(No Model.)

G. WESTINGHOUSE, Jr. & F. MOORE

ENGINEER'S BRAKE VALVE.

No. 401,916. Patented Apr. 23, 1889.

FIG. 1.

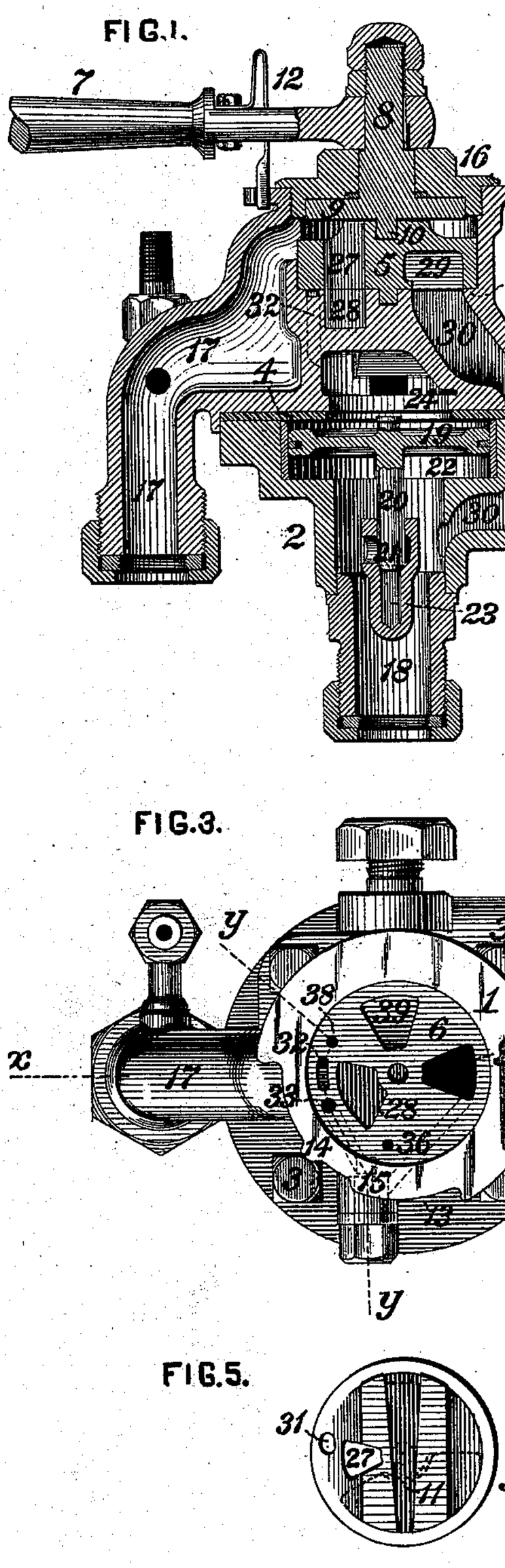

FIG. 2.

