(No Model.)

H. WIEDLING.

DIFFERENTIAL VALVE.

No. 347,856. Patented Aug. 24, 1886.

Fig. 1.

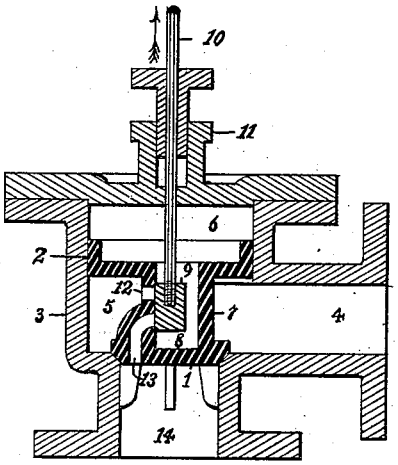


Fig. 2.

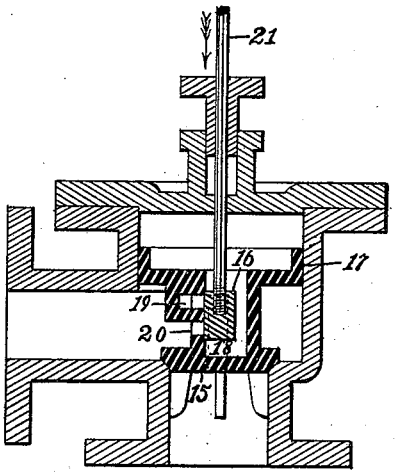


Fig. 3.

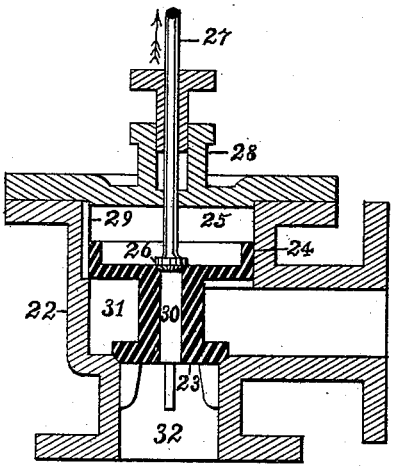
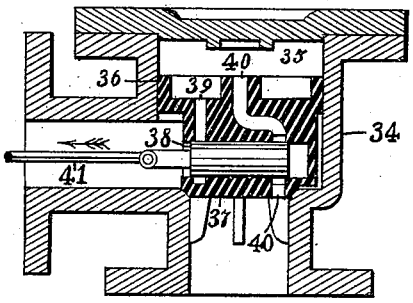


Fig. 4.



Hermann Wiedling
INVENTOR

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UNITED STATES PATENT OFFICE.

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DIFFERENTIAL VALVE.

SPECIFICATION forming part of Letters Patent No. 347,856, dated August 24, 1886.

Application filed September 10, 1885. Serial No. 176,660. (No model.)

To all whom it may concern:

Be it known that I, HERMANN WIEDLING, a citizen of the Empire of Germany, residing at the city, county, and State of New York, have invented certain new and useful Improvements in Differential Valves, of which the following is a specification.

My invention relates to disk-valves which are operated by pistons connected thereto and which are moved by the difference of pressure thereon, produced through secondary valves in connection with said piston.

In the drawings, Figure 1 is a longitudinal sectional view of my invention, and Figs. 2, 3, and 4 are longitudinal sectional views of various modifications thereof.

Fig. 1 shows the disk-valve 1, which is connected with the piston 2, situated in the valve-casing 3.

4 is the inlet-pipe, which opens into the space 5 between the disk-valve 1 and its piston 2. The latter is movable in the piston-chamber 6, and is connected by means of the neck 7 with the disk-valve 1.

Within the neck 7 is the hollow valve-chamber 8, wherein is the slide-valve 9, which can be moved by the rod 10, passing out through a stuffing-box, 11.

12 is a channel from the space 5 into the space 8, and 13 is a channel which serves as an outlet from space or chamber 8 into outlet-pipe 14.

In the figures the valve 9 is shown in a central position, where it covers both the channels 12 and 13. When it is moved by means of the valve-rod 10 in the direction of the arrow, it will open the channel 13 and allow the fluid to escape from chamber 8 and space 6, whereby the pressure above the piston 2 will be so much reduced that the piston 2 will be lifted by the full pressure below it in space 5, thereby opening the valve 1. If the pressure in space 6 is reduced more than is necessary to lift the piston 2 and valve 1, they will be moved up, while the secondary valve 9 remains stationary until the channel 12 will pass above the top of valve 9, when pressure will be admitted through the channel 12 into the chambers 8 and 6 until the pressure therein is raised to a point where the piston 2 and valve 1 will be kept balanced above the seat of the valve 1, the distance being dependent upon the stroke of the secondary valve 9. If, when the valve 1 is in this position, the valve 9, by means of the valve-rod 10, is moved in a direction opposite to that of the arrow, the channel 12 will be thereby opened, and the full pressure thereby admitted into the chambers 8 and 6, which will drive the valve 1 to its seat. In the construction shown in this figure the main valve 1 will be always moved into the direction of the movement of its secondary valve 9—that is, if the movement of the valve 9 be up, the valve 1 will be raised also, whereas if the movement of the valve 9 is downward the valve 1 will be closed.

