(No Model.) 3 Sheets—Sheet 1.

D. T. PERKINS.

AIR BRAKE.

No. 345,537. Patented July 13, 1886.

Fig 1

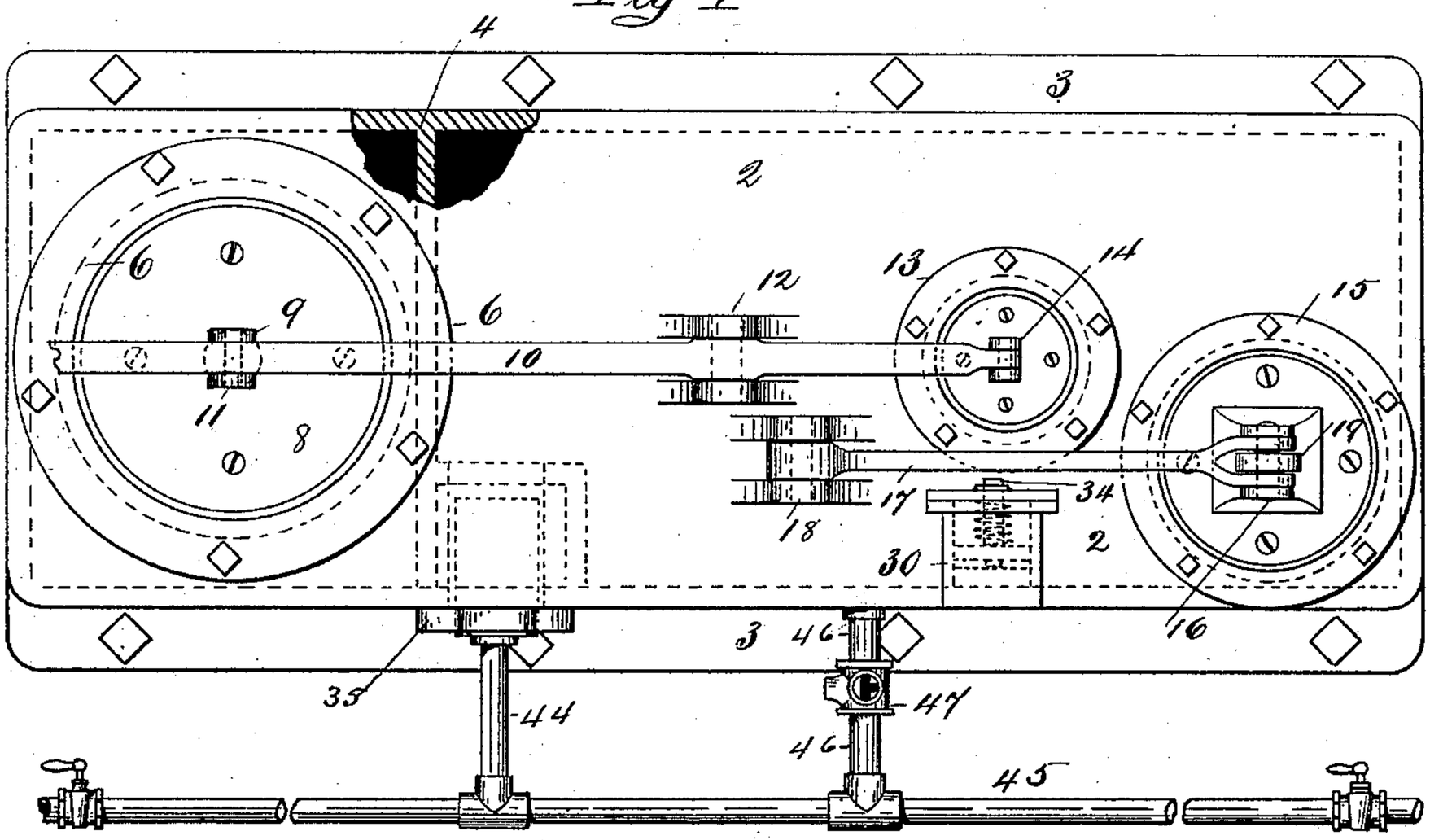
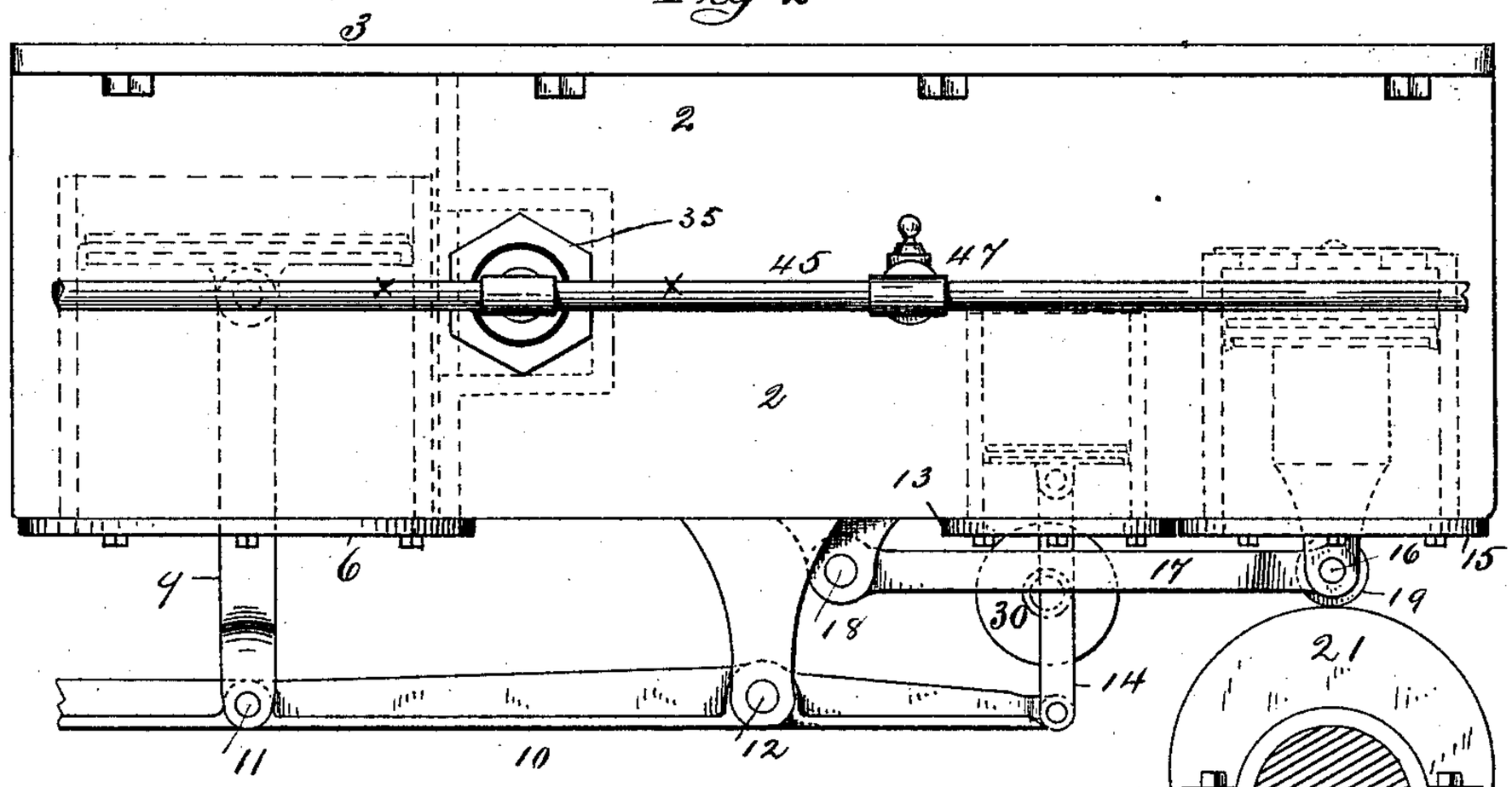


