(No Model.) 2 Sheets—Sheet 1.

# G. WESTINGHOUSE, Jr.

## AUTOMATIC BRAKE REGULATOR.

No. 345,820. Patented July 20, 1886.

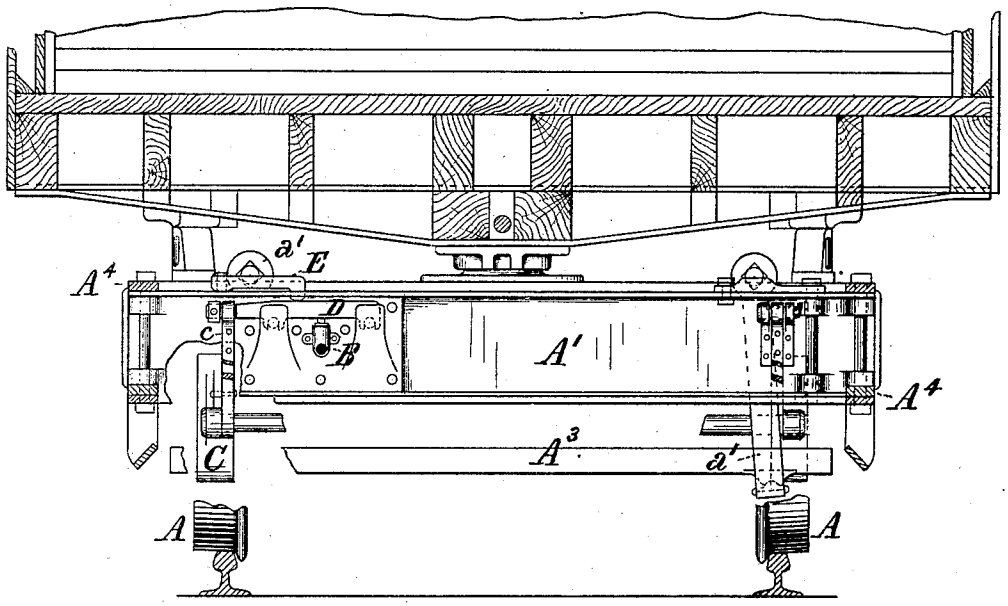


Fig. 1.

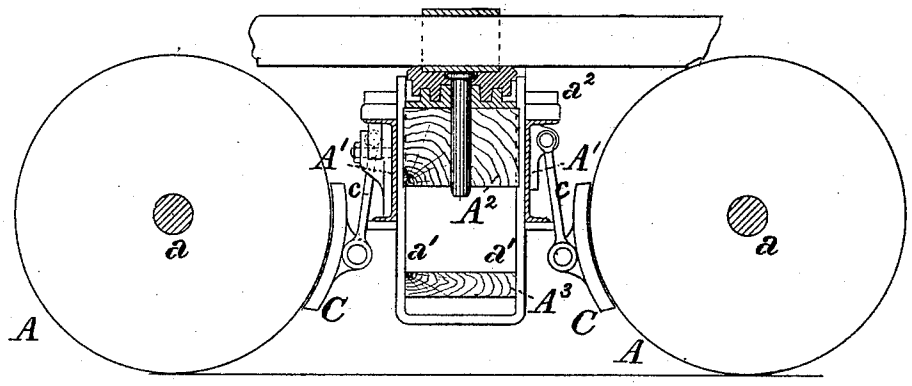


Fig. 2.

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Inventor. George Westinghouse Jr.
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(No Model.) 2 Sheets—Sheet 2.

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## AUTOMATIC BRAKE REGULATOR.

