2 Sheets--Sheet 1.

G. WESTINGHOUSE, Jr.

Steam and Air Brakes.

No. 134,177. Patented Dec. 24, 1872.

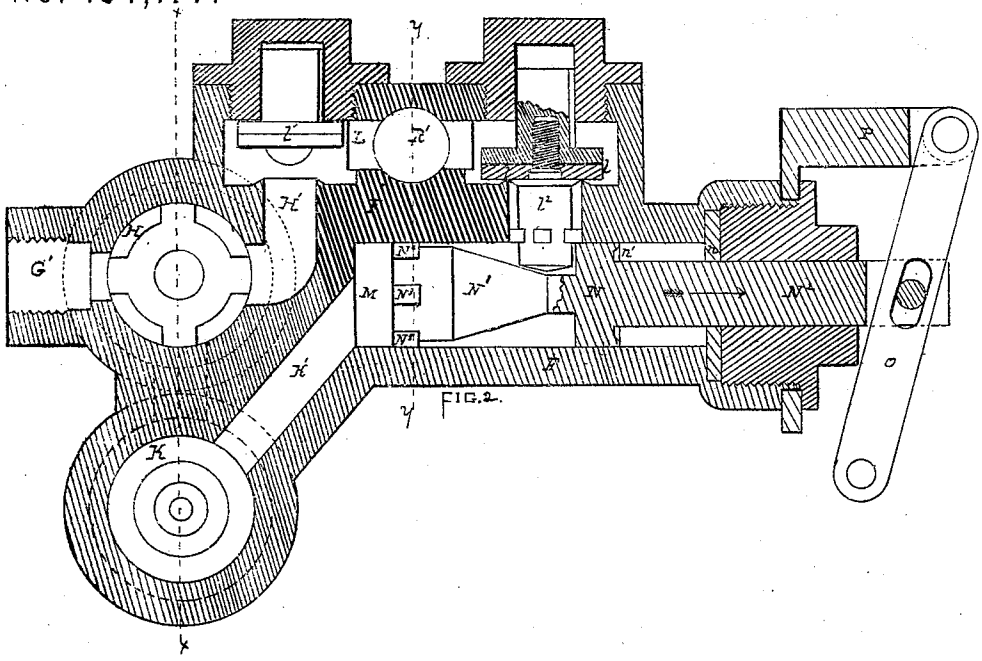

FIG. 2.

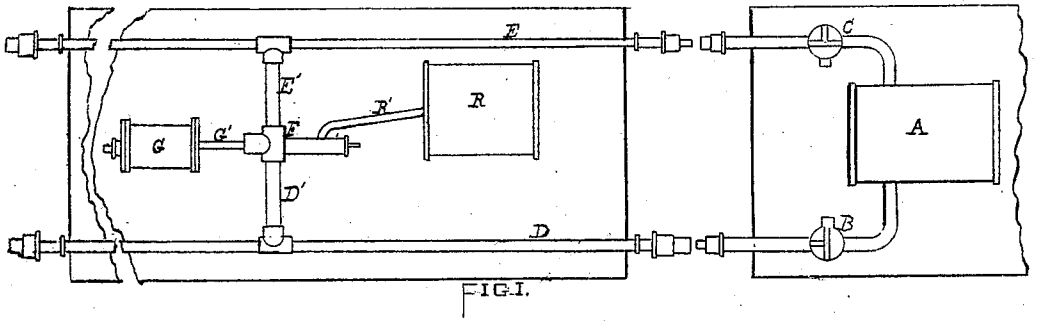

FIG. 1.

Witnesses.

R. G. Wentworth

James L. Kay

Inventor.

George Westinghouse Jr.
by Bakewell, Christy & Kerr,
his atty's.

