

(No Model.)

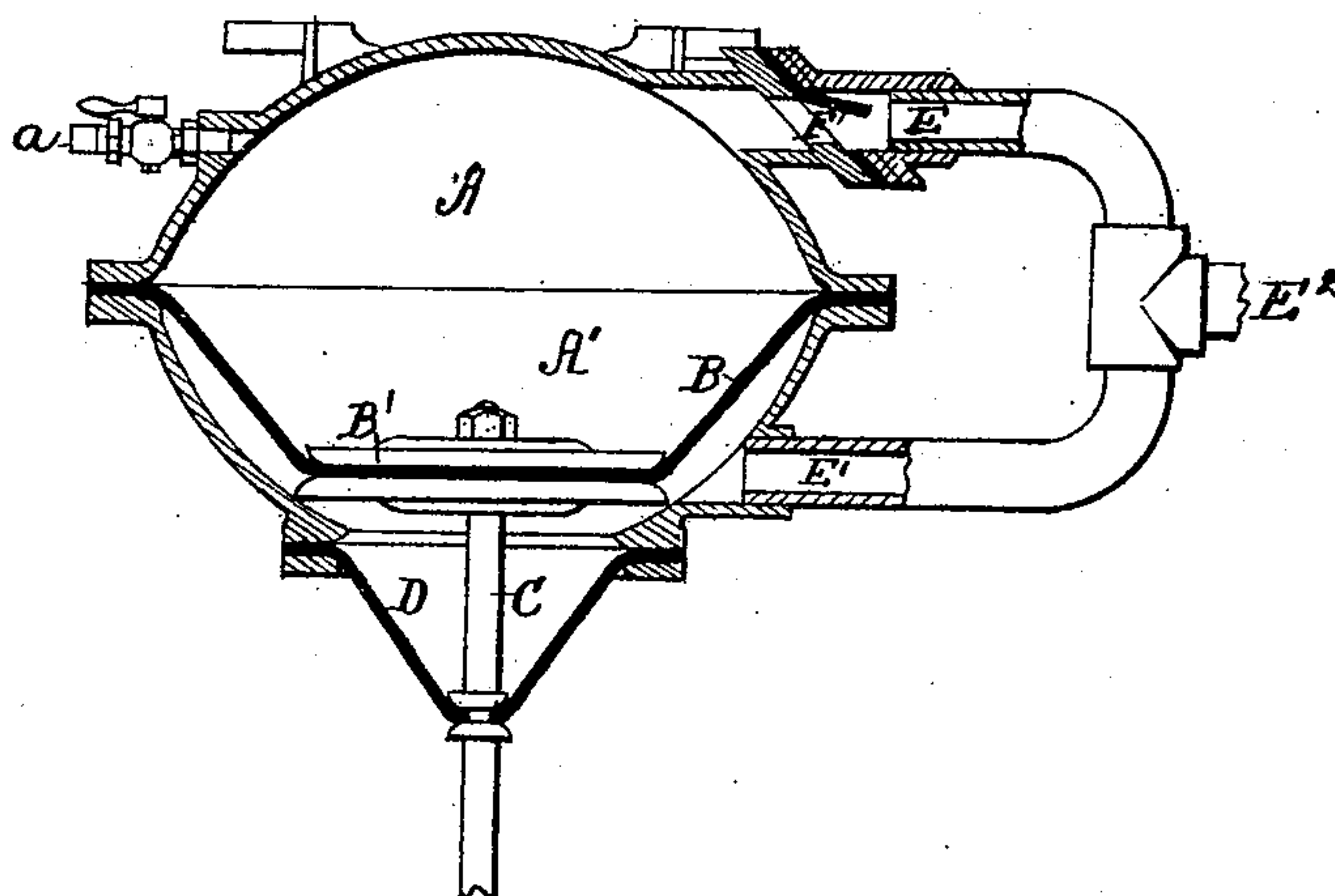
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F. W. EAMES.  
Vacuum Brake Apparatus.

