

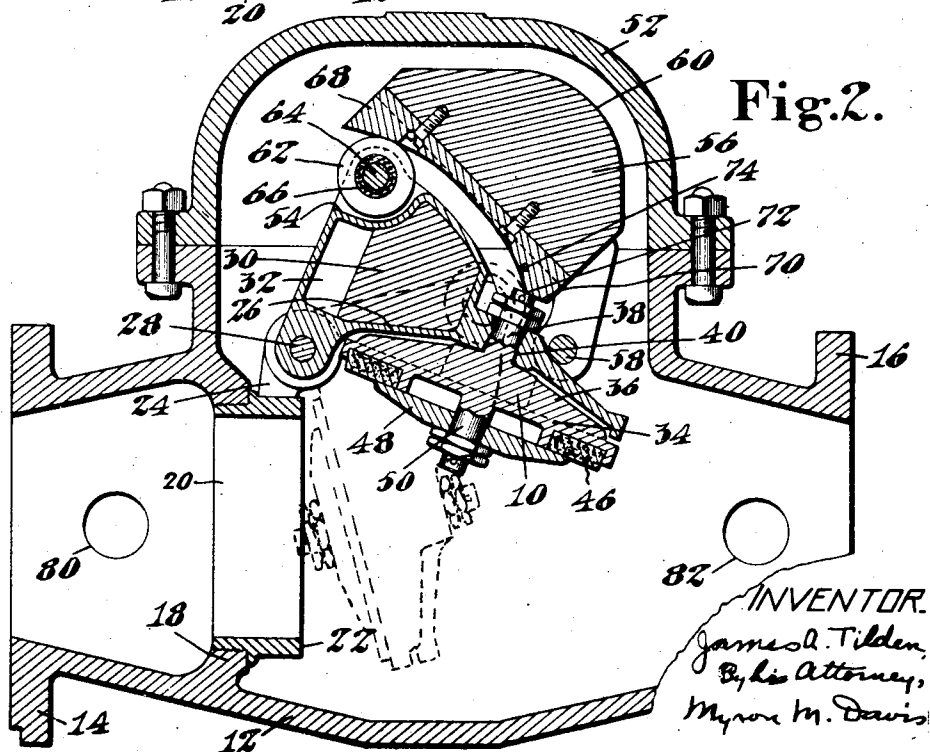
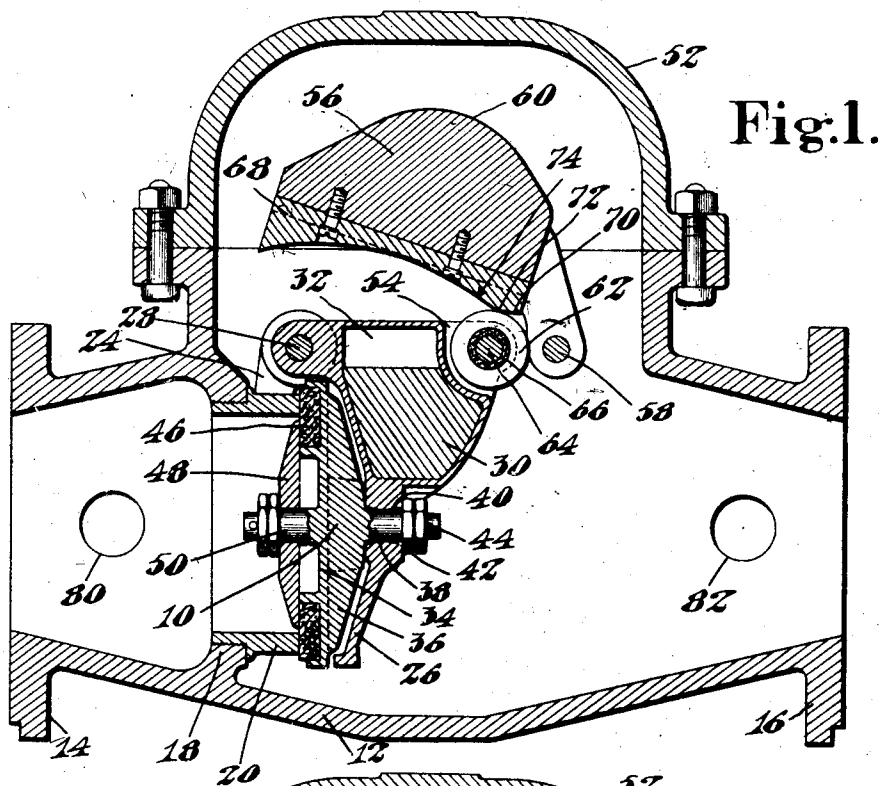
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J. A. TILDEN

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VALVE

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INVENTOR.

