No. 650,018. Patented May 22, 1900.

# W. B. MANN.

## QUICK ACTION TRIPLE VALVE.

(Application filed Feb. 2, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2.

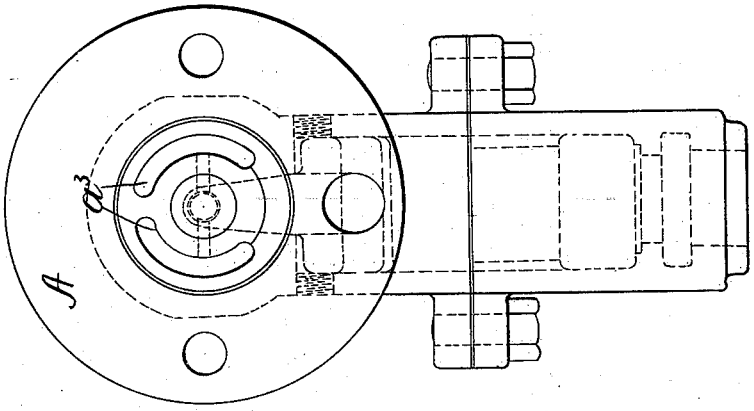
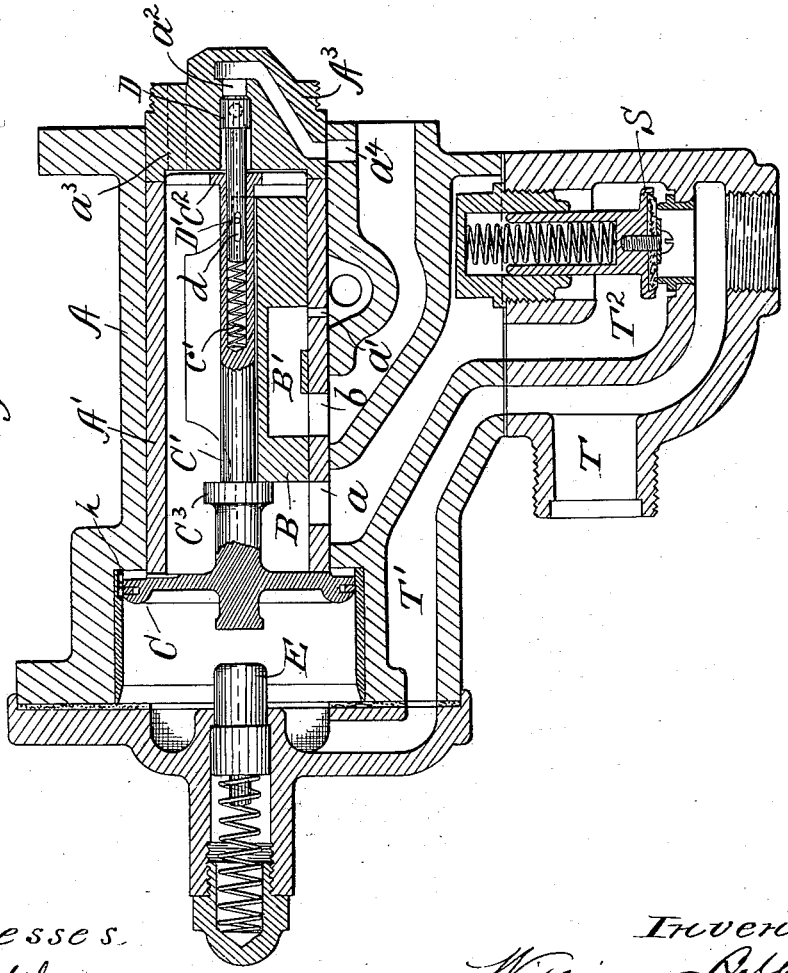



Fig. 1.




Witnesses.
H. R. Edelen.
S. T. Cameron

Inventor.
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his Attorney.

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Fig. 3.

