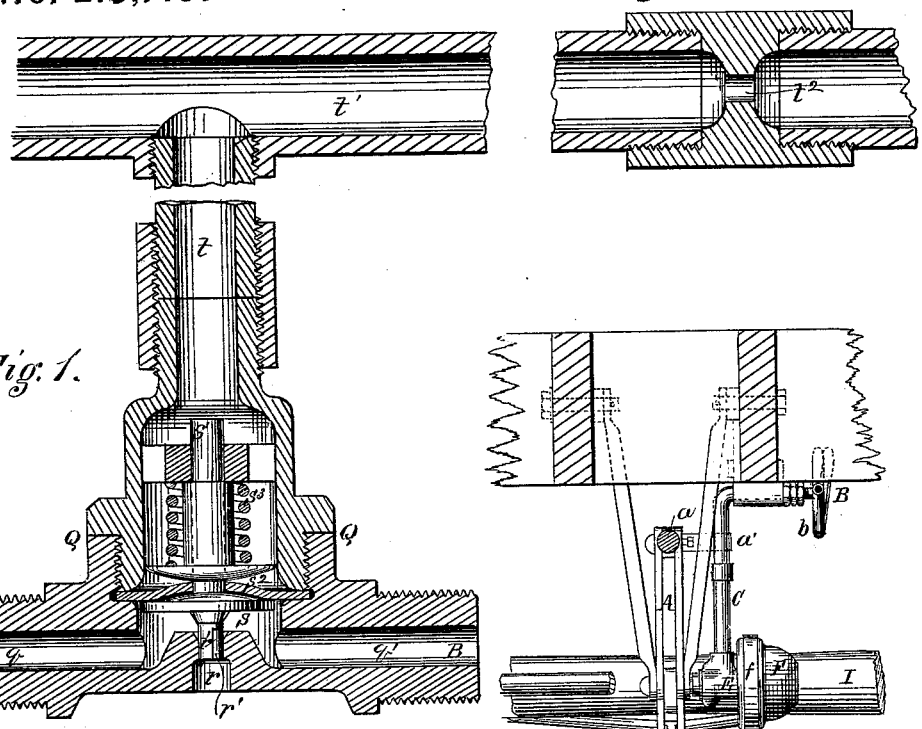
2 Sheets—Sheet 1.

G. WESTINGHOUSE, Jr.

Fluid-Pressure Brake Apparatus.

No. 218,149. Patented Aug. 5, 1879.



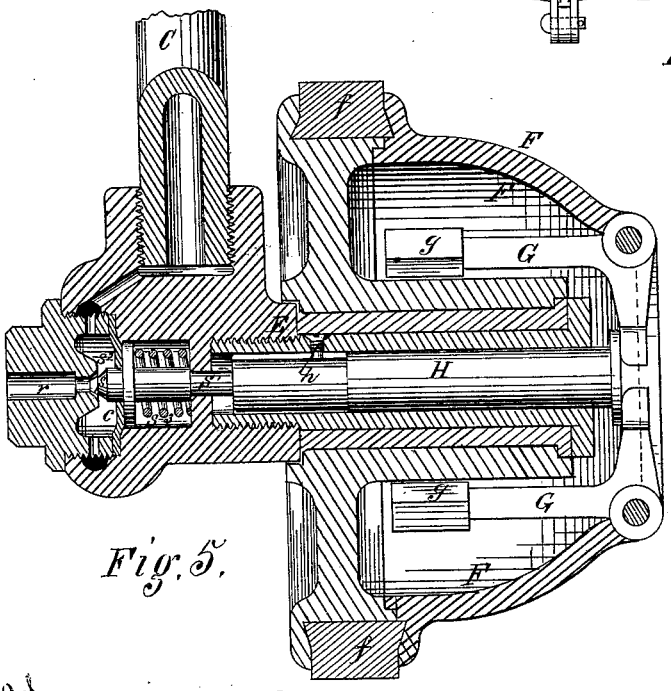


Fig. 5.

Witnesses.
R. F. Whiddesey
C. L. Parker

Inventor George Westinghouse Jr.
by Attorney George N. Christy

2 Sheets—Sheet 2.

G. WESTINGHOUSE, Jr.

Fluid-Pressure Brake Apparatus.

