

April 16, 1935.

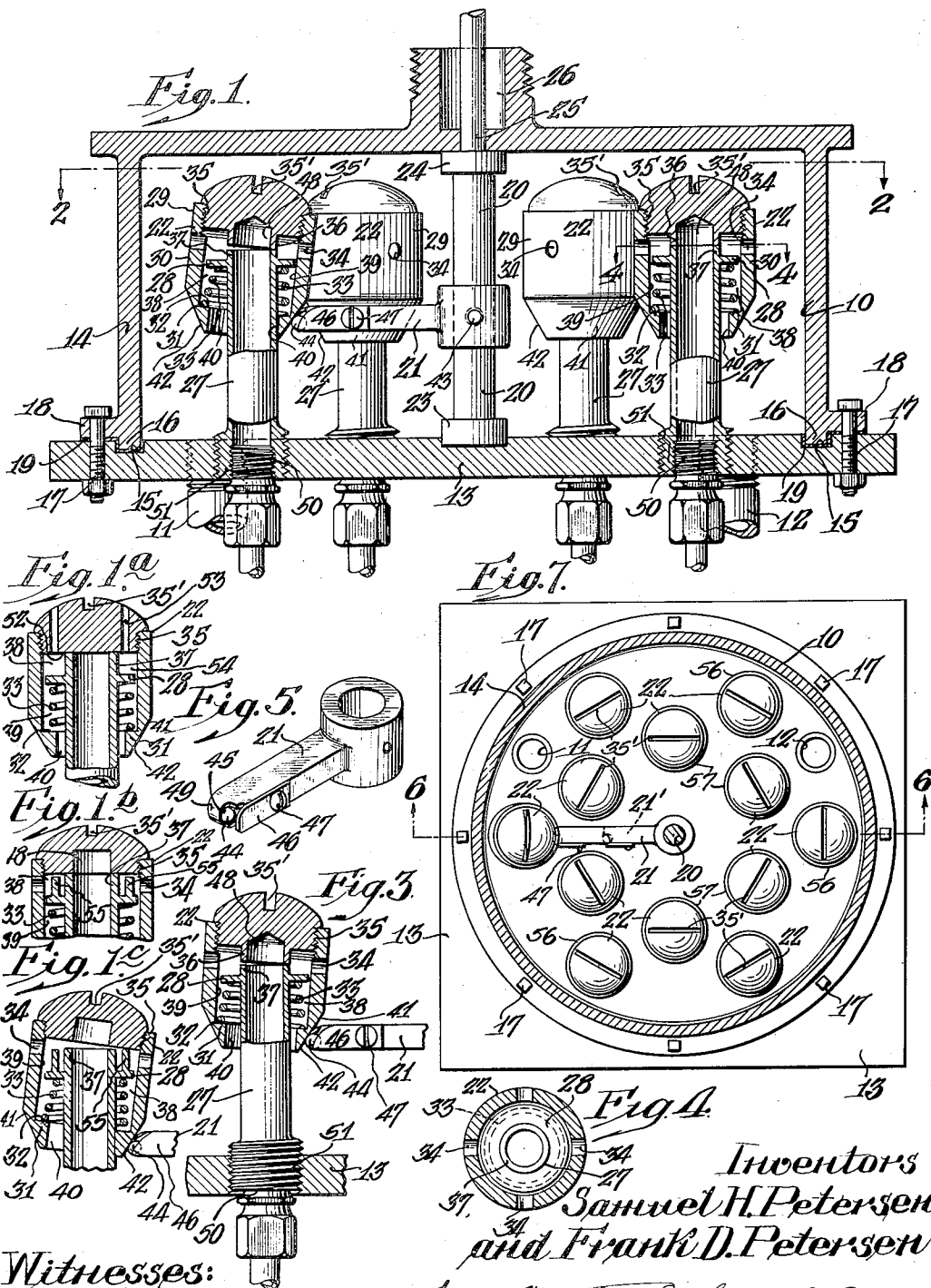
S. H. PETERSEN ET AL

1,997,977

VALVE CONTROLLING DEVICE

Filed Nov. 15, 1932

2 Sheets-Sheet 1



Witnesses:

Oliver W. Backer
Walter Chinn.

