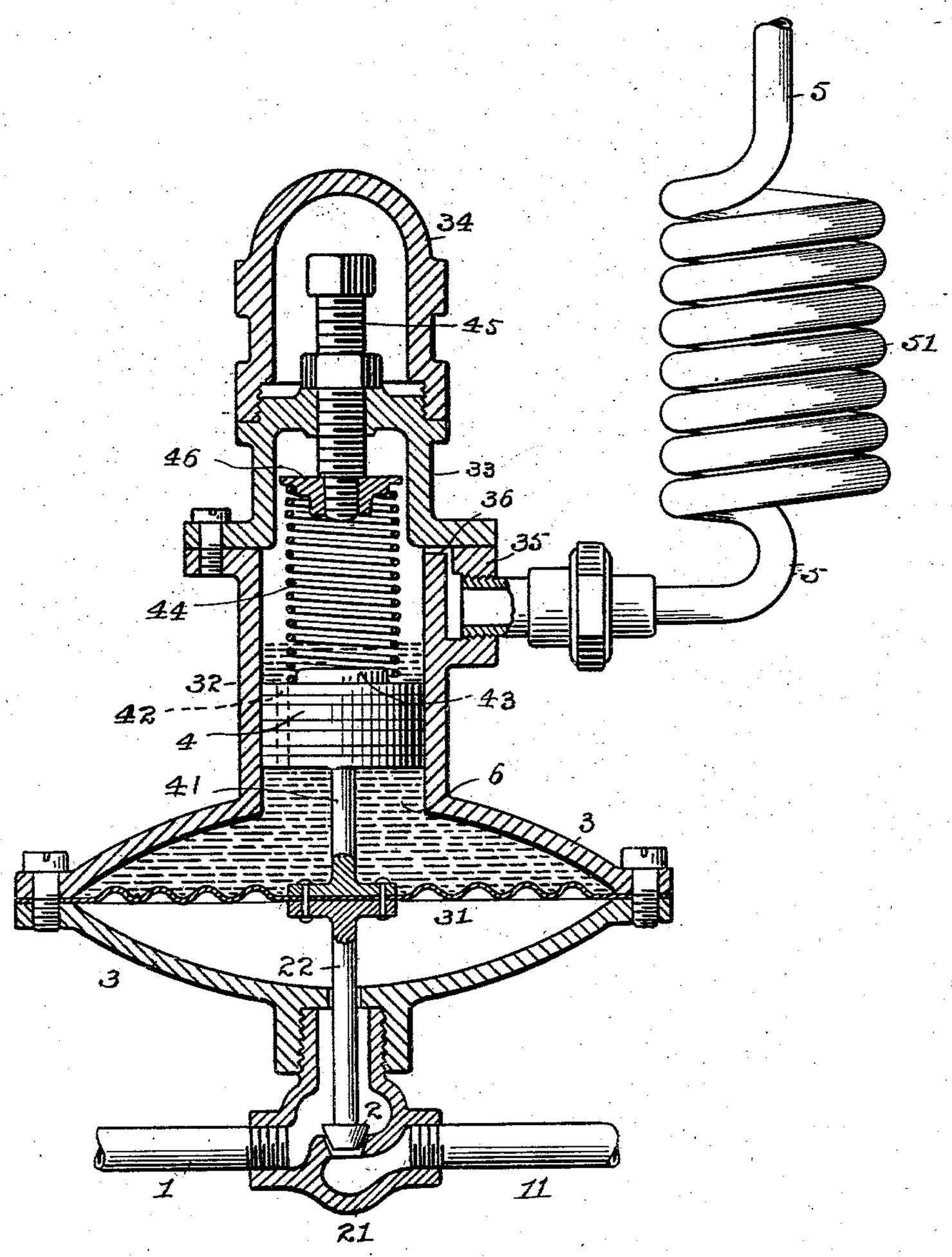
No. 740,704. PATENTED OCT. 6, 1903.

W. F. SINGER.

VALVE.

APPLICATION FILED JAN. 3, 1903.

NO MODEL.



WITNESSES.

H. F. Lamb.

W. S. Glover.

INVENTOR.

William F. Singer

by Geo. L. Cooper atty

No. 740,704. Patented October 6, 1903.

UNITED STATES PATENT OFFICE.

WILLIAM F. SINGER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO GEORGE P. CARROLL, OF BRIDGEPORT, CONNECTICUT.

VALVE.

SPECIFICATION forming part of Letters Patent No. 740,704, dated October 6, 1903.

Application filed January 3, 1903. Serial No. 137,735. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM F. SINGER, a citizen of the United States, residing at No. 1118 South Forty-sixth street, Philadelphia, Pennsylvania, have invented a new and useful Improvement in Valves, of which the following is a specification.

My invention relates to valves in which the flow of a fluid is controlled by variations of pressure on a diaphragm. It is intended to prevent the "hammering" of such valves by rapidly-repeated vibrations of the diaphragm, whereby both valve and diaphragm are quickly destroyed. It also assists in preventing any commingling of the fluids above and below the diaphragm.

