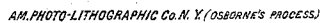


Pneumatic and Hydraulic Car-Brakes.

Patented May 5, 1874.



UNITED STATES PATENT OFFICE.

HENRY F. KNAPP, OF NEW YORK, N. Y.

IMPROVEMENT IN PNEUMATIC AND HYDRAULIC CAR-BRAKES.

Specification forming part of Letters Patent No. **150,584**, dated May 5, 1874; application filed September 23, 1873.

To all whom it may concern:

Be it known that I, HENRY F. KNAPP, of the city, county, and State of New York, have invented an Improved Pneumatic and Hydraulic Car-Brake, of which the following is a specification:

Figure 1 is a side elevation of an engine and car provided with my improved brake. Fig. 2 is a bottom view of the same; Fig. 3, a top view, partly in section, of the pump employed; Fig. 4, a perspective view of the four-way cock; and Fig. 5 a cross-section of the same.

Similar letters of reference indicate corresponding parts in all the figures.

The object of this invention is to produce a brake arrangement for use on railroad-trains that may be entirely and most effectually controlled from the engine, and to utilize in this behalf the operation of a pump, which connects, by flexible tubing, with air or water cylinders suspended from the under side of the cars, the pistons of which cylinders connect with the cross-heads of the brakes.

When suction is applied to this/flexible tubing, the pistons of the aforementioned cylinders will be moved one way, while they will be moved in the opposite direction when the air or liquid is forced through such flexible tubing by the pump aforesaid. Thus, by reversing the action of the pump as regards its connection with the said flexible tubing and suspended cylinders, the position of the brakes may be reversed, and their action completely controlled. To effect this action I have introduced, in connection with the pump and flexible tubing, a four-way cock, which is so arranged that it can either be turned to make the flexible tubing, the suction-pipe for the pump, or the discharge-pipe. It will then only be necessary to so place the cock as to make the flexible tubing a suction-pipe when it is desired to put the brakes off, and to turn it the other way to make said tubing a discharge-pipe when it is desired to apply the brakes. By this arrangement of the cock, the pump can be kept in constant operation, and will thus be enabled to exhaust the air from the brake-cylinders almost to a complete vacuum, and to compress it therein. The cock mentioned in this connection may also be utilized for other purposes than for the application of

brakes, and constitutes an important feature of the invention.

In the accompanying drawing, the letter A represents the locomotive-engine of a train. B B are cars of suitable construction connected with the locomotive. From the under side of each car is suspended a cylinder, whose piston-rod *a* connects, by a lever, *b*, and rods *d d*, with the cross-bars D D of the car-brakes, as is fully indicated in Fig. 2. From the locomotive extends, beneath all the cars, a flexible pipe, E, which connects, by suitable branches *e*, with the several cylinders C. As to the operation of the brake, it will be readily understood that when suitable fluid is forced, through the pipe E, into a cylinder, C, and the piston thereof moved out, the brakes will be applied against the wheel, while, when suction is applied to the pipe E, and the piston of the cylinder C drawn in, the brakes will be withdrawn from the wheels. This arrangement may, however, be reversed, so that by the application of suction the brakes may be applied, and, by force, they may be put off. The pipe E connects, in the locomotive, with a small cylindrical cock, G. This shell and cock may, however, as well be conical. The shell F connects at a point diametrically opposite to where the pipe E enters it, by another pipe, H, with a suitable single or double acting pump, I, which is placed in the locomotive, and operated by steam in suitable manner. On the same side on which the pipe E enters the shell F another short open-ended pipe, J, enters said shell, as shown in Fig. 3, and at a point diametrically opposite to where said pipe J enters the shell another pipe, L, connects the shell with the pump I. As far as the operation of the pump is concerned, the pipe H thereof is the discharge-pipe, and the pipe L the suction-pipe; and however the pump may operate, the function of these two pipes will always remain the same. The cock G has two passages, *g* and *h*, cut diametrically through it at the same distance from each other as the pipes E and J are from each other where they join the shell. When the cock is turned into the position shown in Fig. 3, so that the passage *g* connects the pipes J and L, and the passage *h* connects the pipes E and H, the pipe E will become the

discharge-pipe of the pump, and the pipe J the suction-pipe, through which air is drawn. When, therefore, in this position, the pump operates, the brakes will be applied, since air is forced, through the pipe E, into the cylinder C, and the pistons thereof are moved out with the effect already mentioned. The cock G has, however, two more passages cut through it, one of which, *i*, extends from the peripheral line in which the passage *g* is situated diagonally across to the peripheral line in which the passage *h* is situated, so that its terminal points are on opposite sides of the cock. The other passage, *j*, of the cock extends also diagonally across the same from the peripheral lines aforementioned, but crosses the passage *i*, so, however, as not to communicate with the same, as indicated in Fig. 3. When the cock is turned to disconnect the passages *g h*, and to connect the passages *i j*, the effect will be that, by the passage *j*, the pipe J will be connected with H, while the pipe E will be connected with the pipe L by *i*. The pipe E will thereby become the suction-pipe of the pump, and the pipe J the discharge-pipe; and, if the pump operates, the brakes will be detached or disengaged.

In the drawing, I have only shown one pipe, E, under the train, for conveying the compressed air or fluid to the brake-cylinder, and the same pipe answers for creating a vacuum in the brake-cylinder; but this can be altered by substituting two pipes, one for each end of the two cylinders, and thus, by conveying the compressed air from one pipe to the other, and have it enter either above or below the piston,

I can put on or take off the brakes by the compressed air or fluid in both cases. This plan, however, I do not find as desirable as the one with the single pipe E, as it involves a much more expensive plan, and doubles the connection between the pipes and cars. The pipe E is of the ordinary or suitable kind of flexible or jointed tubing, leaving an uninterrupted passage throughout its length, except at the rear end of the train, where I put a cap upon it to make it air-tight, so that air or water from the pump cannot get out, and must necessarily enter the brake-cylinder.

If desirable, a reservoir for storing up power, and a vacuum-tank for giving the opposite effect, may be placed in connection with the pump, and with the pipe E, the connections being provided with two-way or other cocks, to be manipulated, so that either one or the other of these tanks may be brought to the aid of the pump.

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

1. The cock G, having the diametrical passages *g h*, and the diagonal passages *i j*, and combined with the shell F and pipes E J H L, to operate substantially as herein shown and described.

2. The brake-cylinder C, combined with the flexible tubing E, shell F, cock G, pipes H I J, pump I, to operate substantially in the manner specified.

HENRY F. KNAPP.

Witnesses:

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