No. 218,149. **Patented Aug. 5, 1879.**

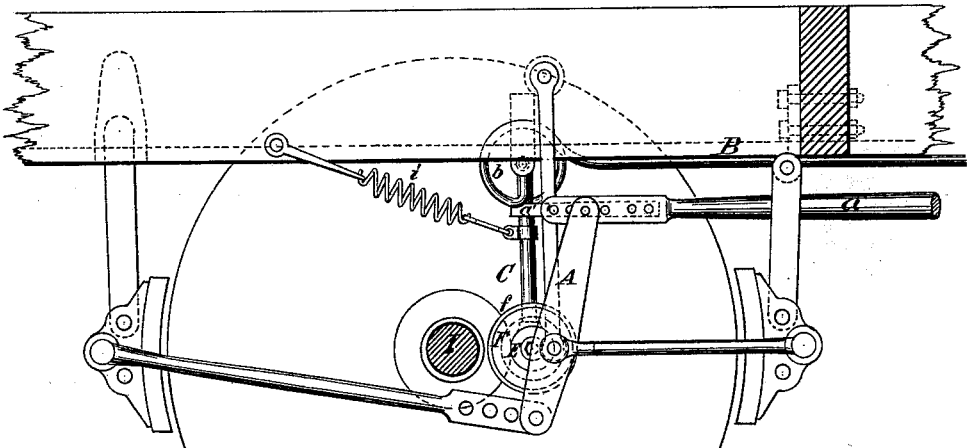


Fig. 2.

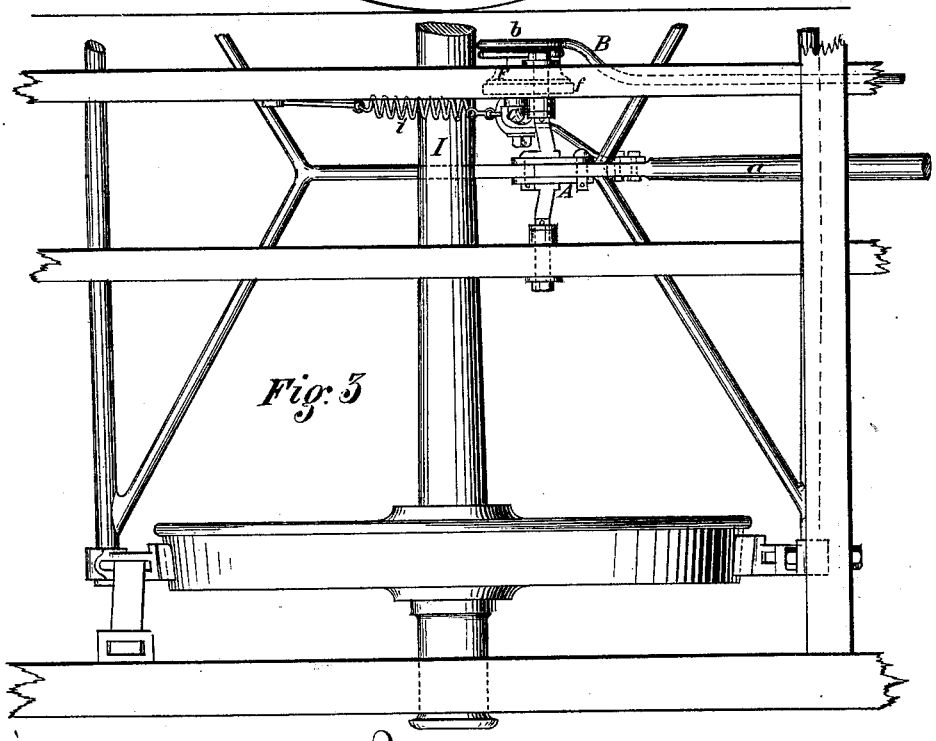


Fig. 3

Witnesses.
R. F. Whitlesey
C. L. Parker

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By Attorney George H. Christy

UNITED STATES PATENT OFFICE.

GEORGE WESTINGHOUSE, JR., OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN FLUID-PRESSURE BRAKE APPARATUS.

