(No Model.) 2 Sheets—Sheet 1.

H. K. WHITNER.

BRAKE.

No. 338,900. Patented Mar. 30, 1886.

Fig. 1.

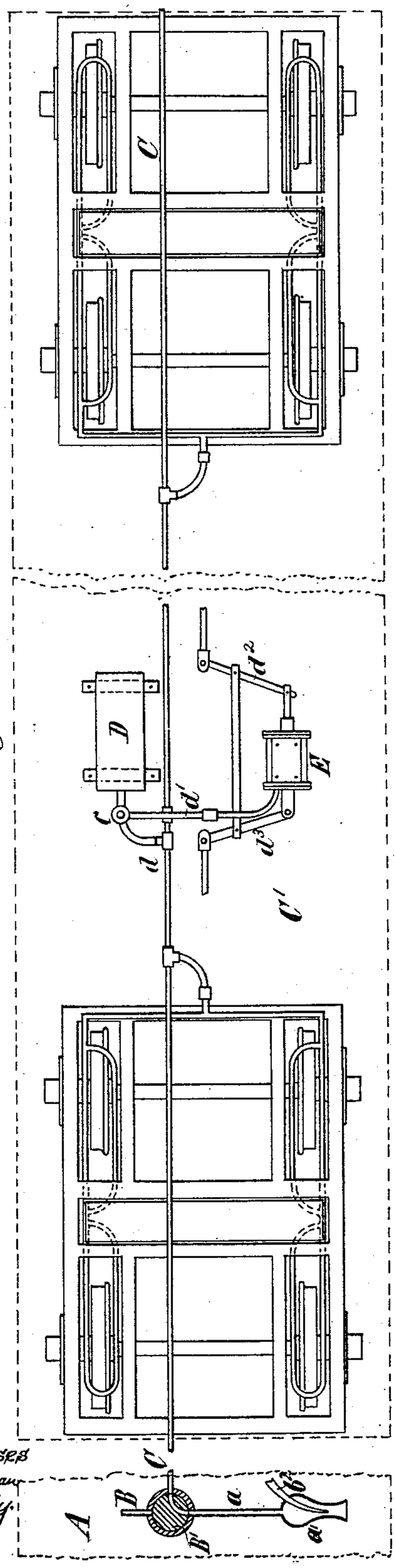
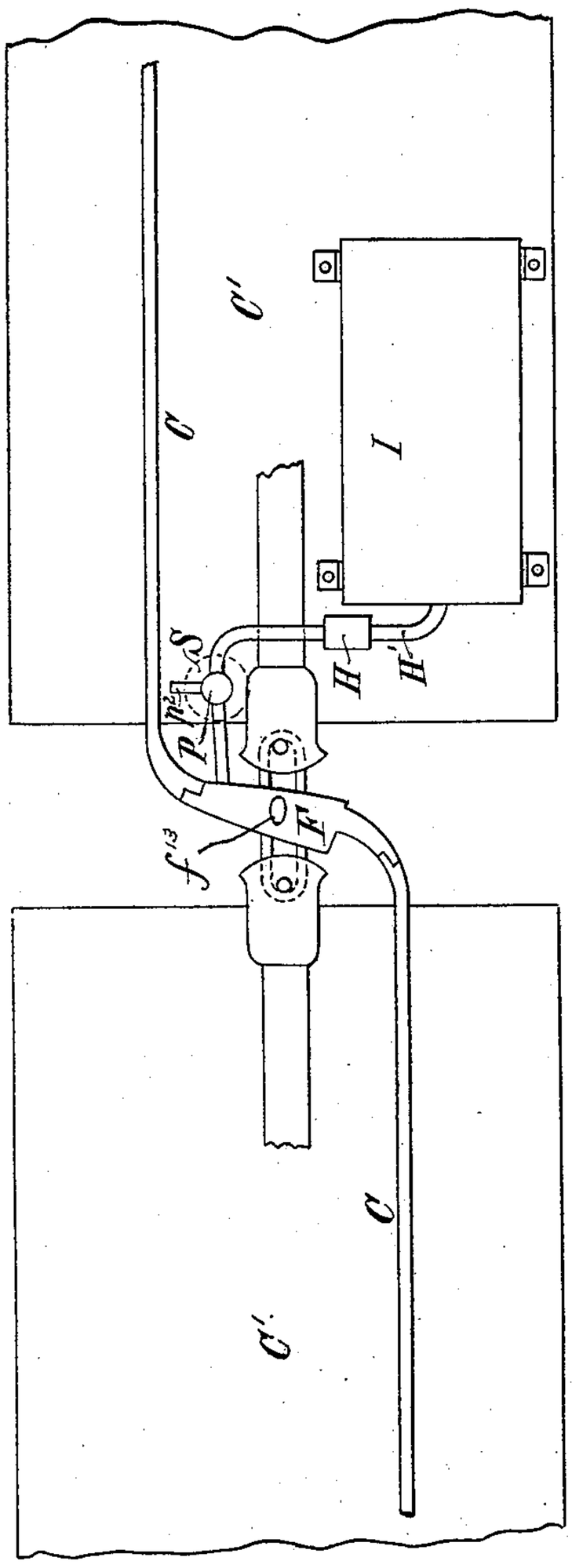