Inventors
Samuel H. Petersen
and Frank D. Petersen
by *Wm. Steel Jackson and Son*
Attorneys.

April 16, 1935.

S. H. PETERSEN ET AL
VALVE CONTROLLING DEVICE

1,997,977

Filed Nov. 15, 1932

2 Sheets-Sheet 2

Fig. 2.

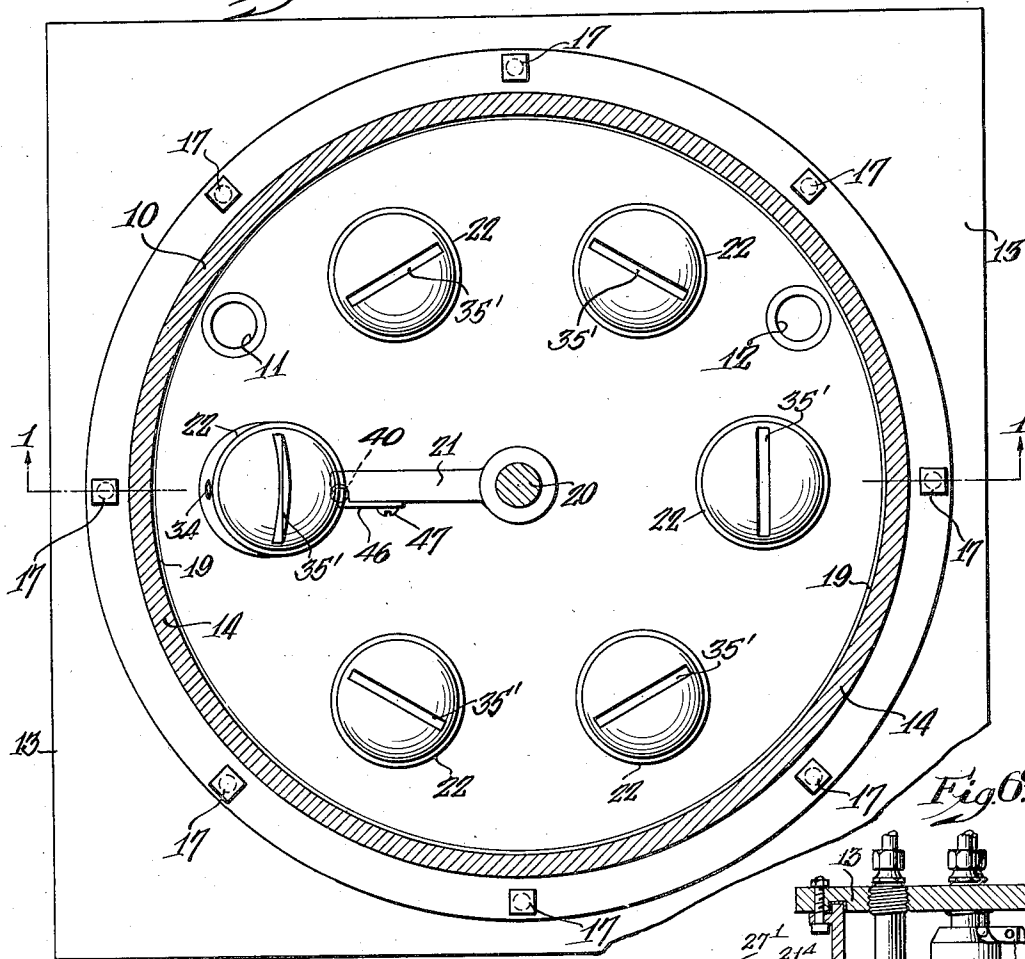
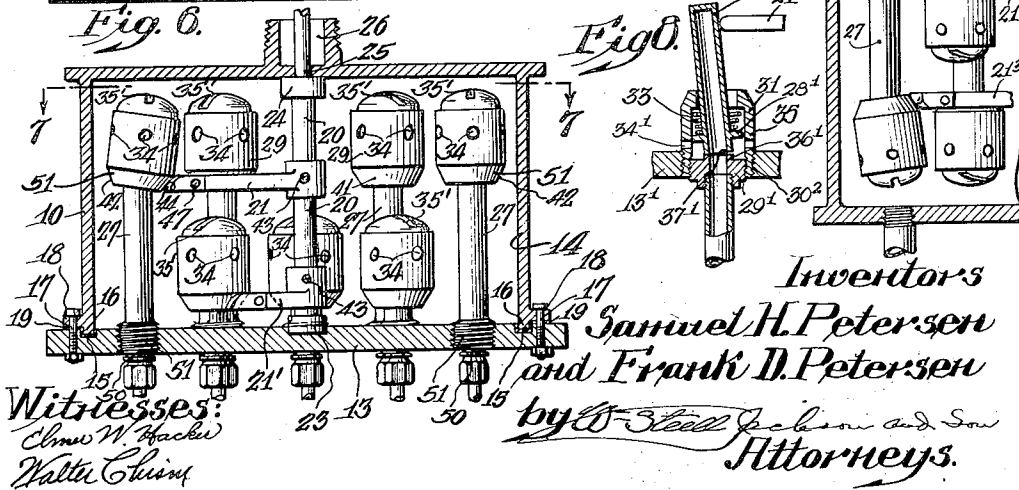


