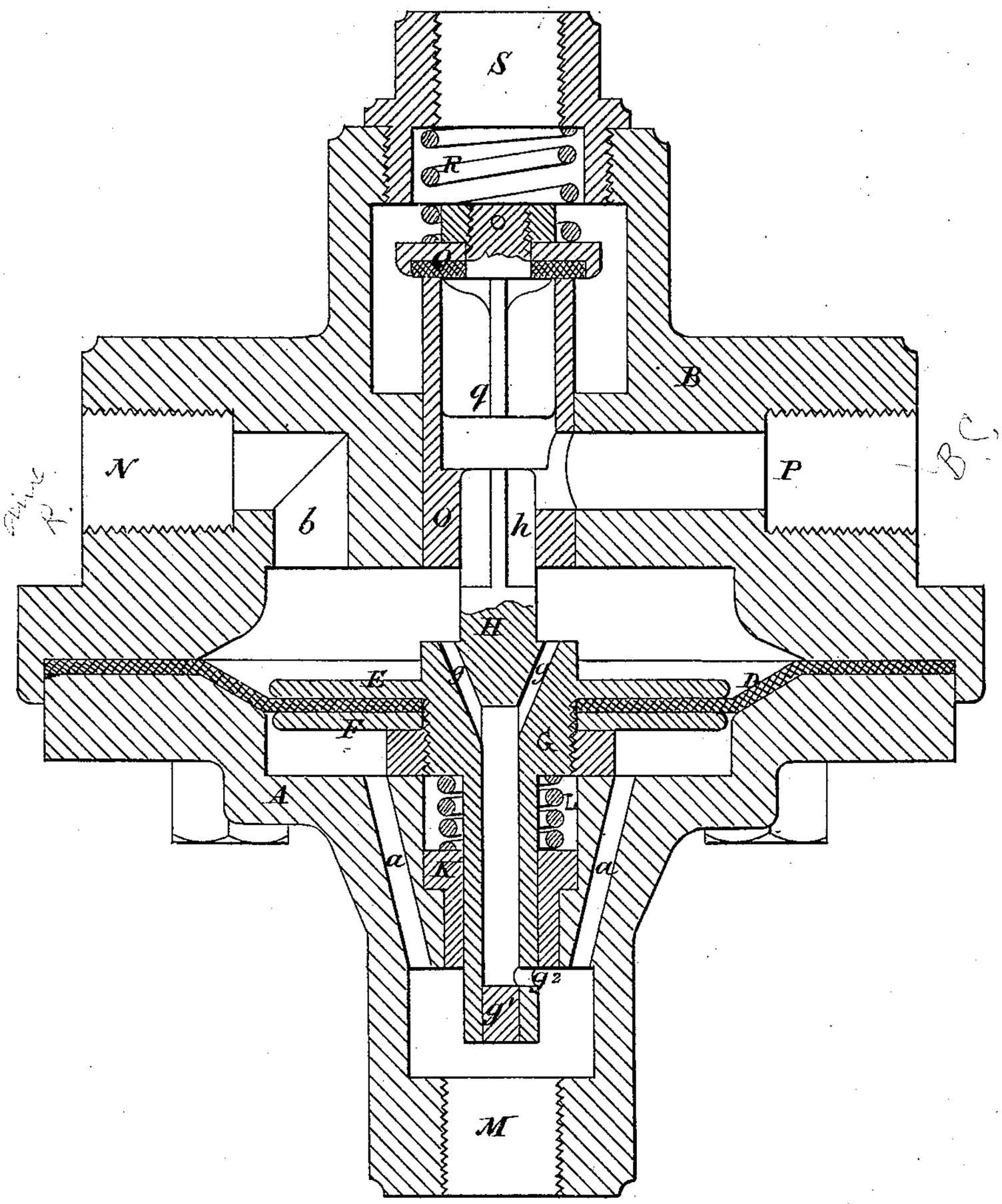
(No Model.) 2 Sheets—Sheet 1.