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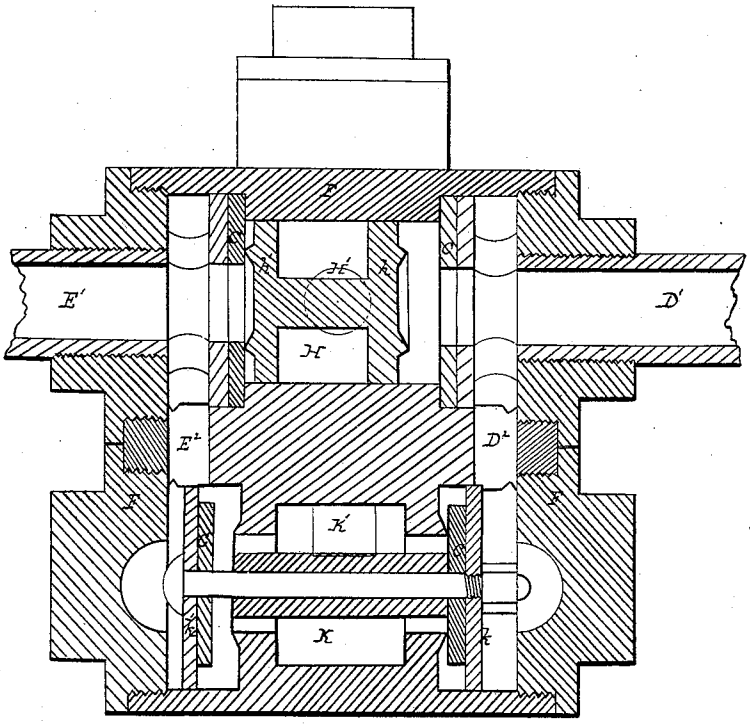

FIG. 3.

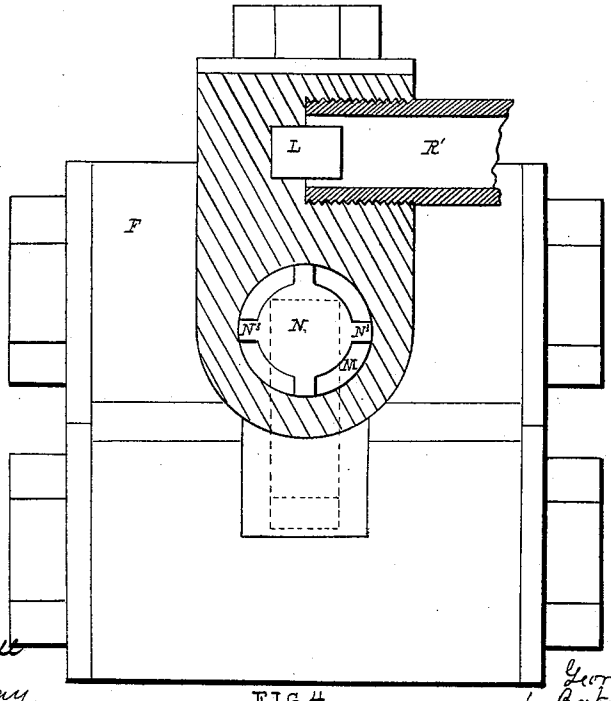

FIG. 4.

Witnesses

R. F. Wentworth

James L. Kay

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by Bakewell, Christy & Kerr
his Attys.

UNITED STATES PATENT OFFICE.

GEORGE WESTINGHOUSE, JR., OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN STEAM AND AIR BRAKES.

Specification forming part of Letters Patent No. **134,177**, dated December 24, 1872.

To all whom it may concern:

Be it known that I, GEORGE WESTINGHOUSE, Jr., of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Steam-Power Air Brake, Valve, and Ports; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing forming part of this specification, in which—

Figure 1, diagramatically, represents a plan of the under side of a car-body and part of a locomotive-body, showing in outline the reservoirs, pipes, brake-cylinders, and connections. Fig. 2 is a longitudinal section of the valve-box and valves F of Fig. 1. Fig. 3 represents a transverse section through *x x*, Fig. 2; and Fig. 4 represents a like section through the line *y y*, Fig. 2.

Like letters of reference indicate like parts in each.

In the specifications of patents granted to me March 5, 1872, Nos. 122,404 and 122,405, I have described various constructions of devices for working the power-brakes of railway trains by means of compressed air, and also for transmitting signals from one part to another of such trains by means of the same agent. One feature described in the patent No. 124,405 was the use of an auxiliary reservoir on each car, in connection with a brake-cylinder and a pipe or pipes extending from end to end of the train; and in the patents above named I have described various modes by which the brakes could be worked and signals could be given, either by hand or automatically, in case of a car becoming detached or running off the track.

My present invention relates to an improved construction of the valves and ports employed in such apparatus.

To enable others skilled in the art to make and use my improvement, I will proceed to describe its construction and mode of operation.