Fig. 2.



Witnesses
Geo. Wadman
R. J. Cody.

Inventor
Hiram K. Whitner,
by his attorneys,
Gifford & Brown

(No Model.) 2 Sheets—Sheet 2.

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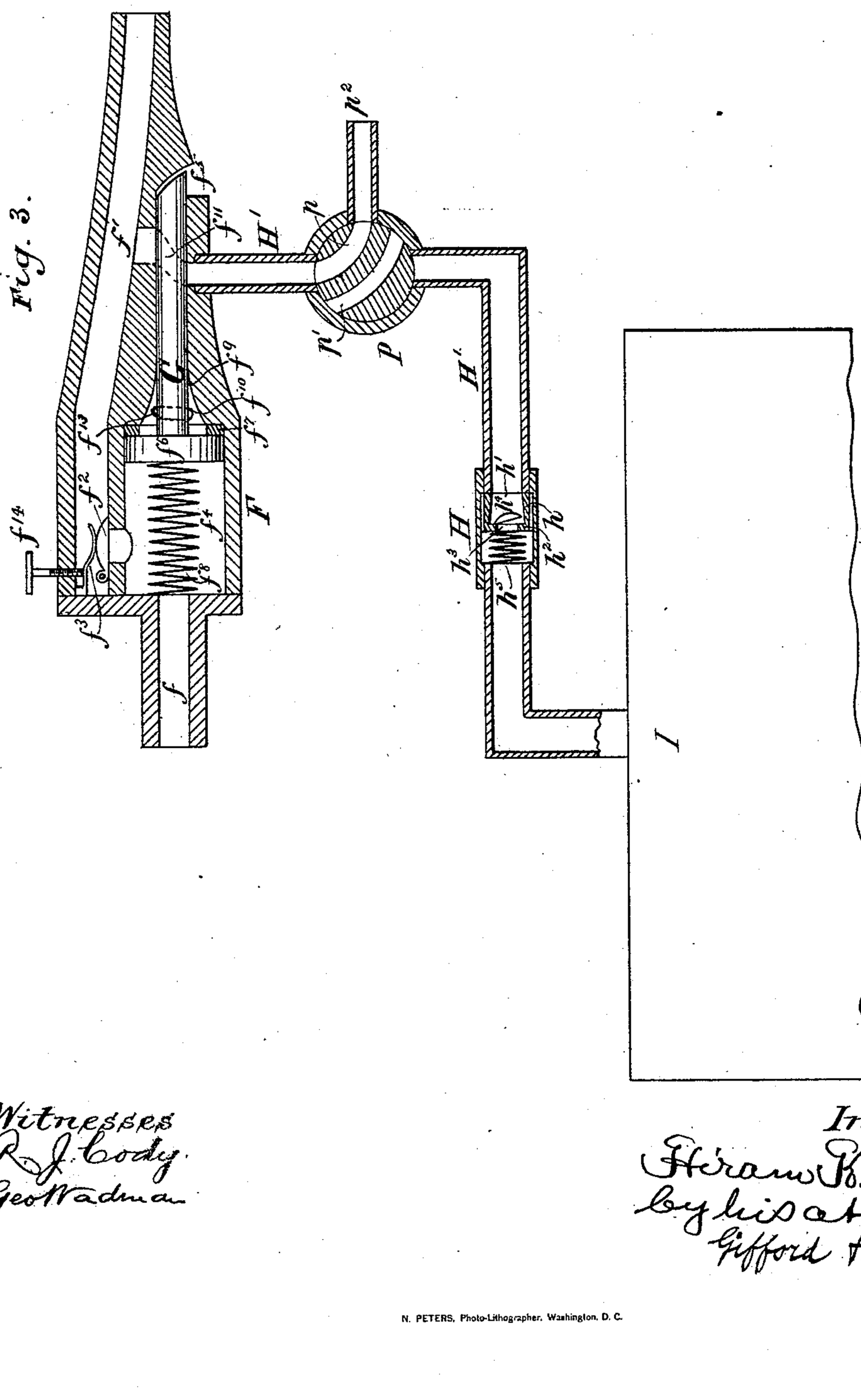
Fig. 3.



