

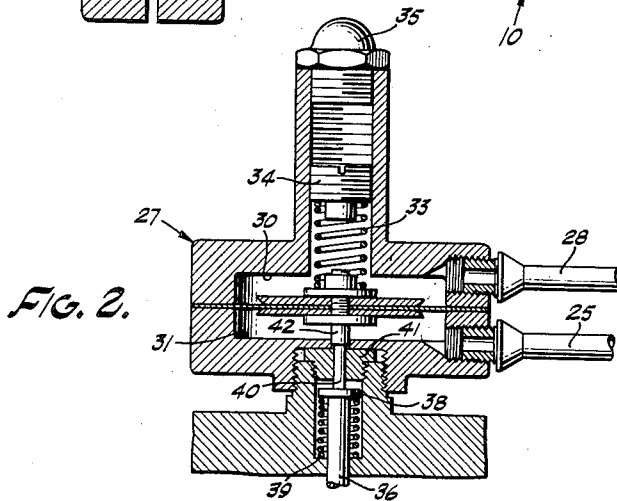
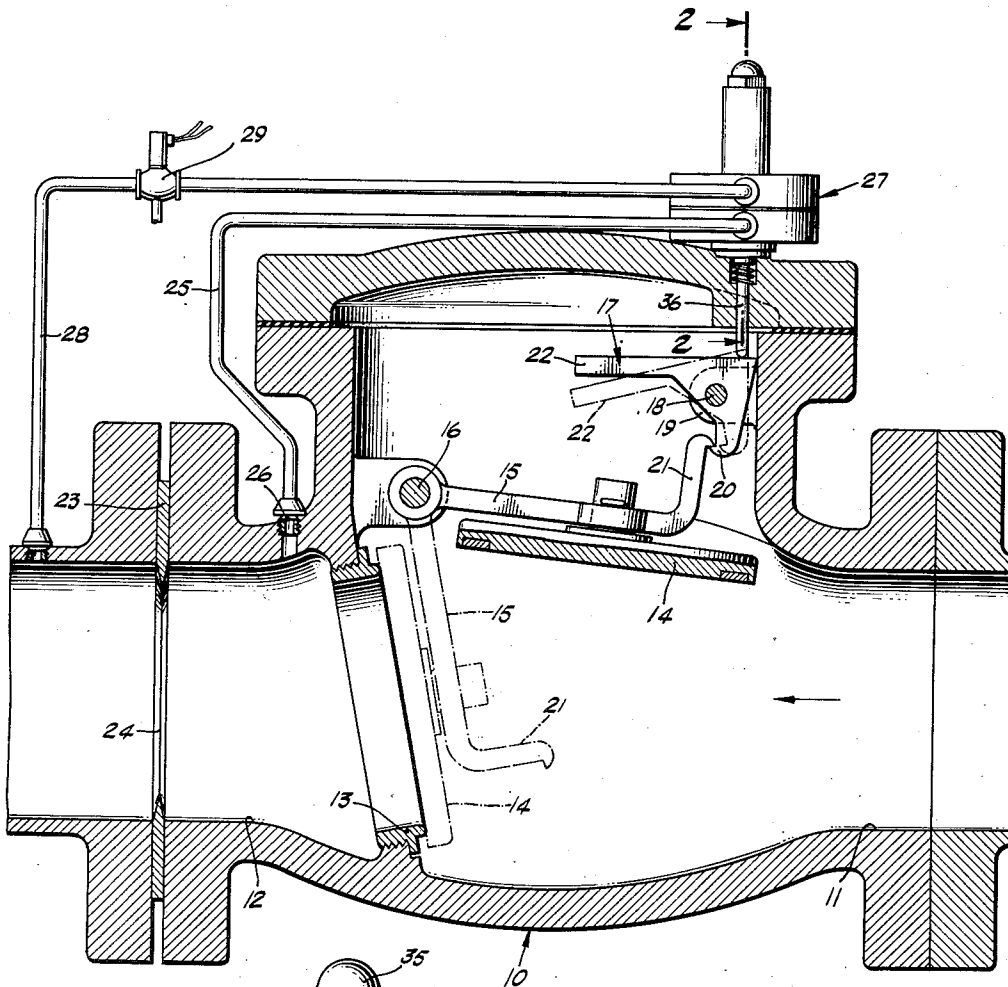
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VALVE CONTROL MECHANISM

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VALVE CONTROL MECHANISM

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This invention relates to improvements in valve control mechanisms.

An object of the invention is to provide a construction wherein there is a normally open valve closure urged into closed position either by gravity or otherwise, and which is releasably held in open position and controlled by a mechanism responsive to the rate of flow through the valve. In this manner, if the rate of flow through the valve varies materially from a predetermined or set rate the valve will be caused to automatically close.

