2 Sheets—Sheet 1.

T. COOPER.

VACUUM CHAMBERS FOR CAR-BRAKES.

No. 184,461. Patented Nov. 21, 1876.

FIG 1.

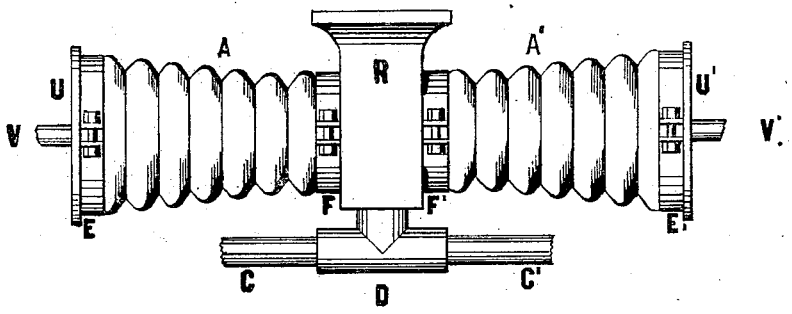


FIG 2.

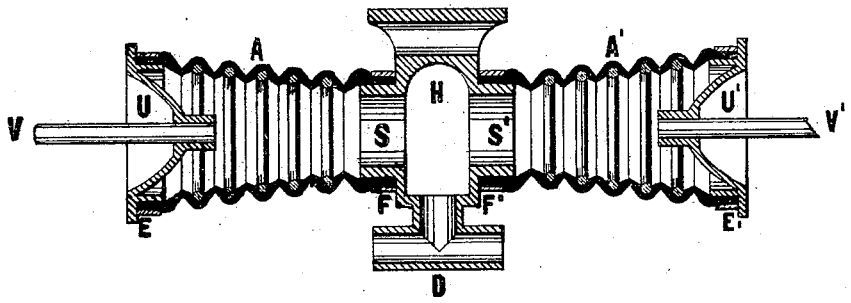


FIG 4.

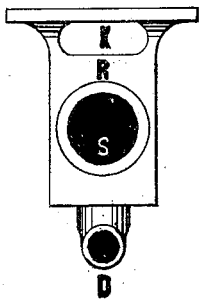


FIG 3.

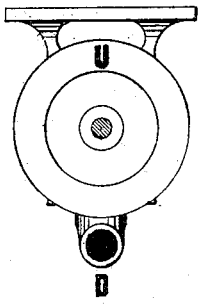
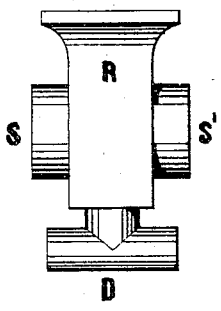


FIG 5.



WITNESSES.

Philip F. Larner

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2 Sheets—Sheet 2.

T. COOPER.

VACUUM CHAMBERS FOR CAR-BRAKES.

No. 184,461. Patented Nov. 21, 1876.

FIG 6.

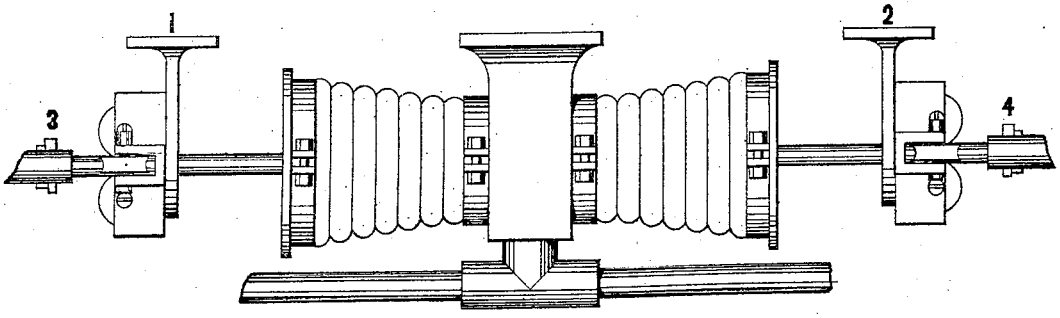


FIG 8.

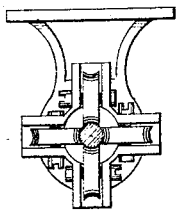


FIG 7.

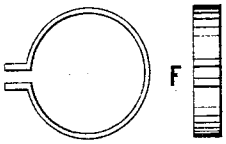


FIG 9.