G. WESTINGHOUSE, Jr.

VALVE ARRANGEMENT FOR PNEUMATIC RAILWAY BRAKES.

No. 251,490. Patented Dec. 27, 1881.

FIG. 1.



Witnesses:
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(No Model.) 2 Sheets—Sheet 2.

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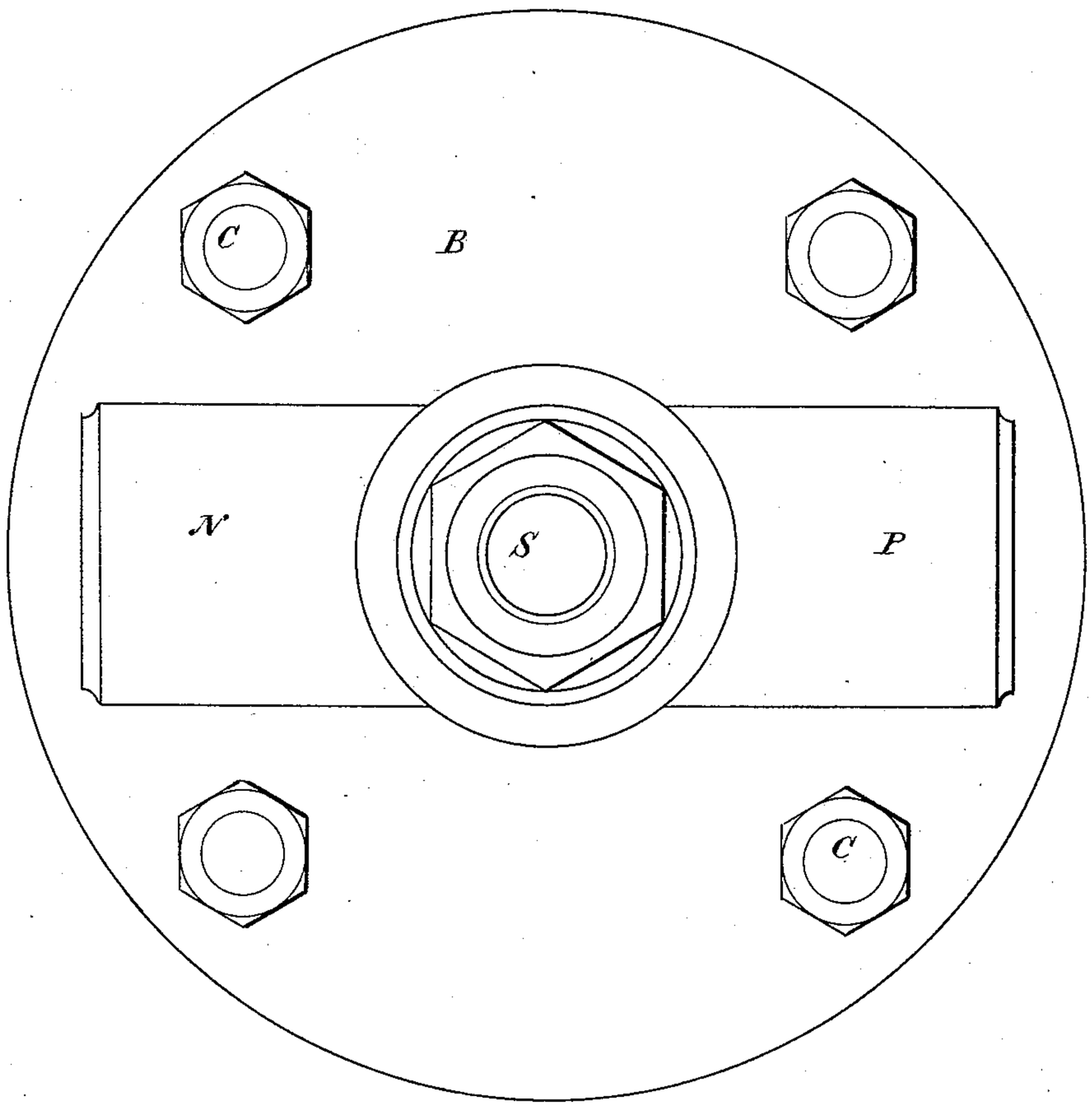
FIG. 2.