Fig 2



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(No Model.)

3 Sheets—Sheet 2.

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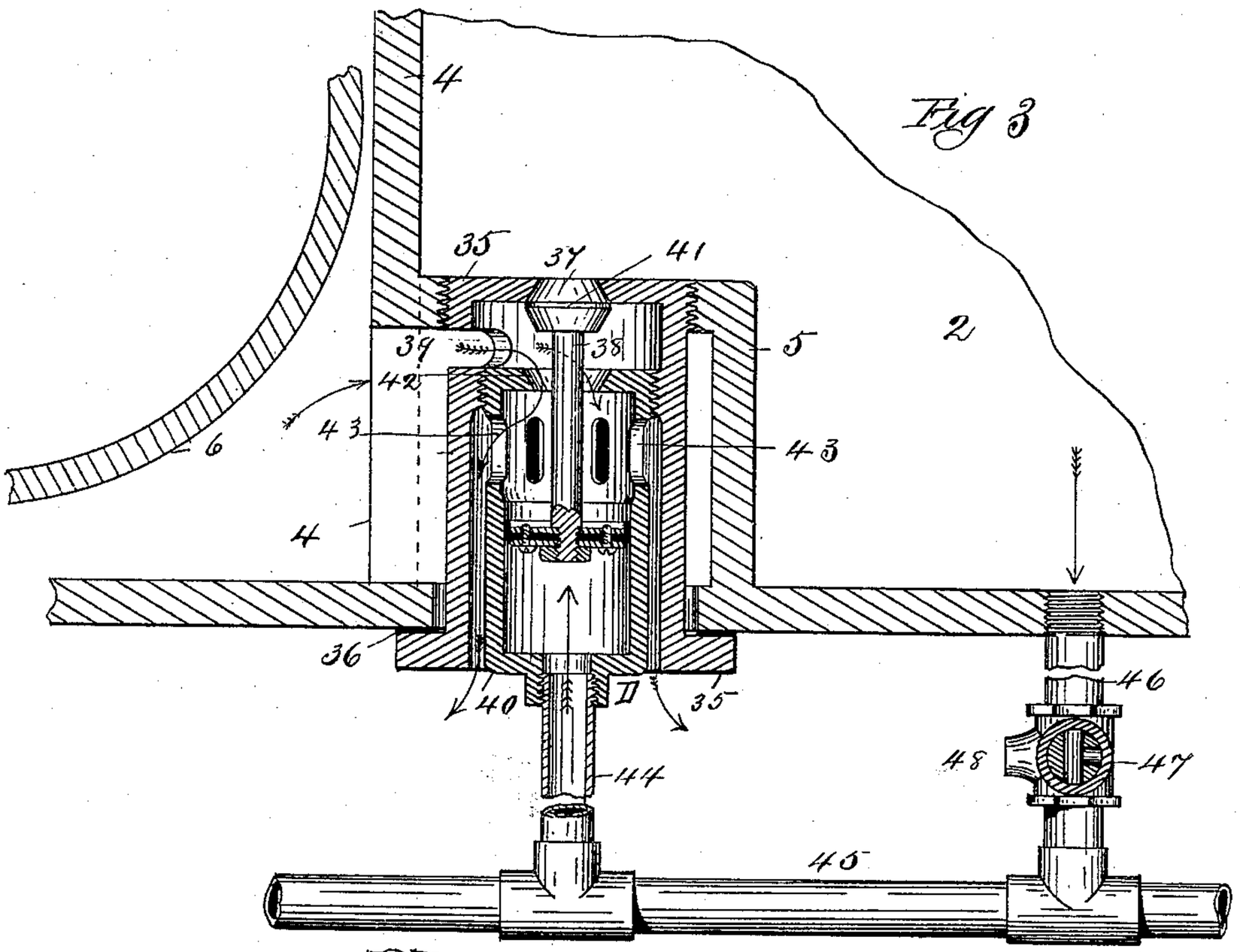