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*Fig. 3.*

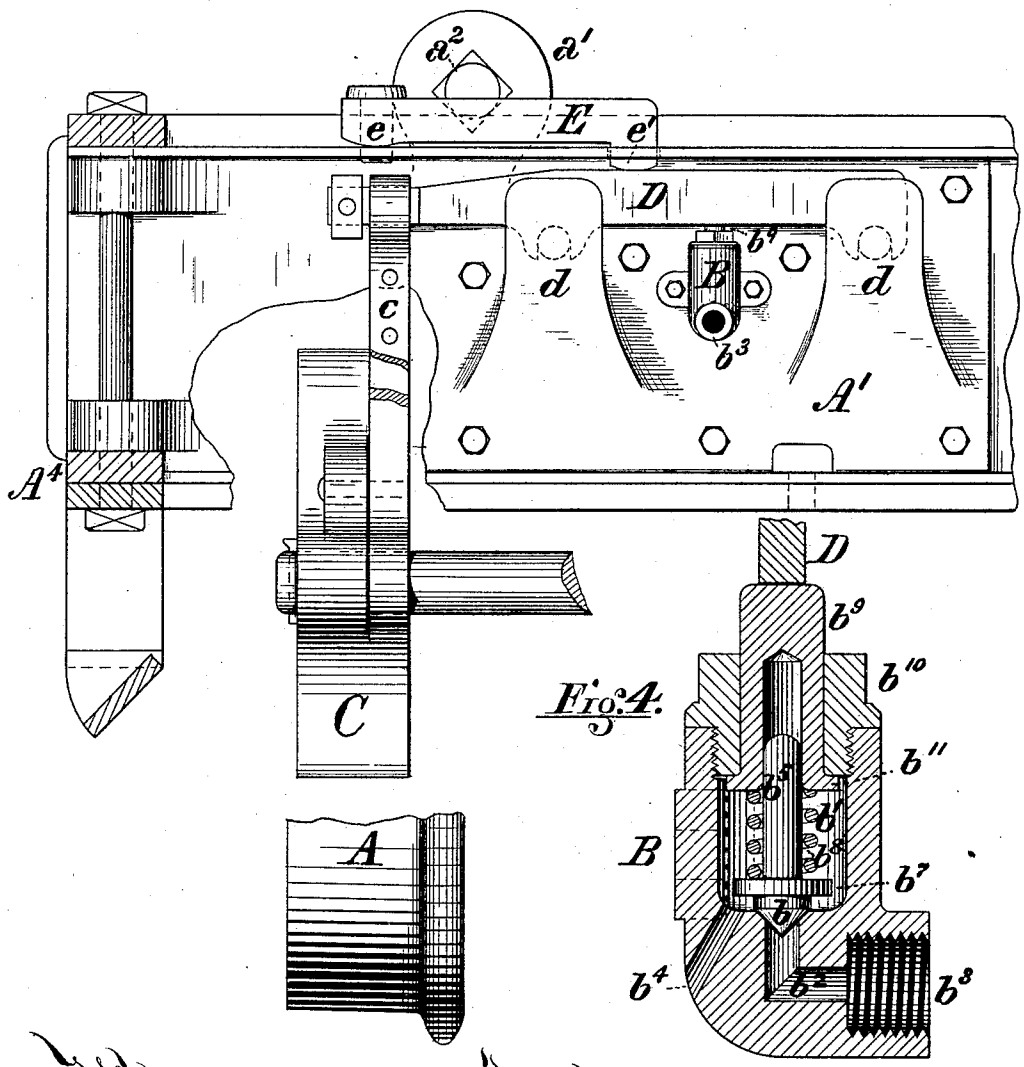


*Fig. 4.*




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# UNITED STATES PATENT OFFICE.

GEORGE WESTINGHOUSE, JR., OF PITTSBURG, PENNSYLVANIA.

## AUTOMATIC-BRAKE REGULATOR.

SPECIFICATION forming part of Letters Patent No. 345,820, dated July 20, 1886.

Application filed March 3, 1884. Renewed May 7, 1886. Serial No. 201,483. (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, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Automatic-Brake Regulators; 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 representing like parts—

Figure 1, Sheet 1, is a transverse sectional elevation of a car-truck illustrating the application of my invention; Fig. 2, a longitudinal central section through the same; Fig. 3, Sheet 2, a view in elevation and on an enlarged scale of the operative mechanism; and Fig. 4, a vertical central section, on a further enlarged scale, through the regulating valve-chamber.

In the operation of railway-brakes it is well recognized that the retarding action of the power employed to apply the brake-shoes to the wheels is most effectively and properly exerted when so proportioned to the resistance of the wheels as to induce the greatest degree of friction thereon below that which will cause them to slide upon the rails; and, further, that the pressure required to induce such degree of friction while variable within a considerable range, under different conditions of speed of train, state of rails, the material of the shoes, and the duration of their application to the wheels, bears a certain ratio to the load carried by the wheels, and consequently such pressure, to be fully efficient, should be greater or less in correspondence with variations in the load borne by the wheels.