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UNITED STATES PATENT OFFICE.

GEORGE WESTINGHOUSE, JR., OF PITTSBURG, PENNSYLVANIA.

VALVE ARRANGEMENT FOR PNEUMATIC RAILWAY-BRAKES.

SPECIFICATION forming part of Letters Patent No. 251,490, dated December 27, 1881.

Application filed August 27, 1881. (No model.)

To all whom it may concern:

Be it known that I, GEORGE WESTINGHOUSE, Jr., a citizen of the United States, residing at Pittsburg, Pennsylvania, have invented a new and useful Improved Valve Arrangement for Pneumatic Railway-Brakes, of which the following is a specification.

Railway-brakes are worked pneumatically in either of two ways. According to the one method air is compressed by a pump and transmitted by a pipe extending throughout the train to charge auxiliary reservoirs or separate vessels or the several brake-carriages, and these reservoirs are connected with the brake-cylinders by valves so arranged that when either purposely or accidentally the pressure in the train-pipe is reduced the pressure stored in the reservoirs is admitted to act on the brake-pistons, so as to put on the brakes. According to the other method the air in the train-pipe is rarefied by a steam-ejector, or otherwise, and thus a partial vacuum is produced in the auxiliary reservoirs, and then, upon the pressure in the train-pipe being either purposely or accidentally raised the vacuum in the auxiliary reservoirs is brought into action on the brake-pistons, causing the brakes to be applied.

My invention relates to an arrangement of valves for governing the communications between the train-pipe, the auxiliary reservoir, the brake-cylinder, and the open air applicable when the method of operating last described—that is to say, vacuum action—is employed, the valve arrangement being, however, so contrived that it permits the train-pipes, auxiliary reservoirs, and brake-cylinders being used for working with compressed air. Thus a brake-carriage fitted with the valve arrangement which I am about to describe may form part of a train in which the brakes are worked by vacuum, or part of a train in which they are worked by compressed air.

Before describing the valve arrangement for this purpose I may state that the brake-cylinder may be of ordinary construction, like a steam-engine cylinder, fitted with a piston having its rod connected to the brake-levers. In this case the train-pipe communicates with the one end or front of the cylinder, and also with the auxiliary reservoir through the valve-box about to be described, and the auxiliary reservoir communicates directly with the other end or back of the cylinder. Instead of a cylinder and piston, a vessel divided by a flexible diaphragm into two compartments is sometimes employed, the diaphragm being bent in the one direction or the other, according as the pressure on its one side exceeds that on its other side. The movement of the diaphragm which is connected to the brake-levers is equivalent to that of the piston, and therefore when in what follows I speak of the brake-cylinder and piston it is to be understood that the description equally applies to the equivalent arrangement of the vessel and its dividing-diaphragm. I may also state that as the auxiliary reservoir is always in communication with one end of the cylinder or with one compartment of the diaphragm-vessel, this reservoir need not be a separate vessel, but may obviously be merely a considerable enlargement of one end of the cylinder or of the one compartment of the diaphragm-vessel.

Having thus generally explained the character of the apparatus of which my improved valve arrangement forms a part, I will now describe that arrangement, referring to the accompanying drawings.