Fig 3

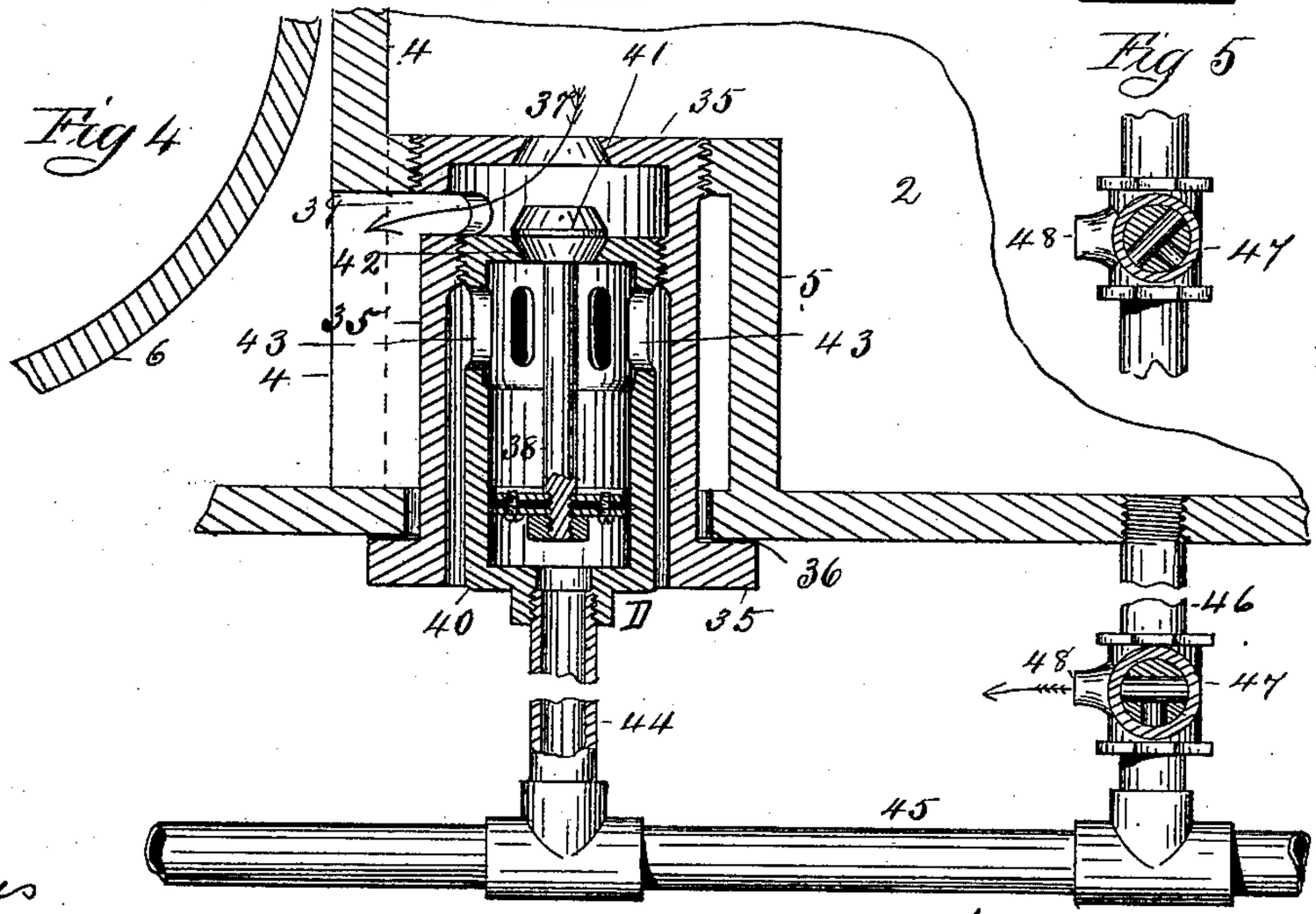

Fig 4

Fig 5

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