(No Model.) 2 Sheets—Sheet 1.

T. O. PERRY.

REVOLVING VALVE.

No. 387,008. Patented July 31, 1888.

Fig. 1.

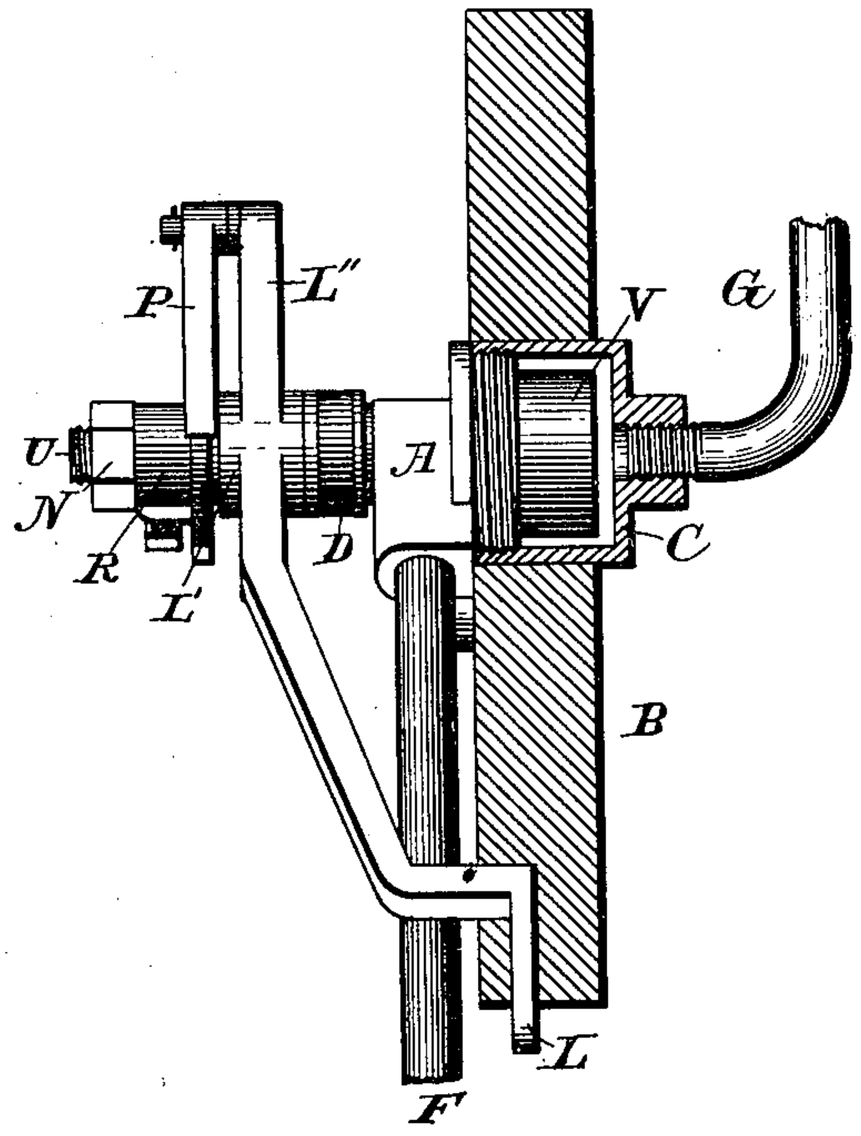


Fig. 2.