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UNITED STATES PATENT OFFICE.

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VALVE.

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This invention relates to valves and is illustrated as embodied in a hydraulic check valve of the back pressure type suitable for use, for example, to by-pass small quantities from a fire supply main. It will be understood, however, that the invention is not restricted to such a use nor is it, in some of its features, restricted to use in that type of valve.

Check valves of the back pressure type are used, for example, in water mains furnishing a potential supply at full head for fire purposes in order that, when the valves are closed, they shall deflect or direct the water through other channels such as by-passes around the valves. Such a by-pass may include a suitable meter to allow the use and measurement of small quantities drawn from the main for other than fire purposes, at greatly reduced head. To this end, it is desired that such valves shall offer a predetermined and substantial resistance to opening and shall be so constructed that, once opened by a large demand, they shall offer a minimum resistance to the flow of water so that they shall not cause a reduction of head at a time when it is most needed.

An object of the present invention is to provide an improved check valve organized to offer a definite and considerable resistance to the movement or initial opening of the valve under ordinary pressures.

Check valves are frequently gravity operated and the difficulty of providing, within the limits of good design, a sufficient single weight to control a movable valve member leads to the employment of compound weights, acting together upon a single valve member. A further object of the invention is to provide a compact and efficient check valve of the compound weighted type.

In accordance with features of the invention, in order that a maximum resistance shall be offered to opening and only a minimum resistance offered once the valve has started to open, the illustrated construction provides a valve member and a supplemental weighted member compounded through a leverage constructed and arranged so that even a small opening movement of the valve member causes a considerable movement of the supplemental weighted member and hence so that the latter member becomes substantially ineffective after a small fractional part of the

total displacement of the movable valve member has taken place.

These and other features of the invention are set forth in the claims and have been more fully described in the following specification, reference being had to the accompanying drawings, in which:—

Fig. 1 is a longitudinal section through the valve casing showing the valve in closed position, and

Fig. 2 is a similar section taken with the valve in fully opened position, showing in dotted lines the critical intermediate position at which the supplemental member is rendered substantially ineffective.

The movable member or flap 10 of the valve is pivotally mounted to control the passage through a valve casing 12 having external flanges 14 and 16 by means of which it may be inserted in the water main the flow through which it is desired to control. This casing has an internal flange 18 in which there is threaded a sleeve 20 having a seat surface 22 and provided with upstanding lugs 24 between which is pivoted the carrier 26 of the flap 10.

In order that the flap 10 may automatically close the passage through the casing 12 when it is not opened and held open by the flow of water, the carrier 26 is pivoted about a horizontal rod 28 in the lugs 24 at the upper part of the casing so that it will be closed by its own weight, adjustably predetermined by the addition or removal of some heavy material such as lead 30 in the pocket 32 of said carrier. Actual closure of the passage is effected by a disk-shaped valve member 34 reinforced by radial ribs 36 and loosely supported in the carrier 26 by a stud 38 passing through a doubly tapered hole 40 where it is held by nuts 42 and cotter pin 44. This valve member 34 has an annular groove upon its face in which a soft rubber washer 46 is held by means of a smaller disk 48 pressed against the washer and held there by locked nuts upon another stud 50 opposing the stud 38 upon the valve member. Thus a soft resilient surface is provided upon the valve member 34 and the latter is self-adjusting so that it will position itself to ensure a uniform engagement all around the seat 22.