Fig 6

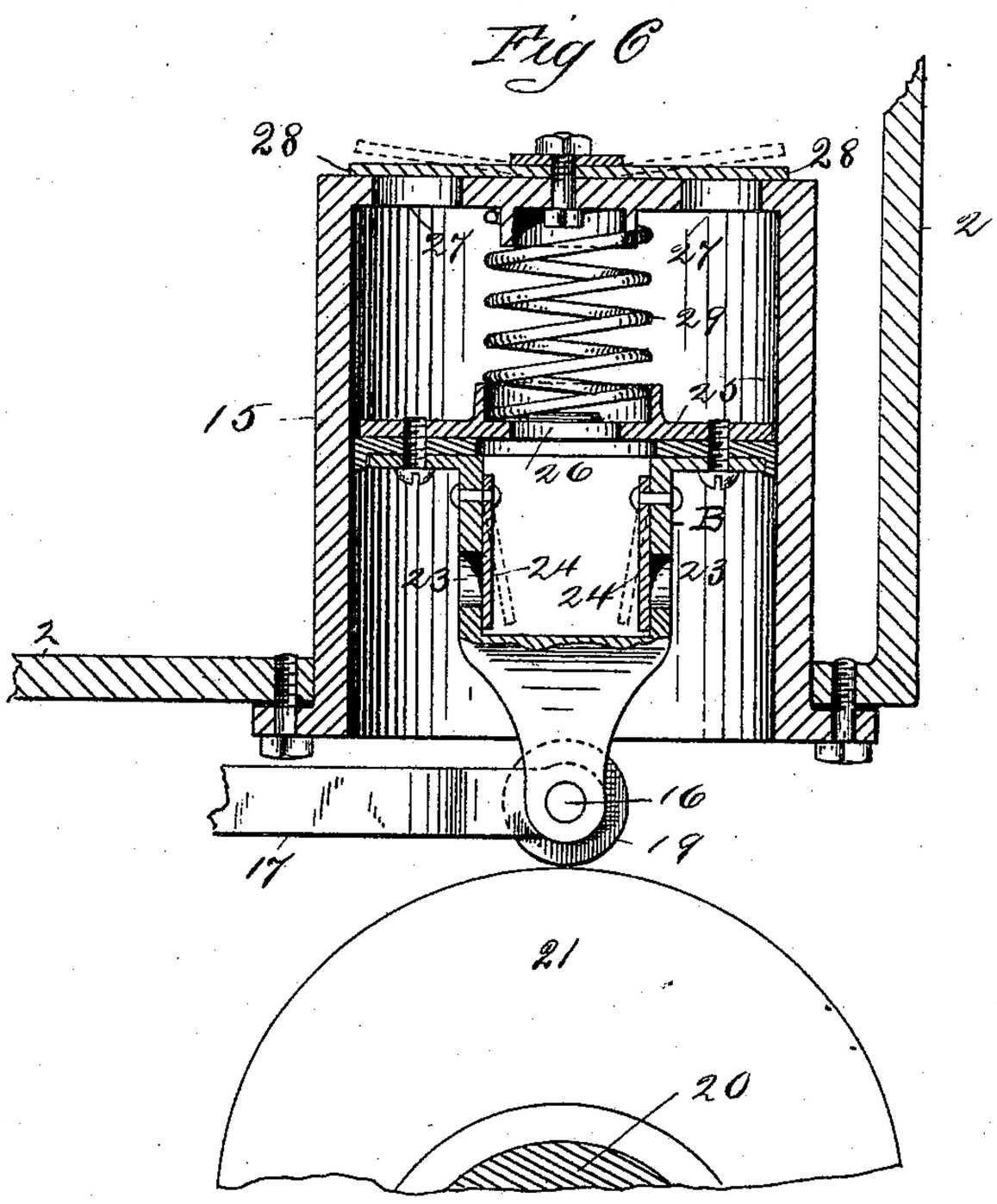
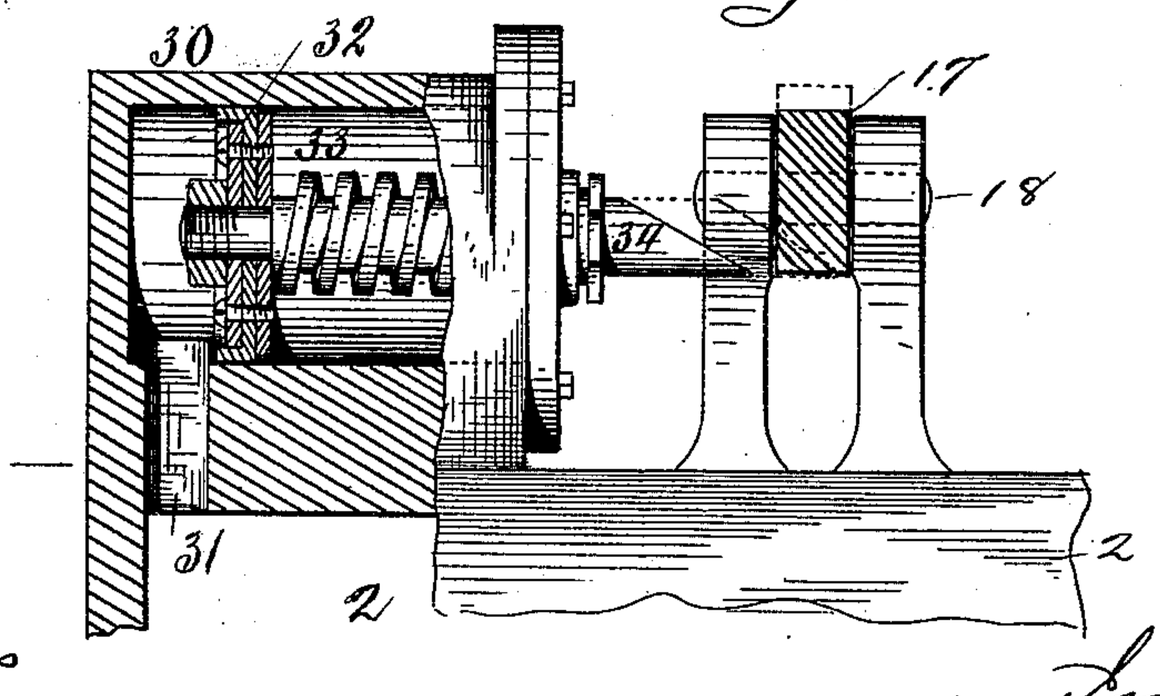


