in the passage.

6. A flow indicator comprising a vane extending into a flow passage and mounted to swing in response to flow therein, means forming a chamber and means having a bore connecting it with said passage, said bore extending transversely from the passage, a pressure responsive device in the chamber including an alarm actuating member extending outside the chamber, said bore having a relief port, a valve normally

closing said port, a stem for said valve extending loosely through the bore, whereby clearance around the stem affords restricted and constantly open communication between the flow passage and the chamber, and means operatively connecting said stem to the vane to effect the opening of the valve when the vane swings in response to flow in the passage, said bore having a vent port, and a valve for said port operable at will to permit a flushing flow from the flow passage through the bore independently of the position of the vane.

7. A flow indicator comprising a vane extending into a flow passage and mounted to swing in response to flow therein, a chamber in constant communication with said passage, a pressure responsive device in said chamber including an alarm actuating member extending outside the chamber, said chamber having a relief port, a valve normally closing said port, said valve having a stem, guideway means for said stem providing clearance around the stem which affords the said communication between the flow passage and the chamber, the flow capacity of said clearance being less than that of the relief port whereby opening the port operates to reduce the pressure acting on said pressure responsive device, and means operatively connecting the valve stem to said vane arranged to effect the opening of the valve when the vane swings in response to flow in the passage.

8. A flow indicator comprising a vane extending into a flow passage and mounted to swing in response to flow therein, means forming a chamber in constant restricted communication with said passage, a pressure responsive device in said chamber including an alarm actuating member extending outside the chamber and yielding means normally opposed by the pressure of the flow passage and operative to actuate the alarm device upon reduction of said pressure below a predetermined value, said chamber having a relief port of greater capacity than said restricted communication, a valve normally closing said port, and means operatively connecting said vane to said valve to effect the opening of the valve when the vane swings in response to flow in the passage.

9. A flow indicator comprising a vane extending into a flow passage and mounted to swing in response to flow therein, means forming a chamber in constant communication with said passage, a pressure responsive device in said chamber including an alarm actuating member extending outside the chamber with yielding means normally opposed by the pressure of the flow passage and operative to actuate the alarm device upon reduction of said pressure below a predetermined value, said chamber having a relief port, a valve normally closing said port, said valve having a stem, guideway means for said valve stem providing clearance around the stem which affords the said communication between the flow passage and the chamber whereby the alarm device is operative upon reduction of pressure in the flow passage, and means operatively connecting the valve stem to said vane arranged to effect the opening of the valve when the vane swings in response to flow in the passage, the flow capacity of said clearance being less than that of the relief port whereby such opening of the port also operates to reduce the pressure acting on the pressure responsive device and to cause actuation of the alarm.

10. A flow indicator comprising a vane extend-

ing into a flow passage and mounted to swing in response to flow therein, means forming a chamber having restricted communication with said passage, a pressure responsive device in said chamber including an alarm actuating member extending outside the chamber, said chamber having a relief port of capacity greater than its said restricted communication with the flow passage, a valve normally closing said port and means operatively connecting said vane to said valve to effect the opening of the valve when the vane swings in response to flow in the passage.

11. A flow indicator comprising a vane extending into a flow passage and mounted to swing in response to flow therein, means providing a chamber in constant but restricted communication with said passage, a pressure responsive device in said chamber including an alarm actuating member extending outside the chamber and yielding means normally opposed by the pressure in the chamber and operative to actuate the alarm device upon reduction of said pressure below a predetermined value, said chamber having a relief port of capacity greater than its said restricted communication with the flow passage, a valve normally closing said port, and means connecting said vane to said valve and operative to effect the opening of the valve when the vane swings in response to flow in the passage, whereby the effective pressure in the chamber is lowered and the alarm is actuated either in response to a reduction of pressure in the flow passage or in response to flow therein.

12. In combination with a flow passage, means forming a chamber and means providing a constantly open restricted passage connecting said chamber with the flow passage, a pressure responsive alarm device exposed to the fluid pressure in the chamber and operable by a reduction of said pressure in said chamber, said chamber

having a relief port of greater capacity than said restricted passage, a valve normally closing said port, and a member movable in response to flow in the flow passage operatively connected to said valve to effect the opening of the relief port in response to flow in the flow passage.

13. In combination with a flow passage, means forming a chamber and means providing a constantly open restricted passage connecting said chamber with the flow passage, a pressure responsive alarm device exposed to the fluid pressure in the chamber and including yielding means reacting in a direction to cause actuation of the alarm but normally balanced and restrained by the opposing fluid pressure in the chamber and operative upon reduction of said pressure, said chamber having a relief port of greater capacity than said restricted passage with a valve normally closing said port, and a member movable in response to flow in the flow passage operatively connected to said valve to effect the opening of the relief port and reduction of pressure in the chamber in response to flow in the flow passage.

14. In combination with a flow passage, means forming a chamber and means providing a restricted passage connecting said chamber with the flow passage, a pressure responsive alarm device exposed to the fluid pressure in the chamber and operable by a reduction of said pressure, said chamber having a relief port of greater capacity than said restricted passage valve means controlling said relief port and operable to reduce the effective pressure in the chamber applied to said device, a member movable in response to flow in the flow passage, and means operatively connecting said member to said valve means for actuating the valve to reduce the pressure in the chamber in response to flow in the flow passage.

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