No. 803,591. PATENTED NOV. 7, 1905.

H. T. HERR & W. V. TURNER.

DOUBLE HEADING VALVE DEVICE FOR AIR BRAKES.

APPLICATION FILED FEB. 2, 1904.

3 SHEETS—SHEET 1.

Fig. 1.

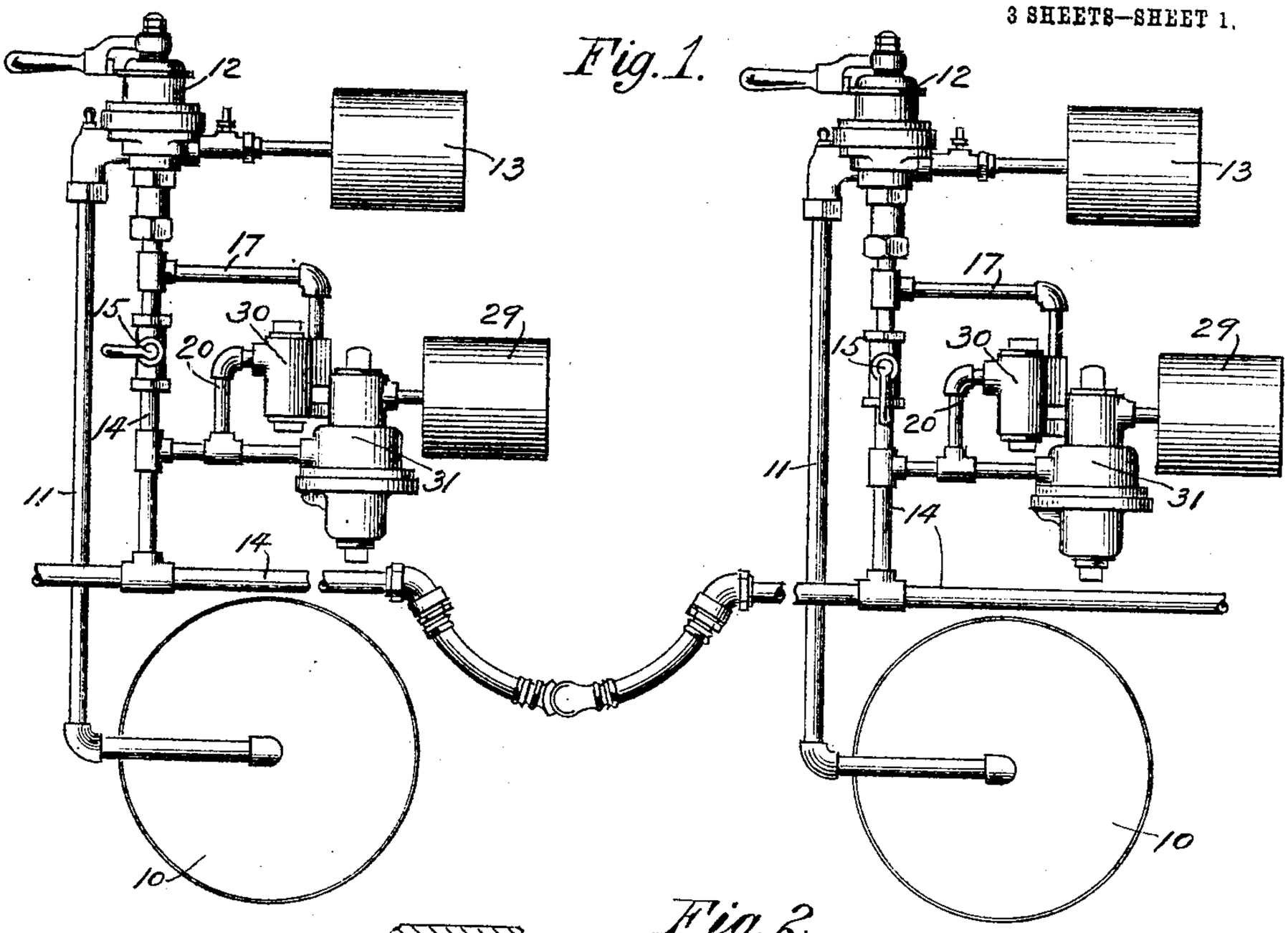
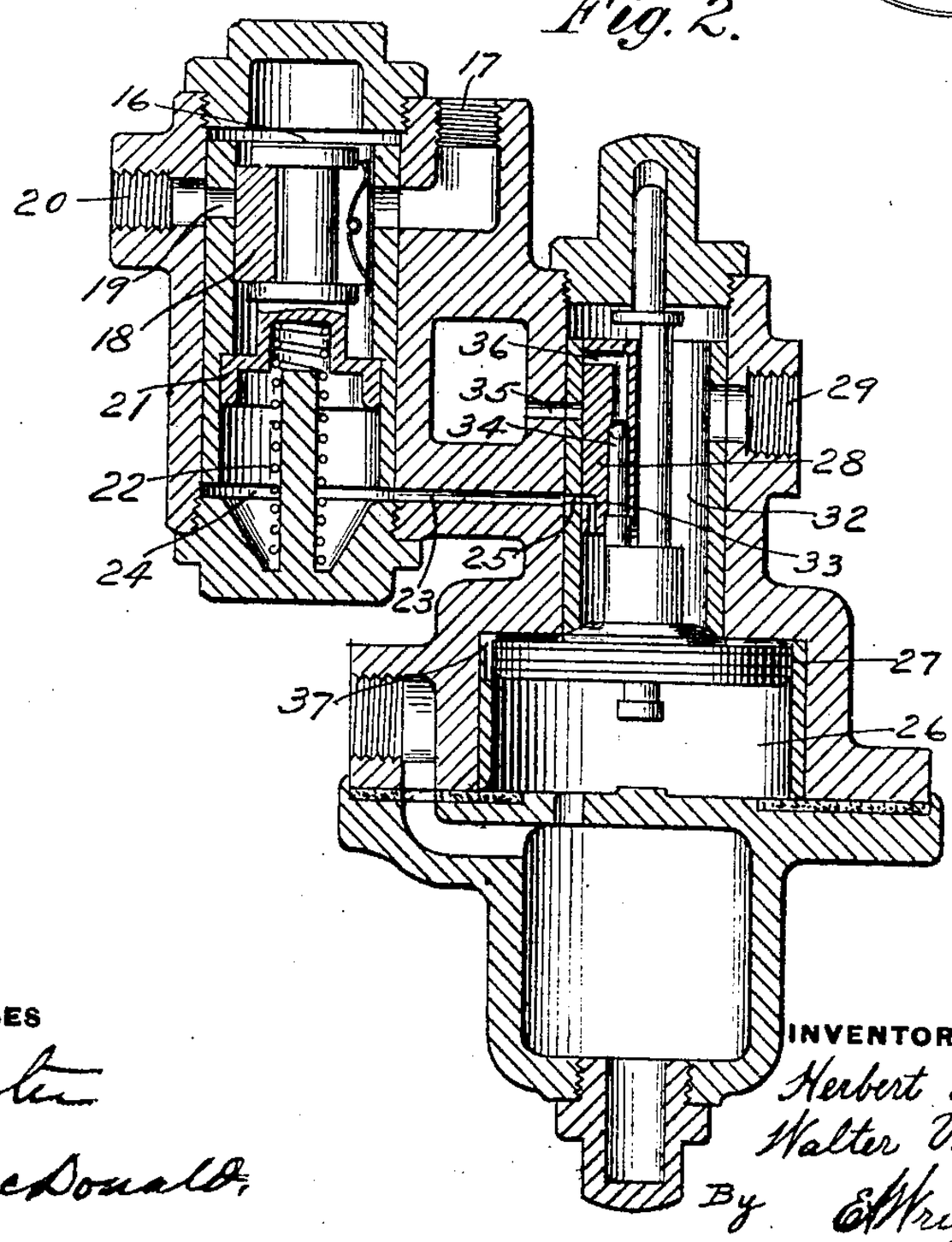