It is the object of my present invention to so regulate the application of fluid-pressure to the operation of brake-shoes that a greater or less force may be exerted upon the latter in braking, as required by and in accordance with the relation of the load upon the wheels against which the shoes are pressed to the resistance induced upon the shoes in braking.

The improvements claimed are hereinafter fully set forth.

My improvements are, for illustration, herein shown as applied in connection with a freight-car four-wheeled "swing" truck of the usual construction, the wheels A of which are secured upon axles *a*, the boxes of which fit pedestals in side frames, $A^4$, connected by transoms A'. The weight of the end of the car supported by the truck rests upon a bolster, $A^2$, which is fitted to move vertically between the transoms A' and bears upon a spring-plank, $A^3$, which is coupled at or near each of its ends by swing-hangers *a'* (which may be either single or double) and swing-hanger pivots $a^2$ to the transoms A'. A valve-casing, B, is secured to the outside of one of the transoms of one or both trucks of the car, said casings having an internal chamber, *b'*, in which a regulating-valve, *b*, is seated above the inner opening of a supply-port, $b^2$, leading into a nozzle, $b^3$, which is threaded or otherwise adapted to be connected by a flexible pipe with an operating brake-cylinder, taking its supply from a reservoir of fluid under pressure, through which the application of the brake-shoes C to the wheels A is effected in any approved manner, and a relief or discharge port, $b^4$, leads from the chamber *b'* of the casing to the atmosphere. The stem $b^5$ of the regulating-valve fits freely in a longitudinal recess or socket in a stem, $b^9$, which fits accurately and is adapted to move longitudinally in the central bore of a cap, $b^{10}$, closing the upper end of the valve-casing B. A spring, $b^8$, bears at one end against a flange, $b^{11}$, on the lower end of the stem $b^9$, and at the other against a collar, $b^7$, on the valve-stem $b^5$, its tendency being to maintain the valve *b* against its seat with a greater or less degree of pressure, according to the downward or upward movement of the stem $b^9$. The tension of the spring $b^8$, when the stem $b^9$ is at its highest point, as shown in Fig. 4, is such as will maintain the regulating-valve *b* closed against such pressure in the fluid-pressure reservoir as is proper to effect the application of the brake-shoe when the least amount of weight is carried by the truck—that is, when the car is empty and the train moving at a moderate speed—but in its normal position for operation, as shown in Fig. 3, the stem $b^9$ is held at its lowest position in the casing, giving a degree of compression to the spring sufficient to prevent the escape of any air. The valve is held

to its seat with a variable force during the time the brakes are acting with their maximum effect proportionately to the pressure brought to bear upon the stem $b^9$ by the application of the brake-shoe to the wheel as effected or modified by and in accordance with the greater or less weight applied to the truck in the loading of the car. The resultant of the action of that proportion of pressure of the weight of the car-body and load carried by one wheel of each truck against the drag or resistance of the wheel on the shoe acts upon each regulating-valve to increase or to relieve, as the case may be, the pressure which holds the same to its seat through a lever, D, which is supported on pivot-bearings *d*, fixed on the transom A′ on each side of the valve-casing B. The lower side of the lever D bears upon the top of the stem $b^9$, and its outer end, extending beyond the adjacent pivot-bearing *d*, is coupled to the upper end of a link, *c*, the lower end of which is in turn coupled to the brake-shoe C. A lever, E, is pivoted at one end to the transom A′, resting on the upper surface thereof by a segmental bearing, *e*, and its free end is provided with a downward projection, *e′*, which bears upon the top of the lever D. One end of the swing-hanger pivot $a^2$ bears upon the lever E, and it therefore follows that a greater or a less downward pressure will be exerted upon the levers E and D, and will consequently require a greater or less force on the hanger *c* to move the lever D, which, accordingly as it is moved more or less, regulates the pressure upon the spring $b^8$ of the regulating-valve, which pressure is therefore proportionate to the load applied to the truck through its bolster $A^2$, and, further, that such downward pressure acts in opposition to the tendency of the brake-shoe to move the outer end of the lever D when applied in braking the wheel. In the normal position of the parts the lever D is forced to its lowest position, and the spring $b^8$ is compressed to a tension beyond that which is proper for the application of the brake-shoes under the conditions of the least amount of load in the car and at moderate speed.