Fig 7



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UNITED STATES PATENT OFFICE.

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AIR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 345,537, dated July 13, 1886.

Application filed March 18, 1886. Serial No. 195,745. (No model.)

To all whom it may concern:

Be it known that I, DUANE T. PERKINS, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Air-Brake Devices for Railway-Trains, of which the following is a specification.

This invention relates to a system of air-brakes for railway cars or locomotives; and it consists, essentially, of devices whereby the air-pressure necessary to apply the brakes to a car is generated on that car, each car of a train thus generating the pressure requisite for the application of its own brakes; and the invention furthermore consists of devices whereby the pressure thus generated on any car of the said train may be used to apply the brakes to all of the other cars simultaneously, each car, however, supplying its own brake-operating power.

In the drawings forming part of this specification, Figure 1 is a bottom plan view of air-brake devices embodying my invention, showing a portion of the air-reservoir broken away and the air-conducting pipe attached to the reservoir. Fig. 2 is a side elevation of the same, and showing the car-axle in section, which is attached to the operating cam or eccentric. Fig. 3 is a view, partly in section, taken through line *x x*, Fig. 2, of the air-valve for operating the piston which applies the power to the brakes, the parts of said valve being shown in the position they are in when the train is in motion and the brakes are off, and showing a portion of the reservoir, the partition in said reservoir, the valve-box, and a part of cylinder 6, and, partly in section, the three way cock. Fig. 4 is a view similar to Fig. 3, showing the changed positions of the valve parts and of the plug of the three-way cock. Fig. 5 illustrates the position of the plug in the three-way cock when it is desired to operate the brakes on all of the cars composing the train from a given car or from the locomotive. Fig. 6 is a view, partly in section, of the air-pump, a portion of the eccentric by which it is operated, and a part of the reservoir in which the air is compressed. Fig. 7 is a view, partly in section, of the pressure-regulating valve, showing a portion of the air-reservoir, a section of the air-pump connection rod, and its pivotal stand.

In the drawings like figures refer to like parts in the different views, and 2 is an air-reservoir of suitable metallic construction, and having two flanges, 3, to permit of bolting it to the timbers on the under side of a car. Said air-reservoir is divided into two compartments by a transverse partition, 4. (Shown part section and in dotted lines in Fig. 1, and in dotted lines in Fig. 2.) The larger of said compartments serves as a reservoir for compressed air, and has the air pump and compressor 15 located therein. The smaller of said compartments has located therein the brake-lever piston and its cylinder 6, and air is admitted to said compartment from the said larger compartment through an opening in the partition 4, to act on the said brake-lever piston, and after so acting said air escapes through said opening, the induction and eduction thereof being controlled by an air-valve, D, as hereinafter described. A hollow valve-box, 5, substantially square in cross-section, is fixed in the said compressed-air compartment, at the side of said partition 4, in the position shown in dotted lines in Figs. 1 and 2, and in cross-section in Figs. 3 and 4. This hollow valve-box receives the air-valve, as hereinafter set forth. A second cylinder, 13, of less diameter than said cylinder 6, having open ends and a suitable piston therein, having a connecting-rod, 14, attached thereto, is fixed in the compressed-air reservoir. The piston of said cylinder 13 is connected, as shown, to one end of a lever, 10, which is pivoted at a point between its ends under the reservoir 2, and the brake-piston 8 is connected to said lever between its pivot-point and its free end, which is shown broken off in Figs. 1 and 2. The free end of said lever has, by the action of the above-mentioned piston 8, a downward motion, caused by the air-pressure on said piston, and it has a reverse motion (when the air-pressure is removed from said piston) by the action of the piston in the cylinder 13, under the influence of the compressed air. The free end of said brake-lever 10 is adapted to be connected with the brakes of a car or engine by any suitable means, whereby its said downward motion