Fig. 2.



WITNESSES

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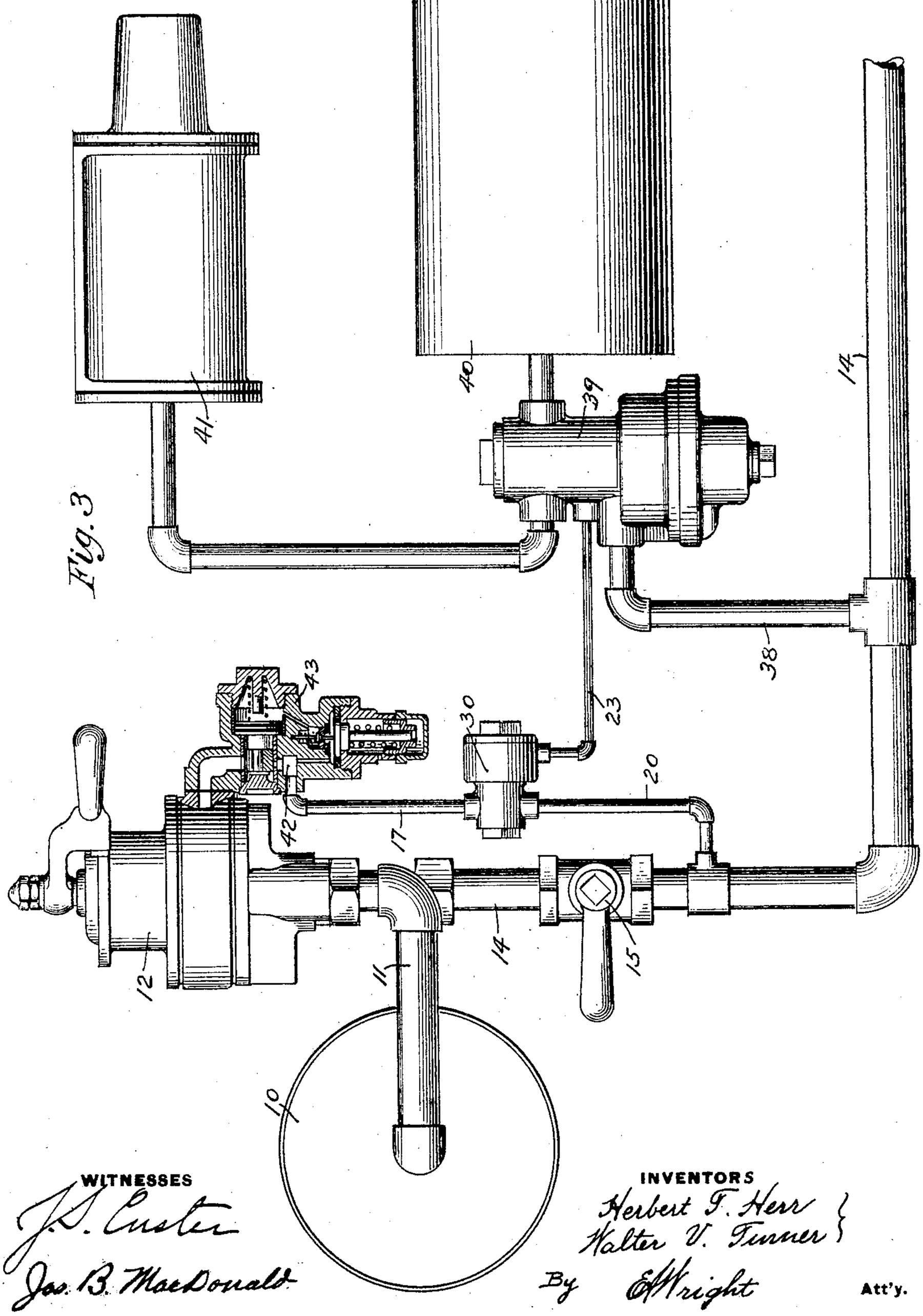
Fig. 3



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3 SHEETS—SHEET 3.

Fig. 4.

