G. WESTINGHOUSE, Jr.

Piston-Diaphragm for Power-Brakes.

No. 217,837. Patented July 22, 1879.

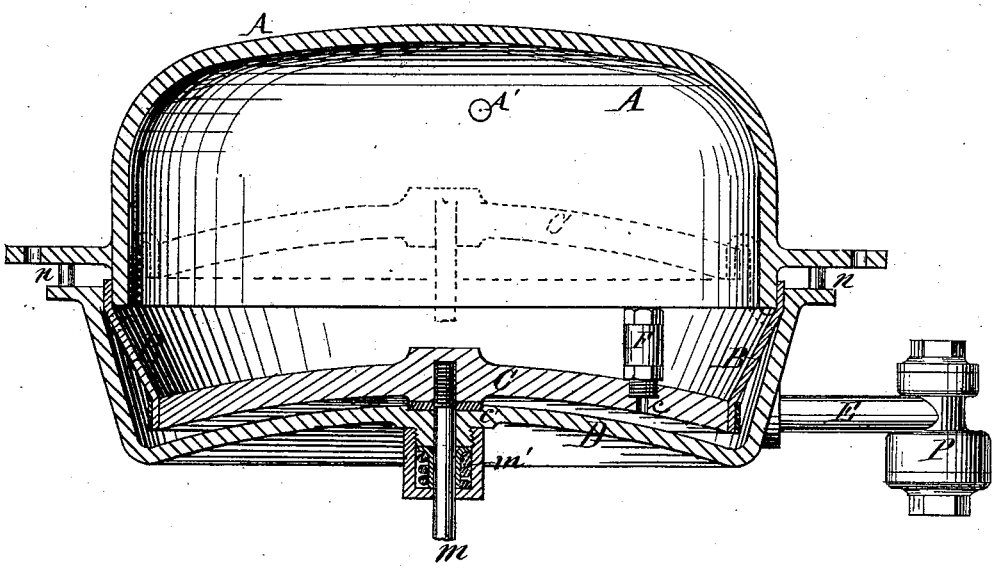

Fig. 1.

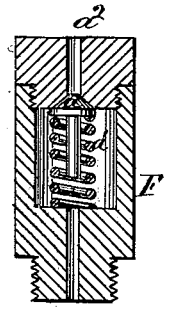

Fig. 2.

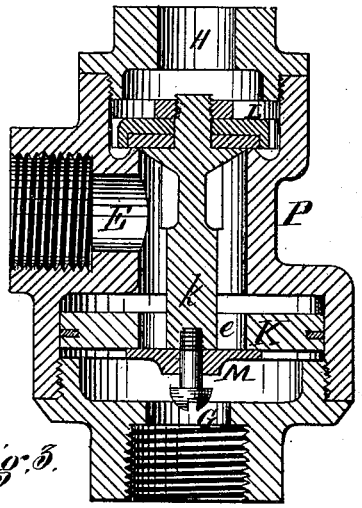

Fig. 3.

Witnesses
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UNITED STATES PATENT OFFICE.

GEORGE WESTINGHOUSE, JR., OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN PISTON-DIAPHRAGMS FOR POWER-BRAKES.

Specification forming part of Letters Patent No. **217,837**, dated July 22, 1879; application filed May 7, 1879.

To all whom it may concern:

Be it known that I, GEORGE WESTINGHOUSE, Jr., of Pittsburg, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Piston-Diaphragms for Power-Brakes; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1 is a sectional view of a flexible-diaphragm apparatus embodying my present improvement. Fig. 2 is an enlarged sectional view of the valve marked F in Fig. 1, and Fig. 3 is an enlarged sectional view of the valve marked P in Fig. 1.

My present invention relates, chiefly, to the construction and operation of a flexible-diaphragm apparatus for use principally as a part of an automatic vacuum-brake equipment, in which the brakes are applied by the admission of atmospheric pressure to one side of a moving flexibly-mounted diaphragm, which until then, and while the train is running, is subject to little or no atmospheric pressure. This apparatus consists of a close box, A, of a dome or other suitable shape, jointed on its open side to a box, D, of any convenient form—such, for example, as that shown. The two boxes are secured together by screw-bolts and flanges *n*, or in other desired known way. In the joint formed by the two I clamp one end of a short somewhat tapered tubular piece of caoutchouc, B, or other suitable flexible impervious durable material. The other end of this tubular piece B is properly fastened, in any of the ways known to the art, to the edge of a disk, C, which moves somewhat like the piston of a cylinder; but in moving toward the dome half A of the vessel thus formed, the flexible piece B folds or bends into substantially the form represented by dotted lines.

The box D may be made deeper and the flexible piece B longer, if a longer stroke or motion is desired in the disk C, than is shown in the drawings.