Valves of this type have a large variety of different uses. For example, the combination embodying the present invention may be incorporated in a pipe line leading from a large ammonia storage tank. The pressure at which the ammonia is maintained in the storage tank may vary widely. If such a line in which the present valve is incorporated leads from the storage tank to a compressor, the compressor will draw ammonia from the storage tank at a predetermined rate with very little variation. In the event that the pipe line leading from the storage tank to the compressor should break, the rate of flow through the valve would materially increase and it would be desirable to immediately close the valve so that all of the ammonia in the storage tank would not be permitted to escape. It will be appreciated that under such circumstances where the pressure in the storage tank may vary considerably that the control mechanism that effects a closing of the valve should be largely independent of pressure variations but should be immediately responsive to material variations in the rate of flow through the valve.

An object of the present invention is to provide a valve control mechanism that satisfactorily meets all of these requirements.

Another object of the invention is to provide a valve control mechanism having the above-mentioned characteristics wherein the valve can be closed if desired manually or from remotely located control points.

With the foregoing and other objects in view, which will be made manifest in the following detailed description and specifically pointed out in the appended claims, reference is had to the accompanying drawings for an illustrative embodiment of the invention, wherein:

Figure 1 is a longitudinal vertical section through a construction embodying the present invention; and

Fig. 2 is a vertical section taken substantially upon the line 2-2 upon Fig. 1.

Referring to the accompanying drawings wherein similar reference characters designate similar parts throughout, the improved construction comprises a valve body or housing 10 having an inlet 11 and an outlet 12. The inlet and outlet are preferably flanged to cooperate with companion flanges on the pipe line or conduit within which the body is adapted to be inserted. Within the body there is disposed a valve seat 13 engageable by a closure 14 that is loosely mounted on a swingable arm 15. This swingable arm is mounted on a transversely extending pintle 16, a portion of which preferably extends through the wall of the housing 10 to the exterior thereof so that it may be rotated from the exterior of the housing to swing the closure into open position. The closure 14 is normally held in open position by means of a latch 17 pivotally mounted on a pin 18 that is supported on ears 19 within the housing. This pivoted latch has a dog 20 engageable with a finger 21 on the arm 15 to releasably hold the closure in open position. The latch

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17 has a weight 22 that urges the latch to swing in a counterclockwise direction as viewed in Fig. 1, to release the closure. The closure 14 is adapted to swing by gravity or it may be urged by a spring into closing position against the seat 13.

The above-described construction is not new in the art and it will be appreciated that other types of self-closing valves may be substituted therefor if desired.

In association with the valve there is an orifice plate 23 having an orifice 24 therein. This orifice plate is illustrated as being replaceably clamped between the downstream end of the body 10 and the adjacent companion flange on the conduit. The orifice plate may be removed and replaced with other plates having larger or smaller orifices therein to meet various conditions.

Upstream with respect to the orifice plate there is a tubing 25 connected as at 26 to the interior of the housing 10 and serving to conduct pressure to a diaphragm housing, generally indicated at 27. Downstream with respect to the orifice plate 23 there is a similar tubing 28 connected to the interior of the conduit and serving to conduct pressure to the diaphragm housing 27. This tubing may have a three-way solenoid valve 29 incorporated therein for a purpose hereinafter to be described.

The diaphragm housing 27 is divided into two compartments or chambers 30 and 31 by a diaphragm 32. The tubing 28 leads to the chamber 30 and the tubing 25 leads to the chamber 31. A compression spring 33 urges the diaphragm 32 downwardly and the pressure exerted by this spring on the diaphragm may be adjusted by means of a threaded plug 34. 35 indicates merely a closure plug for the top of the diaphragm housing which may be removed for the purpose of adjusting the plug 34 and consequently the pressure exerted by the spring 33 on the diaphragm.

Above the latch 17 there is a slidable pin 36 that engages the top of the latch within the housing 10. This pin is equipped with a head 38 and is surrounded by means of a compression spring 39 which urges the pin upwardly. The head 38 engages a pin 40 that slidably extends through a gland 41 with a relatively close fit. The upper end of this pin is engageable with a stud 42 on the under side of the diaphragm.