shall force the brakes against the car-wheels, and the said action of the piston of cylinder 13 causes the brakes to be taken off by reversing the motion of lever 10, as aforesaid. The said air pump and compressor 15 consists of the cylinder 15, open at its lower end, and having a perforated inner end, on which are secured suitable clapper-valves, 28, arranged to vibrate over said perforations, said cylinder end having on its inner side a short tubular projection, which enters the end of a coil-spring, 29, to hold the end of the latter in place. A suitable piston, 25, is fitted in said cylinder, having a central air-passage, 26, and a suitable tubular projection thereon to that above described, to hold the lower end of said spring in place, the function of the latter being to move the piston away from the said perforated end of the cylinder, and to hold the piston-rod B against the eccentric 21. A short hollow connecting-rod, B, is secured to the under side of the said piston 25, having side air-passages, 23, and suitable clapper-valves, 24, hung on the inner side of the connecting-rod, to vibrate over said air-passages. The lower end of said connecting-rod B is bifurcated, as shown, and therein is hung on a bolt, 16, passing transversely through it, a friction-roll, 19, and by said bolt the end of a steadying connecting-bar, 17, is pivoted to the end of the piston-rod B, and the opposite end of the bar 17 is pivoted to a standard, 18, on the bottom of the reservoir.

In Figs. 2 and 6 are illustrated in section a portion of a car-axle, 20, on which is secured an eccentric, 21, which is adapted to be rotated by said axle against the roller-bearing end of the connecting-rod B of the air-pump 15, giving its piston an inward motion, whereby air is forced through the passages 27 in the end of the cylinder into the reservoir, the spring 29 driving said piston in the reverse direction, and causing air to be taken into the cylinder through the passages 23 and 26, respectively, in the connecting-rod B and the piston 25. An automatic pressure-governor, 30, for regulating the maximum air-pressure in the reservoir, is attached to the latter, as shown in Figs. 2 and 7, and consists of a cylinder having an air-passage, 31, through one side, communicating with the interior of the reservoir, and having a piston, 32, with which a rod, 34, is connected, having a wedge-shaped end, which projects through the cylinder-head, and a coil-spring, 33, is placed on said rod between said head and piston, to draw said rod into the cylinder, the latter being located near the side of the aforesaid bar 17, which is connected to the piston-rod of the air-pump 15. The action of said governor is as follows: When the desired maximum air-pressure is attained in the reservoir, said air-pressure drives piston 32 and rod 34 outward, forcing the said wedge-shaped end of the latter under the bar 17, thereby holding its vibrating end up, and preventing the eccentric 21 from operating the air-pump 15; but as soon as the air-pressure in the reservoir becomes reduced the spring 33 causes the end of rod 34 to be withdrawn from under bar 17, letting it and the piston-rod B move down, so that the eccentric will again set the air-pump in motion. The resistance of the spring 33 to compression is what determines the maximum pressure that can be attained in the reservoir, and the force of the spring is regulated accordingly. An air-pipe, 45, running by the side of the reservoir 2, serves to convey compressed air from the latter to the air-valve D, and to allow air to escape from the latter, and it performs the same functions in relation to the air reservoirs and valves of any other cars of a train when the pipes 45 of all the cars are connected, making a continuous line, as hereinafter set forth. A branch pipe, 46, having a three-way cock, 47, with an air-outlet, 48, on one side, connects the compressed-air reservoir with pipe 45, and a branch, 44, connects the latter with the air-valve D. Stop-cocks, as shown in Fig. 1, are placed in pipe 45, to cut off the connection between different cars when desired.

In Figs. 3 and 4 is shown the construction of the air-valve for operating the piston 8 of cylinder 6, whose function it is to apply the brakes. The valve-body 35 is screwed into the rear wall of the hollow valve-box 5, hereinbefore described, the outer flanged end of said valve-body bearing against the wall of the reservoir, as shown, and provided with suitable packing, 36. A valve-opening, 37, is made in the rear end of valve-body 35, and is adapted to be opened and closed by the movement of the double-faced plunger-valve 41, and by means of which communication between the reservoir 2 and cylinder 6, through valve opening 37 and port 39 near the rear end of valve-body 7, is established or broken. A cylindrical shell, 40, of smaller external diameter than the interior of the valve-body 7, and provided with a slight shoulder at its inner end properly threaded, is screwed to the valve-body in the position shown, thus leaving sufficient space for the movements of valve 41 to open or close either valve-opening 42 or 37. The shell 40 is a cylinder provided with a piston, 38, which is also the valve-stem, properly speaking, and the double-faced valve 41 is secured to its inner extremity. A valve-seat, 42, is made in the inner end of shell 40, and adapted to receive the under side of the double-faced valve when plunger 38 is down, and thereby prevent the escape of air through the ports in the upper part of shell 40. These ports 43 in the shell 40 are to permit the air which has been used to apply the brakes to escape when valve 37 is closed to cut off the pressure from the reservoir, the direction the air takes at this time being from the compartment in which the cylinder 6 is located through ports 39 and 43, and out between the shell 40 and the interior face of the valve-body, as shown by the arrows in Fig. 3. The cylinder 40 of air-valve 7 is placed in direct

communication with the air-reservoir by means of the branch pipe 44 to air-conducting pipes 45, in which pressure is always maintained, except when the brakes are applied to stop or hold a train or a car, the air being supplied to said pipe through a branch, 46, and a three-way cock, 47. The object of the said action of the piston in cylinder 13 is to assist in letting off the brakes. There is always pressure on this piston, and when the brakes are applied by cylinder 6 it is against this pressure, but the wide difference between the area of the pistons of the two cylinders 6 and 13 makes the resistance of that in cylinder 13 relatively slight; but when pressure is removed from the piston in cylinder 6 the pressure on the said smaller piston, 13, is ample to quickly release the brakes. If desired, the cylinder 13 and its piston may be omitted; but in that case the brakes would be let off more slowly.

