W. V. TURNER.

FLUID PRESSURE BRAKE.

APPLICATION FILED MAR. 18, 1904.

920,504. **Patented May 4, 1909.**

2 SHEETS—SHEET 1.

Fig. 1.

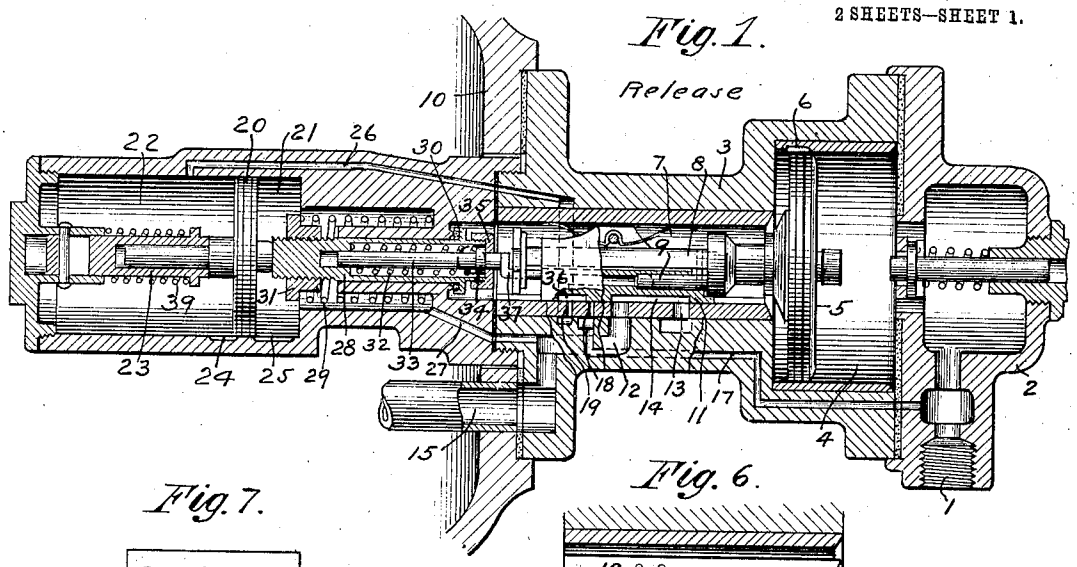


Fig. 7.

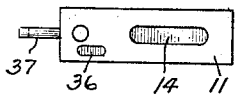


Fig. 6.

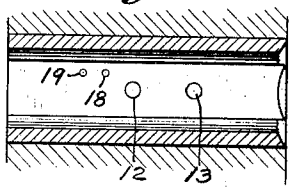


Fig. 2.

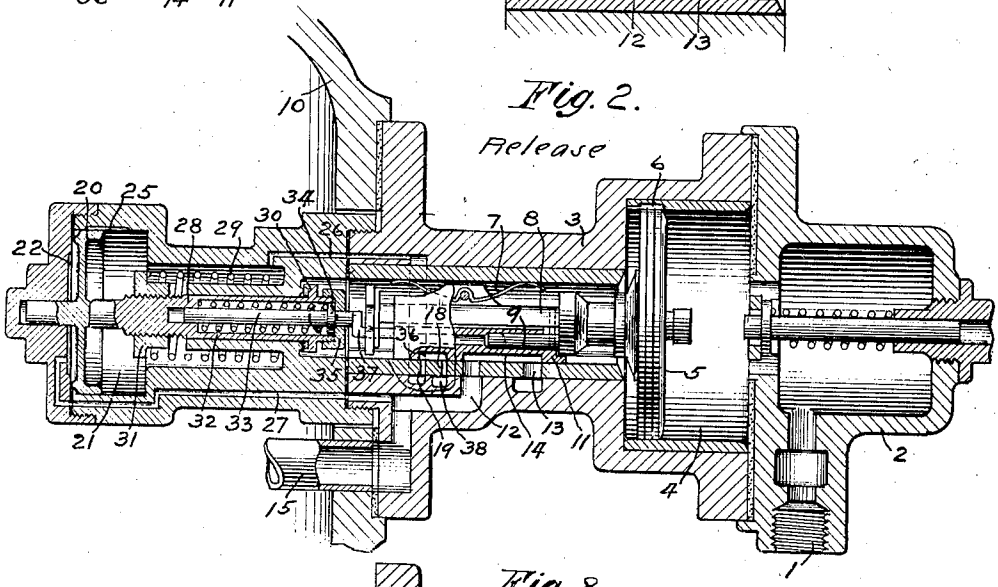
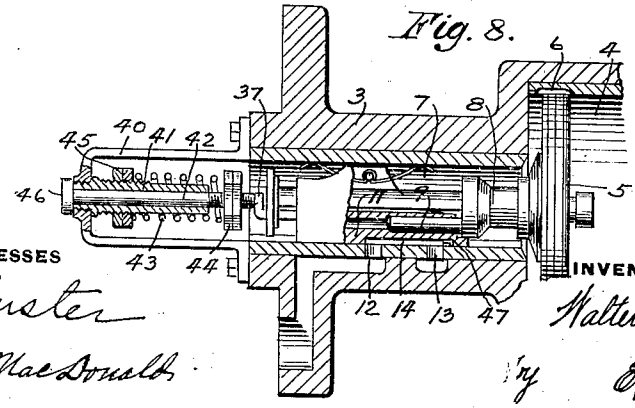