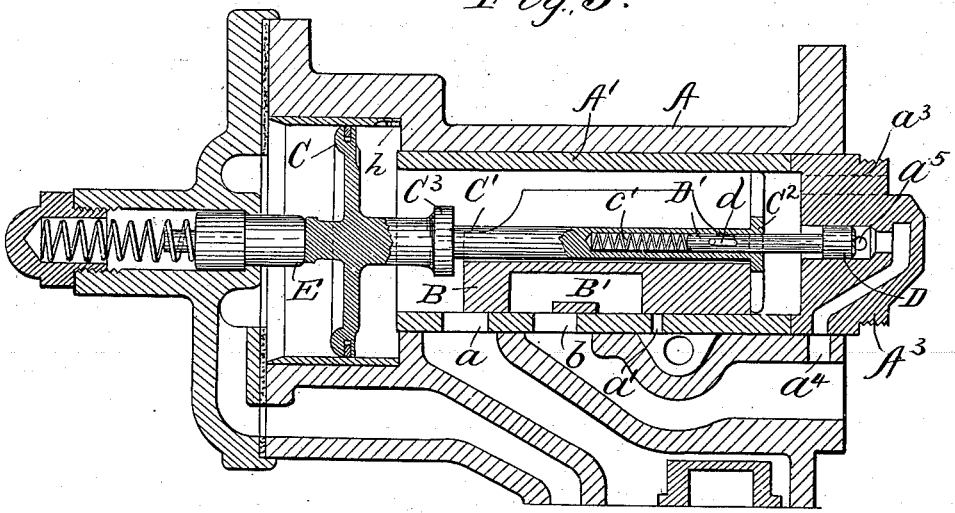



Fig. 4.

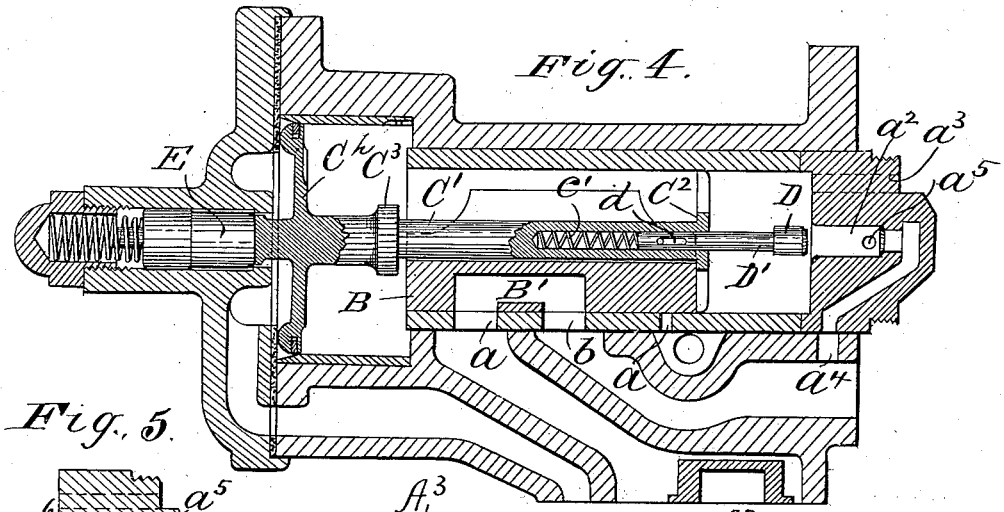
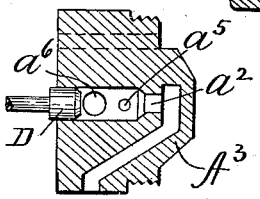



Fig. 5.



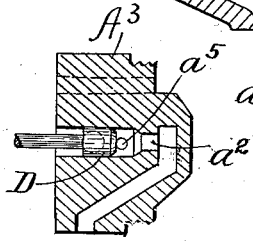




Fig. 6.

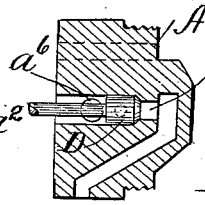



Fig. 7.

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his attorney.

# UNITED STATES PATENT OFFICE.

WILLIAM B. MANN, OF BALTIMORE, MARYLAND.

## QUICK-ACTION TRIPLE VALVE.

SPECIFICATION forming part of Letters Patent No. 650,018, dated May 22, 1900.

Application filed February 2, 1900. Serial No. 3,665. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM B. MANN, a resident of the city of Baltimore, in the State of Maryland, have invented a new and useful Improvement in Quick-Action Triple Valves, which invention is fully set forth in the following specification.