Fig. 6.



Inventors
Samuel H. Petersen
and Frank D. Petersen
by *W. Steel Johnson and Son*
Attorneys.

Witnesses:
Charles W. Backus
Walter Chinn

UNITED STATES PATENT OFFICE

1,997,977

VALVE CONTROLLING DEVICE

Samuel H. Petersen and Frank D. Petersen,
Philadelphia, Pa.

Application November 15, 1932, Serial No. 642,742

5 Claims. (Cl. 137—145)

Our invention relates to mechanism for automatically controlling periodic flows of liquids.

The main purpose of our invention is to provide a device for intermittently supplying discharges of fluid by means of valves provided with rocking or tilting closures, which make circumferentially ringed seals.

A further purpose is to provide a valve with a cap portion that is adapted to rocking movement upon an upwardly directed face of an outlet pipe.

A further purpose is to construct a rocking valve with a compression spring interposed between the valve and an outlet pipe.

A further purpose is to place a rocking valve upon the upper end of an outlet pipe.

A further purpose is to pivot a rocking valve member upon an upper end of a supporting member and to provide a variable size opening by an adjustment of the path of movement of an operating arm attached to a rotating shaft; and permissibly to vary the rates of valve opening by shifting the pivot after the valve starts opening movement.

A further purpose is to construct a supporting device for a rocking valve with an angular surface, upon which a rotary cam arm engages to rock the valve and to supply an adjustment between the valve and the cam arm.

A further purpose is to provide a rotating shaft with a cam arm having a dislodging ball located in the end of the cam arm adapted to break the water seal of the valve.

A further purpose is to provide a rotatable cam with a ball in its engaging surface to break a water seal of a valve and a solid portion on the cam beyond the ball, to hold a rocking valve cap in an open position with respect to an outlet pipe.

A further purpose is to construct a rocking valve with an angular surface, upon which a cam arm is adapted to operate, movement of the arm with respect to the valve changing the amount of rocking movement of the valve with respect to its cooperating discharge portion.

A further purpose is to reduce fluid friction in a rocking valve by the use of a cupped portion of a cap above the discharge opening of a valve.

A further purpose is to provide a plurality of rotary arms to actuate a plurality of rocking valves.

We have elected to show one only with slight modifications of the different forms our invention may assume, selecting a form however that

is practical and efficient in operation and which well illustrates the principles involved.

Referring to the drawings:

Figure 1 is a vertical section of a fluid and pressure distribution and control system illustrating our invention and taken on the line 1—1 of Figure 2.