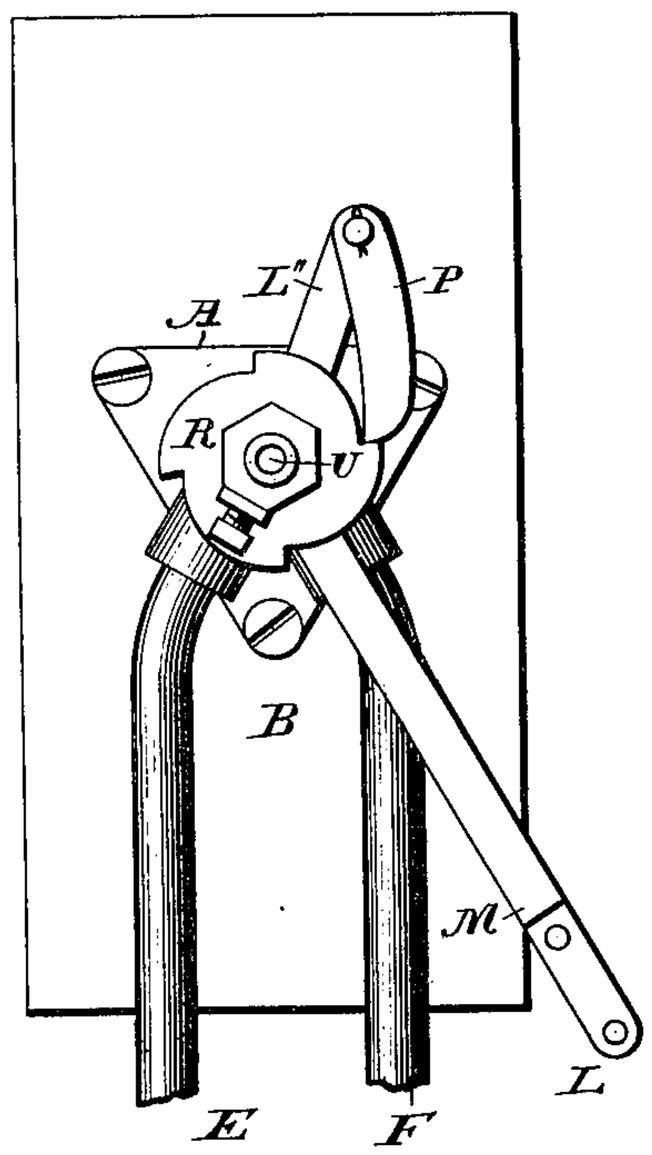


Fig. 3.

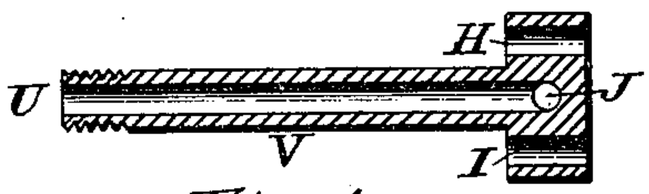


Fig. 4.

Fig. 5.

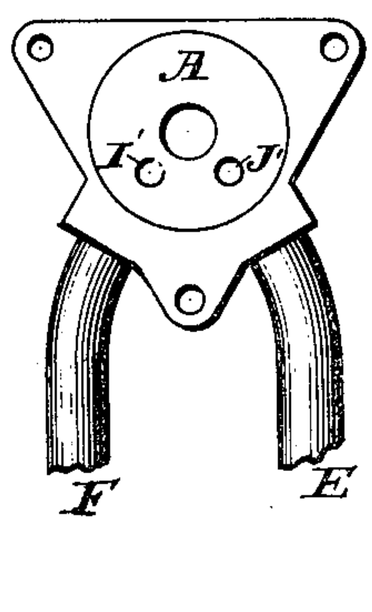
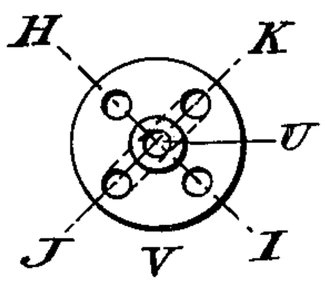


Fig. 6.



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(No Model.) 2 Sheets—Sheet 2.

T. O. PERRY.

REVOLVING VALVE.

No. 387,008. Patented July 31, 1888.