No. 241,333.

Patented May 10, 1881.

Fig. 1.



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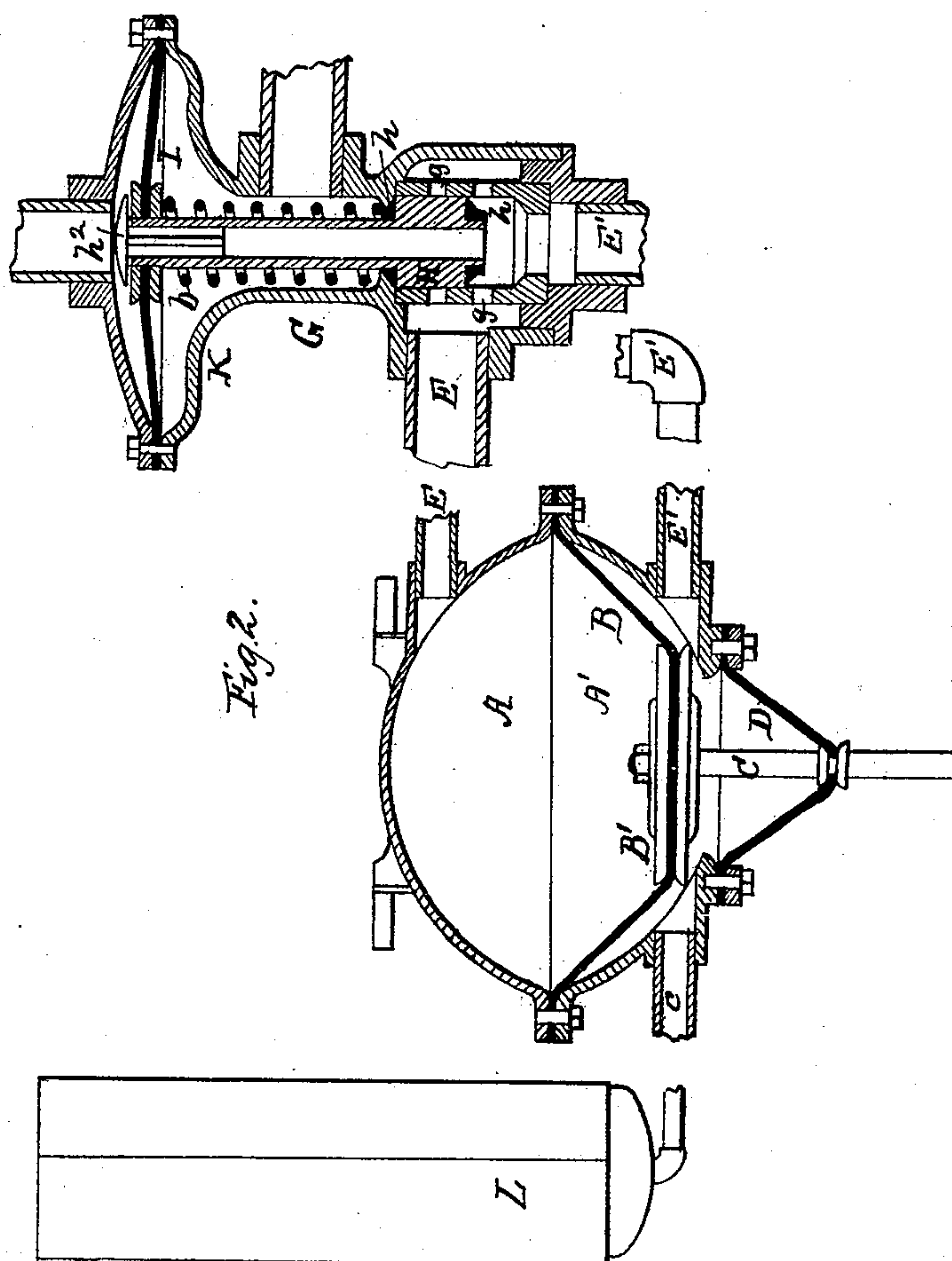
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# UNITED STATES PATENT OFFICE.