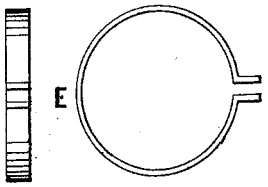


FIG 10.

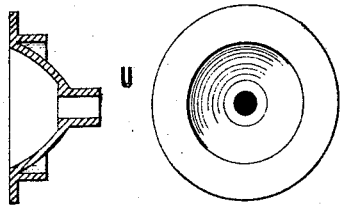


FIG 11.

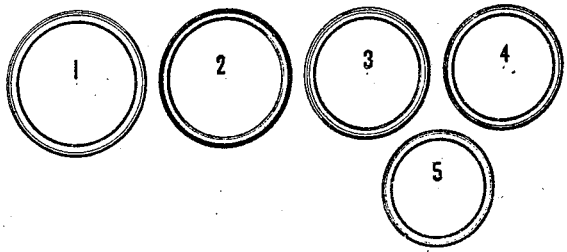
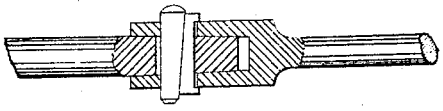


FIG 12.



WITNESSES.

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UNITED STATES PATENT OFFICE.

THEODORE COOPER, OF WARWICK, RHODE ISLAND.

IMPROVEMENT IN VACUUM-CHAMBERS FOR CAR-BRAKES.

Specification forming part of Letters Patent No. **184,461**, dated November 21, 1876; application filed April 6, 1876.

To all whom it may concern:

Be it known that I, THEODORE COOPER, of Warwick, in the county of Kent and State of Rhode Island, have invented certain new and useful Improvements in Vacuum-Chambers for Car-Brakes; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part thereof, is a true, clear, and complete description of my invention.

My said improvements relate to that class of longitudinally-collapsible vacuum-chambers which are composed in part of flexible material, and have heads, upon the exterior of which the pressure of the atmosphere is exerted for furnishing the power requisite for actuating the car-brake mechanism.

It is well known to be essential that a vacuum-chamber should be longitudinally collapsible to an extent or degree which will, at least, admit of such a movement of its head as is requisite to effect the movement of the several parts of the brake mechanism which are controlled by the chamber; also, that the head or heads of said chamber should have such a superficial area as will enable them, with an attainable or desirable vacuum, to afford sufficient surface for atmospheric pressure to secure the requisite power for properly setting the brakes; also, that the longitudinally-collapsible chamber should be laterally non-collapsible without impairing its longitudinally-collapsible capacity.

It is obvious that it is of value that the number of joints in these chambers be reduced as far as possible, because air-tight joints are requisite, and they are not readily attained at the outset, nor easily maintained when subjected to the various unfavorable conditions incident to their practical use. There is still another point of great practical value, to which, so far as my knowledge extends, no attention has been given prior to my present invention. After long-continued study of the subject, attended with numerous experiments and tests, I have demonstrated that a vacuum-chamber for a car-brake should have a normal interior cubical capacity no greater than is absolutely requisite for permitting the required movement of its head or heads, and affording on the exterior of said heads a proper pressure area to secure the requisite power for setting and holding the brakes. The value of this feature will be readily comprehended when it is considered that it involves not only economy in operation, but also promptness in action.

It will be seen, whether the air be exhausted from a chamber by means of an air-pump or by means of a steam-jet, that the labor of the pump and the volume of steam in the jet required for that service will be proportionate to the interior cubical capacity of the vacuum-chamber; and, further, that in proportion to the interior capacity of the chamber, it will be prompt or slow in its action, because a pump or steam-jet can more promptly exhaust the air from a small chamber than from a larger one, other controlling conditions being equal.

I have practically attained, by reason of my invention, a vacuum-chamber which meets fully all of the heretofore well-known requirements, and possesses the novel features of value which I have recited; and my invention consists, mainly, in a vacuum-chamber for car-brakes having sides composed, in whole or in part, of flexible material suitably stiffened, peripherically arranged to collapse longitudinally a head to which the brake mechanism is connected, and tapered, so that it is larger at the end to which this head is attached than at the opposite end. In such a chamber the requisite area of head is provided for, while the interior capacity is reduced to a minimum, because the chamber is larger at the head than at the opposite end, having an outline like a frustum of a cone laterally or peripherically grooved.