My invention relates to triple valves for air-brakes of that class known as "quick-action" triple valves.

In my application filed December 8, 1899, Serial No. 739,685, I have shown a triple valve of simplified construction by which the train-pipe may be quickly exhausted to the brake-cylinder to secure the quick serial action of all the triple valves of a train in emergency applications of the brakes and by which the auxiliary reservoirs can be so quickly recharged that retaining-valves and like expedients may be dispensed with, both of which operations are controlled by the main valve, while the passage of air-pressure from the auxiliary reservoir to the brake-cylinder is controlled by the graduating-valve independently of the main valve. In the construction shown in my said application, however, the amount of air passing from the auxiliary reservoir to the brake-cylinder per unit of time is the same during graduating and emergency applications, whereas it is desirable in emergency applications to have the auxiliary-reservoir air pass to the brake-cylinder much more rapidly than during graduating applications. The present invention is an improvement upon the construction described in my said application, whereby during graduating applications I am enabled to restrict the amount of air passing from the auxiliary reservoir to the brake-cylinder per unit of time, while during emergency applications a greatly-increased volume of air passes from the auxiliary reservoir to the brake-cylinder in any given unit of time, the passage of auxiliary-reservoir air to the brake-cylinder being at all times controlled by the graduating-valve independently of the main valve.

Certain other details will be described in the body of the specification, and particularly pointed out in the claims.

The inventive idea may receive various mechanical expressions, one of which I have shown in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section of a triple valve embodying my invention with the parts in release position. Fig. 2 is a right-hand end elevation of Fig. 1. Fig. 3 is a view similar to Fig. 1 with the parts in graduating position. Fig. 4 is a like view with the parts in emergency position, and Figs. 5, 6, and 7 are detail views of a modification.

Referring to the drawings, the valve-casing A has within it the bushing A′, within which is formed the seat for the main valve B. Leading from this valve-seat is a large train-pipe port $a$, a large brake-cylinder port $b$, and a restricted exhaust-port $a'$ leading to the atmosphere. The end of the valve-chamber adjoining the auxiliary reservoir has firmly secured therein a block of metal $A^3$, having suitable openings $a^3$, Fig. 2, leading from the valve-chamber to the auxiliary reservoir, and a duct $a^2$, leading from the valve-chamber to the brake-cylinder by way of a port $a^4$, said duct $a^2$ and openings $a^3$ being connected by a restricted passage or passages $a^5$, Figs. 3 and 4. The main valve B has formed therein a large duct B′, whose opposite ends register with the ports $a$ $b$ when the main valve is in emergency position, Fig. 4, and which connect the ports $b$ and $a'$ when the parts are in release position, Fig. 1. This main valve is operated by the usual triple-valve piston C, having lost-motion connection with the valve by means of the piston-stem C′, the spider $C^2$, and the shoulder $C^3$, as will be readily understood. The piston-cylinder is in communication with the train-pipe T through the passage T′, and the valve-chamber is also in communication with the train-pipe by way of the valve S, the passage $T^2$, and the port $a$. The graduating-valve D is supported with its stem D′ in the bore of the piston-stem C′ and is retained therein against the tension of a spring $c'$ by a pin-and-slot connection $d$, the valve being thus retained in alinement with the horizontal portion of the duct $a^2$. The transverse sectional area of the duct $a^2$ greatly exceeds that of the restricted duct $a^5$, so that when the graduating-valve D is in the graduating position shown in Fig. 3 there is only a limited amount of air

passing from the auxiliary reservoir to the brake-cylinder; but when the graduating-valve D is withdrawn from the duct $a^2$, as occurs in the emergency position shown in Fig. 4, the auxiliary-reservoir air may pass in large volume to the brake-cylinder.

By reference to Fig. 1 it will be seen that when the triple valve is in release position no part of the face of the main valve rests over a port exposed to atmospheric pressure. The ports $a'$ and $b$ are each exposed to such pressure, but in the release position the duct B' registers with said ports and the face of the valve rests entirely upon the valve-seat. One important result due to this construction is that the valve is rendered much more sensitive than it would be if it were resting with its face covering a port or ports exposed to atmospheric pressure, and hence it will respond more readily to slight reductions of train-pipe pressure for the purpose of securing service applications of the brakes.

