No. 768,386 PATENTED AUG. 23, 1904.

J. LORD.

# AUTOMATIC DIFFERENTIAL BRAKE PRESSURE MECHANISM.

APPLICATION FILED DEC. 23, 1903.

NO MODEL.

FIG. 1.

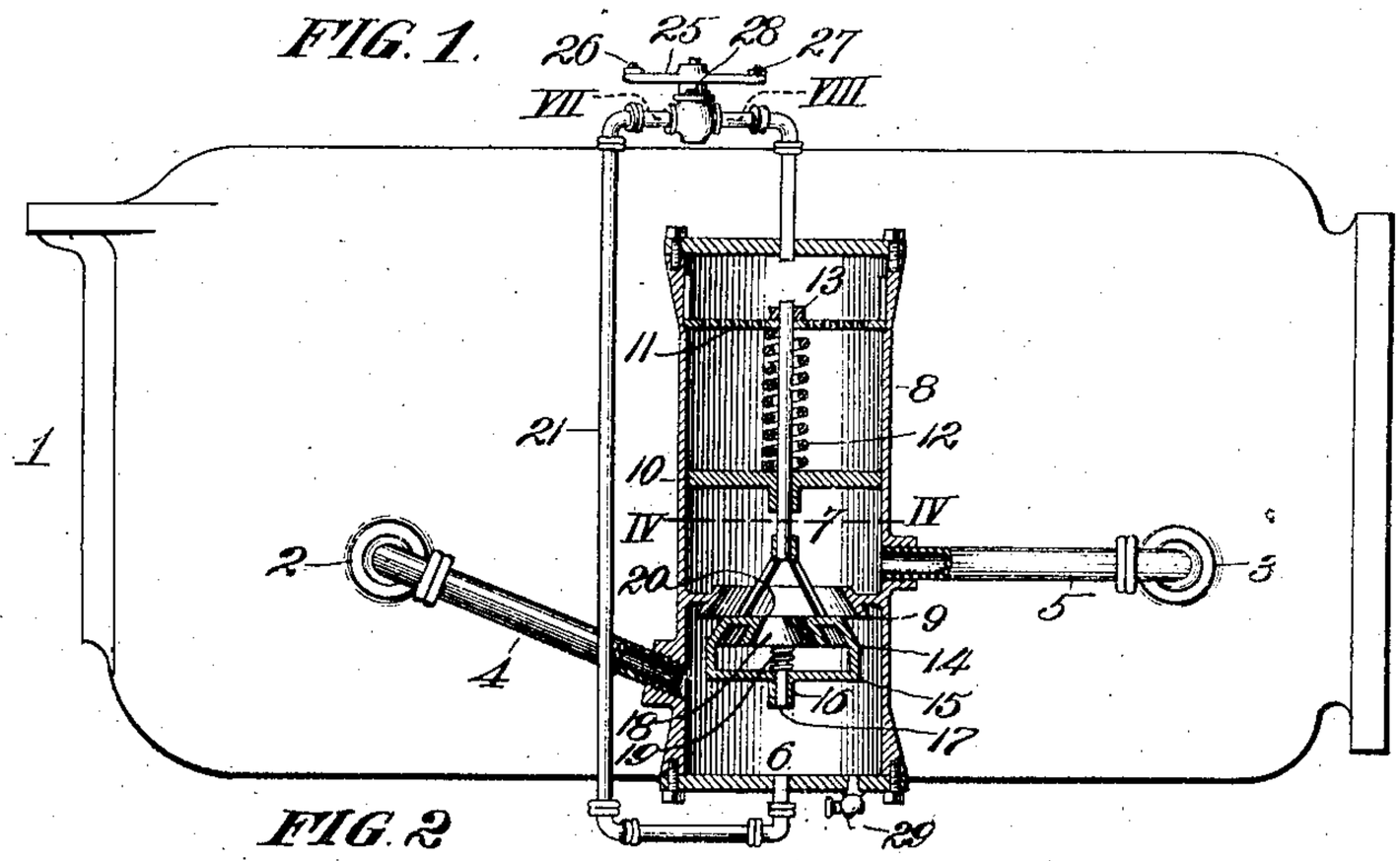