FREDERICK W. EAMES, OF WATERTOWN, NEW YORK.

## VACUUM-BRAKE APPARATUS.

SPECIFICATION forming part of Letters Patent No. 241,333, dated May 10, 1881.

Application filed October 29, 1880. (No model.) Patented in England February 15, 1879.

*To all whom it may concern :*

Be it known that I, FREDERICK W. EAMES, a citizen of the United States, residing at Watertown, in the county of Jefferson and State of New York, have invented certain new and useful Improvements in Vacuum-Brake Apparatus, (Case K;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification, the same having been patented to me by the government of Great Britain by Letters Patent No. 616, dated February 15, 1879.

My present invention relates to vacuum-brake apparatus; and it consists in a peculiar construction and arrangement of the diaphragm or piston chamber and its controlling valve device, all of which will be hereinafter described, and then pointed out in the claims.

In the drawings, Figure 1 shows one form of carrying out my invention, which is a vertical section of the same. In this arrangement two flanged dish-shaped metal shells, A A', are provided, which clamp between their flanges a flexible diaphragm, B. This diaphragm carries a central plate, B', which serves to secure to the diaphragm a pendent vertical rod, C, connected to the brake-levers. In lieu of a packing, I fit to this rod a flexible conical sleeve. This sleeve covers the opening in the shell A, as shown at D, and is attached to the rod by an air-tight joint. It is made of a length equal to at least half the stroke of the pendent rod C, and moves therewith in and out of the shell. This arrangement of an air-tight sleeve obviates the necessity of providing the rod C with a stuffing-box and admits of a more sensitive action of the diaphragm and rod. Each shell is provided with an exhaust-pipe, E and E', and these pipes connect with a common pipe, E<sup>2</sup>, which leads to the air-ejector. The pipe of the upper shell is fitted with a clack-valve, F, which, on air being admitted to the exhaust-pipe, will prevent its passage to the upper shell, leaving the air free to pass to the under side of the diaphragm and set the brakes in action. Air may be admitted directly to the upper shell, to release the brakes of a de-

tached car, by opening a valve or cock, a, provided for that purpose. If thought desirable, air may be withdrawn from both shells by means of a single pipe attached to the lower shell, an opening in the diaphragm, closed by a clack-valve opening downward, serving to bring the two shells into communication with each other. The upper shell, A, may be constructed of greater relative area than is here shown, so as to provide a larger and more effective vacuum-power, or a storing-reservoir may be connected thereto by means of a pipe having free communication therewith.

Fig. 2 shows the flexible diaphragm chamber arranged in relation to a valve device in such a manner that the brakes will be put on by causing air to be admitted to one side of the diaphragm by a pipe having an opening with the outer air in close proximity thereto. This construction and arrangement quickens the action of the vacuum-brake and increases its power. The pipes E E' from the opposite sides of the diaphragm B or piston communicate with the cylindrical barrel G, provided with a valve-seat at its opposite ends. The pipe E', leading from the shell A', connects with the end of the barrel G. Surrounding this barrel is an annular chamber, which is in communication with the pipe E, leading to the shell A. Communication between this annular chamber and the barrel is made by ports g g, which ports are alternately opened and closed by an elongated piston, H, which is provided with the conical valves h h' at its opposite ends, for operating between the valve-seats before mentioned. The rod of this piston is hollow, and it is attached by a flanged coupling with a flexible diaphragm, I, contained in case K, which forms a virtual extension of the cylindrical barrel G, in which the valve-piston H works. This case K, above the diaphragm, is in communication with the line of exhaust-tubes or brake-pipes which extend throughout the train, and below the diaphragm it is open to the air, preferably in communication with a compartment of the carriage to which the apparatus is attached. The hollow piston-rod is closed at top by a puppet-valve, h<sup>2</sup>, and under the action of the exhaust in the vacuum-tubes it rises, to allow of the air being drawn from the opposite sides of the diaphragm or piston of the shell in direct connection with the brakes. At this