In the normal position the closure 14 is latched in its open position by the latch 17. Variations in pressure in the ammonia tank or in the fluid supplied to the valve have no noticeable effect on the valve. Thus, a high increase in pressure is conducted through both the tubes 25 and 28 to opposite sides of the diaphragm 32 and are balanced or substantially so. Conversely, a decrease of pressure is effective through the tubes 25 and 28 on opposite sides of the diaphragm without affecting it. Under normal conditions a compressor downstream with respect to the orifice plate 23 will draw ammonia from the supply tank through the valve at a predetermined rate. As long as this rate persists there will be a slight differential in pressure created by the orifice plate. Thus, the pressure transmitted to the diaphragm housing through the tube 25 will be slightly greater than the pressure transmitted through the tube 28. This slightly higher pressure in the chamber 31 than the pressure that exists in the chamber 30 would urge the diaphragm 32 upwardly. Such upward movement, however, is opposed by the compression spring 33. Consequently, under normal conditions, while the compressor is drawing fluid at a predetermined rate there is no tripping or actuation of the valve.

On the other hand, if the pipe line downstream from the orifice plate between the orifice plate and the compressor should break this would permit flow through the valve to occur at a very materially increased rate. The differential in pressures in the tubes 25 and 28 would consequently increase so that the pressure in the chamber 31 would be sufficiently higher than the pressure in the chamber 30 to cause the diaphragm to lift against the pressure of the spring 33. When the diaphragm is lifted it permits the pin 36 to be elevated by its spring 39, thus permitting the weight 22 to rotate the latch 17, allowing the closure 14 to immediately close and seat against the seat 13. In this way, in the event that the pipe line lead-

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ing to the compressor should break or become damaged the valve will be caused to automatically close to prevent further escape or loss.

The valve may be manually or intentionally tripped by means of the solenoid valve 29. The electric conductors leading to the solenoid of this valve may be connected to any electric switch located in the immediate neighborhood or at a remote control point. When this solenoid valve is energized by closing the electric circuit through its solenoid its effect is to shut off the tube 28 and open the chamber 30 to atmosphere. Any ammonia that may be in the chamber 30 and in that portion of the tube 28 that is between the solenoid valve 29 and the diaphragm housing 27 is lost to atmosphere but its volume is negligible.

From the above-described construction it will be appreciated that an improved valve control mechanism is provided which is not influenced by variations in pressure in the fluid conducted therethrough but which is influenced by variations in the rate of flow therethrough. Consequently, any increase or decrease in the pressure of the fluid supplied to the valve does not cause it to trip. But in the event that some circumstance causes the rate of flow through the valve to materially change the valve will be automatically tripped and caused to close.

The tubings 25 and 28 may have manually operable valves inserted therein if desired so as to isolate the diaphragm housing from the line during the period that the pipe line is being filled. When the line has been filled and conditions have been more or less stabilized in accordance with normal operations, such manual valves, not shown, may be opened and left open.

Various changes may be made in the details of construction without departing from the spirit and scope of the invention as defined by the appended claims.

I claim:

1. A valve operable to shut off when flow therethrough exceeds a predetermined rate comprising a valve body having an inlet and an outlet and a valve seat therebetween facing toward the inlet, a valve closure swingably mounted in the body adapted to seat upon said seat, a latch pivotally mounted in said body engageable with the closure to releasably hold the closure in open position, said latch being biased to release the closure, a diaphragm and housing therefor on the exterior of the body, means operatively connecting the diaphragm and the latch through a wall of the body whereby the diaphragm may hold the latch in opposition to the bias thereon in engagement with the closure, means for creating a pressure differential in the flow of fluid that passes

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through the body, and means for conducting the differential pressures to opposite sides of the diaphragm in such a manner that as long as the pressure differential does not exceed a predetermined degree the diaphragm will hold the latch in engagement with the closure but when the differential exceeds a predetermined degree the diaphragm will allow the latch to release the closure and thus allow the closure to close.

2. A valve operable to shut off when flow therethrough exceeds a predetermined rate comprising a valve body having an inlet and an outlet and a valve seat therebetween facing toward the inlet, a valve closure swingably mounted in the body adapted to seat upon said seat, a latch pivotally mounted in said body engageable with the closure to releasably hold the closure in open position, said latch being biased to release the closure, a diaphragm and housing therefor on the exterior of the body, means operatively connecting the diaphragm and the latch through a wall of the body whereby the diaphragm may hold the latch in opposition to the bias thereon in engagement with the closure, said means including a spring exerting pressure on the diaphragm in a direction to cause said means to allow the latch to release the closure, a spring in the diaphragm housing arranged to exert pressure on the diaphragm in opposition to the mentioned spring, means for adjusting the pressure exerted by the last-mentioned spring, means for creating a pressure differential in the flow of fluid that passes through the body, and means for conducting the differential pressures to opposite sides of the diaphragm in such a manner that as long as the pressure differential does not exceed a predetermined degree the diaphragm will hold the latch in engagement with the closure but when the differential exceeds a predetermined degree the diaphragm will allow the latch to release the closure and thus allow the closure to close.

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