FIG. 2

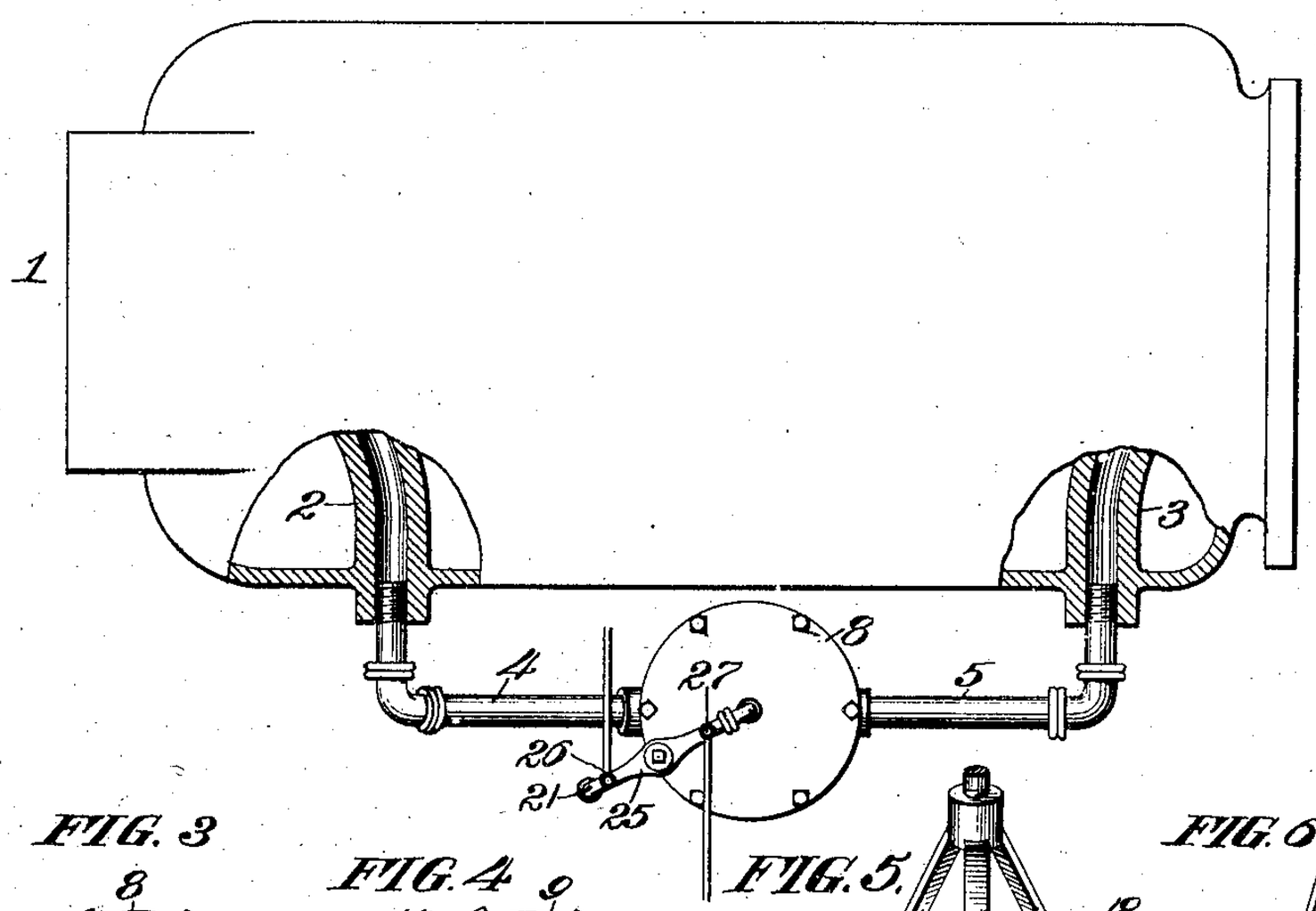



FIG. 3

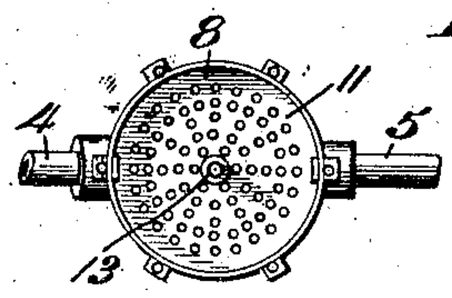



FIG. 4

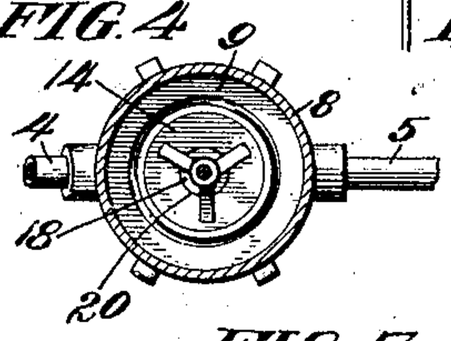



FIG. 5.