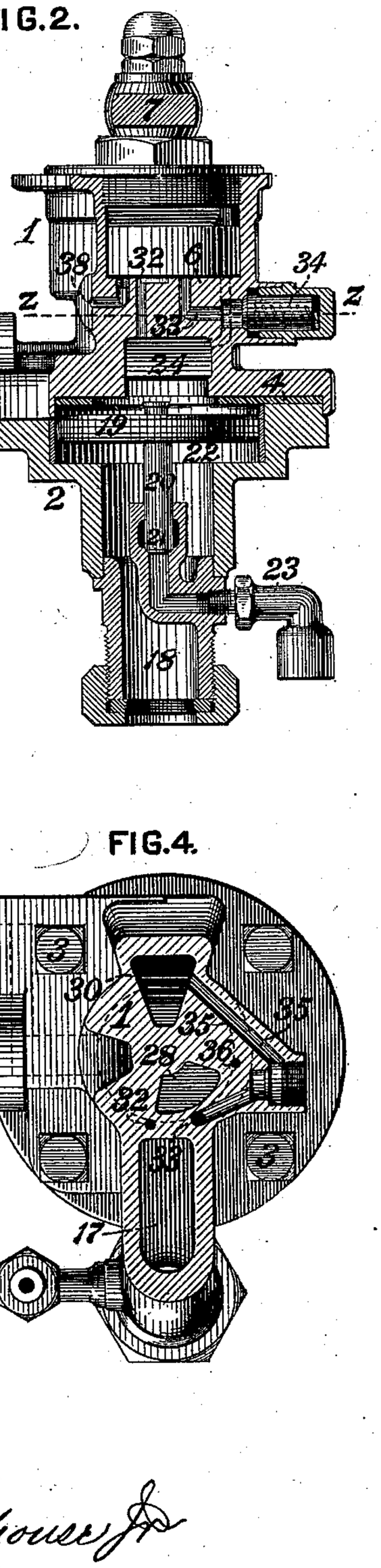

FIG. 3.

FIG. 4.

FIG. 6.

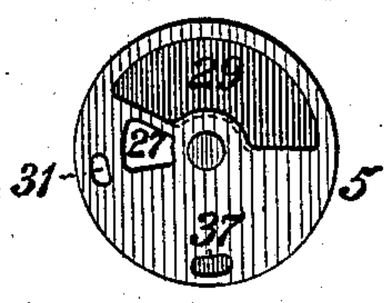

FIG. 5.

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UNITED STATES PATENT OFFICE.

GEORGE WESTINGHOUSE, JR., AND FRANK MOORE, OF PITTSBURG, PENNSYLVANIA.

ENGINEER'S BRAKE-VALVE.

SPECIFICATION forming part of Letters Patent No. 401,916, dated April 23, 1889.

Application filed January 2, 1889. Serial No. 295,212. (No model.)

To all whom it may concern:

Be it known that we, GEORGE WESTINGHOUSE, Jr., and FRANK MOORE, citizens of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Engineers' Brake-Valves, of which improvement the following is a specification.

Our invention relates to appliances employed in automatic brake mechanisms for effecting and regulating the supply of air under pressure from a main reservoir or source of supply to a brake or train pipe in the release of the brakes, and its exhaust from the brake-pipe into the atmosphere in the application of the brakes.

The object of our invention is, primarily, to provide for such gradual opening and closure of the valve which controls the discharge of air from the brake-pipe as to cause a substantial equalization of pressure in the brake-pipe and uniform application of the brakes throughout the length of the train, and obviate the liability to release the brakes on the forward cars in long trains, which has heretofore been found to be induced by an inequality of pressure in the brake-pipe occasioned by the quick release of a considerable quantity of air and the sudden closure of the discharge-valve thereafter, and from which the breaking of the train into two or more sections has sometimes resulted.

A further object of our invention is to effect a simplification of structure and prevent the access to the valve-operating piston of grease or other foreign matter tending to clog or interfere with its free and normal movements.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a longitudinal central section through an engineer's brake-valve embodying our invention at the line $x\,x$ of Fig. 3; Fig. 2, a longitudinal section at the line $y\,y$ of Fig. 3; Fig. 3, a plan or top view with the cap removed; Fig. 4, a transverse section at the line $z\,z$ of Fig. 2; and Figs. 5 and 6, top and bottom views, respectively, of the regulating-valve detached.

In the practice of our invention we provide a valve chamber or casing, which is composed of an upper section, 1, and a lower section, 2, connected by bolts 3, a suitable packing-ring or gasket, 4, being interposed to make a tight joint between the sections. A rotary regulating-valve, 5, is fitted upon a seat or valve-face, 6, in the upper section, and is adapted to be moved axially thereon by a lever-handle, 7, secured upon a stem, 8, which is formed or fixed upon a plate or disk, 9, having a tapered key or tenon, 10, on its lower side, which engages a corresponding recess or mortise, 11, on the valve 5. A spring-stop, 12, is secured to the handle 7, in order to limit the range of movement of the latter to the length of a circumferential recess, 13, formed in an end flange on the upper section, 1, of the valve-chamber, said recess having projections 14 15 located in proper position to abut against the stop 12 in different adjustments of the valve, hereinafter described. The upper section is closed at top by a cap, 16, having a packing proper to admit of the free passage of the valve-operating stem without leakage.

A passage or nozzle, 17, which is formed upon the upper section, 1, of the valve-chamber, and is provided at its outer end with a screw-thread, or otherwise adapted to be connected with a pipe leading to the main air-reservoir of the brake mechanism in which the appliance is employed, serves to establish continuous communication between the main air-reservoir and the space within the valve-chamber above the rotary valve 5.

