J. & J. G. HARDY.

Vacuum-Brakes for Railway-Cars.

No. 199,540. Patented Jan. 22, 1878.

Fig. 3.

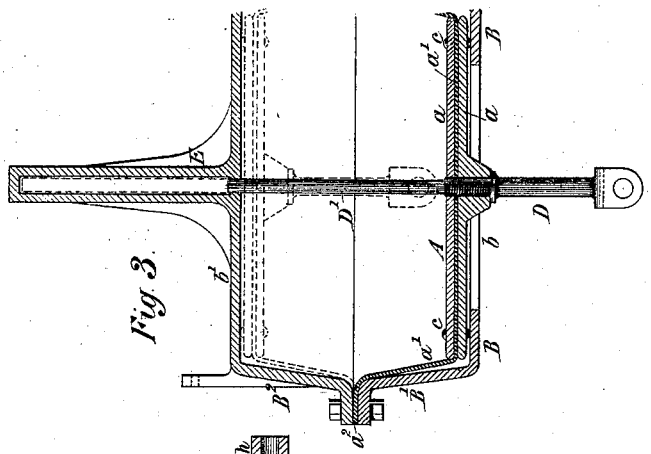


Fig. 2.

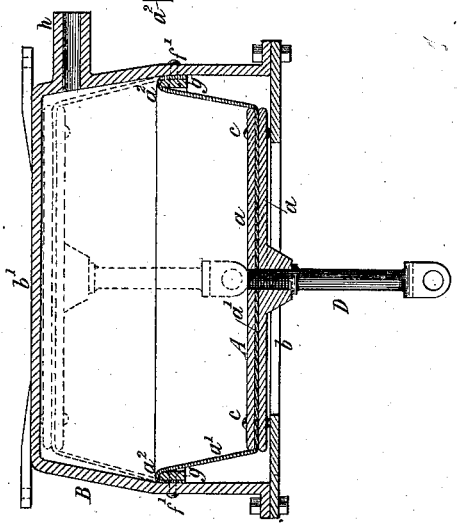


Fig. 1

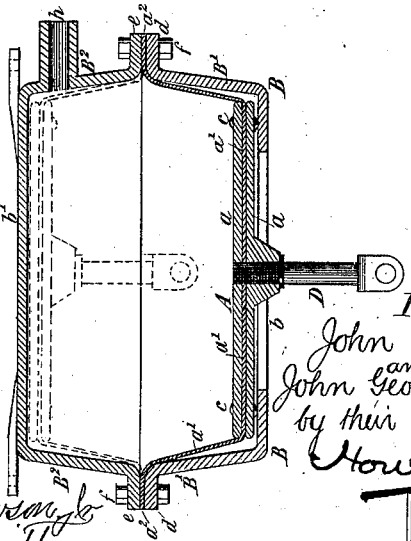
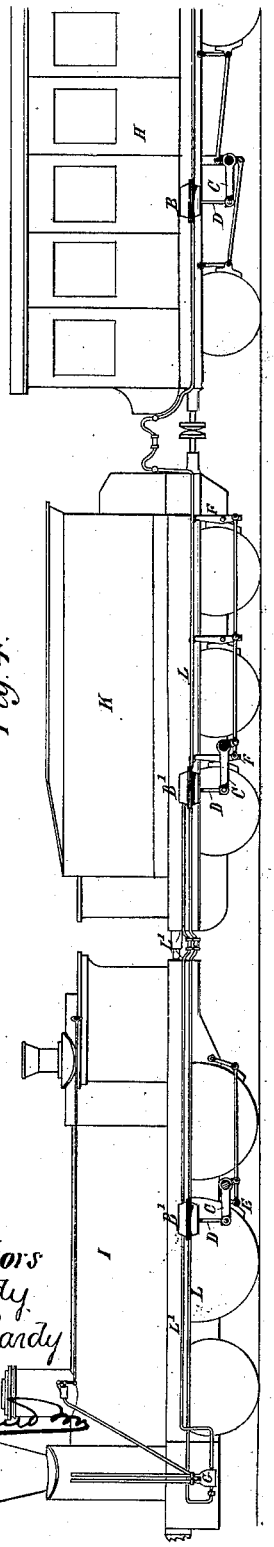


Fig. 4.



Witnesses

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UNITED STATES PATENT OFFICE.

JOHN HARDY AND JOHN GEORGE HARDY, OF VIENNA, AUSTRIA.

IMPROVEMENT IN VACUUM-BRAKES FOR RAILWAY-CARS.

Specification forming part of Letters Patent No. **199,540**, dated January 22, 1878; application filed May 31, 1877.

To all whom it may concern:

Be it known that we, JOHN HARDY and JOHN GEORGE HARDY, both of Vienna, in the Empire of Austria, engineers, have invented Improvements in Railway-Brakes, of which the following is a specification:

Our invention relates to that class of car-brakes which are operated by the pressure of the atmosphere acting on a piston or diaphragm working in a cylindrical casing, the atmospheric resistance on the opposite side of the piston having been removed by the production of a vacuum by an injector, air-pump, or other suitable exhausting apparatus.

The objects of our invention are, first, to so construct a brake of this character that it will be sensitive in its action, and yet be able to withstand the strains to which it is subjected; and, secondly, to so arrange the brakes and air-exhausting pipes on a train of cars that the brakes on the engine and tender may be applied simultaneously with or before those on the cars.