Figures 1a, 1b and 1c are fragmentary vertical sections similar to a portion of Figure 1, but illustrating modifications.

Figure 2 is a horizontal section taken on the line 2—2 of Figure 1.

Figure 3 is a fragmentary vertical section similar to a portion of Figure 1, but illustrating an adjustment between the rocking member of the valve and the cam arm.

Figure 4 is a horizontal section taken on the line 4—4 of Figure 1.

Figure 5 is a perspective view of a detail of the cam arm.

Figure 6 is a vertical section, similar to Figure 1, but showing a modification and taken on the line 6—6 of Figure 7.

Figure 6a is a fragmentary section corresponding generally to Figure 6 but showing a further modification.

Figure 7 is a horizontal section, similar to Figure 2, but showing a modification and taken on the line 7—7 of Figure 6.

Figure 8 is a fragmentary longitudinal section through a further modified form in which the member corresponding to the cap in the other figures is stationary.

Like numerals indicate like parts in all figures.

Describing in illustration and not in limitation and referring to the drawings:

In the structure shown in Figures 1, 2, 3, 4 and 5, inclusive, we have shown a fluid pressure distribution box 10 which is provided with alternative inlets 11 and 12 located at the bottom of the box 10.

The box 10 includes a base plate 13 and a casing 14 that is an inverted cup forming the sides and top of the box. The upper side of the base plate is annularly grooved at 15 to receive the downwardly directed edge 16 of the casing and the base and casing are held together by bolts 17 at a rim 18 forming an integral part of the casing. The joint between the base and rim may be made tight in any suitable way, as by a gasket 19 in the groove 15.

A shaft 20 is located in the central portion of the box 10 and carries a cam arm 21, which arm is for rocking different outlet valves 22 suc-

cessively to open the valves and allow flow from the box interior. The shaft turns in bearings 23 and 24 respectively upon the base plate and upon the casing.

5 The upper portion of the shaft is shown reduced as at 25 to eliminate vertical play of the shaft and any leakage upwardly around the shaft is prevented by a suitable gland 26.

10 Preferably the inlet and outlet valves and connections are all in or supported by the base plate, in that this permits an easy opening and closure of the box by removal and replacement of the casing without disturbing any of the valves or any of the piping to and from the box.

15 The outlet valves 22 are desirably arranged in one or more preferably horizontal rows arcuate with respect to the shaft axis, all of the valves of any row being thus at substantially the same distance from the shaft axis.

20 We have provided each valve structure 22 with an outlet pipe 27 threaded on its lower end to make connection at 28 with the base plate 13.

The outlet pipe 27 extends upwardly from the base plate into the interior of the box 14.

25 Near the upper end of the outlet pipe 27 we provide a stop 23, conveniently formed as an outwardly extending flange. The stop 23 positions centrally a valve carrying head 29 having a depending guide or guard 30 shown in the figures as a cylindrical apertured wall. The guard surrounds the outlet and carries an inwardly extending abutment 31 to form a seat 32 for a coiled spring 33 positioned between the stop 28 and the bottom seat 32. The guard is apertured at 34.

35 The head 29 is in the form of a plug threaded at 35 into the wall and slotted at 35' for screw driver insertion. The head presents a downwardly projecting circular ring valve 36 which rests upon the upper circumferential edge 37 of the outlet pipe and closes the outlet when the head is not tilted.

40 The head, guard and abutment together form a unit, which, in the form shown, is aptly called a cap. Notwithstanding that the invention may appear in other forms, obviously not aptly so called, for convenience this language is used. The cap illustrated is formed hollow at 38 by boring at 39 and counterboring at 40. This counterboring 40 provides a seat at 31 against which the tension spring 32 engages at its lower end.

50 At its lower outside surface 41 the guard may be of uniform diameter if no adjustment by variation of operating arm height be desired, but is preferably tapered at 42 to permit such an adjustment of valve throw by variation of height of an engaging surface for the cam arm 21.