A is the main reservoir of compressed air on the locomotive, from which branches, furnished with three-way cocks B and C, lead to the two air-pipes D and E, communicating throughout the train. Each of the cocks B and C has an opening in its case on one side to the atmosphere. When the cock is turned, as at B, the pipe D, to which it belongs, is open to the atmosphere, and the air within it is therefore at atmospheric pressure. When the cock is turned, as at C, the pipe E, to which it belongs, is in communication with the reservoir of compressed air A, and is therefore supplied with compressed air. The cocks also may be turned partly round, so as to close all these passages. The pipes D and E are connected by branches D^1 E^1 with a valve-box, F, constructed according to my present invention, as I will presently describe, and this valve-box is connected by a pipe, G′, with the brake-cylinder G and by a pipe, R′, with the auxiliary reservoir R. The letters D^1, E^1, G′, and R′, on Figs. 2, 3, and 4, indicate, respectively, the connections to the valve-box F of the branches and pipes marked by the same letters in Fig. 1—that is to say, the branches D^1 and E^1, from the air-pipes D and E, communicate, respectively, with opposite ends of the first chamber H, and also with those of the second chamber K, by passages D^2 and E^2, found in the ends of the valve-box F. The brake-cylinder G communicates by the pipe and passage G′ with the middle of the first chamber H, and the auxiliary reservoir R communicates by the pipe and passage R′ with the third chamber L. The first chamber H contains two valves, *h* and *h′*, connected by a stem, and capable of sealing on caoutchouc or leather seats C provided at each end of the chamber. The action of the valves *h h′* is such that when the pressure in one of the pipes D or E exceeds that in the other the valve at the end of the chamber where there is the greatest pressure is opened and the other valve is closed, and thus the pipe containing air at the higher pressure is in communication with the brake-cylinder by the passage G′, and it is also in communication with the third chamber L of the valve-box by a passage, H′, leading thither from the middle of the first chamber H, while communication is closed between the chamber H and the low-pressure pipe, and also between the pipes. In the second chamber K there are also two valves, *k* and *k′*, connected by a stem and faced with caoutchouc or leather disks C, each valve being capable of seating on a seat provided on the middle part of the chamber K, which communicates by a passage, K^1, with a fourth chamber, M.

The action of the valves $k\,k'$ is such that when the pressure in either of the pipes D or E exceeds that in the other the pipe containing air at the lower pressure is in communication with the fourth chamber M, while communication is closed between that chamber and the high-pressure pipe, and also between the pipes. The connected valves in the chambers H and K are, in construction and action, similar to valves described in the former specifications referred to, (No. 124,405,) and therefore it is to be understood that no claim to novelty is now made in respect of those valves, except for their use in combination with the other parts of the apparatus, which I will now describe. The passage H′, from the middle of the first chamber H to the third chamber L, is fitted with a valve, l^1, which closes when the pressure in the auxiliary reservoir R, communicated through the pipe R′, exceeds the pressure in H. Another passage from the third chamber L to the fourth chamber M is also fitted with a valve, l, which closes when the pressure in the auxiliary reservoir exceeds that in M. The fourth chamber M is of cylindrical form and is fitted with a piston, N, from which projects a conical boss, N^1, with guide-wings N^3. The valve l has a stem, l^2, which, when the valve is closed, nearly touches the smallest part of the conical boss N^1. The rod N^2 of the piston N passes through a hole in the cover of the chamber and is connected to a lever, O. The back of the piston N has a raised annular rib, N^1, which, when the piston is at the extreme of its stroke, seats as a valve against a caoutchouc or leather disk, N, and thereby prevents leakage of air round the rod N^2. The lever O is mounted on a bracket, P, which can be turned round under the lip of the cover to any attitude so as to suit the direction of a cord, chain, or rod which is attached to the outer end of the lever O. This cord, chain, or rod is attached to the automatic tripping apparatus described in the specifications above referred to, No. 125,404, or to the carriage in front, or to the coupling of the slack-pipe between the carriages; or, if desired, it may be carried along the different compartments of the carriage or train so that it can be pulled by the conductor or brakeman.