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Gifford & Brown.

UNITED STATES PATENT OFFICE.

HIRAM K. WHITNER, OF NEW YORK, N. Y.

BRAKE.

SPECIFICATION forming part of Letters Patent No. 338,900, dated March 30, 1886.

Application filed December 14, 1885. Serial No. 185,564. (No model.)

To all whom it may concern:

Be it known that I, HIRAM K. WHITNER, of New York, in the State of New York, have invented a certain new and useful Improvement in Brakes, of which the following is a specification.

My improvement relates to so-styled "air-brakes" in use upon railway-cars.

Heretofore in the use of air-brake systems it has been found impossible to properly brake trains of great length, about thirty cars in one train being the greatest number which has been effectively braked from one main air-reservoir. Much of the labor of braking long freight-trains has therefore been necessarily done by means of the ordinary hand-brakes, which, as is well known, are slow in operation and inefficient.

It is the object of my improvement to enable trains of any desired length to be efficiently braked by means of the air-brakes.

I will describe my improvement in detail, and then point out the novel features in claims.

In the accompanying drawings, Figure 1 represents the bottom of a portion of a locomotive and the bottom of a car, showing the arrangement of an air-brake system as in common use. Fig. 2 represents the bottom of a portion of two cars, the balance being broken away to save space, a coupling-valve chest employed in my improvement arranged between them and connecting portions of the brake system, and an auxiliary reservoir employed in my improvement. Fig. 3 is a detail view of certain parts shown in Fig. 2, the same being partly in section.

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

A designates the bottom of a portion of the engine.

B designates a pipe leading from the main compressed-air reservoir located at the engine. (Not shown in the drawings, but under control of the engineer, as usual.)

B′ designates a cock provided with suitable ways, whereby communication may be made between the main air-reservoir and a main pipe, C, and between the main air-pipe C and the atmosphere. As here shown, communication is made with the atmosphere through a pipe, *a*, terminating in a siphon, *a′*, provided with a steam-ejector, b^2. By means of the ejector a vacuum may be created in the main air-pipe.

C′ designates the bottom of a car. The main air-pipe C, as usual, extends throughout the train, suitable connections being made between adjacent cars.

D designates the auxiliary reservoir connected to the main air-pipe by a pipe, *d*. A valve, *c*, is arranged in said pipe, as usual. A pipe, *d′*, leads from said valve to a brake-cylinder, E, of ordinary construction. Levers d^2 d^3 connect at one of their ends to the rods of the piston within the cylinder E and at the other of their ends to brake-rods, by which, when compressed air is admitted to the cylinder E, the brakes will be applied.

As the apparatus thus far described does not, broadly, constitute part of my invention, I have referred to it thus briefly. Each car, however, throughout the train which is in included in the system is to be provided with apparatus substantially as shown and described as being upon the bottom of the car C′.

In order to accomplish the purpose previously referred to of braking very long trains, I divide the train into sections consisting of any suitable number of cars each. For clearness, I shall call the section nearest the engine the "first section," the one next farther from the engine the "second section," and so on. Each of these sections may be braked and the brakes released independently of the other section or sections. I will describe in what manner this is accomplished.