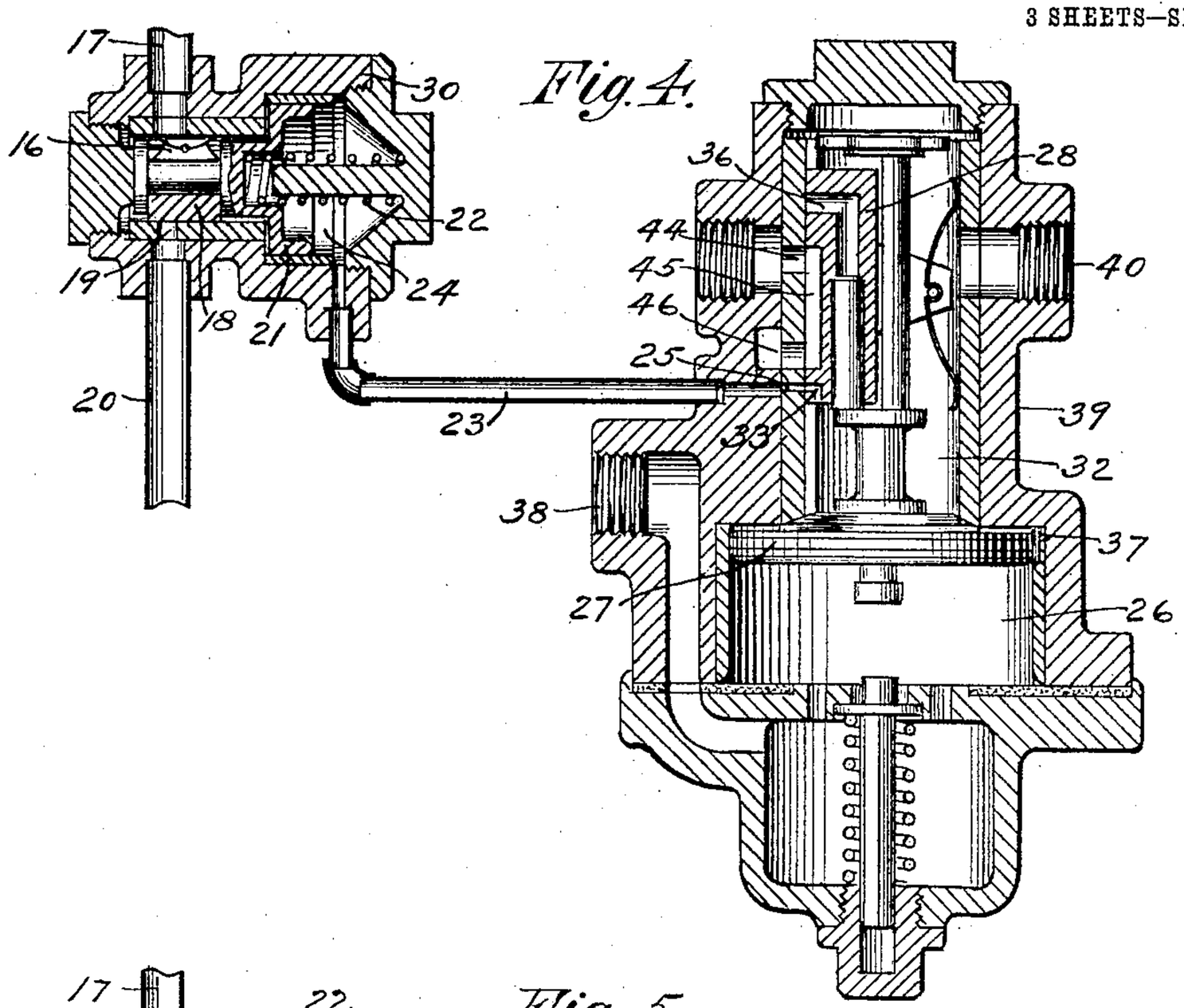

Fig. 5.

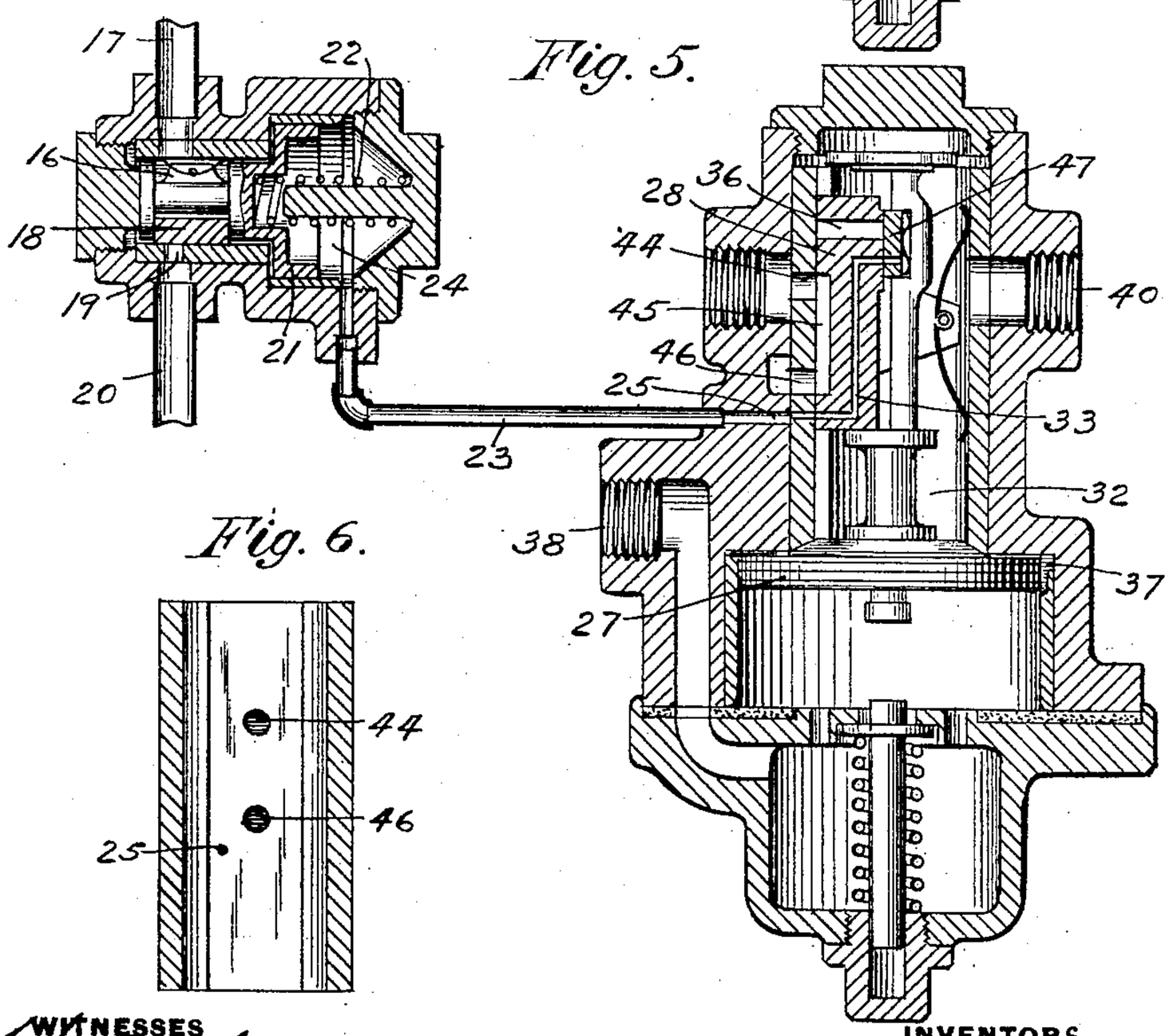

Fig. 6.

