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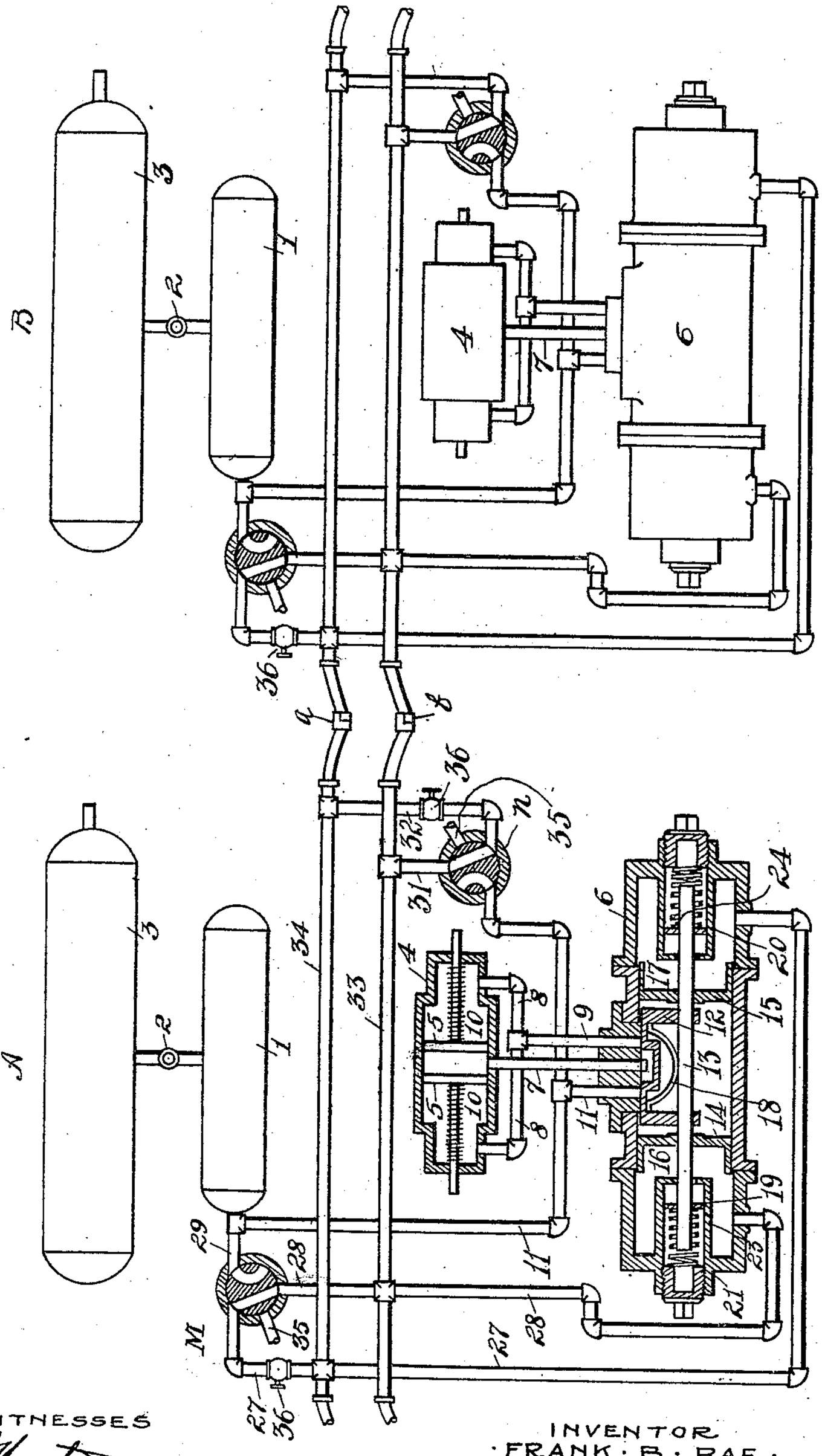
F. B. RAE.

AIR BRAKE.

APPLICATION FILED JAN. 10, 1906.



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AIR-BRAKE.

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To all whom it may concern:

Be it known that I, FRANK B. RAE, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Air-Brakes, of which the following is a full, clear, and exact specification.

This invention relates to air brake systems and its object is to provide a system wherein a minimum amount of air will be lost during operation.

Such systems generally employ a valve regulating the introduction of air pressure to the brake cylinder, and the valve is controlled by pressure from the reservoir or train pipe.

Ordinarily in order to secure a complete application of the full pressure to the brakes it is necessary to reduce the pressure in the train pipe from the pressure required to close the valve to substantially zero pressure.