Fig. 8.



WITNESSES

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FLUID PRESSURE BRAKE.

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2 SHEETS—SHEET 2.

Fig. 3.

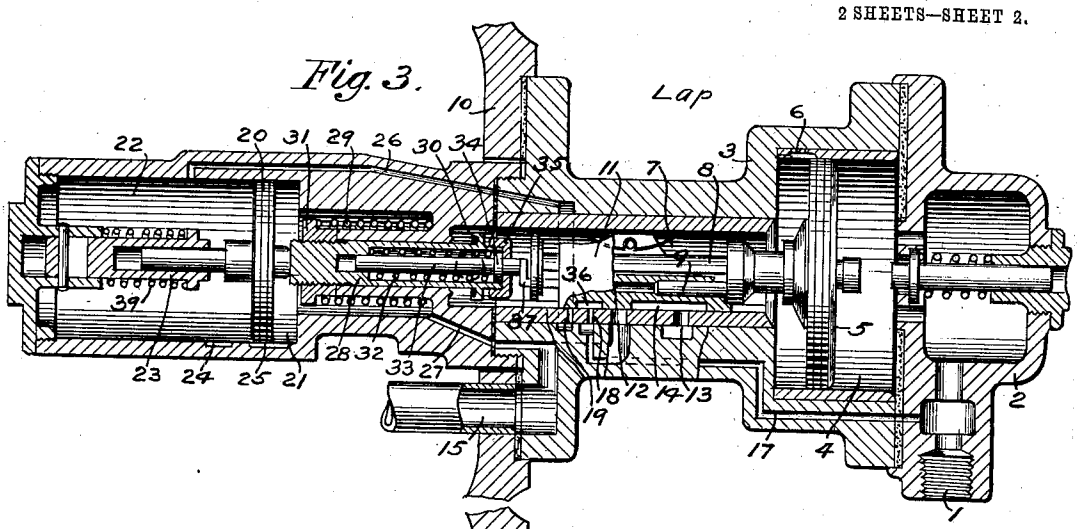


Fig. 4.