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UNITED STATES PATENT OFFICE.

HERBERT T. HERR, OF ROANOKE, VIRGINIA, AND WALTER V. TURNER, OF WILKINSBURG, PENNSYLVANIA, ASSIGNORS TO THE WESTINGHOUSE AIR BRAKE COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

DOUBLE-HEADING VALVE DEVICE FOR AIR-BRAKES.

No. 803,591. Specification of Letters Patent. Patented Nov. 7, 1905.

Application filed February 2, 1904. Serial No. 191,645.

To all whom it may concern:

Be it known that we, HERBERT T. HERR, residing at Roanoke, county of Roanoke, State of Virginia, and WALTER V. TURNER, residing at Wilkinsburg, county of Allegheny, State of Pennsylvania, citizens of the United States, have invented a certain new and useful Improvement in Double-Heading Valve Devices for Air-Brakes, of which improvement the following is a specification.

This invention relates to an air-brake, and more particularly to what is known as a "double-heading valve device," adapted to be applied to the air-brake equipment upon locomotives or motor-cars for automatically controlling the supply of air from the main reservoir to the train-pipe on each locomotive or motor-car when two or more are coupled up together in a train, and the brake system is operated by one of the engineer's brake-valves on one of said locomotives or motor-cars. When two or more locomotives or motor-cars are thus coupled up in a train, the brakes are usually operated by the engineer's brake-valve on the leading locomotive or motor-car, while the main reservoirs and brake-valves with their feed-valves on the other locomotives or motor-cars are cut out either by turning a cut-out cock in the train-pipe below each brake-valve or by placing the brake-valves in lap position with all ports closed. With the present standard apparatus this action results in cutting off entirely the main reservoirs and air-pumps on all except the first locomotive or motor-car, so that all the work of supplying the brake system with air is thrown upon the pump and reservoir of the leading locomotive or motor-car, and the other pumps on the following locomotives can render no assistance. It has heretofore been proposed to use a normally open valve device operated by a reduction of train-pipe pressure for closing a by-pass around the cut-out cock in the train-pipe on the locomotives and operated by an increase of train-pipe pressure to open said by-pass, whereby upon release of the brakes by means of the engineer's brake-valve on the leading locomotive a valve in said by-pass on the following locomotives is automatically opened to supply air under pressure from each main reservoir to the train-pipe and thereby assist in restoring and maintaining the pressure in the train-pipe and auxiliary reservoirs, the engineer's brake-valves on the said following locomotives being set in running position. These prior valve devices being normally open depend upon the reduction of train-pipe pressure made at the train-pipe discharge-port of the leading brake-valve in service applications for closing the communication from the main reservoir to the train-pipe on the following locomotives when the brakes are to be applied; but it is found in actual practice to be very difficult to secure the closing of these valves at the time of applying the brakes, for the reason that with these valves open air from each of the main reservoirs on the following locomotives is being fed into the train-pipe as rapidly as it can be discharged at the first brake-valve. Consequently the train-pipe pressure cannot be reduced sufficiently to actuate these valves to close nor to secure the application of the brakes in service.

The principal object of this invention is to overcome these defects and provide an improved cut-off valve device for this purpose which shall be normally closed, but operated by an increase of train-pipe pressure, which is made for releasing the brakes to open said valve device and thereby establish communication from the main reservoirs and feed-valves on the following locomotives to the train-pipe for assisting in restoring the pressure therein.

This invention is also adapted to be used on electric or other motor cars equipped with the automatic air-brake system and in which each car is provided with an air-pump, main reservoir, pump-governor, engineer's brake-valve, train-pipe, auxiliary reservoir, triple valve, and brake-cylinder for operating singly or with several cars coupled up in a train. Heretofore when a plurality of these cars have been coupled up in a train a line of main-reservoir pipe has been run through the train for connecting all of the main reservoirs together and means have also been employed for connecting up all the pump-governors for the purpose of securing a simultaneous cutting in and out of all the pumps in order to require each pump to do a substantially equal share of the work. By means of the addition of our improved valve device to the air-brake equip-

ment of such motor-cars the additional couplings of the main-reservoir pipes between the cars, which are very objectionable, may be dispensed with altogether, as may also any device for connecting up the pump-governor throughout the train for securing simultaneous action, since each pump may then be governed independently to supply its main reservoir and the air from all of the main reservoirs will be utilized to assist in restoring the train-pipe and auxiliary-reservoir pressures when the brakes are released after each application.