These objects we attain in the manner which we will now proceed to describe, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional view of our improved car-brake; Figs. 2 and 3, views of modified forms of the brake; and Fig. 4, a side view of a locomotive, tender, and car, showing the arrangement of brakes and air-pipes.

Referring to Fig. 1, B is the brake-cylinder, made in two halves, B^1 and B^2, in the form of truncated cones, secured to each other at their bases by bolts *f*, passing through flanges *d e*, the flat end *b'* of one cone, B^1, being closed, while the end *b* of the other half of the cylinder is made open.

A is the piston, formed, in the present instance, of two rigid disks, *a a*, constituting the piston-head, to which the piston-rod D is secured. This piston A is of nearly the same size as the flat head of the vacuum-chamber of the cylinder, but fits loosely within the latter.

The piston-head is connected with the cylinder by means of a "sack," *a'*, so as to completely exclude communication between the two halves of the cylinder. The sack *a'* is secured to the piston-head by riveting the sack at *c* between the disks *a a*, a tight joint being similarly made where the sack is connected to the cylinder, about midway between its extremities, by bolting the edges of the sack between the flanges *d e*, as shown in Figs. 1 and 3.

In the modification, Fig. 2, the main portion of the cylinder is made of one piece, and the sack secured to about the center of the cylinder by the ring *g*, fastened by rivets *f'*. The cylinder itself, however, is of substantially the same form as that shown in Figs. 1 and 3—that is, the vacuum-chamber has sloping sides and a flat head, *b'*, the brake-cylinder being of this form for the reasons explained hereinafter.

The piston-rod D is connected to the brake-levers by a suitable system of levers, C F, as shown in Fig. 4. In order to steady the action of these levers the piston-rod D may have an extension, D', adapted to move freely in a closed cap, E, in the head *b'* of the cylinder, as shown in Fig. 3.

The outlet *h* of each cylinder communicates, through a system of pipes, with an ejector, air-pump, or other suitable air-exhausting apparatus, so that on exhausting the air from the cylinder the pressure of the atmosphere on the piston A will cause it to assume the position shown by dotted lines, so as to apply the brakes to the car-wheels.

Brakes having rigid cylinders or casings, as heretofore constructed, have been principally of two kinds—in one case a piston adapted to slide in a cylinder being used, while in the other case a flexible diaphragm has been adapted to a casing of substantially spheroidal form. The objections to these constructions are, that in the former case the friction on the piston and in the necessary stuffing-boxes greatly detracts from the power exerted by the atmospheric pressure, while in the case where a flexible diaphragm has been used the rigid head of the piston-rod, on which only the atmospheric pressure could have any effective pressure, has been of too small a size to be practically useful.

In our form of cylinder and piston the friction is reduced to a minimum, while the peculiar form of the casing permits the use of the largest possible size of rigid piston on which the atmospheric pressure may act, while the

piston and sack adapt themselves to the sloping sides and flat head of the cylinder, thereby allowing the atmospheric force to be exerted to its full extent, while at the same time protecting the piston and sack from undue strains. In all cases the sack should be connected to the cylinder at or about midway between each end, in order that the piston and sack may rest on the sloping sides and ends of the cylinder in both of the extreme positions of the pistons, so that the sack and its fastenings may be relieved from undue strain in either position.

In reference to our improved arrangement of air-pipes, as shown in Fig. 4, practical experience has shown that where vacuum-brakes are used with the same system of pipes communicating with all the brakes throughout the train, the vacuum is first created in the brake-cylinder on the last car, while on the engine and tender (where the greatest impetus is) the brakes are not applied until a vacuum has been created in all the cylinders on the cars in the rear. Consequently the impetus of the engine and tender drags the train some distance before it can be stopped.

In order to avoid this difficulty we use one system of pipes and brakes for the engine and tender only, and an entirely separate system of pipes for the cars.

Referring to Fig. 4, G is the ejector; B, the vacuum or brake-cylinder of one of the cars H, while B^1 B^1 are the brake-cylinders of the engine I and tender K.

The brake-cylinders of the cars H are connected with the ejector by a pipe, L, while the brake-cylinders B^1 B^1 of the engine and tender are connected to the same or a separate ejector by another-pipe, L′, separate from and independent of the pipe L. Hence, when the air-exhausting apparatus is set in action, the brakes of the engine and tender will be at once applied with maximum effect, slightly before the brakes on the cars are applied, so that the impetus of the heaviest part of the train (the engine and tender) will be at once counteracted.

We do not desire to claim, broadly, a brake-cylinder with a diaphragm; but

We claim as our invention—

1. In a vacuum-brake, the combination of the cylinder, having an exhaust-outlet, sloping sides, and flat heads, with the piston-head A, of about the size of the head of the vacuum-chamber, the said piston-head being connected to the brakes by suitable levers, and to the cylinder by a flexible sack, *a′*, secured thereto about midway between the ends of the said cylinder, so that the piston and sack may rest on the head and sloping sides of the cylinder in each of the extreme positions of the piston, all substantially as described.

2. The within-described system of brakes, comprising one or more ejectors, a series of brake-cylinders, a set of pipes connecting an ejector with the brake-cylinders on the engine and tender only, and an independent set of pipes connecting an ejector with the cylinder on the cars, as and for the purpose set forth.

In witness whereof we have signed our names to this specification in presence of two subscribing witnesses.

JOHN HARDY.
JOHN GEORGE HARDY.

Witnesses:
C. O. PAGET,
T. BARTAL.