In fitting up the apparatus a branch pipe, E, leading from the main exhaust-pipe, that runs the length of the train, opens into the box D below the disk C. Through the disk C is a small port, *c*, and over this port is a valve-box, F, of any suitable construction, with a valve so loaded or held by spring-pressure that it will readily open to a slight difference of pressure. One convenient construction is represented in Fig. 2, where the valve *a* is held by a light spring, a^1, against the port a^2, leading into the upper part of the vessel. The air in the pipe E being rarefied or exhausted, a like rarefaction will be effected within the outer casing, D, below the disk C, and also by the opening of the valve *a* to nearly a like degree in the space above the disk, so that the disk C will be practically in equilibrium, with no effective air-pressure on either side. In this condition the train will be in running order, the brake-shoes being held clear of the wheels by springs, as is usually done, or by weights.

When the engineer desires, now, to apply the brakes, he opens a cock or valve, so as to admit external air through the pipe E to the vessel below the disk C. The pressure of the air so admitted, being prevented by the valve *a* from passing to the other side of the disk C, forces it upward or inward to the position indicated by the dotted lines C′, and such action is transmitted through the stem *m*, by the brake rods or chains, to the brake-levers, in the usual way.

So long as considerable difference of pressure exists on both sides of C, the valve in F remains closed and the brakes are kept on; but when the air is again exhausted through E, the brakes are released by the disk C, making its reverse or outward stroke, and the pressure on both sides of it being again nearly equalized, the valve F again opens as rarefaction proceeds, so that the pressure becomes practically equal, and the apparatus is again ready to be used in applying the brakes.

The valve *a* in F admits of fluctuations of pressure, such as would be caused by leakage, without interfering materially with the operations described, and also provides for the exhaustion of such air as may leak into the space above or inside the disk C.

The stem *m* of the disk works through a cup-leather or other suitable packing, *m′*, and the boss of the disk seats itself as a valve on a washer of caoutchouc or other soft material, *c′*, thus preventing any possible leakage of air

into the box D, even should the packing of the gland be or become defective.

For supplying air to each diaphragm without transmitting it through the entire line of tubing, I employ, at any suitable point in the line of each pipe E, as at P, a valve device such as is represented in Fig. 3.

This valve-box has three nozzles. By one, G, it is connected with the air-exhaust pipe, which extends throughout the length of the train. By another, E, connection is made with the pipe E, and a third, H, opens to the external air. The lower part of this valve-box is fitted with a piston, K, the stem *k* of which is extended upward, and carries a valve, L, opening upward. Through the piston K are apertures *e*, which are covered by a valve, M, opening downward.

When the air is exhausted through E, *e*, and G, the valve L is closed by atmospheric pressure, M being open; but when the pressure in G is increased, the valve M closes, and the piston K, having, as compared with L, much the greater area, is pressed upward, so as to open the valve L, and thereby admit atmospheric pressure to E, with the result and effect already described.

In lieu of the valve L, other forms of valves may be employed, with such connection by stem or otherwise with the piston K that it may be opened and closed with the upward and downward motion of the piston, so as thereby to provide for the quick and rapid admission of air into the brake-vessels from the atmosphere, thereby avoiding the loss of time consequent upon the transmission of the requisite amount of air through long pipes. Also, in lieu of the piston K, such mechanical equivalents thereof as are known in air-brake apparatus may be employed, such as a flexible diaphragm or a collapsible vessel capable in one adjustment of opening a valve, and in a reverse position capable of opening an air-port through or past the same.

I also provide for using the same vessel A B C D in the working of the ordinary form of vacuum-brake. In such case the brake-pipe connection is made with the port A′ of the box A, so that the exhaustion of the air through the same shall operate the disk C and apply the brakes. Atmospheric pressure then operates through E, which is left open for the purpose. The same vessel may also be used, if so desired, in compressed-air brakes, with such changes as will come within the knowledge of those skilled in this art. When used in the automatic vacuum, the port A′ may be closed by a plug.

I claim herein as my invention—

1. The method of operating automatic vacuum-brakes by maintaining during the free running of the train a vacuum or partial vacuum on both sides of a piston-diaphragm, C B, and admitting air, when the brakes are to be applied, to one side of such piston-diaphragm, substantially as set forth.

2. A vessel for use in brake apparatus, consisting of a closely-packed or jointed vessel, A D, supplied with a piston-diaphragm, C B, and having a valve-governed port, *e*, opened and closed by slight variations of air-pressure, substantially as set forth.

3. A piston-diaphragm, B C, operating in a close box or case, in combination with a valve-case having ports E F G, piston K, and valve L, or their described equivalents, substantially as and for the purposes set forth.

4. The vessel A D, having piston-diaphragm C D, with valved ports *e*, a packed stem, and ports A′ and E, substantially as set forth, whereby the same apparatus is adapted for use in ordinary vacuum, automatic vacuum, or compressed-air brake equipments.

In testimony whereof I have hereunto set my hand.

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Witnesses:

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