time the piston H will be at its highest position by reason of the exhaust above the diaphragm and the pressure of air below the same. This action may be supplemented by a coiled spring, *b*, if desired. The lower shell, *A'*, may be made of greater vertical length, or a reservoir, *L*, may be connected therewith by a pipe, *c*, to give an increased effectiveness in setting the brakes by providing a larger vacuum reserve pressure.

The operation is as follows: A vacuum is being constantly maintained in the brake-pipe *E*<sup>2</sup>, which serves to exhaust the air from both sides of the diaphragm *B*. When it is desired to apply the brakes air is admitted to the pipe *E'*, which closes the valve *F* of Fig. 1 or the valve *h*<sup>2</sup> of Fig. 2. Upon the valve *F* closing the air will rush into the pipe *E'* and destroy the equilibrium of the diaphragm *B*, whereby movement of the rod *C* will ensue, thereby setting the brakes in action. Upon the re-establishment of the vacuum in the pipe *E* a vacuum will again be restored on both sides of the diaphragm and the brakes taken off. Upon the valve *h*<sup>2</sup> of Fig. 2 closing by the admission of air to the pipe *E*<sup>2</sup> the diaphragm *I* will fall, carrying the piston *H*, thereby closing pipe *E'* and opening a passage for the air into the pipe *E*, thereby applying the brakes. When it is desired to take off the brakes the vacuum in the pipe *E*<sup>2</sup> is again restored, when the diaphragm *I* will rise, carrying piston *H*, which will close communication with the outer air and open up a passage from the pipes leading to both sides of the diaphragm and the brake-pipe *E*<sup>2</sup>, the valve *h*<sup>2</sup> covering the opening in the hollow piston-rod rising for this purpose.

To maintain a vacuum in the pipe *E*<sup>2</sup> to keep the brakes ready for action, I may use a small ejector constantly blowing, or an automatically-operating ejector, and to render the same entirely automatic in a simple and compact manner I locate on the engine and attach to the ejector a diaphragm acted upon by a vacuum on one side and a weight on the other, and connect it by a secondary valve, which, when

opened, allows steam to lift the main valve of the ejector and open up a passage for the steam from the boiler through the ejector or exhaust; or any known steam and air pump suitable for the purpose may be employed.

What I claim is—

1. In combination with a single line of brake-pipes and a piston or diaphragm chamber in which a vacuum is maintained on both sides of the piston or diaphragm, a valve device for admitting the external air direct to one side of the piston or diaphragm by the admission of air to the brake-pipe, substantially as and for the purpose set forth.

2. In combination with a single line of brake-pipes, a vacuum-reservoir, and a piston or diaphragm chamber in which a vacuum is maintained on both sides of the piston or diaphragm, a valve device, substantially as shown, for admitting the external air direct to one side of the piston or diaphragm upon the admission of air to the brake-pipe, substantially as and for the purpose set forth.

3. A valve so arranged and constructed as to have communication with both sides of the diaphragm or piston of a vacuum-chamber, and connecting with the exhaust brake-pipe, whereby, upon the establishment of a vacuum of any degree in the brake-pipe and chamber, an equilibrium of pressure on both sides of said diaphragm or piston will immediately result, substantially as set forth.

4. The combination, in a valve device, of the diaphragm or piston *I*, hollow piston-rod *H*, having the double-ended valve *h h'*, and the valve *h*<sup>2</sup>, substantially as set forth.

5. The combination, in a valve device, of the diaphragm or piston *I*, hollow piston-rod having the double-ended valve *h h'*, valve *h*<sup>2</sup>, and lateral passages *g g*, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

FRED. W. EAMES.

Witnesses:

CHAS. D. BINGHAM,  
E. D. EAMES.