The operation of the valve is as follows:

*Charging.*—When pressure is admitted to the train-pipe T through the engineer's valve, it passes through passage T' to the rear of the piston C and through passage $T^2$ to the front of the piston; but before entering the passage $T^2$ it has to lift the check-valve S against the tension of its spring, and this causes the pressure to reach the rear of the piston through passage T' slightly in advance of that passing to the front of the piston through passage $T^2$, and this advance pressure on the rear of the piston throws it to the right, carrying with it the main valve B and graduating-valve D, thereby uncovering port $a$ and closing duct $a^5$, as shown in Fig. 1. Pressure thereupon passes in such large volume through passage $T^2$, port $a$, the valve-chamber, and openings $a^3$ to the auxiliary reservoir that the latter is charged at approximately train-pipe pressure almost instantly, perfect equalization being ultimately had through the usual feed-in duct $h$.

*Graduating or service applications.*—The ports being in the position shown in Fig. 1 and the engineer being desirous of securing a gentle application of the brakes for checking the speed of the train or for service stops, he slightly reduces train-pipe pressure through the engineer's valve. This reduction of pressure is felt at the rear of the piston C by way of the passage T', but the valve S promptly closes upon any reduction of train-pipe pressure, and hence passage $T^2$ does not participate in such reduction, the result of which is that the pressure on the front or auxiliary-reservoir side of the piston slightly exceeds that on the rear or train-pipe side, and this causes the piston to move a short distance to the rear or toward train-pipe pressure until it contacts with the spring-pressed button or abutment E, as shown in Fig. 3, at which point the pressure in the auxiliary reservoir and train-pipe becomes equalized and the piston comes to rest. The first part of this movement of the piston brings the spider $C^2$ in contact with the valve B, but without moving the graduating-valve D, which by reason of its pin-and-slot connection with the piston stem C' is held by its spring $c'$ in position to close the duct $a^5$ and prevent the passage of any air from the auxiliary reservoir to the brake-cylinder. As soon as the spider $C^2$ contacts with the main valve B it operates to move said valve to the left. The first part of this movement of the valve B closes the port $a'$, immediately after which the pin engages the end of the slot and the graduating-valve D also moves to the rear and uncovers the restricted duct $a^5$ without being withdrawn from the duct $a^2$, thereby permitting pressure to pass from the auxiliary reservoir to the brake-cylinder through duct $a^5$ only. The parts are so proportioned that the piston C comes to rest against the plunger E just as the graduating-valve D uncovers the duct $a^5$. The duct $a^5$ being open, pressure continues to pass from the auxiliary reservoir to the brake-cylinder until the former is reduced slightly below train-pipe pressure, which causes the piston to move toward the auxiliary reservoir, but without moving the main valve B, this being possible by reason of the lost-motion connection between the piston-stem and said valve. This slight movement of the piston does release the graduating-valve D, and the spring $c'$ again seats said valve over duct $a^5$. In this position the main valve B covers exhaust-port $a'$ and graduating-valve D closes duct $a^5$, so that pressure is retained constant in the brake-cylinder. Should the engineer desire to increase the brake-cylinder pressure, he makes a further slight reduction of train-pipe pressure through the engineer's valve, and the auxiliary-reservoir pressure returns the piston to its position in contact with the plunger E, as shown in Fig. 3, thereby again uncovering duct $a^5$ and permitting pressure again to pass from the auxiliary reservoir to the brake-cylinder until the auxiliary-reservoir pressure is again reduced below the existing train-pipe pressure, when the piston C will shift to the right and cause the graduating-valve to reclose the duct $a^5$, and the increased pressure is retained in the brake-cylinder as before. This operation, technically known as "graduating," may be repeated as often as desired or until auxiliary-reservoir and brake-cylinder pressures are equalized. It is to be observed that by reason of the sensitiveness of the main valve when in release position, as heretofore pointed out, it is moved with great promptness by the piston C even under the very small reductions of train-pipe pressure which occur in graduating.