A pipe or passage, 18, is connected to the lower section, 2, of the valve-chamber and to a pipe leading to the main air or brake pipe, which is thus maintained in communication with the valve-chamber below and up to the face of the rotary valve 5. A movable abutment, 19, which is preferably a piston, as shown, but which may, if preferred, be a flexible diaphragm, is fitted to work freely in a chamber, 22, which communicates with the pipe 18, so that the piston 19 may be subject on its lower side to the pressure in the brake-pipe. The piston 19 is secured upon a stem, 20, the lower end of which carries a discharge-valve, 21, which is adapted to close upon a seat at the inner end of a discharge-pipe, 23, leading from the pipe 18 to the atmosphere.

The packing-ring 4, which is interposed between the sections of the valve-chamber, extends into the piston-chamber 22, so as to provide a bearing-surface for the piston at the upper extremity of its traverse, and thereby act, in addition to the packing of the piston, to prevent leakage past the same. The piston-chamber 22 communicates above the piston 19 with a chamber, 24, in the upper valve-casing section, 1, the chamber 24 being connected by a pipe, 25, with a small supplemental chamber, 26, in order to provide an increased capacity for the storage of air under pressure.

The regulating-valve 5 controls in the several positions into which it may be moved by the handle 7 a series of ports and passages in the valve-chamber, to be presently described, by which communication is established as follows: first, between the main air-reservoir and the brake-pipe, for the purpose of releasing the brakes, and between the main air-reservoir and the chamber above the piston, in order to charge said chamber and its connected supplemental chamber with air at a pressure equal to that in the brake-pipe, and thereby to institute an equilibrium of pressure on both sides of the piston and hold the discharge-valve to its seat; second, between the main air-reservoir and a port leading to an extra pressure-valve governing a passage leading to the brake-pipe, in order to effect the accumulation of a determined excess of pressure in the main reservoir to insure the release of the brakes, and also between the brake-pipe and the chamber above the piston, to maintain an equilibrium of pressure in said chamber and the brake-pipe; third, between the chamber above the piston and the atmosphere, in order to destroy the equilibrium of pressure existing on both sides of the piston, and thereby, through the higher pressure which then acts on its lower side, to effect its upward movement, and the consequent unseating of the discharge-valve, for the discharge of air in the application of the brakes in ordinary or service stops; fourth, between the brake-pipe and the atmosphere through a passage of comparatively large area, in order to effect the application of the brakes with maximum rapidity and force, as in emergency stops.

In what may be descriptively termed the "first position" of the regulating-valve 5, in which the spring-stop 12 abuts against the upper extremity of the guide-recess 13, Fig. 3, being the position for releasing the brakes, a port, 27, formed in and extending through the valve, communicates with a direct supply-port, 28, in the valve-seat 6, which valve-seat port communicates, through a passage or cavity, 29, in the face of the valve, with a passage, 30, leading through the valve-chamber sections 1 2 to the brake-pipe connection 18. A direct passage is thus afforded for air from the main reservoir to the brake-pipe to effect the release of the brakes and the succeeding recharging of the auxiliary reservoirs. At the same time communication is established, through a smaller port, 31, in the valve, and an equalizing supply-port, 32, in the valve-seat, between the main air-reservoir and the chamber 24 above the piston and connected supplementary chamber 26, equilibrium of pressure in the chamber above and below the piston being thereby established and the discharge-valve held to its seat.

In the second position of the regulating-valve 5, in which the spring-stop 12 bears against the projection 14 of the guide-recess, being the position while running, the smaller through-port, 31, of the valve is brought into communication with a port, 33, leading from the valve-seat to the inner or under side of an extra pressure-valve, 34, which controls a port, 35, leading to the brake-pipe passage 30. The valve 34 is loaded by a spring to maintain a determined excess of pressure in the main reservoir above the pressure in the brake-pipe, in order that there may always be a reserve pressure in the main reservoir to insure the release of the brakes. The recess 29 in the face of the valve, which is still in communication with the brake-pipe, is at the same time in communication with a secondary equalizing-port, 36, leading into the chamber 24 above the piston, so as to maintain an equalization of pressure in the brake-pipe and said chamber.