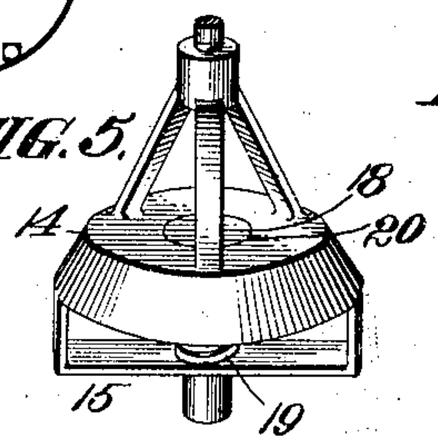



FIG. 6

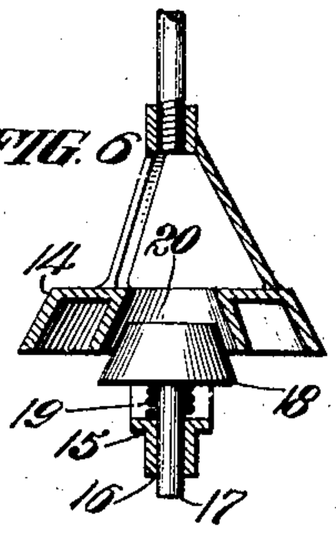



FIG. 7

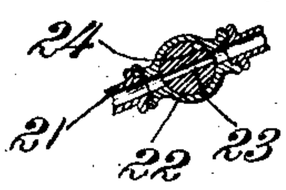
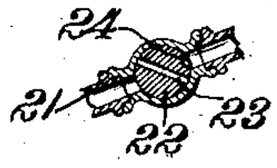



FIG. 8.




Witnesses
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No. 768,386. Patented August 23, 1904.

# UNITED STATES PATENT OFFICE.

JOSEPH LORD, OF HAYS, KANSAS, ASSIGNOR OF ONE-HALF TO MARQUIS L. FRIZZELL, OF ST. ANTHONY, IDAHO.

## AUTOMATIC DIFFERENTIAL BRAKE-PRESSURE MECHANISM.

SPECIFICATION forming part of Letters Patent No. 768,386, dated August 23, 1904.

Application filed December 23, 1903. Serial No. 186,392. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH LORD, a citizen of the United States, residing at Hays city, in the county of Ellis and State of Kansas, have invented certain new and useful Improvements in Automatic Differential Brake-Pressure Mechanism, of which the following is a specification.

This invention relates to automatic air-brake apparatus, and has for its object to produce means for automatically applying differential pressure on loaded and empty cars on an emergency application of the brakes, so as to arrest the train without sliding and therefore flattening the wheels of the empty cars.

With this primary object in view the invention consists in certain novel and peculiar features of construction and organization, as hereinafter described and claimed, and in order that it may be fully understood reference is to be had to the accompanying drawings, in which—

Figure 1 represents a central vertical section of a differential valve attachment for freight-car auxiliary reservoirs, one of said reservoirs being shown in elevation and connected to the differential valve. Fig. 2 is a top plan view of the same with the reservoir partly broken away to show wherein it differs in construction from those now in general use. Fig. 3 is a top plan view of the differential valve with its upper head or end omitted. Fig. 4 is a horizontal section on the line IV IV of Fig. 1. Fig. 5 is a detail perspective view of the valve mechanism. Fig. 6 is a central vertical section of the mechanism shown in Fig. 5. Fig. 7 is an enlarged horizontal section on the line VII VIII of Fig. 1, said valve being arranged to permit the air to pass through it. Fig. 8 is a similar view with the valve arranged to cut off such passage of air and to permit of the escape of the air from one side of the piston of the differential valve.

