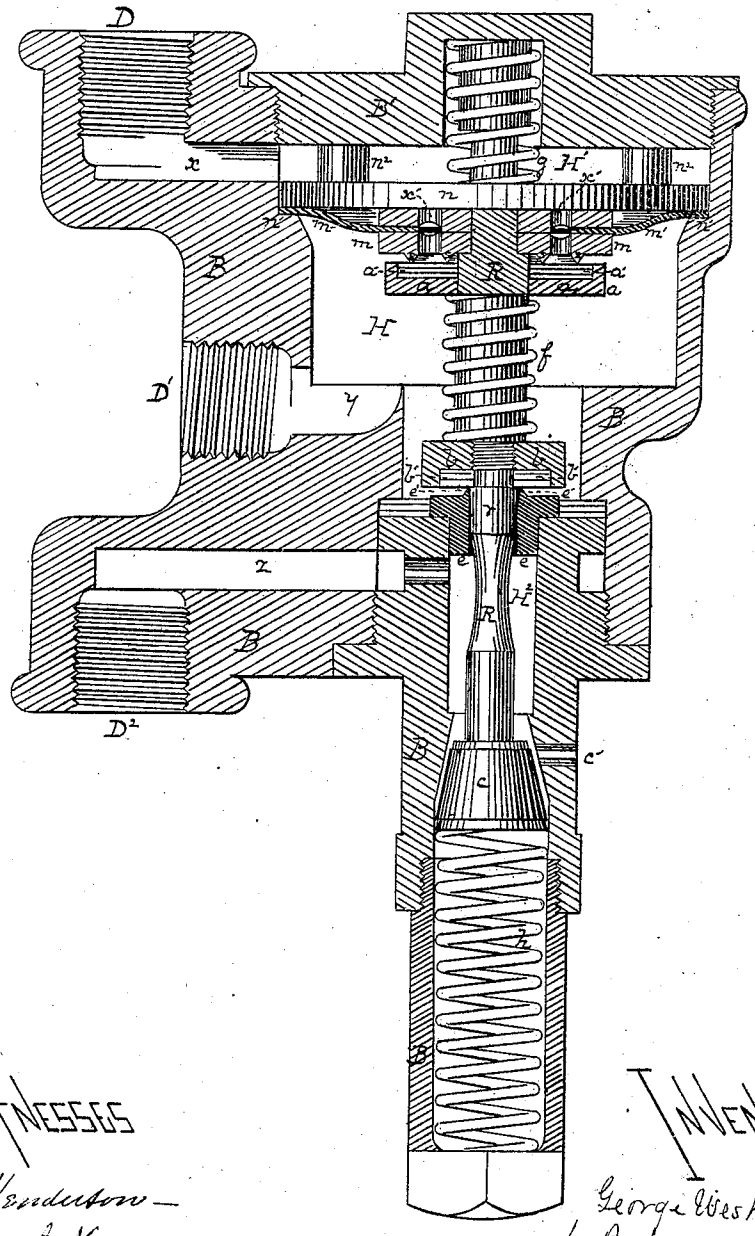
G. WESTINGHOUSE, Jr.

Valve Devices for Steam and Air Brakes.

No. 138,827. Patented May 13, 1873.



WITNESSES

R. E. Henderson —
James L. Kirg

INVENTOR

George Westinghouse Jr.
by Bakewell, Christy & Kerr
his attys.

UNITED STATES PATENT OFFICE.

GEORGE WESTINGHOUSE, JR., OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN VALVE DEVICES FOR STEAM AND AIR BRAKES.

Specification forming part of Letters Patent No. **138,827**, dated May 13, 1873; application filed February 1, 1873.

To all whom it may concern:

Be it known that I, GEORGE WESTINGHOUSE, Jr., of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Valve Device for Steam or other Fluid Brakes; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing, which represents my improvement in sectional view.

In the systems of steam-power air-brakes heretofore described in various patents provision is made for the flow of air or other fluid under pressure from the brake pipe or pipes into a reservoir arranged under or in connection with each car, and for applying the brakes by allowing the compressed air thus stored up in each reservoir to escape into the brake-cylinder. In such combination a triple valve has been described of such construction and with such connections that by a continuous pressure of air in the brake-pipe communication was kept open thence to each reservoir and closed to the brake-cylinder, but kept open from the latter to the external atmosphere, and also so that by lowering the pressure of air in the brake-pipe communication was opened from each reservoir to the brake-cylinder of that car and all other communications closed.

My present invention relates to an improved construction of the triple valve by means of which this operation is effected.

To enable others skilled in the art to make and use my improvement, I will proceed to describe its construction and mode of operation.