In the third position of the regulating-valve 5, in which the spring-stop 12 bears against the projection 15, being the position for the application of the brakes in ordinary or service stops, a recess or cavity, 37, in the face of the valve is brought into communication with the port 32, leading into the chamber 24 above the piston, and with a preliminary exhaust-port, 38, leading from the seat of the valve to the atmosphere, a discharge of air from the chamber 24 through the ports 32 and 38 being thereby effected. The equilibrium of pressure in said chamber and in the chamber 22 on the opposite side of the piston 19 being consequently destroyed, the piston and connected discharge-valve 21 are moved upwardly by the excess of pressure on the lower side of the piston, and air is discharged from the brake-pipe through the discharge-pipe 23 for the application of the brakes. After such an amount of air has been discharged as is requisite to apply the brakes with desired force the regulating-valve 5 is moved backward to what is termed "lap position," which is about midway between its second and third positions, above specified. When in said lap position all ports are closed, and the discharge through the pipe 23 continues until the pressure below the piston 19 is reduced slightly below that in the chamber 24 above the piston, when the excess of pressure above the piston will gradually move it downwardly, closing the discharge-pipe and cutting off the discharge of air from the brake-pipe. The slow and gradual downward movement of the piston in

closing the discharge-valve admits of sufficient time for the equalization of pressure throughout the entire length of the brake-pipe, and thereby insures a substantially uniform application of the brakes on all the cars of a long train. The discharge of air may be repeated one or more times by returning the regulating-valve to its third position after having been brought to lap, and the application of the brakes with any desired degree of force may be effected by repeated discharges of air from the chamber above the piston.

In the fourth position of the regulating-valve, in which the spring-stop 12 abuts against the lower extremity of the recess 13, Fig. 3, being the position for the application of the brakes in emergency stops, the recess 29 of the valve 5 is brought into communication with the brake-pipe passage 30 and with a direct exhaust-passage, 39, of comparatively large area, leading from the valve-seat 6 to the atmosphere. The free and rapid discharge of air from the brake-pipe which is thereby effected provides for the application of the brakes with maximum rapidity and force, as required in making emergency stops.

We claim as our invention and desire to secure by Letters Patent—

1. In an engineer's brake-valve, the combination of a movable abutment and a connected discharge-valve controlling the exhaust of air from a brake-pipe, said abutment being adapted to open the discharge-valve by a disturbance of equilibrium of pressure on its opposite sides, and to close and maintain the closure of the discharge-valve in and by the restoration of such equilibrium, substantially as set forth.

2. In an engineer's brake-valve, the combination of a discharge-valve controlling the exhaust of air from a brake-pipe, a movable abutment connected to the discharge-valve, and a regulating-valve controlling ports by which, respectively, an equilibrium of pressure is established and a difference of pressure is effected on opposite sides of the abutment to maintain the closure and effect the opening and closure of the charge-valve, substantially as set forth.

3. In an engineer's brake-valve, the combination of a movable abutment fitted to work in a chamber communicating with a brake-pipe connection on one side of the abutment, a discharge-valve connected to said abutment and controlling a pipe leading from the brake-pipe connection to the atmosphere, a supply-port for establishing equilibrium of brake-pipe pressure in the chamber on opposite sides of the abutment, an exhaust-port for relieving pressure in the chamber on the side of the abutment opposite that which is in communication with the brake-pipe connection, and a regulating-valve controlling said supply and exhaust ports, substantially as set forth.

4. In an engineer's brake-valve, the combination of a valve casing or chamber, a main air-reservoir connection and a brake-pipe connection leading thereinto, a direct supply-port formed in a valve-seat in the chamber and adapted to establish direct communication between said connections, a movable abutment fitted to work in a chamber in the casing communicating on one side of the abutment with the brake-pipe connection, a discharge-valve connected to said abutment and controlling a passage from the brake-pipe connection to the atmosphere, an equalizing supply-port leading from the abutment-chamber to the valve-seat on the side of the abutment opposite to that which is open to the brake-pipe connection, and a regulating-valve working on the valve-seat and controlling the direct supply and equalizing ports, substantially as set forth.