55 We attach great importance to the universal character of our rocking valve. Many valves which might otherwise be suited to use by us are rendered less valuable, or even made useless because they must be set in one angular position with respect to an operating member, or in one of a few possible angular positions.

60 With our rocking valve, on the other hand, it makes no difference how the outlet pipe 27 may be turned, for adjustment or otherwise, or how the cap may be turned with respect to the outlet pipe. Obviously, the cap will move angularly with respect to the outlet pipe 27 as it is free to turn with respect to the outlet pipe, but, as the cam engaging surface 42 of the guard 30 extends entirely around the cap, it is immaterial how the cap or the outlet pipe may be turned. This is a distinct advantage, not only 65 in effecting adjustment of the valves, but also

in assembling the valves initially or after they have been removed for cleaning.

5 The arm 21 is fastened to the shaft 20 by a set screw 43 or any suitable preferably adjustable fastening device. A ball 44 is inserted into a recess 45 at the forward end of the arm and is held in place by a cover plate 46 fastened to the arm by a screw 47. Even if not free to turn, the ball is of advantage in presenting a hardened surface, but has not only this advantage but 10 that of reducing friction while shifting the valve to open position, when, as preferred, the ball is free to turn in the socket formed for it.

15 Water or mixed fluids enter the box 10 under pressure through inlet pipes 11 and 12 to surround the valves in their closed positions.

20 The rotary motion of the shaft 20 which carries the cam arm 21 causes the cam to come in contact with the tapered portion of each valve unit in turn, to dislodge the unit from its valving seat upon the outlet pipe so that the fluid entering the ports in the unit can pass through the outlet pipe. During the flow of the fluid into the outlet it passes through a recess 48 in the plug, reducing fluid friction.

25 When the cam arm engages the tapered portion of the cap or rocking member, we have found that the ball 44 provides a desirable initial engaging member since it reduces friction to a minimum and that the solid portion 49 of the arm 21 provides enough dwell to allow the required amount of fluid to pass through the outlet pipe for the desired purpose.

30 It will be noted that adjustment of the extent of rocking motion of the cap can be made in two different ways. In the first instance the outlet pipe can be raised or lowered with respect to the cam arm, so that the arm will engage a higher or lower portion of the angular surface of the cap, thereby opening the valve more or less, according to the amount of flow desired. It will also be noted that when this form of adjustment is used, individual valves may be set to discharge different amounts of fluid from the various outlet pipes.

35 When it is desired to discharge the same amount of fluid through each valve, the arm can be adjustably fastened to the rotary shaft at different heights with respect to the caps.

40 Outlet fittings 50 are threaded into the bottom at 51 of each outlet pipe 27. The ultimate points of use of the measured fluid will be reached by means of delivery pipes 51.

45 It will be apparent that by pivoting of the rocking member of the valve upon a stationary portion, the wear upon the cooperating parts will be reduced to a minimum. At the same time, we have found in practice that this valve arrangement has practically eliminated chattering of the valve parts, due in part at least to the spring tension between the cap and the outlet pipe.

50 By interposing the spring 32 between the stop 28 of the outlet pipe and the abutment 31 of the cap 29, we have produced a very desirable construction by which the valve can be returned accurately to its closed position when the cam arm has passed.

55 Movement of the rocking member of the valve is limited by the walls of the counterbore 40. When the rocking member is moved, the counterbore walls 40 will abut the wall of the discharge pipe 27, limiting the movement of the rocking member.

60 In the forms shown in Figures 1a, 1b and 1c, we have illustrated variations in the valve structure.

In Figure 1a we have eliminated the downwardly projecting ring valve 36 and have shown the inner surface 52 of the plug acting as the valve closure. We have also eliminated the valve ports in the guard walls and have placed them in the plug of the cap as shown at 53. The device of Figure 1a can desirably eliminate the annular spacing 36' about and above the portion acting as the ring valve, as the placing of the outlets in the plug as shown in this figure will allow the fluid to change direction in the chamber 54 of the valve without causing friction.