Referring more particularly to Figs. 2 and 3, F designates a coupling-valve chest placed between the sections of the train. Primarily its function is to couple together the ends of the main air-pipe C. It may be secured to the ends of the air-pipe by any suitable securing device which will afford a detachable connection. By arranging the cars so that the portion of the main air-pipe upon adjacent cars shall be on opposite sides of the cars the coupling-valve may be caused to extend obliquely, and when thus arranged there will be more space for its accommodation; hence it may be made larger than would be practicable if the same extended lengthwise of the cars. The valve-chest is provided with a passage, *f*, leading to the main air-pipe upon one of the cars, and with a passage, *f′*, leading to

the main air-pipe upon the other of the cars. Communication between the passages f f' is controlled by means of a valve, f^2, located in the passage f', and adapted to normally close such communication by means of a spring, f^3. The valve-chest is also provided with a valve-chamber, f^4, and a vent-aperture, f^5. A valve, G, is arranged in the valve-chamber f^4. The head f^6 of this valve is normally held against packing f^7, constituting a seat therefor, by means of a spring, f^8, abutting at one end against the head f^6 and at the other against the opposite end of the valve-chamber. The power of this spring is sufficient to hold this valve to its seat when the main air-pipe in the section forward of the valve-chest is vented in the usual manner. The valve G fits snugly and is adapted to slide to and fro within a passage, f^9, in the valve-chest, having an open end, f^{10}, communicating with the atmosphere by means of apertures f^{13} in the shell of the valve-chest immediately behind the head f^6 of the valve. As shown in dotted lines, a passage, f^{11}, extends through the valve G in a direction obliquely to the axis of the valve. This passage communicates at one end with the passage f' in the valve-chest and at the other with a valve-chest, H, located in a pipe, H', leading to a compressed-air reservoir, I. The pipe H' is severed to accommodate the valve-chest H. The valve-chest H has within it a movable valve-chamber, h, of less diameter than that of the interior of the valve-chest. This valve-chamber has an open end, h', and an end, h^2, provided with a port, h^3, adapted to be closed by a valve, h^4, within the valve-chamber. The end h' of this valve-chamber abuts against the portion of the pipe H' which is nearer the valve-chest F. The pipe H' thereby constitutes a seat for the valve-chamber. The valve-chamber is held normally against its seat by means of a spring, h^5, abutting at one end against the chamber and at the other against the portion of the pipe H' which is nearer the compressed-air reservoir I. When the reservoir I is to be charged, pressure closes the valve h^4 and forces the valve-chamber h inward, thereby opening an annular passage between it and the inner wall of the valve-chest, through which the compressed air flows into the reservoir. When pressure is equalized, the spring h^5 returns the valve-chamber h to its seat. The secondary main air-reservoir I is preferably of large capacity, and may be located upon the bottom of a car in any suitable position. In freight-train service it is advantageous to place it upon the conductor's caboose, which may, for convenience, be located between the first and second sections of the system.

The arrow shown in Fig. 2 points in the direction of the forward end of the train. With this in view, the following description of the operation of the previously-described apparatus will readily be understood. I will speak first of a train made up of two sections. When compressed air flows into the main air-pipe from the main reservoir at the engine, it charges the main air-pipe, the auxiliary reservoir upon each car, and the secondary main reservoir I. The valve f^2 does not prevent the flow of air for these purposes. The brakes in the first section may be applied by venting that section in the usual manner without affecting the brakes in the second section, for the reason that when the first section is vented the valve f^2 is closed by the pressure behind it, or from the second section, and prevents a reflow of air from the second section. If it is desired to brake the second section in addition to the first section, a partial vacuum is created in the main air-pipe of the first section by means of the ejector b^2. Atmospheric pressure behind the head f^6 of the valve G will then force the valve forward against the resistance of the spring f^8. When so drawn forward, the passage f^{11} in the valve no longer affords communication between the main air-pipe and the secondary main reservoir I. The valve G is drawn forward so far, however, that communication is opened between the main air-pipe of the second section and the vent-aperture f^5, whereby the second section is vented and the brakes thereof applied. When the vacuum is destroyed in the main air-pipe of the first section, the valve G at once returns to its seat. Communication is opened between the secondary main reservoir and the main air-pipe of the second section. Compressed air from this reservoir flows into the second section, and the brakes thereof are at once released.

The secondary reservoir I, although very desirable, is not wholly essential, as the brakes upon the second section would of course be released ultimately by the recharging of the main air-pipe from the main cylinder on the engine. By using the secondary reservoir I, however, I am enabled to get a quicker release of the brakes in the second section than would otherwise be possible.