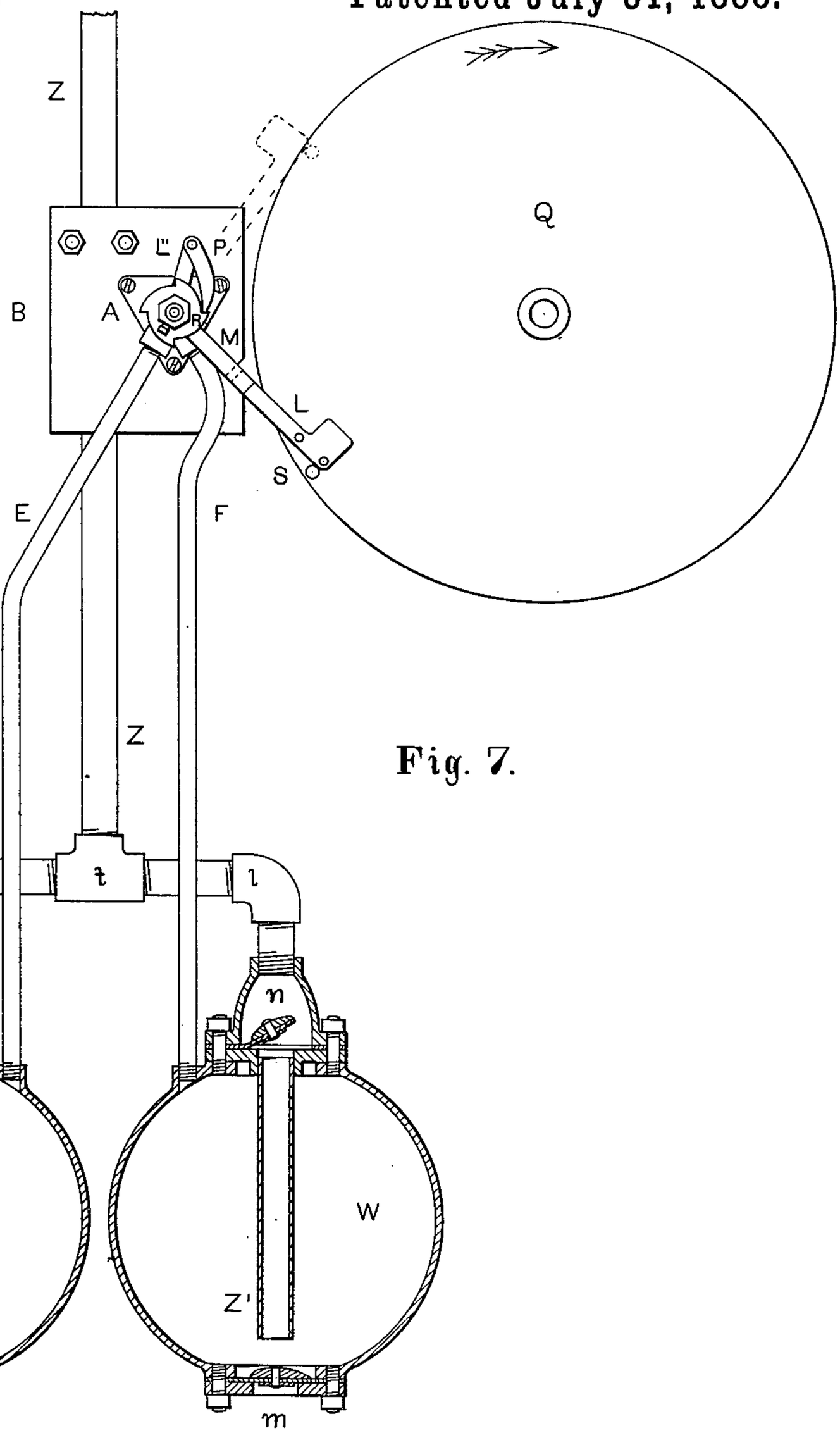

Fig. 7.

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INVENTOR:
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UNITED STATES PATENT OFFICE.

THOMAS O. PERRY, OF CHICAGO, ILLINOIS.

REVOLVING VALVE.