When such communicating cord, chain, or rod is pulled either by the automatic tripping apparatus when the carriage runs off the line, or by the carriage separating from that before it, or by hand, the piston N is drawn along in the direction of the arrow, and its conical boss N^1 passing under the valve-stem l^2 raises the valve l so as to let compressed air flow from the auxiliary reservoir by the pipe R′ and past the raised valve l into the chamber M behind the piston N. The pressure of the air so admitted acting on the piston N forces it still further in the direction of the arrow, and its conical boss still further raises the valve l, so as to admit a greater supply to the chamber M. From this chamber the air flows by the passage K′ to the middle of the chamber K, whence it passes either or both of the connected valves $k\,k'$, by either or both of the channels D^2 E^2 and branches D^1 E^1, to either or both of the pipes D and E, and also past either or both of the valves $h\,h'$ to the middle of the chamber H, whence it flows, by the pipe G′, to the brake-cylinder G, and there acts upon the piston so as to put on the brakes. Moreover, either or both of the pipes D E, being thus charged with compressed air from any one of the auxiliary reservoirs, the pressure transmitted by them to the chambers K and M in the valve-boxes of other carriages acts on the piston N of those valve-boxes, and raises the valve l so as to admit to the pipes and the several brake-cylinders of the train a further supply of compressed air.

In the specifications above referred to I described audible and visible signals connected to the main air-pipes. I employ such signals in connection with the apparatus described above, each signal being connected by branch pipes to both the main air-pipes D and E. These branches communicate with the signal through a valve-box containing a pair of connected valves like those marked $k\,k'$ in the chamber K, the air-pipes communicating with the ends of the chamber, and the signal communicating at K′ with the middle. The action of these valves is such that when the pressure in either of the pipes D or E exceeds that in the other the signal is cut off from communication with the high-pressure pipe, but remains in communication with the other. When either or both of the pipes is charged with compressed air, as above described, either by the action of the automatic tripping apparatus when a carriage runs off the line, or by the pull of the cord, chain, or rod when the carriages become separated, or when pulled by hand, the audible or visible signals are caused to give their indications at the same time that the brakes are put on.

On now referring to Fig. 1 it will be seen that when one of the three-way cocks, as C, is turned so as to put one of the air-pipes, as E, in communication with the main reservoir of compressed air A, the chambers H of the several valve-boxes F throughout the train receive a supply of compressed air, which passes, by the pipes G′, to the several brake-cylinders and causes the brakes to be put on, and also, by the passages H′, past the valves l^1 into the chamber L, and thence, by the pipes R′, to the several auxiliary reservoirs, which thus become charged with compressed air. By turning the cock C to the position of that shown at B, so as to let air issue from the pipe to the atmosphere, the air flows from the several brake-cylinders and the brakes are taken off. But the air which, when the brakes were put on, had charged the auxiliary reservoirs, is retained there by the closing of the valves l^1. The brakes having been taken off, the cocks B and C are both turned so as to close all passages through them, and then the brakes can be put on and signals given by the compressed

air contained in the auxiliary reservoirs which is brought into action by the movement of any one of the pistons N, as above described, the movement of one of the pistons serving to move the others, and thus to utilize the pressure in all the auxiliary reservoirs of the train.

In consequence of the arrangement of valves, as above described, either of the pipes D or E may be used for charging the auxiliary reservoirs and applying the brakes, and either pipe may serve for the communication of signals. Also, the same construction of apparatus may be employed in connection with hydraulic, gas, or other fluid brakes, or where the brakes are applied by a vacuum pressure; but where a vacuum is employed the valves should be inverted, the action of the air being reversed. In connection with hydraulic brakes an accumulator would have to be used in place of the reservoir.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a system of air-brake apparatus, a brake-cylinder and an auxiliary reservoir, with an air-pipe connection, for charging both simultaneously with compressed air, in combination with a check-valve arranged in the air-passage which leads to the auxiliary reservoir, arranged to prevent the escape of the air therefrom when the air is let out of the brake-cylinder, substantially as set forth.

2. In combination with an auxiliary reservoir, a piston, N′, acting on a valve which is arranged in the line of communication thence to such reservoir, so as to open a passage for the flow of air from such reservoir to the brake-cylinder or brake-cylinders, substantially as set forth.

3. The combination of the valves *h h′*, *k k′*, *l l′*, and their chambers and connecting-ports, arranged and operating substantially as described.

In testimony whereof I, the said GEORGE WESTINGHOUSE, Jr., have hereunto set my hand.

GEORGE WESTINGHOUSE, JR.

Witnesses:
JOHN H. BAILEY,
G. H. CHRISTY.