The accompanying drawing represents, partly in vertical section, partly in elevation, a valve provided with my device.

Although the valve may be used to control the flow of any desired fluid and may in like manner be operated by any suitable fluid above the diaphragm, I will, for convenience only, describe its application to a refrigerating system. In this case the pipe 1 may be considered as leading from the compressor and the pipe 11 to the expansion-coils. The valve 2, the body 21 of which connects these, may be either an expansion or an "antiflooding" valve. On the valve-body 21 is mounted a diaphragm-chamber 3, containing a diaphragm 31. Rising vertically and axially from the upper shell of the chamber 3 is a cylindric extension 32, in which reciprocates a piston 4, provided with rod 41, aperture 42, and boss 43. Axially secured to the diaphragm 31 are the piston-rod 41 and the stem 22 of the valve 2, around which stem gas freely passes to the lower portion of the diaphragm-chamber 3. A thrust-spring 44 engages the boss 43 and acts to depress the piston 4 and to seat the valve 2. The tension of this spring is regulated by a screw 45, carrying a button 46, and adjustable in a cap 33, which closes the cylinder 32. A bonnet 34 on the cap 33 prevents interference with the screw 45, as well as any leakage of gas. A lateral offset 35 at the upper end of the cylinder 32 is threaded to connect with a tube 5, leading from the expansion-coils. The tube 5 may well be formed with a spiral coil 51. The port 36, connecting the offset 35 with the cylinder 32, is preferably placed as near as possible to the upper end of the cylinder. A body of oil, glycerin, or other liquid 6 fills the upper shell of the diaphragm-chamber 3 to a point preferably somewhat above that reached by the piston 4 at its highest.

The operation of my device will be readily understood from an inspection of the drawing. It is of course clear that the condenser-pressure, which acts against the lower side of the diaphragm 31, is much greater than the suction-pressure in the tube 5 and upon the oil 6. The adjustable spring 44 acts to compensate for this difference, as well as for necessary changes of pressure. Whenever the condenser-pressure of the gas acting on the lower side of the diaphragm exceeds the combined forces of the spring and of the suction-pressure, the valve 2 will be open, as shown, and gas will pass through the pipe 11 to the expansion-coils. When the expansion-pressure increases beyond a predetermined point, such pressure will be transmitted through the oil 6 to the upper side of the diaphragm 31 and the valve will be seated, thereby cutting off the flow of gas to the expansion-coils. The movement of the diaphragm in either direction, however, will be greatly retarded by the piston 4, which can only move in the cylinder 32 as fast as it is permitted by the flow of oil through the aperture 42.

In former constructions—*i. e.*, those in which the piston and body of oil are omitted—there exists for several seconds when the valve is either opening or closing a pulsative equilibrium between the pressures on the opposite sides of the diaphragm. While this lasts the diaphragm vibrates rapidly, thereby crystallizing its own structure as well as hammering the valve. My device if proportioned properly entirely obviates this difficulty, only a single slow movement of the parts occurring at each opening or closing of the valve. As it is important to keep the oil 6 or other liquid used out of the expansion-pipes, I construct the offset 35 with a wall between it and the cylinder 32 and place the port 36 at the upper

end of this wall. For the same reason the pipe 5 is provided with the spiral coil 51. Of course any well-known form of baffle-separator would serve in place of the coil. The coil, however, has the great advantage of being free from joints, in which leaks are liable to occur.

What I claim is—

1. A diaphragm-valve having a chamber, a cylinder connected to said chamber, a piston movable in said cylinder, and a diaphragm in said chamber and connected to the valve and to said piston, the space between said diaphragm and said piston being adapted to retain a body of liquid.

2. A diaphragm-valve having a chamber, a cylinder connected to said chamber, a piston movable in said cylinder and a diaphragm in said chamber connected at one side to the valve and at the other side to said piston, the space between said diaphragm and said piston being adapted to retain a body of liquid.

3. In a diaphragm-valve in combination, a diaphragm-chamber, a diaphragm by which said chamber is separated into two parts, the upper portion of said chamber being extended to form a cylinder, a valve connected to the lower side of said diaphragm, a piston movable in said cylinder and connected to the upper side of said diaphragm and means for the passage of a liquid from the space below to the space above said piston.

4. In a diaphragm-valve in combination, a diaphragm-chamber, a diaphragm by which said chamber is separated into two parts, the upper portion of said chamber being extended to form a cylinder, a valve connected to the lower side of said diaphragm, a piston movable in said cylinder and connected to the upper side of said diaphragm and an aperture in said piston.

5. In a diaphragm-valve in combination, a diaphragm-chamber, a diaphragm by which said chamber is separated into two parts, the upper portion of said chamber being extended to form a cylinder, a valve connected to the lower side of said diaphragm, a piston movable in said cylinder and connected to the upper side of said diaphragm, means for the passage of a liquid from the space below to the space above said piston and means for the admission of gas to the space above said piston consisting of an offset, a wall separating said offset from said cylinder and a port in said wall substantially at its top.

WILLIAM F. SINGER.

Witnesses:
GEO. L. COOPER,
KATH. M. FARRELL.