The operation of my improved devices, when the brakes are to be applied to the entire train from the locomotive or tender, is as follows: The supply-pipe 45 is made of a continuous length from one end of a car to the other, short hose-connections, as in the ordinary air-brake, uniting the ends of said pipe between each car. Near each end of said pipe, under each car, is placed an ordinary stop-cock, by means of which the pipe under each car can be made tight, as would be necessary if the brake were to be used only on one car; or, in the case of an entire train being operated from one given point in said train, one of said stop-cocks would be used to shut the extreme rear end of said pipe 45. The three-way cocks 47 under each car are then set in the position shown in Fig. 5 by means of any convenient rod or lever extending up into the car. The three-way cock 47 under the locomotive or tender alone is left in the position shown in Fig. 3, the position of the parts of the air-valve D being that seen in Fig. 4—viz., with ports 37 open. As soon, therefore, as the train has moved a sufficient distance to accumulate any pressure in reservoir 2 under the tender, if the latter be of a locomotive, the said pressure, operating through the pipe 45, closes the valve-ports 37 in the air-valves D under all of the cars of the train. It will be observed that while the brakes for the whole train are to be applied from one point on that train, all of the air-compressing cylinders begin to work as soon as the train starts; but sufficient pressure cannot be generated in any one reservoir to apply the brakes to any of the cars before the air-valve ports 37 will be closed, preventing such operation of the brake. This must be, as it is obvious that it requires less pressure to close the port 37 in air-valve D than to operate the brakes on a car. The piston in cylinder 40 of valve D is made with an area much larger than the area of port 37, in order that the valve 41 may easily close port 37 against whatever pressure may be found in reservoir 2. The position of the devices is then that seen in Fig. 3, when the pressure in the operating-reservoir on the tender has reached a certain point. When the maximum pressure in any of the reservoirs has been reached, the piston 32 in cylinder 30 operates to lift the air-compressing piston out of engagement with its operating-eccentric on the axle, and to so hold it out of engagement until the reduced pressure in the reservoir allows spring 33 to withdraw the beveled end of said piston rod from under the lever 17, and the air-compressor is again put in operation. It will thus be seen that constant pressure is kept on all of the reservoirs automatically, and in case of accident to any of the brake-operating mechanism on the tender or locomotive the brakes for the entire train can be applied from the car next to the tender, or from any car in the train, by turning any one of the three-way cocks from the position shown in Fig. 5 to that shown in Fig. 4, whereby the pressure in pipe 45 is released. When it is desired to apply the brakes to a train, the three-way cock on the tender or locomotive is turned from the position shown in Fig. 3 to the position of the cock shown in Fig. 4, thereby shutting off the pressure on pipe 45 from the reservoir, and opening a passage from the pipe to the open air through said cock and vent 48. As soon as the pressure is taken from pipe 45, the pressure in the reservoir under each car, acting on the end of the valve which closes port 37, immediately forces said valve 41 and piston 38 down to the position shown in Fig. 4, thereby leaving free passage from the reservoir under each car to its brake-operating cylinder 6, through ports 37 and 39, and the pistons 8 of all the cars move downward simultaneously, applying the brakes to all the cars. Only such an amount of air is lost each time the brakes are applied as is required to fill pipe 45, and only a small part of the contents of one of the reservoirs 2 is therefore used to replace the air used in applying the brakes to several cars. To release the brakes of all the cars at once it is only necessary to turn the three-way cock 47 back to the position it was first in—viz., that shown in Fig. 3—and immediately the pressure on pipe 45 operates to close the ports 37 in the valve D under each car, and the air in cylinder 6 escapes through ports 39 and 43 of the valve 7, and down through the space between the valve-body and cylinder 40, as indicated by arrows in said Fig. 3. When it is desired to operate the brake of one car alone independently of all the rest, as in the case of a mixed train—viz., a train composed of cars some of which possess the air-brake and some which do not—the cocks 49 are both turned so as to close each end of pipe 45 under the car. The pressure in pipe 45 then operates to close the port 37 in precisely the same manner as it does when the brakes of an entire train are operated, as hereinbefore described, and the brakes are applied to the car by turning the three-way cock 47, as described, to release the pressure in the air-conducting pipe.

Thus it will be seen that my improved brake-operating devices possess the great advantage of being adapted to be easily operated from any given car on a train to apply the brakes to the entire train, and yet they are not thereby rendered incapable of being operated from any other car on the train for the same purpose; and, furthermore, any car provided with my improved brake is capable of being operated independently of any devices on either the locomotive or any other car to apply the brakes to said car.

What I claim as my invention is—

1. An air-brake device for railway-vehicles, consisting of an air-reservoir attached to a car and divided by a partition, forming two compartments, one for compressed air and one provided with a brake-lever piston and cylinder, substantially as described, combined with the axle of the vehicle, having an eccentric fixed thereon, an air-pump, substantially as described, connected to said reservoir, to compress air therein, having its piston engaged by said eccentric, an automatically-acting air-valve, substantially as described, connected with both of said compartments, to admit compressed air to said brake-lever piston and to discharge the same from the latter, a brake-lever pivoted under said reservoir and connected to said brake-lever piston, and an air-pipe provided with a three-way valve having a vent-passage therefrom connecting said compressed-air reservoir and air-valve, substantially as set forth.