Specification forming part of Letters Patent No. **218,149**, dated August 5, 1879; application filed June 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 Fluid-Pressure Brake Apparatus; 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, Sheet 1, represents a vertical section of an escape-valve which I employ for regulating the pressure of the brake-shoes on the wheels, more particularly in the manner represented in Figs. 2, 3, 4, and 5, of which Fig. 2, Sheet 2, is a side view; Fig. 3, Sheet 2, a plan; Fig. 4, Sheet 1, an end view of part of the car-frame and running-gear with my improvement applied thereto; and Fig. 5, Sheet 1, is a section, to an enlarged scale, of the governor which I employ and the escape-valve worked by it.

In various patents heretofore granted to me I have described systems of working the brakes of railway-trains by fluid-pressure communicated throughout the train by suitable pipes, and more particularly a system according to which air compressed by a pump into a main reservoir on the locomotive supplies auxiliary reservoirs on the several cars of the train, and the store of power retained in these reservoirs is employed to act in cylinders upon pistons connected directly or indirectly with the brake-levers, so as simultaneously to apply the several sets of brakes when desired, or in case of accident to the train.

My present improvement relates, chiefly, to certain additions to fluid-pressure brake apparatus, whereby it is rendered more effective, as also more uniform and regular in its action, thereby making the system of operating therewith more complete and certain.

In carrying it out I connect with some one of the air or other fluid-pressure conduit-pipes an escape-valve, by which to lower the pressure when desired, and open and close such valve automatically, according to the varying speed of the train, as a greater or less reduction of pressure may be desired, by the use of a governor device operated from the axle or other revolving gear of the train, such action of the governor and escape-valve being independent of the more or less open position of the cock or other device by the use of which the brake-pressure is applied.

It will be remembered that in the class of brakes now under particular consideration, known sometimes as the "automatic brake," the air-pressure stored up in the auxiliary reservoir is brought into action on the pistons or other movable parts of the brake-cylinders or diaphragms by reducing to a greater or less degree the fluid-pressure in the conduit-pipes.

In Fig. 1 I have shown a valve box or case, Q, which has four apertures. Two of them, q and q', communicate with the brake-cylinder, the valve-box being introduced into the branch pipe by which the cylinder is supplied. The third aperture, r, opening to the outer air, is fitted with a valve, s, to the stem s^1 of which is attached a flexible diaphragm, s^2, secured at its edge to the valve-box.

The valve has projecting from it a short rod, which works as a guide in the aperture r, and this rod is notched or flattened on one side, as shown at r', so as to give passage through the aperture, varying in area as the valve moves.

The fourth aperture, t, communicates with a pipe, t^1, containing fluid under pressure, which is regulated by a centrifugal governor.

The valve, with its diaphragm s^2, is pressed down by a spring, s^3, adjusted to a pressure less than that required in the brake-cylinder, and it is also pressed down by the fluid in the pipe with which t communicates. As long as the pressure of the spring s^3 along with that in t exceeds the pressure in the brake-cylinder the aperture r remains closed by the valve; but when the pressure in the brake-cylinder exceeds that due to the spring and the fluid in t acting along with it, then the diaphragm s^2 is forced upward, raising the valve s, and so opening the aperture r and allowing air to escape until the pressure in the brake-cylinder becomes reduced to balance the combined pressure of the spring s^3 and the fluid in the branch t.

The pressure of the fluid in t is varied dur-

ing the action of the brakes, so as to be greatest when the wheels are moving rapidly and to decrease as they revolve more slowly, it having been found that the brake-shoes exert greater friction on wheels when they are slowly revolving than when they are rapidly revolving, and consequently less pressure is required in the brake-cylinder as the train is coming to rest.

For the purpose of varying the pressure in t in accordance with the speed of the train, I employ either of two arrangements or constructions.

According to the one the branches t of the several escape-valves throughout the train are all in communication with a pipe, t^1, supplied through a small orifice, t^2, (made therein at at any suitable point,) with compressed air from the reservoir on the locomotive, and provided with an escape-valve, which is held to its seat by a centrifugal governor driven by one of the running axles, as hereinafter described with reference to the other construction.

When the train is moving rapidly, the governor, revolving rapidly, keeps the escape-valve of the pipe closed, so that considerable pressure is maintained in the pipe; but as the train moves more slowly the governor, also becoming retarded, allows the escape-valve of the pipe to open more or less, and thus the pressure in the pipe, and, consequently, that acting on the diaphragm s^2, becomes reduced.