In carrying out my invention I propose to provide means whereby the valve is normally held in closed position by an equalization of pressure on each side thereof, and means whereby train pipe pressure may be introduced upon one side or the other of the valve to unbalance and cause operation of the same. I further provide means whereby after the pressures have been unbalanced as above described communication may be established between the opposite sides in order to equalize the pressure and thus close the valve, without necessarily venting any air from the system.

The invention also comprehends other features of advantage which will be referred to more in detail hereinafter.

In the accompanying drawings I have shown a diagram, partly in section, of one form that the invention may take in practice.

Referring more particularly to the drawings A, B, represent groups of mechanism carried by the respective cars. If the cars are to form units of a multiple unit system the couplings *a*, *b*, will couple the mechanism of the respective cars together. Upon each car is carried a reservoir 1 which is preferably connected by a reducing valve 2 with a main reservoir 3. The brake cylinder 4, which in this instance is shown as having the two brake pistons 5, 5, is connected from between the pistons to the valve 6, by the pipe 7. The rods of the brake pistons 5 are loosely packed in the cylinder so as to permit a restricted leakage of air around the piston rods from the respective ends of the cylinder, and from the ends, on the side of the pistons opposite the pipe 7, the pipes 8, 8, lead to pipe 9, which leads to the valve 6. Springs 10, 10, normally hold the pistons toward the middle of the cylinder, in which positions the brakes are released. A pipe 11 leads from the reservoir 1 to valve 6.

My preferred construction of valve is that shown in the drawings, in which the ports of pipes 7, 9 and 11 are alined and a slide 12 is adapted to connect either ports 7 and 9, or 7 and 11. Normally it closes all the ports. The slide 12 is carried by a rod 13 which is mounted in the piston disks or heads 14 and 15, these heads being arranged to slide in the casing of the valve, and forming with the casing the chambers 16 and 17 in the opposite ends of the valve. To aid in maintaining a proper adjustment between the slide 12 and the ports 7, 9, 11, the spring 18 may be interposed between rod 13 and the slide.

To further insure the maintenance of rod 13 in proper alinement the cylindrical standards 19, 20, the ends of which form bearings for the rod, may be formed in the casing of the valve, and to insure that the slide shall normally stand in its central position, as shown, and thus close all the ports, the springs 21, 22 may surround the respective ends of rod 13, inside the cylinders 19, 20, and be interposed between the collars 23, 24, carried by the rod, and the adjustable ends 25, 26 of the cylinder. M is the operator's valve, and from this valve the pipes 27, 28 respectively lead to the chambers 16 and 17 in the ends of valve 6. Valve M is also connected with reservoir 1 by a pipe 29. An operating valve N may be located at the opposite end of the car, in which case a pipe 30 connects valve N with pipe 11, and pipes 31, 32, respectively connect with pipes 33 and 34 which extend the length of the car and are connected with pipes 27 and 28 respectively. Where two or more cars are coupled together the couplings *a* and *b* couple the pipes 33 and 34 of the respective cars. The operating valves M and N are each four way valves, having appropriate passages for connecting the reservoir with either side of the valve 6, both sides of the valve together, or either of said pipes 27 or 28 (or 31 or 32) with the atmosphere port 35. A valve 36 should be placed in pipe 27 between valve M and pipe 34, and in pipe 32 between valve N and pipe 34, upon each car, and in cases where the cars are units in a train all of these valves will be closed except that adjacent to the operating valve from which the brakes of the train are to be controlled.

In the operation of the system the reservoirs being stored with air under pressure, if two or more cars are coupled together and are to be operated from operating valve M on the forward car the valves 36 throughout the system, except valve 36 adjacent to the operating valve, are closed. The operating valve is shown in the drawing in normal running position, at which time

pipes 27 and 28 are connected and such pressure as may be in those pipes is equally balanced upon the opposite sides of the valve 6. This pressure will ordinarily be kept very low by occasional venting through the vent 35. But whatever the pressure may be, by reason of it being equal upon both sides of the valve it does not interfere with the operation of springs 21, 22, and these springs will therefore maintain the slide 12 in its middle position, in which all the ports are closed. To apply the brakes the operating valve M is turned to connect pipes 27 and 29, which action simultaneously closes the communication between pipes 27 and 28. Pressure from reservoir 1 is now applied, through pipe 29, valve M, and pipe 27 to the chamber 17, which pressure acting upon the head 15 and being added to the tension of spring 22, overcomes spring 21 and moves slide 12 to connect ports 7 and 11, closing port 9. This introduces pressure from reservoir 1 through pipes 29, 11 and 7 into the brake cylinder to apply the brakes. If the operating valve M is not moved from the position above described a complete and quick application of the brakes results. Inasmuch as pipes 27, and pipes 28, upon the several cars are all connected by pipes 34 and 33 respectively the brakes upon all the cars in the system will be operated simultaneously in the same manner as above described. If the operator desires the ordinary application in which limited quantities of air are successively applied to the brakes, thus gradually increasing the pressure, the operating valve is successively turned as before described and then immediately afterward the valve is turned to connect pipes 27 and 28 and cut off communication with pipe 29. This shuts off communication between the reservoir and the brake cylinder, and at the same time the pressure in chamber 17 is equalized with that in chamber 16, through pipes 27 and 28, thus permitting springs to move slide 12 to close all the ports. In order to release the brakes, at any time, valve M is so turned as to connect pipes 28 and 29 which closes pipe 27 and introduces reservoir pressure through pipe 28 to chamber 16, where acting upon the head 14 the slide 12 is moved to connect ports 7 and 9, which permits the air in the brake cylinder, between the brake pistons, to pass out through pipes 7 and 9 to the ends of the cylinder, from whence it escapes to the atmosphere.