In the accompanying drawings, Figure 1 is a diagrammatic view showing the air-brake equipment of two locomotives or motor-cars coupled together with one form of our improvement applied thereto; Fig. 2, a sectional view of the form of valve device as illustrated in Fig. 1; Fig. 3, a diagrammatic view showing a modification of our improvement applied directly to the regular triple-valve device of the locomotive or motor-car, the cut-off valve being located in a by-pass connecting the train-pipe space of the feed-valve with the train-pipe below the cut-out cock; Fig. 4, a sectional view of the improved triple-valve device and cut-off valve as applied in Fig. 3; Fig. 5, a sectional view similar to Fig. 4, but showing a slight modification in the triple-valve device; and Fig. 6, a plan view of the slide-valve seat of the triple valve.

As shown in Fig. 1, the usual locomotive air-brake equipment comprises the main reservoir 10, main-reservoir pipe 11, engineer's brake-valve 12, with equalizing-reservoir 13, train-pipe 14, and cut-out cock 15, located in the train-pipe below the engineer's brake-valve, it being understood that the brake-valve is provided with the usual feed-valve device for supplying fluid under pressure from the main reservoir to the train-pipe when the engineer's brake-valve is in its running position, and thereby normally maintain the train-pipe pressure at a predetermined standard. According to our improvement a cut-off valve is located in a by-pass around the cut-out cock in the train-pipe, and means, such as a triple-valve device operated by variations in train-pipe pressure, is employed for controlling the movement of the cut-off valve. As shown in Figs. 1 and 2, this cut-off valve 30 comprises a casing having a valve-chamber 16 in open communication through pipe 17 with the train-pipe above the cut-out cock 15 and containing a slide-valve 18, controlling a port 19, leading to pipe 20 and the train-pipe below the cut-out cock. In the casing is located the piston 21 for operating the slide-valve 18 and exposed on one side to fluid under pressure from the main reservoir as the pressure is supplied through the engineer's brake-valve and feed-valve to the pipe 17 when the cut-out cock is closed and the brake-valve is in its running position. The piston 21 is fitted loosely in its bushing to provide means for permitting fluid under pressure to leak past the same, and a light spring 22 is also provided for normally maintaining the valve 18 closed when the fluid-pressures on the opposite sides of said piston are substantially equal. A passage 23 leads from the chamber 24 on the opposite side of the piston 21 to a port 25 in the slide-valve seat of the triple-valve device 31 forming part of our improvement, which comprises a casing having a piston-chamber 26 and valve-chamber 32 containing the piston 27 and slide-valve 28, the piston-chamber communicating with the train-pipe, and the valve-chamber being connected with an additional reservoir 29. The slide-valve 28 is provided with a port 36 controlled by the graduating-valve 34 and adapted to register with port 35 in the valve-seat leading to the atmosphere when moved under a reduction of train-pipe pressure. The operation of this form of our improvement is as follows: When two or more locomotives or motor-cars are coupled up in a train, the brakes are operated by the engineer's brake-valve at the head end of the train while the cut-out cocks 15 in the train-pipe connection below the engineer's brake-valves on the following locomotives are closed, as indicated in Fig. 1, the brake-valves being placed in running position. On the first locomotive the cock 15 is open, so that the controlling brake-valve is in full-open communication with the train-pipe, and the valve devices located in the by-pass pipe around the cut-out cock have no effect upon the operation of the brakes. Compressed air from the first main reservoir is then supplied through the feed-port and feed-valve of the first engineer's brake-valve to the train-pipe, charging the same and the auxiliary reservoirs through their feed-grooves to standard pressure. At the same time the additional reservoir 29 is charged through the feed-groove 37. The brake-valves on the following locomotives are set in running position, so that air from each main reservoir is supplied through its feed-valve to the by-pass pipe 17 and valve-chamber 16 of our improved cut-off valve, and from thence leaking around the piston 21, passes into the chamber 32 and reservoir 29 through ports 23, 25, and 33, when the valve 28 of the triple-valve device is in its release position, as shown. During the time of charging up the system the port 19 of the cut-off valves on the following locomotives will also be open, so that all of the main reservoirs will be utilized to assist in the first charging up of the train-pipe and auxiliary reservoirs. When normal pressure is reached, the cut-off valves 18 are closed by the springs 22, since the fluid-pressures on opposite sides of piston 21 are substantially equal. The system now being charged to normal pressure, the fluid-pressures on opposite sides of the piston 21 are substantially equal, and the