SPECIFICATION forming part of Letters Patent No. 387,008, dated July 31, 1888.

Application filed November 4, 1885. Serial No. 181,806. (No model.)

To all whom it may concern:

Be it known that I, THOMAS O. PERRY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Revolving Valve, of which the following is a specification.

The objects of my invention are to provide for delivering a liquid or gaseous current flowing from a first aperture, pipe, or reservoir alternately and at intervals into second and third apertures or pipes, and also at the same time to provide for establishing successive alternate communications between said second and third apertures and a fourth aperture, so that while the current is allowed to flow from the first aperture into the second another current may at the same time flow from the third aperture into the fourth aperture, or vice versa. When first and third apertures are made to communicate, communication is at the same time established between second and fourth apertures.

The main feature of the mechanism used for accomplishing these objects is a revolving valve, to which are imparted at intervals partial rotations by means of a pawl and ratchet-wheel, or otherwise, each partial rotation reversing the relations of second and third apertures to first and fourth apertures, as indicated above.

The details of my invention are fully illustrated in the annexed drawings, in which—

Figure 1 is a side elevation of valve and connections, partially in section. Fig. 2 is a rear elevation of the same. Figs. 3 and 4 are longitudinal sections of the valve, taken, respectively, in planes through consecutive openings. Fig. 5 is a front elevation of the valve-seat and connecting-pipes. Fig. 6 is a rear elevation of the valve. Fig. 7 illustrates a special application of the revolving valve as used with a pneumatic water-elevator.

Like letters indicate the same parts in the various figures.

The valve V is in the form of a disk provided with a hollow stem, U, which forms the axle upon which it revolves. The disk of the valve is perforated by a series of holes arranged in a circle concentric with the hollow stem and at equal intervals. Alternate holes, H I, pass directly through the disk, as shown in Fig. 3, and alternate holes, J K, communicate with the hollow stem U, as shown in Fig. 4. Four holes are shown in the drawings; but they might be two, four, six, eight, or any even number. If but two holes are used, one will pass through the disk and the other will communicate with the hollow stem, and they will be on opposite sides of the axis. The valve-seat A has a cylindrical hole through its center, through which the stem of the valve passes loosely, so as to turn freely therein. It also has the two apertures I′ and J′, which communicate with and form the terminals of the pipes F and E, respectively.

The apertures I′ and J′ in the valve-seat are at the same distance from the axis of the valve and at the same distance apart as the holes I and J, or any two consecutive holes in the valve. The adjoining faces of the valve and valve-seat are ground together, so as to form close contact throughout.

The cylindrical cap C is screwed onto the outside of the valve-seat, and forms a chamber inclosing the disk of the valve. It also forms the terminal of the pipe G, connecting therewith.

The ratchet-wheel R is secured to the valve-stem U in the rear of the valve-seat, and has at its periphery notches or teeth corresponding in number to the holes H I J K in the valve. The pawl P is pivoted to one end of the short arm L″ of the lever L L′ L″, which is fulcrumed upon or about the valve-stem U, so as to turn freely and independently about the axis of the valve. The arm L′ may be conveniently fulcrumed upon the ratchet-wheel hub, passing a little more than through the arm and resting against the back of the valve-seat. In this way the adjoining faces of the valve and valve-seat may be held against each other; also, a spring or elastic ring, D, placed between two washers, may be interposed between the ratchet-wheel hub and the back of the valve-seat; but this is not essential, nor is the pivoting of the lever upon the ratchet-wheel hub necessary. It is only necessary to so pivot the lever about the axis of the valve that the pawl will properly engage the teeth of the ratchet-wheel.

The nut N on the end of the valve-stem is convenient for adjusting the tension of the

spring or elastic ring D previous to securing the ratchet-wheel to the valve-stem by means of a set-screw or otherwise.