According to the other construction, instead of regulating the pressure in t by means of a pipe communicating throughout the train and having the pressure in it controlled by one governor, I combine the escape-valve of each brake-cylinder with a local governor driven from one of the running axles of the car itself, such construction being represented in Figs. 2, 5.

The brake-lever A is worked by the rod a, connected in the usual way to the piston of the brake-cylinder, from which cylinder there is communication, by a pipe, B, and tubular link C, to the interior of the escape-valve under its diaphragm s^2. The pipe B is bent into one or more coils at b, to allow of a little flexure when the link C is moved.

To the lower end of the link C is fixed a horizontal axle, E, forming a bearing, on which the governor revolves. This governor consists of a hollow casing, F, having on its periphery a ring, f, of caoutchouc, leather, wood, or other suitable material of like nature, and having mounted within it two bent levers, G, with weights g at their inner ends. The short arms of the levers G bear on the end of a central sliding rod, H, which is prevented from revolving by a stud, h, projecting into a slot of the rod. The inner end of the rod H bears against the stem s^1 of the escape-valve, which is similar in construction and arrangement to that described above with reference to Fig. 1, having an opening at r to the outer air.

The link C, with the governor, is drawn toward the carriage-axle I by a spring, i; but so long as the brakes are off, as shown in Fig. 2, the periphery f of the governor-casing is kept away from contact with the axle I by a hooked bar, a', which is fixed to the rod a and is bent partly round the link C.

When the rod a advances so as to put on the brakes the link C is permitted to be drawn by the spring i till the periphery f of the governor-drum is brought in contact with the axle I, and thereby caused to revolve. While it revolves rapidly, its weights g, tending by centrifugal force outward, cause the rod H and the stem of the escape-valve to be pressed forward, closing the escape-aperture r; but when, on the train moving more slowly, the governor is driven with less velocity, the pressure, acting under the diaphragm s^2, overcomes the centrifugal force of the governor, so as to unseat the valve and allow escape by the aperture r, thereby causing the pressure acting in the brake-cylinder to be reduced, and consequently diminishing the pressure of the brake-blocks upon the wheels as they revolve more slowly.

I am aware that a governor device has been combined with the running axle of a train, and by means of a slide-valve with the charging and discharging pipes of a steam-brake apparatus, in such manner that with the varying speed of the train the steam-pressure was automatically admitted to and discharged from the brake-cylinder, so as to prevent the train from running at any time at greater than a predetermined speed. My present invention differs from this in the fact that the action of the governor is independent of the more or less open position of the charging-cock, which latter is under the control of the engineer, so that he can apply the brake whether the train be running fast or slow, and the function of the governor and escape-valve is simply to vary the effective force of such fluid-pressure as the engineer may thus admit to the brake-cylinders, while the train may gradually slacken its speed.

I claim herein as my invention—

1. A valve-case, Q, having ports q q', for connection in the line of communication to the brake-cylinder, a port, r, leading to the external air, a diaphragm (or equivalent piston) valve for opening and closing the escape-port by variations of air-pressure, and a spring, s^3, for providing an excess of pressure on one side, substantially as set forth with reference to Fig. 1.

2. In combination with the conduit-pipes and brake-cylinder of a fluid-pressure brake apparatus, a fluid-pressure escape-port opened and closed by a governor acting independently of the more or less open position of the fluid-pressure charging device or devices of the apparatus, substantially as set forth.

3. A governor operating the escape-valve of a fluid-pressure brake, such governor being

brought into frictional contact with the running axle of a truck or released therefrom automatically on the application or release of the fluid-pressure, the combination being substantially as set forth.

4. In combination with a movable governor and running car-axle, a fluid-pressure conduit-pipe, B C, having one or more coils, *b*, substantially as set forth.

5. In combination with a car-axle movable governor, fluid-pressure pipe, and escape valve and ports, a connection from the movable brake-rigging for shifting the governor one way, and a spring for shifting it the other way, substantially as set forth.

In testimony whereof I have hereunto set my hand.

GEO. WESTINGHOUSE, JR.

Witnesses:

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