spring 22 holds the piston and valve 18 in its normal position with the port 19 closed, and the brake-valve cut off from the train-pipe on the second or following locomotive. When an application of the brakes is made by reducing the train-pipe pressure at the leading brake-valve, the pistons 27 and valves 28 of the triple-valve portion of our improved device on the following locomotives immediately move to service position, cutting-off port 25 and opening the graduating-port 36 to port 35 leading to the atmosphere. The air under pressure from the reservoir 29 then flows to the atmosphere until the pressure is slightly less than that of the train-pipe, when the graduating-valve 33 is closed in the usual way. In the meantime the slide-valve 18 of the cut-off valve has remained in its closed position, since the fluid-pressures on the opposite sides of the piston 21 have remained equal by the closing of the port 25. When the train-pipe pressure is increased by moving the first brake-valve for the purpose of releasing the brakes, the pistons 27 on the following locomotives immediately move to release position registering ports 25 and 33, and thereby releasing the pressure from chamber 24, which has been maintained at standard train-pipe pressure, to the chamber 32 and reservoir 29 of the triple-valve device, in which the pressure has been reduced during the application of the brakes. This causes the piston 21 and slide-valve 18 to move back and instantly open the port 19, thereby establishing communication from the main reservoir and feed-valve through the by-pass to the train-pipe on each of the following engines for assisting in restoring the pressure in the train-pipe and auxiliary reservoirs throughout the train. At the same time fluid under pressure from the main reservoir and feed-valve continues to leak past the piston 21 and feeds through ports 25 and 33 into the reservoir 29 until the pressure therein, as well as that in the train-pipe, is restored substantially to the normal pressure, during which time the valve 18 remains open and all of the main reservoirs are utilized in restoring the system to a normal degree of pressure. When the pressure in reservoir 29 is restored to nearly equal that in chamber 16 for which the feed-valve is set, the pressures will equalize on opposite sides of piston 21, and the spring 22 will then act to move the piston and slide-valve to its normal position, thus closing the port 19 and communication through the by-pass pipe to the train-pipe.

It will now be apparent that by using the regular triple-valve device of the air-brake system on the locomotive or motor-car for performing the function of opening and closing the port 25 from the piston-chamber 24 of the cut-off valve the triple-valve part 31 of the device and reservoir 29, as shown in Figs. 1 and 2, may be dispensed with, and such a modification is shown in Fig. 3, in which 38 indicates the usual branch from the train-pipe leading to the triple valve 39, auxiliary reservoir 40, and brake-cylinder 41. In this modification the cut-off valve 30 is also shown in a by-pass leading from the train-pipe chamber 42 of the standard feed-valve device 43 to the train-pipe below the cut-out cock 15, the object of connecting the pipe 17 to the train-pipe chamber of the feed-valve being to secure a more direct connection from said feed-valve to the chamber 16 of the cut-off valve, and thereby render the device more sensitive in its operation. The operation of this form of our improvement will be readily understood from Fig. 4 and is substantially the same as that already described, with the difference that the triple-valve device, in addition to controlling the port 25 from the piston-chamber of the cut-off valve, also performs its usual functions of discharging air from the auxiliary reservoir to the brake-cylinder through port 44 in service applications and releasing the brake-cylinder to the atmosphere through cavity 45 and exhaust-port 46 when moved to release position.

According to the modified form of triple-valve device shown in Fig. 5 the graduating-valve is made in the form of a slide-valve 47, mounted on the main slide-valve 28 for controlling the service-graduating port 36 through the main slide-valve and also controlling the port 33, which leads through the main slide-valve and registers with port 25 when in release position. By this means the port 25 and chamber 24 back of the piston 21 will be cut off from the auxiliary reservoir by the first movement of the triple piston 27 with the graduating-valve 47 and before the main slide-valve is moved. This construction renders the device more sensitive and insures the closing of the port 25, and consequently of port 19, even though another application of the brakes should be made after a release and before the train-pipe and auxiliary reservoirs are fully recharged.

It will be noticed that while the train-pipe pressure is being restored from all of the main reservoirs through their respective feed-valves after the brakes are released each auxiliary reservoir on a locomotive or motor-car is being recharged not only through its feed-groove 37, but also through the ports 25 and 33. Consequently the pressure in these auxiliary reservoirs will be substantially equal to that of the train-pipe at the head end of the train and be recharged at the same rate. By this means the pressures on opposite sides of the piston 21 will become substantially equal and secure the closing of the valve 18 on the second locomotive or motor-car before all of the auxiliary reservoirs throughout the train have been fully recharged to normal pressure, so that the restoration of the last pound or two of train-pipe pressure and the usual train-pipe leakage will be supplied from the main reservoir of

the leading locomotive or motor-car through its feed-valve and the automatic cut-off valves on the following locomotives will normally be closed and remain so until the brakes are released after an application.

From the foregoing it will now be evident that we have provided a simple and effective device, which may readily be applied to the present equipment of locomotives or motor-cars for securing the assistance of all of the main reservoirs of a plurality of locomotives or motor-cars coupled up in a train in restoring the fluid-pressure into the brake system when the brakes are operated from a single point, as the brake-valve at the head end of the train.