The whole structure is supported upon a piece of wood or other material, B, through which a hole is cut to receive the cap C, and to which the valve seat is secured by means of screws or bolts. The downward movement of the arm L of the lever L L′ L″ should be limited by a stop, M, on the support B, and the teeth of the ratchet-wheel should be so placed with reference to the holes in the face of the valve that some consecutive two of the holes in the valve shall be brought in conjunction with the two aperture I′ J′ whenever the turning of the valve is arrested by the arm L striking against the stop M.

The operation of the valve is as follows: When any two consecutive holes of the valve, as I J, stand opposite to the two apertures I′ J′ in the valve-seat, communication is established through one of the holes, I, between the pipe G and the pipe F, and also through the hole J between the pipe E and the hollow stem U, which passages I have previously called, respectively, first, second, third, and fourth apertures or pipes. Now, if the valve be revolved in either direction about its axis one-fourth of a revolution, communication will be established between the pipes G and E and between the pipe F and the hollow stem U, as then the holes I and K, or else J and H, according as the direction of revolution is right or left, will stand opposite the apertures I′ and J′, thus reversing the relations of the pipe G and the hollow stem U to the pipes E and F. Another quarter-turn of the valve in the same direction as before will re-establish communication between the pipes G and F and between E and U through the holes H and K, which now stand opposite I and J, and so, by virtue of the reversed relations of any two consecutive pairs of the holes I J K H with reference to the apertures I′ and J′, each quarter-turn of the valve will change communication of the pipe G with one of the pipes E F to communication with the other, and at the same time will similarly reverse communication of F or E with U. Thus fluid may flow from G into F, and at the same time another current may flow from E into U or from G into E and from F into U, these relations being reversed by each quarter-turn of the valve. The desired change of communication between passages is effected either by turning the valve continually in the same direction or by reversing the direction of turning at will. It is only required that the valve be turned either way through one-quarter of a revolution.

This description applies to the valve, as shown in the drawings, with four holes. If two or six or eight or any other even number of holes are used, the same description would apply, except that the fraction of a revolution through which the valve should be successively turned would correspond to the number of holes in the disk.

The use of four holes or more in the face of the valve is preferable to the use of but two, as the amount of valve-motion is thus less in a given time, and the wear on the valve and valve-seat is consequently diminished by increasing the number of these holes; also, four or more holes in the valve are better adapted than two to use with a pawl and ratchet-wheel.

The valve may be turned by grasping with the hand the valve-stem U, which protrudes at the rear of the valve-seat; but, by means of the ratchet-wheel R, pawl P, and lever L L′ L″, to which a reciprocating motion may be given either by hand or by means of suitable connection with a motor, the valve can be conveniently made to turn at intervals as needed.

By making the arm L sufficiently heavy the valve may be operated by lifting the end of the arm and letting it drop of its own weight. There would be an advantage in this method, in that the valve would turn quickly when needed, though the arm should be lifted slowly, as it might be, for instance, by a slowly-revolving wheel, Q, having one or more pins or spurs, S, at its periphery, over which the arm end L might catch, be lifted the required distance, and slip off at intervals. The upward or backward movement of the arm need not be exactly limited, but should be sufficient to let the pawl catch over one succeeding notch of the ratchet-wheel at each lift, and not over two notches. This valve was originally designed for conveying compressed air to and from two chambers of a water-elevator, the pipes E and F connecting each with a separate chamber, to which it was desired to admit air alternately and from which the air needed to escape at alternate intervals, somewhat after the manner of the passage of steam to and from the opposite ends of an ordinary steam-engine cylinder. The pipe G conveyed air to the valve from an air-compressor, and while the current flowed from G through one of the pipes E or F to the chamber connected thereto, air could escape from the chamber connected with the other of the pipes F or E through the hollow stem U, and each partial revolution of the valve, as previously stated, reversed the direction of the currents in the pipes E and F.