My invention further consists in a vacuum-chamber longitudinally collapsible, having a suitable head or heads, and clamping-rings with corrugated sides, composed of molded vulcanizable gum or gum compound of a suitable nature, and interior annular braces or stiffeners, which are embedded in the gum, and are practically inseparable therefrom. Such a chamber requires no joints except at its two ends, the braces or stiffeners are always maintained in their proper relative posi-

tions, and the flexible material, being molded, is not unduly liable to crack or break at the recesses between the braces.

It will be seen that this last-recited portion of my invention is not limited to a chamber smaller at one end than at the other, because, whether the sides of the chamber be straight or inclined, equally valuable results will accrue by reason of the molded gum and the annular braces embedded therein.

To more particularly describe my invention, I will refer to the accompanying drawings, of which there are two sheets, and in which—

Figure 1, Sheet 1, represents, in side view, two of my vacuum-chambers united to a central metallic chamber, so that the three constitute a double vacuum-chamber. Fig. 2, Sheet 1, represents the double chamber in longitudinal central section. Fig. 3 represents the same in end view. Fig. 4 represents, in end view, the central metallic chamber. Fig. 5 represents the central chamber in side view. Fig. 6, Sheet 2, represents, in side view, my double chamber collapsed, and guiding devices desirable for maintaining the head-rods in a line parallel with the axial line of the chambers. Figs. 7 and 9 represent, in side and edge views, clamping-rings, by which the ends of a chamber are secured to a neck on the central metallic chamber, and to a head, respectively. Fig. 8 represents, in end view, the apparatus shown in Fig. 6. Fig. 10 represents, in central longitudinal section and end view, the head of a chamber. Fig. 11 represents five annular braces, which are embedded in the flexible sides of the chamber. Fig. 12 represents, in section, a coupling-connection desirable for uniting a head-rod with a brake-rod beneath a car.

In each instance, A and A′ denote the collapsible tapering portions of the vacuum-chamber. They should be made of fine gum, carefully compounded, so as to be strong and durable. They are vulcanized in a mold especially designed for the purpose. The method of manufacture, and the special means employed therein, constitute the subject of a separate application for Letters Patent. The annular braces shown in Fig. 11 are numbered consecutively, commencing at the largest. They occupy positions indicated in Fig. 2, and, being embedded in the gum, it is practically impossible for them subsequently to get out of place. Each end of the corrugated flexible portion is provided with a plain neck, which is parallel with the axial line of the chamber.

The central metallic chamber at R is provided with a suitable flange for securing it to a car-frame, and has an opening, as at K, Fig. 4, to admit of the proper location of brake-rods when employed in connection with hand-brakes. The interior portion of this chamber is shown at H, Fig. 2, with which the branch pipe D communicates, for connection with the pipes C C′ and the exhaust apparatus and auxiliary chambers, as is fully described in another application for Letters Patent relating to this subject. The collapsible portions of the chambers are united with the central chamber by means of the necks S S′ and the clamping-collars F and F′. (Shown in Fig. 2.) The working-heads of the chamber are shown at U and U′, and the flexible portion of the chamber is secured thereto by means of flanges on the heads and the clamping-collars E and E′, respectively. The heads U and U′ are concaved, as shown, presenting an extensive exterior area, and are provided with central necks, to which the head-rods V and V′ are respectively connected. These rods are shown in Fig. 6 to be provided with frictionless guides, consisting in each instance of four anti-friction pulleys with grooved peripheries, arranged to encircle the rod and maintain it in a position coincident with the axial line of the chamber. The small figures in Fig. 6, at 1 and 2, show the head-rod hangers and frictionless guides, while at 3 and 4 the connections of the head-rods with the brake-rods are shown in side view. In Fig. 12 one of these connections is shown in detail, to be provided with a gib and tapering pin, whereby a close unity of the two rods may be maintained.

In Fig. 6 the chamber is shown to be fully contracted, as if exerting power on the brakes. The flexible material can assume no form or shape while in service which is not in harmony with the lines predetermined in the mold, and therefore its liability to crack or break is reduced to a minimum, as I believe, or at least that liability is thereby guarded against as far as is practicable.

Having thus described my invention, I claim as new and desire to secure by these Letters Patent—

1. A tapered vacuum-chamber, composed in part of flexible material, substantially as described.

2. A molded seamless corrugated vacuum-chamber, having sides composed of flexible material, and provided with internal annular braces or stiffeners, embedded in said material, substantially as described.

THEODORE COOPER.

Witnesses:
J. C. B. WOODS,
THOMAS F. COSGROVE.