Having now described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In an automatic air-brake, the combination with a main reservoir and train-pipe, of a normally closed valve device for controlling communication from the main reservoir to the train-pipe, and means actuated by an increase of train-pipe pressure for opening said communication.

2. In an automatic air-brake, the combination with a main reservoir and train-pipe, of a valve for controlling communication from the main reservoir to the train-pipe, a piston or movable abutment exposed on its opposite sides to fluid-pressure for actuating said valve, and means operated by an increase of train-pipe pressure for varying the pressure on one side of said abutment.

3. In an automatic air-brake, the combination with a main reservoir and train-pipe, of a valve for controlling communication from the main reservoir to the train-pipe, a piston or movable abutment exposed on its opposite sides to fluid-pressure for actuating said valve, and means operated by an increase of train-pipe pressure for releasing fluid under pressure from one side of said abutment.

4. In an automatic air-brake, the combination with a main reservoir and train-pipe, of a valve for controlling communication from the main reservoir to the train-pipe, a piston or movable abutment exposed on its opposite sides to pressure from the main reservoir for actuating said valve, and means operated by an increase of train-pipe pressure for releasing fluid under pressure from one side of said abutment.

5. In an automatic air-brake, the combination with a main reservoir and train-pipe, of a valve for controlling communication from the main reservoir to the train-pipe, a piston exposed on one side to pressure from the main reservoir, means for permitting a leakage past said piston, and means operated by an increase of train-pipe pressure for releasing fluid under pressure from the opposite side of said piston.

6. In an automatic air-brake, the combination with a main reservoir, train-pipe, auxiliary reservoir, triple valve and brake-cylinder, of a valve for controlling communication from the main reservoir to the train-pipe, a piston exposed on its opposite sides to fluid-pressure for actuating said valve, and means operated by an increase of train-pipe pressure for releasing fluid under pressure from one side of said piston to the auxiliary reservoir.

7. In an automatic air-brake, the combination with a main reservoir, train-pipe, auxiliary reservoir, triple valve and brake-cylinder, of a valve for controlling communication from the main reservoir to the train-pipe, a piston exposed on its opposite sides to fluid-pressure for actuating said valve, and means operated by the triple valve for releasing fluid under pressure from one side of said piston to the auxiliary reservoir.

8. In an automatic air-brake, the combination with a main reservoir, train-pipe, auxiliary reservoir, triple valve and brake-cylinder, of a valve for controlling communication from the main reservoir to the train-pipe, a piston exposed on one side to fluid under pressure from the main reservoir, means for permitting a leakage past said piston, and means operated by the triple valve for opening communication from the chamber on the opposite side of said piston to the auxiliary reservoir.

9. In an automatic air-brake, the combination with a main reservoir and train-pipe, of a valve for controlling communication from the main reservoir to the train-pipe, a piston subject to opposing fluid-pressures for actuating said valve, a release-passage leading from the chamber on one side of said piston, a triple-valve device having a piston operated by variations in train-pipe pressure, a main slide-valve actuated by said triple piston and having a port for communicating with said release-passage, and a graduating-valve movable with respect to the main slide-valve and operated by the piston for controlling the release-port through the said main valve.

10. In an automatic air-brake, the combination with a main reservoir and train-pipe and a feed-valve device for regulating the flow from the main reservoir to the train-pipe, of a normally closed cut-off-valve device for controlling communication from the train-pipe chamber of the feed-valve device to the train-pipe, and means operated by an increase of train-pipe pressure for opening said cut-off valve.

11. In an automatic air-brake, the combination with a main reservoir and train-pipe and a feed-valve device for regulating the flow from the main reservoir to the train-pipe, of a cut-off valve for controlling communication from the train-pipe chamber of the feed-valve device to the train-pipe, a piston subject to opposing fluid-pressures for actuating said cut-off valve, and means operated by an in-

crease of train-pipe pressure for releasing fluid under pressure from one side of said piston.

12. In an automatic air-brake, the combination with a main reservoir, train-pipe, engineer's brake-valve, feed-valve device and cut-out cock, of a cut-off valve for controlling communication through a by-pass around the cut-out cock, a piston for actuating said cut-off valve, and means operated by an increase of train-pipe pressure for varying the pressure upon one side of said piston.

13. In an air-brake, the combination with a main reservoir and train-pipe, of a valve for controlling communication from the main reservoir to the train-pipe, a movable abutment for actuating said valve, and fluid-pressure-operated valve mechanism for controlling the pressure on one side of said abutment.

14. In an air-brake, the combination with a main reservoir and train-pipe, of a valve for controlling communication from the main reservoir to the train-pipe, a movable abutment for actuating said valve, and a valve mechanism operated by the opposing fluid-pressures of the train-pipe and a reservoir for controlling the pressure on one side of said abutment.

In testimony whereof we have hereunto set our hands.

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WALTER V. TURNER.

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Witnesses as to Walter V. Turner:
R. F. EMERY,
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