In operation the resistance resultant upon the application of the brake-shoe to the wheel induces a tendency to upward or downward movement in the shoe C, according to the direction of movement of the train, which tendency, through the link *c*, is imparted to the lever D, and is resisted by the lever E in greater or less degree proportionately to the weight acting thereon through the spring-hanger pivot $a^2$. When the pressure applied to the shoe exceeds the degree normal for the weight upon the truck, the tendency of the brake-shoe to upward or downward movement, as the case may be, overcomes the resistance of the weight acting on the lever D through the lever E and swing-hanger pivot $a^2$, and through the link *c* raises or lowers the outer end of the lever D, moving the same upon one or the other of its pivots *d*, and thereby relieving the stem $b^9$ from the pressure thereof. The spring $b^8$, being then relieved from excess of tension above that which is normal for the weight upon the truck, will permit the regulating-valve *b* to lift and allow the escape of operating-fluid from the brake-cylinder, with which the valve-casing B communicates through the ports $b^3$ and $b^4$, until the pressure in the brake-cylinder is reduced sufficiently to exert only the desired force upon the brake-shoe, when the spring $b^8$ will automatically return the valve *b* to its seat in correspondence with the reduction of pressure. The tension of the spring $b^8$, above that necessary to maintain the valve *b* against its seat when the truck bears its minimum load, will thus be diminished to a greater or less degree, and the opening of said valve will be correspondingly governed proportionately to the weight acting on the stem $b^9$ through the levers D and E against the resistance of the wheel on the shoe.

I do not limit myself to the employment of a regulating-valve communicating with a fluid-pressure pipe or reservoir, as said valve may perform a similar function in connection with a vacuum-brake pipe and chamber, which, in the operation of the invention, would constitute mechanical equivalents for corresponding elements of a fluid-pressure apparatus, the regulating-valve being in such case arranged to admit external air, in lieu of permittiug relief of pressure. Further, the class of regulating-valve employed, and the construction of the lever mechanism for the transmission of pressure from the load of the truck and from the brake-shoe to said valve, may be varied in sundry particulars, which are within the judgment of the constructor, without departing from the spirit of my invention.

In Letters Patent of the United States No. 214,337, granted and issued to me under date of April 15, 1879, there is set forth a regulating-valve actuated by variations in the speed of a car-wheel, to automatically regulate the supply of fluid under pressure to the brake-cylinders. I am further aware that a relief-valve controlled and actuated by, and only by, the pressure of the load in the car, and designed to directly effect the regulation of the pressure applied to the brakes by the varying weight of the load in the car has been heretofore proposed. Such automatic regulating-valve adapted, as above stated, to be actuated either by variations of speed or variations of weight, I do not herein broadly claim; but I am not aware that prior to my invention a valve has been employed to regulate fluid-pressure by and in accordance with variations in the resultant of the action of the load borne by the wheels to which brake-shoes are applied by the action of such fluid-pressure against the drag or resistance of the wheels upon the shoes in the operation of braking.

I claim herein as my invention—

1. The improvement in the method of varying the pressure of brake-shoes upon wheels, which consists in transmitting to a regulating-valve adapted to effect variations in the fluid-

pressure, by which a brake-shoe is applied to said wheel, the resultant effect of the action of the weight carried upon a wheel against the resistance induced in applying a brake-shoe thereto, substantially as set forth.

2. In a fluid-pressure-brake apparatus, the combination of a car-wheel, a brake-shoe, a pressure-regulating valve governing a port communicating with a fluid-pressure pipe or reservoir, a system of levers for transmitting the pressure of the weight carried upon the wheel to the regulating-valve, and a connection between said lever system and the brake-shoe, substantially as set forth.

3. The combination of a pressure-regulating valve governing a port communicating with a fluid-pressure pipe or reservoir, mechanism, substantially as described, for applying the pressure of weight carried upon a car-wheel to said valve, and mechanism, substantially as described, for transmitting the effect of the friction of a brake-shoe against a wheel to said valve in opposite direction to the action of the applied weight thereon, substantially as set forth.

4. The combination, with a car-truck, of a pressure-regulating valve working in a chamber secured to the truck-frame, and governing a port communicating with a fluid-pressure pipe or reservoir, a lever bearing on pivots on the truck-frame and upon the regulating-valve and coupled to a brake-shoe, and a lever which receives the pressure of the weight borne by a supporting member of the truck, and transmits the same to the lever bearing on the regulating-valve, substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand.

GEO. WESTINGHOUSE, JR.

Witnesses:
J. SNOWDEN BELL,
R. H. WHITTLESEY.