The upper part of the casing 12 is closed by means of a dome 52 providing space for a lever arm 54 on the valve carrier 26 and for

an auxiliary weighted lever 56 having lateral arms by means of which it is pivotally supported upon a horizontally disposed rod 58 extending parallel to the rod 28 at the other side of the upper part of the casing so that the auxiliary lever overhangs the arm 54 of the valve carrier. The outer surface 60 of the supplemental weighted lever 56 is shaped like and lies substantially parallel to the adjacent inner surface of the corresponding part of the dome 52 to obtain the desired weight in a minimum space. This weighted auxiliary lever 56, swinging in the opposite sense from the flap 10 to conserve space and further to reduce the necessary size of the dome 52, is arranged to overhang said valve member and to bear against a roller 62 mounted centrally at the end of the arm 54 upon the valve carrier in all positions of the parts. Such a centralized rolling contact avoids uneven pressure or twisting with the resultant bearing friction. The roller is pivotally mounted upon a pin 64 surrounded by a hard rubber bushing 66. The hard rubber bushing 66 prevents corrosion of the bearing between the roller and the pivot and is self-lubricated by the action of the surrounding water.

The under side of the weighted lever 56 is recessed slightly to receive a central shoe 68 slightly wider than the roller 62. The face of this shoe is curved for the greater portion of its length so that, when the valve is in open position as in Fig. 2, the center of the curve coincides with the center of the pivot rod 28. At the end of the shoe nearer the pivot rod 58, however, the shoe is recessed or cut away at 70 to provide a shoulder 72 under which the roller 62 must ride as the valve lifts said auxiliary lever 56 when it attempts to move from closed to open position. As the valve starts to open, such movement is opposed not only by the weight of the flap 10 itself including the enclosed weight 30 but is additionally opposed by the full effect of the weighted lever 56 as its shoulder 72 bears against the lever arm 54 upon the valve carrier 26 to resist its opening movement. Further it will be noted that movement of the roller 62 in emerging from the recess 70 of the shoe is effective to move the weighted lever 56 through practically its whole range of movement to an upright position in which it is only slightly unbalanced. The passage of the roller under the shoulder 72 upon the shoe 68 is marked by an automatic increase in the effective length of the lever arm 54 as the point of contact upon the roller turns away from the pivot rod 28. Just as soon as the roller 62 has passed the shoulder 72 and reached a point such as 74 upon the curved surface of the shoe 68, it holds the weighted lever 56 in the upright and substantially ineffective position to which it has been moved and in which any pressure exerted by said

weighted lever, acting in a direct line through the pivot 28, has no closing effect upon the valve member 10, and further movement of the valve member under pressure of the water is resisted only by its own weight.

For the sake of a concrete example of one particular use of my check valve, let us assume that the valve casing 12 has been inserted in the fire supply main of a large factory and that a by-pass is provided connecting the passages 80 and 82 at opposite sides of the valve. A suitable meter (not shown) of small capacity is usually included in the by-pass which is capable of measuring such small quantities as may be drawn for non-emergency purposes. My valve, in common with all such valves of the back-pressure type, will be maintained in its closed position partly by the action of its weights but more especially by the balancing effect of the hydrostatic pressure against the right-hand side of the valve member. This condition of equilibrium will continue until the demand, or chance for expansion of the water upon the right side, increases to a point where there is a substantial diminution of the head upon this side, causing an unbalanced condition. The capacity of the by-pass is not enough to allow a drop in pressure upon the outgoing or right side of the valve when small quantities are being drawn sufficient to unbalance and open the valve. This allows the use of this source of supply to a limited extent by the factory for commercial purposes, such use being measured and paid for. When, however, a demand arises for a considerable quantity, as in case of a fire, the drop in hydrostatic pressure upon the right side creates an unbalanced condition which starts the opening of the valve. It will be noted that the valve is so constructed that a very considerable and predetermined difference of pressures must exist before the combined effects of the weights 30 and 56, acting through their lever arms, will be overcome. As soon as the movement of the valve member is sufficient to carry the roller 62 past the shoulder 72, thereby lifting the auxiliary weighted lever 56 to an upright position in which it is ineffective, the latter will be held in such ineffective relation as the roller 62 moves along the curved surface of the shoe 68. The valve flap 10 may then be readily pushed out of the direct path of the flowing water so that no substantial resistance is offered to diminish the head. Upon the cessation of this demand, the valve flap 10 will fall back to its closed position by its own weight and, as soon as the roller 62 passes the shoulder 72 and enters the recess 70 of the shoe, the weighted lever 56 will drop back by its own weight into the position overhanging the arm 54 of the valve carrier 26 where it is most effective to assist in holding the valve closed.