*Emergency applications.*—When it is desired to produce an emergency application of the brakes by securing high and sudden pressure in the brake-cylinder, the engineer causes a large and sudden reduction of train-pipe pressure through the engineer's valve, and the

great preponderance of pressure on the auxiliary-reservoir side of the piston C shifts it with great rapidity from the release position, Fig. 1, or the graduating position, Fig. 3, to the extreme limit of its throw toward the train-pipe—that is, to the emergency position shown in Fig. 4—in which position the main valve B closes the exhaust-port $a'$ and the duct B′ therein connects ports $a$ and $b$. The result of this is that train-pipe pressure lifts the valve S and passes in large volume via passage $T^2$ and duct B′ to the brake-cylinder, thereby causing that quick reduction in train-pipe pressure upon which the quick serial action of all the triple valves of a train depend. As the piston is in the act of moving to full emergency position it carries the graduating-valve D with it, thereby first uncovering the restricted duct $a^5$, and then just prior to reaching the limit of its emergency throw it entirely withdraws the valve D from the duct $a^2$, thereby permitting auxiliary-reservoir pressure to rush in large volume to the brake-cylinder and almost instantly equalizing the pressure in said reservoir and cylinder. The parts are so proportioned that the graduating-valve D is not withdrawn from the duct $a^2$ until just before the channel from the train-pipe to the brake-cylinder through duct B′ is fully open. The result of this is that the train-pipe air passes to the brake-cylinder without any opposition from the large volume of auxiliary-reservoir pressure, the latter being held back until the train-pipe has been exhausted to the degree necessary to secure quick serial action. The check-valve S closes as soon as the pressure in the train-pipe and brake-cylinder approximately equalizes, thereby preventing back pressure from the brake-cylinder from escaping to the train-pipe. Furthermore, when the reduction of train-pipe pressure occurs as the result of the train breaking in two the valve S promptly closes and prevents any escape of pressure from the brake-cylinder.

*Release.*—To release the brakes either from service or emergency applications, the engineer restores the train-pipe pressure, whereupon the pressure reaches the rear of the piston C via passage T′ quicker than it does the front of the piston via valve S and passage $T^2$, exactly as described above in connection with the charging of the auxiliary reservoir, thereby throwing the piston to its extreme position toward the auxiliary reservoir, as shown in Fig. 1. In this position the duct B′ in the main valve B connects the brake-cylinder with the exhaust-port $a'$ and the port $a$ is left fully open, while the graduating-valve D entirely cuts off all communication between the auxiliary reservoir and the brake-cylinder. Since the exhaust-port $a'$ is much smaller than the charging-port $a$ train-pipe air will pass to and recharge the auxiliary reservoir through port $a$ much more rapidly than brake-cylinder air can escape through exhaust-port $a'$. In fact the recharging of the auxiliary reservoir is practically instantaneous, while an appreciable amount of time is required to exhaust the brake-cylinder. This is of great importance in practice as it enables the auxiliary reservoirs to be recharged when the train is on heavy grades without the use of retaining-valves and without any risk of losing control of the train.

From the foregoing it will be seen that I have devised an exceedingly-simple triple valve, which is a "quick-action" valve, first, in that it produces the quick venting of the train-pipe upon which quick serial action depends; second, in emergency applications it quickly dumps auxiliary-reservoir pressure in large volume into the brake-cylinder, and, third, it charges and recharges the auxiliary reservoir so quickly as to be practically instantaneous.

In Figs. 5, 6, and 7 I have shown a modified form of graduating-valve action in which the graduating-valve D not only controls the restricted duct $a^5$ for service applications, but also controls a large duct $a^6$, leading to auxiliary-reservoir pressure. This duct $a^6$ connects with duct $a^2$ at such a point that the valve D may move in graduating to uncover duct $a^5$ without uncovering duct $a^6$; but in emergency applications the valve D uncovers the duct $a^6$ at about the same time that it escapes from duct $a^2$ in the form shown in Figs. 1, 2, 3, and 4. In the modified form of Figs. 5, 6, and 7 the proportions of the parts are such that in emergency position the valve D is not entirely withdrawn from the duct $a^2$, as will be understood from an inspection of the figures, in which Fig. 7 shows the graduating-valve D in release position; Fig. 6, in graduating position, and Fig. 5 in emergency position. It will be seen that in the latter position auxiliary-reservoir pressure passes in large volume to the brake just as it does in Fig. 4, when the valve D is wholly withdrawn from the duct $a^2$.