5. In an engineer's brake-valve, the combination of a valve casing or chamber, a main air-reservoir connection, and a brake-pipe connection leading thereinto, a direct supply-port formed in a valve-seat in the chamber and adapted to establish direct communication between said connections, a loaded valve governing an extra pressure-port leading from the valve-seat to the brake-pipe connection, a movable abutment fitted to work in a chamber in the casing communicating on one side of the abutment with the brake-pipe connection, a discharge-valve connected to said abutment and controlling a passage from the brake-pipe connection to the atmosphere, a primary and a secondary equalizing-port, each leading from the abutment-chamber to the valve-seat on the side of the abutment opposite to that which is open to the brake-pipe connection, and a regulating-valve working on the valve-seat and controlling the several port-openings therein, substantially as set forth.

6. In an engineer's brake-valve, the combination of a valve casing or chamber, a main air-reservoir connection and a brake-pipe connection leading thereinto, a direct supply-port formed in a valve-seat in the chamber and adapted to establish direct communication between said connections, a movable abutment fitted to work in a chamber communicating on one side of the abutment with the brake-pipe connection, a discharge-valve connected to said abutment and controlling a passage from the brake-pipe connection to the atmosphere, an equalizing supply-port leading from the abutment-chamber to the valve-seat on the side of the abutment opposite to that which is open to the brake-pipe connection, an exhaust-port leading from the valve-seat to the atmosphere, and a regulating-valve working on the valve-seat and controlling the several port-openings therein, substantially as set forth.

7. In an engineer's brake-valve, the combination of a valve casing or chamber, a main air-reservoir connection and a brake-pipe connection leading thereinto, a direct supply-port formed in a valve-seat in the chamber and

adapted to establish direct communication between said connections, a direct exhaust-passage leading from the valve-seat to the atmosphere, and a regulating-valve working on the valve-seat and controlling the direct supply-passage and having a recess or cavity adapted to establish communication between the brake-pipe connection and the direct exhaust-passage, substantially as set forth.

8. In an engineer's brake-valve, the combination of a valve casing or chamber, a main air-reservoir connection and a brake-pipe connection leading thereinto, a direct supply-port formed in a valve-seat in the chamber and adapted to establish direct communication between said connections, a direct exhaust-passage leading from the valve-seat to the atmosphere, a discharge-valve controlling an independent exhaust-passage from the brake-pipe connection, a movable abutment connected to the discharge-valve, and a regulating-valve controlling ports by which, respectively, an equilibrium of pressure is established and a difference of pressure is effected on opposite sides of the abutment, and also controlling communication between the direct supply-port and the brake-pipe connection and between the brake connection and the direct exhaust-passage, substantially as set forth.

9. In an engineer's brake-valve, the combination of a movable abutment fitted to work in a chamber communicating with a brake-pipe connection on one side of the abutment, a supplemental reservoir communicating with said chamber on the other side of the abutment, a discharge-valve connected to said abutment and controlling a pipe leading from the brake-pipe connection to the atmosphere, a supply-port for establishing equilibrium of brake-pipe pressure in the chamber on opposite sides of the abutment, an exhaust-port for relieving pressure in the chamber on the side of the abutment opposite that which is in communication with the brake-pipe connection, and a regulating-valve controlling said supply and exhaust ports, substantially as set forth.

In testimony whereof we have hereunto set our hands.

GEO. WESTINGHOUSE, JR.
FRANK MOORE.

Witnesses:
J. SNOWDEN BELL,
W. D. UPTEGRAFF.

Disclaimer in Letters Patent No. 401,916.

DISCLAIMER.

401,916.—*George Westinghouse, jr.*, and *Frank Moore*, Pittsburg, Pa. IMPROVEMENT IN ENGINEER'S BRAKE VALVES. Patent dated April 23, 1889. Disclaimer filed June 19, 1902, by the present assignee, the *Westinghouse Air Brake Company*.

Enters its disclaimer—

"To so much or such part of claim 7 of said Letters Patent as includes or may be construed to include—

"An engineer's brake valve (otherwise complying with the said claim) which is not provided with a movable abutment, working in a chamber in the valve casing and controlling a discharge valve from the brake-pipe to atmosphere, substantially as described in the specification."—[*Official Gazette, June 24, 1902.*]