The chambers W of the water-elevator (illustrated in Fig. 7) are supposed to be submerged in water and are similar to those ordinarily used where water is elevated by means of compressed air. These chambers fill with water through the valves *m* in the bottom of each, and the pressure of the air admitted at the top through the pipes E F drives the water out through the pipes Z′, which connect in a T with the water-pipe Z above. The check-valves *n* prevent water from flowing back into the chambers. The water is driven from one chamber at a time, and after one is emptied of water the turning of the valve V through a quarter-revolution, as already described, allows the air to escape from the emptied chamber, so that it may refill while water is being driven from the other chamber.

The wheel Q may be driven by a belt or other known mechanism, and should revolve in the direction indicated by the arrow at such a rate that the pin S will lift and release the arm L whenever one of the chambers W is emptied.

The support B, as well as the bearing for the wheel Q, may be attached to the pipe Z, or to any convenient object.

I do not wish to confine my invention to the particular use illustrated in Fig. 7, as it can be applied to other uses.

What I claim as my invention is—

1. A revolving valve consisting of a disk provided with a hollow stem or opening at the center, and having an even number of holes arranged equidistantly in a circle concentric with the valve-axis, alternate holes communicating with the hollow stem or center, and alternate holes passing through the disk, in combination with a valve-seat having two apertures so placed that they may come opposite to and match any two consecutive holes in the valve, substantially as and for the purpose herein described and illustrated.

2. A revolving valve consisting of a disk provided with a hollow stem or opening at its center, and having an even number of holes arranged equidistantly in a circle concentric with the valve-axis, alternate holes communicating with the hollow stem or center, and alternate holes passing through the disk, in combination with a valve-seat having two apertures so placed that they may come opposite to and match any two consecutive holes in the valve, and a cap attached to the valve-seat so as to inclose the disk of the valve and form a convenient pipe terminal or receptacle for fluid flowing into the valve, substantially as herein set forth.

3. In combination with a revolving valve consisting of a disk provided with a hollow stem or opening at its center, and having an even number of holes arranged equidistantly in a circle concentric with the valve-axis, alternate holes communicating with the hollow stem or center and alternate holes passing through the disk, and a valve-seat having two apertures so placed that they may come opposite to and match any two consecutive holes in the valve, a ratchet-wheel having teeth corresponding in number with the holes in the face of the valve secured to the valve-stem, and a pawl pivoted to an oscillating arm so as to engage successively the teeth of the ratchet-wheel, and thus give to the valve a succession of partial revolutions, substantially as and for the purpose herein specified.

4. The combination of the revolving valve V, having ratchet-wheel R rigidly attached thereto or forming a part thereof, with the pawl P, lever L L′ L″, and stop M, for the purpose of rotating the valve always in the same direction about its axis and arresting each successive movement, substantially as herein specified.

5. The revolving valve V, having ratchet-wheel R rigidly attached thereto, in combination with the pawl P, weighted lever L L′ L″, stop M, and wheel Q, having spur or pin S, for the purpose of imparting to the valve at intervals limited partial revolutions always in the same direction about its axis, substantially as herein set forth.

6. The valve-seat A, provided with cap C, in combination with the valve V, having equidistant holes H I J K, and hollow stem U, the ratchet-wheel R, attached to or forming part of the hollow stem, the pawl P, and oscillating lever L L′ L″, substantially as and for the purpose specified.

7. The combination embracing the valve-seat A, cap C, valve V, ratchet-wheel R, pawl P, lever L L′ L″, and stop M, as and for the purpose herein set forth.

8. The combination embracing the valve-seat A, cap C, valve V, with stem U, ratchet-wheel R, pawl P, lever L L′ L″, spring D, nut N, support B, and stop M, as herein set forth.

9. The combination embracing the valve-seat A, valve V, ratchet-wheel R, pawl P, lever L L′ L″, with heavy or weighted arm L, stop M, and wheel Q, with spur or pin S, substantially as herein set forth.

10. The combination embracing the valve-seat A, having cap C, valve V, having hollow stem U, ratchet-wheel R, pawl P, lever L L′ L″, with heavy or weighted arm L, support B, stop M, and wheel Q, having spur or pin S, substantially as herein set forth.

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Witnesses:
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I. K. WEST.