Figures 1b and 1c illustrate a modification in which the cap rocks about an edge separate from the top of the outlet pipe. In this form we provide upwardly extending pins or projections 55 spaced outwardly from the outlet pipe and preferably integral with the flange 28 to allow for greater valve opening space into the outlet pipe. It will be apparent that the point of rocking does not necessarily have to be directly upon the outlet pipe, but can be at a point some distance away from the outlet pipe, but preferably attached to the pipe.

Figure 1c shows the valve of Figure 1b in open position.

Rotary movement of the cam arm 21 intermittently dislodges each of the rocking valve members causing a circumferentially ringed seat to be broken at the upper end of each outlet pipe.

Obviously, fluids of different characters can be supplied to the fluid pressure box through the supply pipes or the same fluid can be supplied to the box through all supply pipes. While our invention is frequently used for distributing water, it may be employed to distribute other fluids, either containing water or entirely free from water. Our invention will also distribute fluid pressure.

In the modification of Figures 6 and 7 we have shown two rows 56 and 57 of valves arranged circumferentially of the axis of the box 10. The inner row 57 of valves is operated by an additional cam arm 21'. In all other respects the construction of Figures 6 and 7 is the same as Figures 1 to 5 inclusive.

The number of outlets will depend on the number of points to which it may be deemed desirable to dispense fluid or fluid pressure from the box interior. The pressure within the box is transmitted through the valved connections, subject to the inevitable loss in pressure.

Usually the distribution of fluid or fluid pressure must be substantially the same at the different points of use and, for this reason, the valve outlet units in one or more rows about the shaft are usually preferably alike in each row and uniformly spaced along each row. Desired differences in discharge or pressure may be accommodated by adjustment of the valves, by enlarged sizes of valve openings or increased amount of displacement of the rocking member from the outlet pipe, so that the openings in the outlet pipes may be of variant sizes and may remain open for variant lengths of time.

Variation in the size of outlet or the extent of valve movement may be desirable not only where differences in quantity of liquid are to be taken care of, but where, because of increased frictional retardation, as by longer distance of liquid transmission, a larger opening may be required to secure the same delivery at the longer distance as is secured at a shorter distance by the small opening or shorter time of opening.

The arrangement of outlet pipes and valve

closure rocking members in circular position at different heights as shown in Figures 6 and 7, is convenient though not essential and permits the use of a box of comparatively small diameter to accommodate a large number of outlets, by merely making the box a little deeper than would otherwise be required. The outlet pipes and rocking members of the two rows will be exactly alike except that the outlet pipes of the higher row will be longer than the outlet pipes of the lower row.

Any slight difference in time of opening due to the slightly larger radius of the arm operating the higher row of valves or rocking members may be equalized by a difference in height adjustment of rocking members and their supports with respect to the operating arms, or by changing the circumferential extents of the operating parts of the arms acting upon the valves at different radii so that each circumferential extent shall span the same angular distance of arm travel.

Figure 6a corresponds generally with Figure 6 with the difference, however, that the structure is upside down as compared with Figure 6, the piping 27 passing through a top plate 13 corresponding to the bottom plate 13 of Figure 6 and being threaded into this plate as in the Figure 6 form.

The caps having heads 29 may be of the same character as the caps in the other form in all particulars. However, in this case the springs 33 (not shown but existing within the heads) should be slightly stronger than the springs within the form shown in Figure 1, for example, because here they have to support the weight of the heads and to bring their valves into engagement with the valve seats on the tubes with pressure of the same order as that existing in the form of Figure 1.

Since the ends of the arms 21², 21³ engage now with downwardly and outwardly sloping surfaces instead of with upwardly and outwardly sloping surfaces, they are oppositely sloped from the slope in Figure 1. The same end construction including the balls and cover plates 46 are shown.

In the form of Figure 8 a different type of reversal is shown.