2. An air-brake device for railway-vehicles, consisting of an air-reservoir attached to a car and divided by a partition, forming two compartments, one for compressed air and one provided with a brake-lever piston and cylinder, substantially as described, combined with the axle of the vehicle, having an eccentric fixed thereon, an air-pump, substantially as described, connected to said reservoir, to compress air therein, having its piston engaged by said eccentric, an automatically-acting air-valve, substantially as described, connected with both of said compartments, to admit compressed air to said brake-lever piston, and to discharge the same from the latter, a brake-lever pivoted under said reservoir and connected to said brake-lever piston, a piston actuated by the compressed air in said reservoir, connected to one end of said lever, and an air-pipe provided with a three-way valve having a vent-passage therefrom connecting said compressed-air reservoir and air-valve, substantially as set forth.

3. A reservoir for compressed air, located under a car and having a connection with brake-operating mechanism, substantially as described, having an air-compressing pump therein consisting of the cylinder 15, having a perforated head, and clapper-valves vibrating over its perforations, a piston in said cylinder having a central perforation, and a hollow piston-rod connected therewith having side perforations, and clapper-valves vibrating over the latter on the inside of the piston-rod, and a spring to move the said piston in one direction, combined with the axle of a car and an eccentric fixed on the latter, whereby motion is imparted to said piston, substantially as set forth.

4. In combination, the rod 17, connected by one end to the reservoir and by its opposite end to the piston of the air-pump, the cylinder 30, attached to the reservoir 2, and receiving compressed air from the latter, the piston-rod 34, having a suitable head within said cylinder, and having a wedge-shaped end to engage with one side of said rod 17, and a retracting-spring, 33, on said piston-rod, substantially as set forth.

5. The air-valve for admitting air from the compressed-air compartment of the reservoir to that in which the brake-cylinder 6 is located, and for discharging air from the latter, consisting of the valve-body 35, having an end and a side passage, an air-cylinder, 40, having an air-passage through one end and one or more air-passages through its sides, secured by one end in said valve-body, and of smaller diameter than the interior of the latter, and a double-faced valve acting between the ends of said body and cylinder to close and open said air-passage therethrough, having a stem on which is secured a piston-head in said cylinder 40, combined with the reservoir 2 and an air-pipe conveying compressed air from the latter to said cylinder 40, substantially as set forth.

6. The air-reservoir 2, divided into two compartments by a partition, the air-pump consisting of the cylinder 15, having a perforated head provided with clapper-valves, a piston and valves connected therewith, substantially as described, and a spring actuating said piston in one direction, an eccentric, 21, fixed on a car-axle and engaging with the piston-rod of said air-pump, combined with an open-ended cylinder, 13, located in said reservoir and having a suitable piston therein, a brake-operating lever, 10, pivoted under said reservoir and having the latter-named piston connected with one end thereof, a brake-operating cylinder, 6, and its piston located in the smaller of said two compartments and having its piston connected to said lever 10, an air-valve, substantially as described, located near the partition between the said two compartments and actuated by the air-pressure in said reservoir, whereby compressed air is admitted to and discharged from the smaller of said two compartments in which is located said cylinder 6 and its piston, and an air-pipe connecting the compressed-air compartment of said reservoir and the air-valve cylinder, provided with a suitable valve-cock for admitting air to the latter, combined and operating substantially as set forth.

7. An air-brake device for railway-vehicles, consisting of an air-reservoir, 2, adapted to be secured to the bottom of a car and divided into two compartments by a partition, a valve-

box, 5, formed within the larger of said two compartments at the side of said partition, and communicating with the smaller one through an opening in the latter, a valve-body, 35, secured within said valve-box, having an air-passage through its end communicating with said larger compartment and an air-passage through its side communicating with said smaller compartment, an air-cylinder, 40, having an air-passage through one end and one or more air-passages through its sides, secured by one end in said body 35, and of smaller diameter than the interior of the latter, a double-faced valve acting between the ends of said body 35 and cylinder 40, to close and open said air-passages therethrough, having a stem on which is secured a piston-head in said cylinder 40, an air-pipe, 45, connecting said larger reservoir-compartment with the outer end of said air-cylinder 40, a three-way valve-cock connected in said air-pipe, an open-ended cylinder, 6, secured within said smaller reservoir-compartment and having a piston, 8, therein, a brake-lever, 10, pivoted under said reservoir and connected to said piston 8, an open-ended cylinder, 13, secured within said larger reservoir-compartment and having a piston therein connected to one end of said lever 10, a second cylinder, 15, secured in the last-named compartment, having a perforated head provided with clapper-valves, a piston, 25, having a central perforation, operating in said cylinder 15, attached to a hollow piston-rod, the latter having side perforations, and clapper-valves inside said piston covering said perforations, a connecting-rod, 17, pivoted by one end to the under side of the reservoir and having its opposite end connected to the end of said hollow piston-rod, a spring, 29, between piston-head 25 and the head of the cylinder, and an eccentric, 21, secured on the axle 20 of a car, and engaging with the lower end of said hollow piston-rod, combined and operating substantially as set forth.

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