It will be seen that in order to cause operation of valve 6 it is only necessary to unbalance the pressure on one or the other side of the valve, and very little air is required for this. Furthermore this unbalancing of pressure in pipes 27 and 28 is below that in the reservoir. Therefore the brakes may be applied and released many times without greatly increasing the pressure in pipes 27 and 28, and that when this pressure is increased beyond that desired for working conditions the venting of a comparatively small quantity of air (by connecting vent 35 with pipes 27 and 28) will relieve the system.

The construction shown in the drawings may be altered in numerous particulars without departing from the invention and I therefore desire it to be understood that I do not limit myself to this precise construction.

Having thus described my invention, I declare that what I claim as new and desire to secure by Letters Patent, is,—

1. In a brake system, the combination with the reservoir and brake cylinder, of a valve controlling the communication between the same, means for maintaining normally equal pressures upon the opposite sides of said valve, means for unbalancing said pressures to cause operation of the valve, a spring device adapted to return the valve to normal position to close the ports, substantially as described.

2. In a brake system, the combination with the reservoir and brake cylinder, of a valve controlling the communication between the same, means for maintaining normally equal pressures upon the opposite sides of said valve, means for establishing communication between the reservoir and one side of said valve to unbalance said pressures and cause operation of the valve, a spring device adapted to return the valve to normal position to close the ports, substantially as described.

3. In a brake system, the combination with the reservoir and brake cylinder, of a valve controlling communication between the same, means for applying pressure upon either side of said valve to move it in one or the other direction, a spring device adapted to return the valve to normal position to close the ports, substantially as described.

4. In a brake system, the combination with the reservoir and brake cylinder, of a valve controlling communication between the same, means for establishing communication between the reservoir and either side of said valve to move the same in one or the other direction, a spring device adapted to return the valve to normal position to close the ports, substantially as described.

5. In a brake system, the combination with the reservoir and brake cylinder, of a valve controlling communication between the same, a pressure chamber upon each side of said valve, a spring device normally holding the ports closed, means for moving the valve to admit pressure to the brake cylinder, and an equalizing passage between the sides of the brake cylinder controlled by said valve, substantially as described.

6. In a brake system, the combination with the reservoir and brake cylinder of a valve controlling communication between the same, springs for normally holding said valve in central position, means for applying pressure on either side of said valve to move it in one or the other direction, and a connecting passage for equalizing the pressure upon both sides of the valve, substantially as described.

7. In a brake system, the combination with the reservoir and brake cylinder, of a valve controlling communication between the same, means for applying pressure upon either side of said valve to move it in one or the other direction, a spring device adapted to return the valve to normal position to close the ports, and a connecting passage for equalizing the pressure upon both sides of the valve, substantially as described.

8. In a brake system, the combination with the reservoir and brake cylinder, of a valve controlling communication between the same, a pressure chamber upon each side of said valve, means whereby pressure in said chamber will move the valve, means for establishing communication between the reservoir and either one of said chambers, and means for closing said communication and establishing communication between the two chambers, substantially as described.

9. In a brake system, the combination with the reservoir and brake cylinder of a valve controlling communication between the same, a pressure chamber upon each side of said valve, means whereby pressure in said chamber will move the valve, means for establishing communication between the reservoir and either one of said chambers, means for closing said communication and establishing communication between the two chambers, and means for establishing communication between said chambers and the atmosphere, substantially as described.

10. In a brake system, the combination with the reservoir and brake cylinder, of a valve controlling communication betwen the same, said valve having a spring on its opposite sides tending to maintain said valve in normal position, a release passage from the brake cylinder normally closed by said valve, and means for applying pressure from the reservoir to one side of said valve to move it to establish communication between the reservoir and brake cylinder, and to the other side of the valve to move it to establish communication between the brake cylinder and the release passage, substantially as described.

In testimony whereof I affix my signature, in presence of two witnesses.

FRANK B. RAE.

Witnesses:
STANTON CLARKE,
O. J. GILLETT.