Figure 1 represents a section, and Fig. 2 a plan, of the valve-box and its fittings. It is made in two parts, A and B, secured together by bolts C passing through their flanges, which clamp between them the outer part of a flexible diaphragm, D. The inner part of this diaphragm is clamped between a flange, E, and a disk, F, screwed on the stem G of the flange E. The stem G is bored up the middle about as far as the flange E, and from the end of the bore holes *g* are bored diagonally, so as to escape the upper part, H, of the stem. The lower end of the bore-hole in G is closed by a plug, g', and just above the plug a hole, g^2, is bored laterally into the central bore. The lower part of the stem G is reduced in diameter and fitted to slide in a bush, K, let into a recess in the body of the lower part, A, of the valve-box. A spring, L, butts on the bush K and against the shoulder of G. Holes *a* make communication between the lower nozzle, M, and the space under the diaphragm D. The space above the diaphragm communicates by a passage, *b*, with a side nozzle, N. The upper part, H, of the stem is fitted to slide in a bush, O, from which

there is a lateral passage to another side nozzle, P, and the stem H is partly cut away at the sides at *h*, so as to give passage for air, while the parts not cut away serve as guides. The upper part of the bush O forms a seating for a valve, Q, which is a disk faced with caoutchouc pressed down to its seat by a spring, R. The stem *q* of the valve Q projects down and terminates some distance above the top of the stem H. Above the valve *q* there is a nozzle, S, opening to the outer air, and preferably provided with a strainer of porous material, to prevent access of dust or dirt.

This valve-box having its nozzle M connected to the train-pipe, its nozzle N to the auxiliary reservoir, (which is always in communication with one end or back of the brake-cylinder,) and its nozzle P connected to the front of the brake-cylinder, the operation is as follows: The train-pipe M being exhausted, the diaphragm becomes deflected, as shown in Fig. 1, and air passes from the auxiliary reservoir and back of the brake-cylinder by N and *b*, and from the front of the brake-cylinder P past the ports *h* of the stem H and through the holes *g* and g^2, and the valve Q being closed the brake-cylinder is thus equally exhausted at both ends, and the brake-piston being in balance the brakes are held off by suitable weights or springs. If, now, the pressure in the brake-pipe be increased either purposely or by the accidental rupture of the pipe or separation of the train, then the diaphragm D is pressed upward, closing the lateral passage g^2, closing also the passage by *h*, and thereafter, by the stem H bearing against *q*, opening the valve Q. Thereupon, while the vacuum is maintained on the one side of the brake-piston with which N communicates, air entering directly past the open valve Q flows by P, so as to press on the other side of the brake-piston, and the piston is thus urged so as to put on the brakes. On again exhausting the train-pipe the diaphragm becomes again deflected, the valve Q closes, and the air is withdrawn from the front of the brake-cylinder, so that the brake-piston is again under equilibrium of pressure, and the brakes are taken off by their weights or springs. When the train-pipe is employed for working the brakes by compressed air the pressure communicated through M raises the diaphragm till the upper face of G is pressed against the lower face of O. The passages *g* and *h* are thus closed, and the brake-cylinder and auxiliary reservoir are cut off from communication with the train-pipe, which is left available for working the other brakes of the train by compressed air.

Having thus described the nature of my invention and the best means I know of carrying it out in practice, I claim as a valve arrangement for working railway-brakes by vacuum—

1. The combination, in one valve-box made in two parts, A and B, and having the four nozzles M N P S, of the flexible diaphragm D, the bored stem G, having end passages, *g*, and a lateral aperture, g^2, the stem H, partly cut away at the sides *h*, the valve Q and its stem *q*, the bushes K and O, the passages *a*, and the springs L and R, substantially as and for the purposes herein set forth.

2. The flexible diaphragm D, having a stem, G, perforated or hollow through a part of its length, cylindrical, as at H, through another part, and recessed, as at *h*, through another part, in combination with valve-case A B, having nozzles M, N, S, and P, substantially as set forth, with reference to providing for the disuse of a vacuum apparatus when coupled up with a compressed-air mechanism.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 5th day of August, A. D. 1881.

GEORGE WESTINGHOUSE, JR.

Witnesses:

JOHN IMRAY,

JNO. P. M. MILLARD.