The parts indicated by B B^1 constitute the valve-case. At D connection is made with the brake-pipe; at D^1, with the reservoir; and at D^2, with the brake-cylinder. The stem R carries all the valves, *a b c*. The valve *a* works loosely on the stem. The other two are rigidly attached to the stem. The upper valve *a* has an elastic disk, *a'*, which, when the valve is closed, seats against the V-shaped rings *s* of the piston *m* so as to make an air-tight joint. The piston *m* is made of less diameter than the chamber H, in which it is arranged, and is made in two parts, being divided by a plane at right angles to the direction of its motion. The inner edge of an India rubber or other suitable flexible annulus, *m'*, is secured between the outer edges of these two parts, and the outer edge of the same annulus rests on a shoulder, n^1, of the valve-case, and is held in place by a metallic annulus, *n*, resting thereon. Posts, n^2, are arranged at suitable intervals between the annulus *n* and the cap B^1 of the valve-case so as to secure the piston *m* and annulus *m'* (the two constituting a movable diaphragm) tightly in place. The opening through the annulus *n* is large enough to allow the piston *m* to move therein the required distance. The upper valve *a* is relatively larger than the next valve *b*. The latter has an elastic packing, *b'*, which seats on the V-shaped ring *e'*. The block *e*, on which this ring *e'* is made, has a hole, which, when the valve *b* is seated, is filled with more or less exactness by a conical part, *r*, of the stem R. This conical part *r* is of such size relative to the hole in the block *e* that as the valve *b* is raised from its seat a small but gradually-increasing opening will be made through the block *e* from the chamber H above to the chamber H^2 below. The third valve *c* is of conical or other suitable form, and is suitably packed so that when moved upward it will close the air-escape port *c'*, and when depressed will leave the same port open. The conical form shown, however, is preferable. A spiral or other suitable form of spring *f* is arranged between the valves *a b* to hold the former to its seat. A like spring, *g*, is arranged between the cap B^1 and the piston *m* for the purpose of pressing the valve *b* to its seat; and a third spring, *h*, is arranged under the third valve *c* to assist in closing it.

In operation the brake-pipe is intended to be kept charged with compressed air at any desired working pressure. The air so compressed passes along the port *x* to the chamber H^1. A series of holes or ports, *x'*, are made through the piston *m* opposite the packed face of the valve *a*. The pressure of the air acting through these holes forces the valve *a* from its seat, and thus permits the air to flow through into the chamber H, whence it passes by the port *y* into the reservoir. Hence, the reservoir on each car will always be charged with compressed air of the same density as that of the air in the brake-pipes

At the same time the valve *b* is held to its seat and the valve *c* held off its seat partly by the downward pressure of the air on top of the valve *b*, and partly by the greater elasticity of the spring *g* as compared with that of the spring *h*. As a result of this the port *z*, which leads from the brake-cylinder, has an open communication by the port *c'* with the external air. While the devices are in this position the brakes are off and in the usual condition for the running of the train.

In order, now, to apply the brakes the air is allowed to escape from the brake-pipes, either so as to lower the pressure partially or relieve it entirely. As a result of this the back pressure of the air in the reservoir, acting against the under side of the valve *a*, closes it against its seat on the piston *m*, and, acting in conjunction with the spring *h*, compresses the spring *g*, raises the piston *m*, and with it the stem R and valves *b* and *c*. The valve *b* is thus opened and the port *c'* is closed. The compressed air then passes from the reservoir through the block *e*, along the port *z*, to the brake-cylinder, where it operates in applying the brakes in the usual or any known way. In order to release the brakes the brake-pipes are again charged with compressed air. The piston *m* and stem R are thereby forced down, the valve *b* closed, and the port *c'* uncovered. The air in the brake-cylinder then escapes, the brakes are released, and the reservoir charged as before.

I have found sometimes that when the valve *b* first opens, if the open orifice through the block *e* be comparatively large, the flow of air from the reservoir to the brake-cylinder will be too rapid. To remedy this defect I make the opening through the block *e* of conical or taper form, or it may be straight, and make the part *r* of corresponding form. Then, as the valve *b* rises from its seat, the conical part *r* will gradually leave its seat, giving at first but a small orifice through, but an orifice which will be gradually enlarged as the valve *b* rises. But other known means may be substituted for securing a gradually-enlarging opening between the chambers H and H^2.

It will be observed that, with the construction shown, the valve devices may all be removed from their case by simply removing the end caps and screwing apart the stem R, which may have a joint at any suitable point for such purpose. Hence, for repairs or renewal of any part it will be unnecessary to disconnect the valve-box from its pipe-connections.

By the use of the flexible annulus *m'* I am enabled to avoid all or nearly all the friction which was enconntered in the use of the triple-valve device, as heretofore constructed, at the same time securing an absolutely-tight joint.

The brake-cylinder may, in this apparatus, take the place of the reservoir, in which case the lowest valve *c* may be dispensed with, and the valve *b* will then perform the function of a discharge-valve.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A piston, *m*, in combination with a flexible annulus, *m'*, and arranged in the communicating chamber of air-brake apparatus, and operative in admitting air and opening and closing an escape-valve, *b*, substantially as set forth.

2. The combination of the valve-opening constituting the communication from the reservoir to the brake-cylinder, when such opening varies in area with the greater or less movement of the valve, with the valve operated by the difference in pressure on two sides of a piston, substantially as set forth.

3. In combination with a triple valve, a spring, *g*, or equivalent weight, suitably arranged, so as to keep the lowest valve *c* clear of its seat under an equilibrium of air or other fluid pressure in the upper valve-box, substantially as set forth.

In testimony whereof I, the said GEORGE WESTINGHOUSE, JR., have hereunto set my hand.

GEORGE WESTINGHOUSE, JR.

Witnesses:
A. S. NICHOLSON,
G. H. CHRISTY.