In practice a train would probably not be composed of more than two sections, but a third section might sometimes be found advantageous. In such case the third section would be vented by means of a more perfect vacuum in the main air-pipe upon the forward section than what would be necessary to vent the second section. In order that the second section may be braked without affecting the brakes upon the third section, it will only be necessary to so increase the pressure with which the valve G is held to its seat in the valve-chest between the second and third sections as that a vacuum sufficient to overcome the resistance of the spring f^8 in the valve-chest between the first and second sections would not be sufficient to overcome the resistance of that spring in the chest between the second and third sections. The engineer, by varying the degree of vacuum created, may, therefore, vent successively each section and apply the brakes thereto as desired.

It is obvions that the resistance of the spring

f^3 may be such that after the brakes of the first section have been applied and exhausted those of the second section may be applied. When the brakes of the second section are applied, the front section may be recharged to an extent not sufficient to overcome the resistance of the spring f^3 and open the valve f^2. The first section will now be ready for a second application of the brakes after the brakes of the second section are exhausted. This is very important in descending long grades, as by thus applying the brakes successively to different sections of the train the wheels of each section are kept cool.

I have shown an adjusting-screw, f^{14}, working in a tapped hole in the valve-chest F, whereby the resistance of the spring f^3 may be varied.

If the engine should not be provided with means for creating a vacuum in the main air-pipe, it will be advantageous to provide means for venting the pipe of the second section by hand. Any well-known method of so venting the pipe may be used, but I have shown a convenient method in Figs. 2 and 3. In these figures, P designates a three-way cock, of which I have shown a cross-section in Fig. 3. It is placed in the pipe H′, preferably between the valve-chests F and H. It is provided with ports or passages p p', and the shell of the cock is provided with an opening to air, which may be a pipe, p^2. When the valve is shifted—as, for instance, by means of the hand-wheel S, (shown in dotted lines in Fig. 2) located in the car—so as to bring the passage p into communication with the portion of the pipe H leading to the valve-chest F and the opening p^2, the main air-pipe is vented and the brakes are applied. To remove the brakes, the valve is shifted to bring the passage p' into communication with the pipe H upon both sides of the valve. The reservoir I then discharges into the main air-pipe and the brakes are removed. Of course, when no vacuum is created in the main air-pipe the valve G remains quiescent. In fact, in such case it may be omitted, together with its appurtenances and coacting parts.

By my improvement I am not only enabled to brake very long trains with the air-brake, but I may brake different sections of the train independently of each other, as desired; or all the sections may be braked at once, if, from impending danger or other cause, such should be deemed necessary.

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

1. In an air-brake system, the combination, with railway-cars, of a main compressed-air reservoir, auxiliary reservoirs, a main air-pipe, mechanism, substantially such as described, for creating a vacuum in said air-pipe, a valve dividing the brake system into sections and opening to admit of the flow of compressed air from the main reservoir throughout the length of the main air-pipe, and closing to prevent a reflow of compressed air from one of the sections of said pipe, and a valve operated, when a vacuum is created in one section of the main air-pipe, to vent another section, substantially as specified.

2. The combination, with railway-cars, of a main compressed-air reservoir, auxiliary reservoirs, a main air-pipe, mechanism, substantially such as described, for creating a vacuum in said air-pipe, a valve dividing the brake system into sections and opening to admit of the flow of compressed air from the main reservoir throughout the length of the main air-pipe, and closing to prevent a reflow of compressed air from one of the sections of said pipe, a valve operated, when a vacuum is created in one section of the main air-pipe, to vent another section, and a compressed-air reservoir operated by the valve last mentioned to discharge into the section of the main air-pipe last mentioned after the same has been vented, substantially as specified.

3. The combination, with a main air-pipe, C, of the coupling-valve chest F, provided with the passages f f', the valve f^2, the valve-chamber f^4, the vent-aperture f^5, the valve G, the spring f^8, and the passage f^9, provided with the open end f^{10}, substantially as specified.

4. The combination, with a main air-pipe, C, of the coupling-valve chest F, provided with the passages f f', the valve f^2, the valve-chamber f^4, the vent-aperture f^5, the passage f^9, provided with the open end f^{10}, the valve G, provided with the passage f^{11}, and the spring f^8, substantially as specified.

5. The combination, with a main air-pipe, C, of the coupling-valve chest F, provided with the passages f f', the valve f^2, the spring f^3, and the adjusting-screw f^{14}, substantially as specified.

HIRAM K. WHITNER.

Witnesses:
DANIEL H. DRISCOLL,
JAMES D. GRISWOLD.