In the said drawings, 1 designates the auxiliary reservoir of a freight-car, from which reservoir, however, is omitted the straight pipe, which extends clear through the reservoir and communicates at one end with the triple valve and at the other with the brake-cylinder. In this case I provide in lieu of said pipe a port 2, which leads to the triple valve and which I therefore term the "triple-valve" port, and a port 3, which leads to the brake-cylinder and which I therefore term the "brake-cylinder" port. These ports lead to the outside of the reservoir by preference, and port 2 is connected by a pipe 4 and port 3 by pipe 5 to the chambers 6 and 7, respectively, of the differential-valve cylinder 8, said chambers being separated from each other by the partition 9, which forms the main-valve seat. Arranged to reciprocate in the customary manner in chamber 7 of said cylinder is a piston 10, the stem of said piston extending slidingly through a suitable guide 11, said guide being by preference in the form of a perforated plate.

12 designates a coil-spring mounted upon the stem and interposed between stationary plate 11 and the piston and tending to force the latter toward the valve-seat partition 9, a collar 13 or its equivalent serving to limit movement in that direction.

Suspended as shown or otherwise from and movable with the piston is the main valve 14, the same being of frustum shape and adapted at certain times, as hereinafter explained, to fit snugly in the valve-seat opening and close the same. This main valve is preferably provided with a depending portion 15, having a vertical passage 16 to receive the depending stem 17 of the supplemental or release valve 18, this valve 18 being also by preference of frustum shape and normally held by the weak spring 19 against its seat 20, said seat being a tapering passage formed entirely through the main valve.

21 designates a system of pipes communicating with the cylinder through its closed ends or heads, as shown most clearly in Fig. 1, and provided at a suitable point with a plug-valve 22, said plug-valve having the usual passage 23 to establish communication between opposite ends of the cylinder when disposed as shown in Fig. 7. It is also provided with a longitudinal groove 24, which

has one end communicating with the atmosphere and its opposite end when the valve is in the position shown in Fig. 8 communicating with that end of the cylinder 8 at the opposite side of the piston from the main and supplemental valves. The stem of the plug-valve carries a cross-rod 25 at its upper end, and connected to opposite ends of the same and extending to within convenient reach from opposite sides of the car are pull-rods 26 and 27. The plug-valve has only sufficient movement to swing the passage 23 out of and groove 24 into alinement with pipe 21, or vice versa, its movement being limited by preference by the usual pin-and-slot connection 28, commonly used on valves of the type under consideration.

In practice the brakeman of the train will by proper manipulation of the pull-rods set the plug-valves on all of the empty cars, as shown in Fig. 8, so that air cannot pass through the plug-valves to the cylinder, but can escape from the latter through the groove to atmosphere. On the loaded cars the plug-valves will be set as shown in Fig. 7—that is, so that the air can pass freely from one end of the cylinder to the other—and in this connection it should be stated that the brakeman will know by the position of the pull-rods how the plug-valves are set—that is to say, if the pull-rod handles (not shown) are close to the edges of the car he will know that the plug-valves are disposed as shown in Fig. 8 and that the valve is set for empty cars. If the handles are some distance back from the edge of the cars, he will know that the plug-valves are set as shown in Fig. 7 for loaded cars.

Assuming that the engineer has made an emergency application of the brakes on a train composed of loaded and empty cars equipped with differential valves embodying my invention, it will be seen that the air from each pipe 4 enters chamber 6 of the cylinder and from said chamber passes up through the main-valve seat into chamber 7 and through pipe 5 to the brake-cylinder. On each loaded car, because the plug-valve is set "open," the air immediately passes through pipe 21 to the cylinder at the opposite side of the piston, and as a result the latter is balanced and the main valve is held unseated, and therefore does not interfere with the application of full pressure in the brake-cylinder. On each empty car as the plug-valve occupies its closed position the air cannot pass through pipe 21 to the opposite side of the piston, and as a result as soon as the pressure of air entering chamber 7 from chamber 6 reaches from twenty to thirty pounds it overcomes the resistance of spring 12 and forces piston 10 to move and seat the main valve, so as to cut off the passage of additional air from chamber 6 to chamber 7, and thus prevent the application of more than the twenty or thirty pounds pressure referred to in the brake-cylinder of the empty car, the surplus air above the piston being forced through the groove 24 to atmosphere by such movement of the piston.

It is to be understood, of course, that the amount of resistance which spring 12 exerts will correspond to about the maximum pressure which should be applied in the brake-cylinder of an empty car. As a result, a differential pressure is automatically applied on loaded and empty cars of the same train, and the flattening of the wheels of the latter is avoided.