The construction shown in Fig. 2 is so far different from that just explained in Fig. 1 that the motion of the main valve 15 is opposite to that of the secondary valve 16. To obtain this result, the piston 17 has again a valve-chamber, 18, in which is the secondary valve 16; but the inlet-channel 20 is below the outlet-channel 19, so that the valve 16 must be moved in the direction of the arrow, which is opposite to that shown in Fig. 1, to open the outlet-channel 19 and thereby the valve 15. If, by means of the rod 21, the valve 16 is moved so as to open the channel 19 so much that the difference of pressure will move the piston 17, and with it the valve 15, the channel 19 will be opened still more by this latter movement and the difference of pressure on the piston 17 increased, so that it will give the main valve its full opening at once. Likewise, if the valve 16 is moved in the opposite direction to that of the arrow, the outlet-channel 19 will be closed and the inlet-channel 20 opened, and thereby the pressure on top of the piston 17 increased, and the piston 17, with the main valve 15, will be moved so as to close the latter, by which motion the opening of the inlet-channel 20 will be increased and completed, so that the main valve 15, by means of the increasing pressure, will be closed rapidly and at once.

Fig. 3 represents a section of the valve-chamber 22, with the main valve 23 and its piston 24, which slides in the piston-chamber 25. The piston 24 is connected with the valve 23 by a neck, through which is channel 30. This channel 30 may be closed by means of the secondary disk-valve 26, which is moved by the valve-rod 27 passing through the stuffing-box 28.

In the side of the chamber 25 is a recess, 29, the function of which will be hereinafter more particularly described.

When the parts are in the position shown in Fig. 3, if the disk-valve 26 is raised, the fluid in the space 25 will flow out through the channel 30, thus lowering the pressure in space 25, when the piston 24 will be raised by the pressure in the chamber 31, thus opening the valve 23. As the piston 24 rises its lower edge will pass above the lower edge of the recess 29, which will allow the fluid to escape from the chamber 31 through the recess 29 into the space 25. The channel 29 is much smaller than the channel 30, and hence the speed of the fluid which moves through said channel 29 into space 25 is much greater in said channel than the speed of the fluid which flows through the channel 30. Hence the difference between the pressure in space 31 and that in 25 is much greater than the difference between the pressure in space 25 and that in the outlet-pipe 32, so that the piston 24 will continue to be lifted, and if, while being so lifted, the motion of the valve 26 is stopped, when the piston 24 has advanced to a point where the channel 30 is partially closed by the valve 26, it will remain stationary when the opening through the channel 30 has been reduced to such dimensions that the difference between the pressure in 31 and that in 25 will only exceed the difference in pressure between 25 and 32 sufficiently to hold the piston 24 and valve 23 in place. If, then, the rod 27 is moved downward in the opposite direction to the arrow, the valve 26 will be closed, or nearly so, and the full pressure from chamber 31, being admitted into chamber 25 through channel 29, will drive down the piston 24 and valve 23 with a speed dependent on the speed of the rod 27 of secondary valve 26, for it is evident that the difference in pressure between space 31 and that of space 25 would be increased if the piston 24 were to move with a greater speed than that of the secondary valve 26.

In the construction already described the opening or closing of the inlet and outlet channels of the secondary valve is more or less dependent on and governed by the motion of the main piston and valve.

Fig. 4 represents a longitudinal section of a device in which the motion of the main piston and valve does not have any effect on the opening or closing of the secondary valve-channels. In this figure, 34 is the valve-chamber, having the piston-chamber 35 for the piston 36 of the main disk-valve 37. The massive secondary piston-valve 38 closes, when in its central position, both the inlet-channel 39 and the outlet-channel 40 of the secondary valve, and is moved by the rod 41. If the rod 41 is moved in the direction of the arrow, the outlet-channel 40 will be opened and all the liquid under pressure let out of the piston-chamber 35 through the channel 40 as piston 36 rises, whereby the valve 37 will be at once fully opened, and as the movement of the valve 37 is substantially at right angles to the movement of the valve 38, the position of the latter relative to its inlet and outlet channels will not practically be changed by the movement of the valve 37. This remains true when the valve 38 is pushed in so as to close the channel 40 and open the channel 39, when the full force, being at once admitted into the chamber 35, will drive down the piston 36 and at once close the valve 37.

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

1. The combination, with a main valve having ports therein, of a secondary valve adapted to govern said ports, but which secondary valve is not moved by the movement of the main valve, substantially as described.

2. The combination of the casing 3, the main valve 1, provided with ports 12 13 therein, and the secondary valve 9, substantially as and for the purposes described.

3. A valve-casing provided with a valve-seat, a piston-chamber and a channel in the side of the piston-chamber, a disk-valve therein, a piston attached thereto to operate the same, a channel through said piston and disk-valve, and a small secondary disk-valve to control the flow of fluid through said last-named channel, substantially as described.

HERMANN WIEDLING.

Witnesses:
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MIRON WINSLOW.