Having described the invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In combination, a self-closing valve member arranged to offer a definite resistance to displacement from one position, and supplemental means bearing against said member in all positions constructed and arranged to superimpose a predetermined additional resistance against the initial displacement of said member until after a fractional part of the total displacement has been passed and then to remain in slightly unbalanced condition imposing only a slight resistance and permitting substantially free movement of said valve member to its position of maximum opening.

2. In combination, a pivotally mounted flap check valve member arranged to be moved to closed position by its own weight, a pivotally mounted supplemental weighted member normally holding said valve shut, and a roller disposed substantially midway of one member bearing upon an intermediate part of the other member, said members being constructed and arranged so that said valve member will move said supplemental weighted member to a substantially ineffective position by means of a relatively small opening movement of said valve member.

3. In combination, a check valve of the back pressure type having a pivoted valve member, and a weighted lever arranged to assist in holding said valve member in one position, said lever having a curved bearing surface provided with a shoulder at one end whereby the lever is substantially ineffective when the curved surface is in contact with the valve member and is effective when the shoulder is in contact therewith.

4. In combination, a valve casing, a depending valve member and a cooperating overhanging weighted member pivoted on substantially parallel horizontal axes near the upper part of the casing, and means extending outwardly from said valve member to bear against said weighted member at a point near the pivot of the latter when the valve is in closed position, said means and weighted member being constructed and arranged so that a small opening movement of the valve member is effective to move said weighted member to an upright position where it is substantially ineffective.

5. In combination, a valve casing provided with a passage having an inlet opening and a discharge opening and a dome extending outwardly from the passage therebetween, a pivotally mounted valve member arranged to control said passage and tending to close under the action of its own weight, and a weighted auxiliary lever coacting with said valve member to assist its closing action, said lever being pivotally mounted to rotate within said dome in the opposite sense from the

valve member and to maintain contact with said valve member in all positions as it cooperates therewith to assist in closing said valve member whereby the size of the dome necessary to house the valve member and the auxiliary member is reduced.

6. In combination, a pivotally mounted valve member depending from a horizontal pivot, said valve member being provided with an arm extending outwardly substantially horizontally when said valve member is closed, and a pivotally mounted auxiliary weight overhanging said arm and bearing against the outer end of the arm thereby to assist in closing said valve member, said valve member and said weight being rotatable in opposite senses as the valve opens and closes.

7. In combination, a depending pivoted valve member having an outwardly extending arm provided with a terminal roller, and an auxiliary weighted lever overhanging said arm and provided with a shoulder near its pivotal mounting bearing against said roller when the valve member is in closed position whereby a small opening movement of the valve member will cause a relatively large movement of the weighted lever so that a considerable force is required to start the valve to open.

8. In combination, a casing having a valve seat, a pivotally mounted valve member and an auxiliary weighted lever in said casing normally overlying and resting against said valve member tending to hold it shut against said seat, said auxiliary lever having a curved bearing surface for contact with the valve member when the valve is open, and a shoulder adapted to bear on the valve member when closed to resist the opening movement of the valve member.

9. In combination, a pivotally mounted valve member and a cooperating overhanging pivoted weighted member bearing against and tending to close the valve member, said members having coacting portions serving as lever arms and being constructed and arranged automatically to increase the effective length of one lever arm by movement of the valve member away from closed position.

10. In combination, a casing having a passage and a valve seat therein, a pivotally mounted flap valve arranged to hang against said seat to close said passage, a pivoted weight in said casing overhanging said valve and bearing against it to assist in holding it closed, and connections between said valve and said weight constructed and arranged to cause a small opening movement of said flap valve to move said weight to an upright substantially ineffective position where it is only slightly unbalanced.

In testimony whereof I have signed my name to this specification.

JAMES A. TILDEN.