Here guards 30' are outwardly threaded at 30² into a base plate 13' and carry annular valve seats 29 threaded within the guards as the heads 29 are threaded into them but apertured and connected with delivery piping. The ring valve 36' cooperates with circumferential edges 37' of preferably tubular closure members 27' which are closed at any point along their length, here shown as closed at the ends. It will be recognized that the tubular construction is desirable for convenience of manufacture chiefly, though an interior opening above the ring portion has advantage in improvement of fluid flow.

The member 27' carries a shoulder 28' between which and the shoulder 31 lies spring 33. The arm 21⁴ pushes the valve member 27' and will push it to different extents according to the height at which the valve member is engaged. As a result, adjustment of height of the arm 21⁴ may be used to adjust not only the extent of opening of the valve but the length of time during which the valve member will be engaged by the arm.

Though one only of these valve constructions is shown in Figure 8, it will be evident that they are suitable for arrangement in circumferential settings as in the other figures for engagement

of a number of them by the same arm and for location in circularly disposed rows at different distances for engagement by different arms as in Figure 6.

- 5 In view of our invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain part or all of the benefits of our invention without copying
10 the structure shown, and we, therefore, claim all such in so far as they fall within the reasonable spirit and scope of our invention.

Having thus described our invention, what we claim as new and desire to secure by Letters
15 Patent is:

1. In a fluid valve, a stationary pipe, a valve seat on one end of the pipe, a valve cap covering the end of the pipe and surrounding the pipe in spaced relation to the pipe for a distance from
20 the end of the pipe and free to rock with respect to the pipe, a hollow valve seat on the inside of the cap cooperating with the valve seat on the end of the pipe and spring means in the space between the cap and the pipe urging the valve
25 seats toward the position of valve closure and a stationary support for the pipe allowing the end of one valve seat to be tilted on the pipe end.

2. In a fluid valve, a pipe, a valve seat at one end of the pipe, a valve cap covering the end of the pipe, surrounding the pipe in spaced relation to the pipe for a distance from the end of the pipe and free to rock with respect to the pipe, a hollow valve seat on the inside of the cap cooperating with the valve seat on the end of the
30 pipe, spring means in the space between the cap and the pipe urging the cap toward the position of valve seating and a tapered surface extending entirely around the cap at a distance from the end of the pipe, whereby the valve may be
35 rocked in any angular position by contact with the tapered surface.

3. In a fluid valve, a pipe, a valve seat on the end of the pipe, a tilting valve cap covering the

end of the pipe and surrounding the pipe in spaced relation to the pipe for a distance from the end of the pipe and free to rock with respect to the pipe, a hollow valve seat on the inside of the cap cooperating with the valve seat on the pipe, a spring in the space between the cap and the pipe urging the cap toward seating position and a stationary support for the pipe, to hold the pipe in a predetermined position with respect to the tilting valve cap. 5 10

4. In a fluid valve, a pipe, an annular valve seat on one end of the pipe, a rocking valve cap covering the end of the pipe and surrounding the pipe in spaced relation to the pipe for a distance from the end of the pipe, a valve seat on the inside of the cap cooperating with the valve seat on the end of the pipe, a port through the cap for admitting fluid to the space inside the cap and outside of the pipe, an abutment on the end of the pipe, an abutment on the inside of the cap and a spring occupying the space between the cap and the pipe and pressing its opposite ends against the abutments. 15 20

5. In a fluid valve, a stationary vertically positioned pipe, an annular valve seat on the upper end of the pipe, a rocking valve cap covering the pipe in spaced relation to the pipe for some distance from the upper end of the pipe, a valve seat on the inside of the cap cooperating with the valve seat on the end of the pipe and the cap having walls forming a port through the cap for admitting fluid into the space inside the cap and outside the pipe, a circular flange on the pipe near the upper end of the pipe, a coiled spring occupying the space between the inside upper end of the cap and the flange on the pipe, tending to press the opposite ends of the spring against the interior of the cap at one end and the circular flange at the other end and the cap including a threaded plug in the cap for assembling the cap and spring on the pipe. 25 30 35 40

SAMUEL H. PETERSEN.
FRANK D. PETERSEN.