Having thus described my invention, I claim—

1. In a quick-action triple valve, the combination of a main valve through which air passes from the train-pipe to the brake-cylinder for emergency applications, and from the brake-cylinder to exhaust to release the brake, and a graduating-valve which controls the passage of air from the auxiliary reservoir to the brake-cylinder independently of the main valve, said graduating-valve permitting a restricted amount of air to pass in service applications and an increased amount in emergency applications, with a triple-valve-operating piston having a partial traverse for service applications and a full or further traverse for emergency applications.

2. In a quick-action triple valve, the combination of a main valve which alone controls the venting of the train-pipe for emergency applications of the brake, and the release of air from the brake-cylinder, and a graduating-valve independent of the main valve said

graduating-valve permitting a restricted amount of air to pass from the auxiliary reservoir to the brake-cylinder for service applications and an increased amount to pass for emergency applications, with a triple-valve-operating piston having a partial traverse for service applications and a full or further traverse for emergency applications.

3. In a quick-action triple valve, the combination of a main valve which alone controls the venting of the train-pipe for emergency applications and a graduating-valve which alone and independent of the main valve controls the passage of air from the auxiliary reservoir to the brake-cylinder in restricted quantity for service applications and increased quantity for emergency applications with a triple-valve-operating piston having a partial traverse for service applications and a full or further traverse for emergency applications.

4. A quick-action triple valve composed of a chamber, a main slide-valve therein having a single duct which connects the train-pipe to the brake-cylinder when the parts are in emergency position and the brake-cylinder and atmosphere when the parts are in release position, a valve-operating piston in operative relation with said slide-valve, a graduating-valve operated by said piston and controlling independently of the main slide-valve the passage of air from the auxiliary reservoir to the brake-cylinder in restricted amount for service applications and increased amounts for emergency applications, and a check-valve between the brake-cylinder and train-pipe and closing toward the latter.

5. In a quick-action triple valve, the combination of a valve-chamber having large ports opening to the auxiliary reservoir, the train-pipe and the brake-cylinder, a restricted port opening to the brake-cylinder, a large duct and a restricted duct between the auxiliary reservoir and the brake-cylinder, with a main slide-valve having a single duct therein which connects the train-pipe and large brake-cylinder ports when the parts are in emergency position and the large brake-cylinder and the atmosphere-ports when the parts are in release position, a graduating-valve controlling said ducts, between the auxiliary reservoir and the brake-cylinder independent of the main valve, and an operating-piston for said main and graduating valves.

6. In a quick-action triple valve the combination of a valve-chamber having large ports opening to the auxiliary reservoir and brake-cylinder and a small port opening to exhaust, a main slide-valve having a duct connecting said brake-cylinder and exhaust-ports when the parts are in release position, a large and a restricted duct opening from the auxiliary reservoir to the brake-cylinder, a graduating-valve controlling said ducts independently of the main valve, a triple-valve-operating piston operatively connected to said main and graduating valves, a passage leading from the train-pipe and entering the valve-chamber through a large port in front of said piston, and a check-valve.

7. The combination of a train-pipe, an auxiliary reservoir, and a brake-cylinder, with a main valve through which the train-pipe is vented to the brake-cylinder in emergency applications and through which the brake-cylinder is exhausted in release positions, and a graduating-valve which independently of the main valve controls a service and an emergency duct from the auxiliary reservoir to the brake-cylinder, and a piston operatively connected to said main and graduating valves.

8. In a triple valve, a valve-casing having a restricted and a larger duct connecting the auxiliary reservoir and the brake-cylinder, a main valve and a graduating-valve which independently of the main valve controls the restricted duct for service or graduating applications of the brakes and the larger duct for emergency applications.

9. In a triple valve capable of instantaneous charging of the auxiliary reservoir from the train-pipe, instantaneous venting of the train-pipe and instantaneous equalization of auxiliary-reservoir and brake-cylinder pressures in emergency applications, the combination of a main slide-valve controlling the charging of the auxiliary reservoir and the venting of the train-pipe, and a graduating-valve which, independently of the main valve, controls the equalization of auxiliary-reservoir and brake-cylinder pressures.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

WILLIAM B. MANN.

Witnesses:
LEVEN J. GWINN,
JOHN J. MOORE.