To effect a quick release of the brakes, the main valve is provided with the small supplemental or release valve, which is held seated by the weak spring 19 only when the pressure from the auxiliary reservoir is removed. As a consequence the instant the engineer exhausts the air through pipe 4 the back pressure in chamber 7 between the piston and the brake-cylinder unseats said release-valve and effects the preliminary or immediate release of the brakes, the unseating of the main valve immediately following. The main valve would not drop quickly enough to give efficient service, because the back pressure from the brake-cylinder on the larger area of the piston would tend to hold it, and therefore said valve, up until the pressure was lowered by leakage from the brake-cylinder, as will be readily understood. Moisture accumulating in the differential-valve casing will be discharged by way of the drain-cock 29.

From the above description it will be apparent that I have produced a differential valve for automatically applying differential pressure on loaded and empty cars of the same train which operates efficiently, positively, and reliably and which can be applied to cars at a comparatively low cost, and while I have illustrated and described the preferred embodiment of the invention it is to be understood that it is susceptible of modification in various particulars without departing from its principle and scope or sacrificing any of its advantages.

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

1. The combination of a casing having supply and discharge ports, and valve mechanism yieldingly controlling the passage of air from one port to the other, a piston movable with said valve mechanism and disposed at the opposite side of the discharge-port from the valve mechanism, a pipe connecting the casing at opposite sides of the piston, a valve mounted in said pipe and provided with a passage, and with a groove, the latter communicating at one end with atmosphere and adapted to communicate at its other end with that portion of the pipe leading to the end of the cylinder at the opposite side of the piston from the valve mechanism thereof.

2. The combination with a casing having

supply and discharge ports, and valve mechanism yieldingly controlling the passage of air from one port to the other, a piston movable with said valve mechanism and disposed at the opposite side of the discharge-port from the valve mechanism, a pipe connecting the casing at opposite side of the piston, a valve mounted in said pipe and provided with a passage, and with a groove the latter communicating at one end with atmosphere and adapted to communicate at its other end with that portion of the pipe leading to the end of the cylinder at the opposite side of the piston from the valve mechanism thereof, and pull-rods for controlling the valve of said pipe.

3. The combination of a casing having supply and discharge ports, a valve mechanism between said ports, means adapted to be actuated by the air from the supply-port to close the valve mechanism, and means actuated by the back pressure from the discharge-port when the pressure from the supply-port is removed, to open communication between said ports.

4. The combination of a casing having supply and discharge ports, a main-valve mechanism between said ports, a supplemental or release valve mechanism forming a part of the main-valve mechanism, and a piston for the casing connected to and disposed at the opposite side of the main-valve mechanism from the discharge-port.

5. The combination of a casing having supply and discharge ports, a valve mechanism between said ports, means for holding the valve mechanism seated, and means actuated by the back pressure through the discharge-port when the pressure at the opposite side of the valve mechanism is removed to effect a preliminary reduction of pressure through the discharge-port.

6. The combination of a casing having supply and discharge ports, a valve mechanism between said ports, means for holding the valve mechanism seated, means actuated by the back pressure through the discharge-port when the pressure at the opposite side of the valve mechanism is removed, to effect a preliminary reduction of pressure through the discharge-port, and means to immediately thereafter unseat said valve mechanism.

7. The combination of a casing having supply and discharge ports, a valve mechanism between said ports and held normally unseated, a piston at the opposite side of the discharge-port from the valve mechanism, and connected to the latter, a spring holding the valve mechanism normally open, a pipe communicating with the casing at opposite sides of the piston and valve mechanism, and means for opening communication through said pipe to the casing, or for shutting off such communication and opening communication between the atmosphere and the end of the casing at the opposite side of the piston from the discharge-port.

8. The combination of an auxiliary reservoir having a triple-valve port, and a brake-cylinder port, a casing having a supply-port connected to the triple-valve port of the reservoir and a discharge-port connected to the brake-cylinder port of the reservoir, a valve mechanism between said casing-ports and held normally unseated, a piston at the opposite side of the discharge-port from the valve mechanism, and connected to the latter, a spring holding the valve mechanism normally open, a pipe communicating with the casing at opposite sides of the piston and valve mechanism, and means for opening communication through said pipe to the casing or for shutting off such communication and opening communication between the atmosphere and the end of the casing at the opposite side of the piston from the discharge-port.

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

JOSEPH LORD.

Witnesses:
H. C. RODGERS,
G. Y. THORPE.