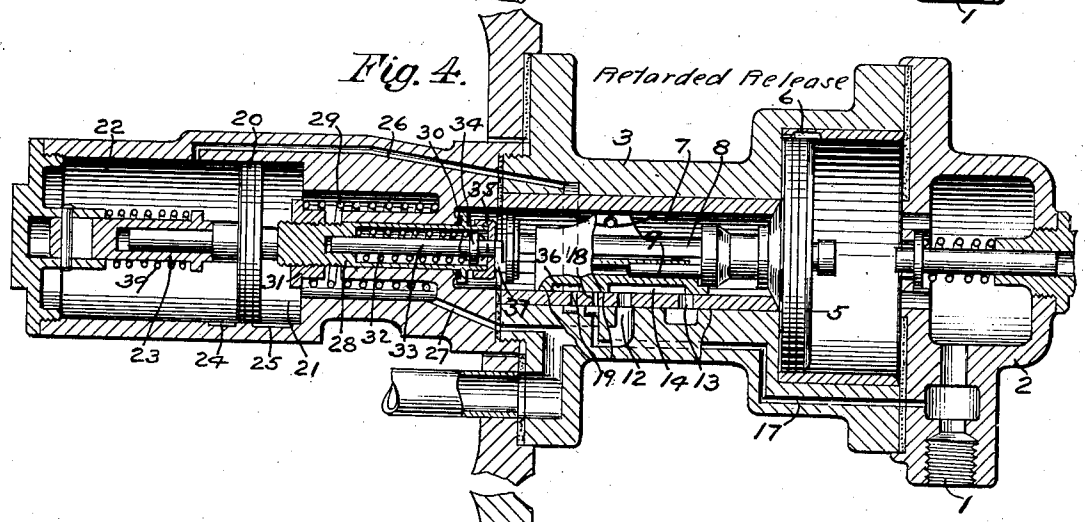
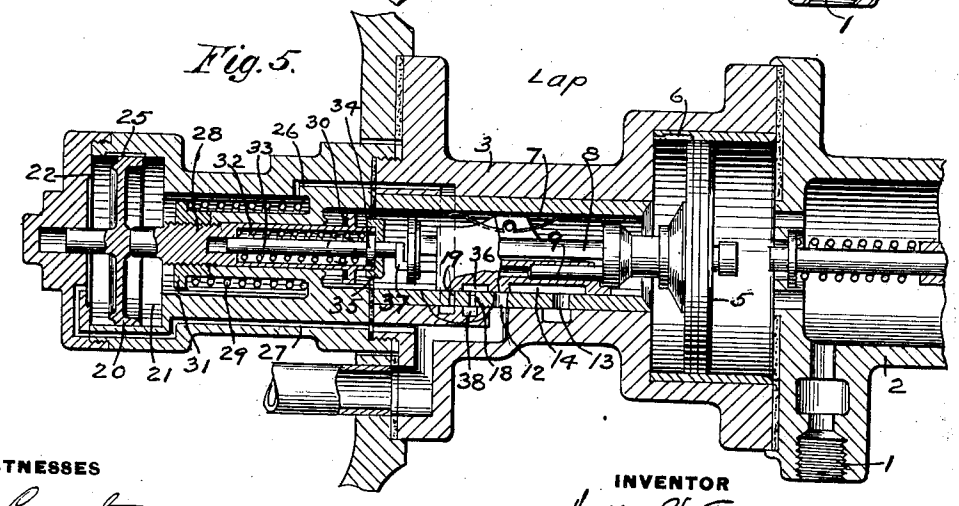


Fig. 5.



WITNESSES

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UNITED STATES PATENT OFFICE.

WALTER V. TURNER, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO THE WESTINGHOUSE AIR BRAKE COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

FLUID-PRESSURE BRAKE.

No. 920,504. Specification of Letters Patent. Patented May 4, 1909.

Application filed March 18, 1904. Serial No. 198,762.

To all whom it may concern:

Be it known that I, WALTER V. TURNER, a citizen of the United States, residing at Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a certain new and useful Improvement in Fluid-Pressure Brakes, of which the following is a specification.

This invention relates in general to fluid pressure brakes, and more particularly to triple valve devices for such brakes, and has for one of its objects to provide improved means whereby the triple valve may be operated by successively increasing the train pipe pressure a few degrees at a time to grade down the brake cylinder pressure by corresponding amounts to any degree desired which may then be retained or entirely released as desired, and thereby secure what is known as a graduated release of the brakes. This result is secured in the present instance by means of an additional piston or abutment subject to fluid pressure upon its opposite sides when the brake is applied, and means for varying the pressure upon one side of said abutment when the train pipe pressure is increased for moving the triple valve to release position and thereby cause the abutment to act by the preponderance of pressure on one side to move back the triple valve and close the exhaust from the brake cylinder.

Another important feature of my invention comprises improved means for retarding the release on the forward end of the train when the brake valve handle is thrown to full release position for increasing the train pipe pressure to release the brakes.

With the present standard equipment, as is well known, when air from the main reservoir is turned into the train pipe at the brake valve for the purpose of releasing the brakes on a long train the wave of increased pressure immediately moves the triple valves on the forward cars to release position and travels toward the rear with diminishing force, so that it often happens on long trains that the rise in train pipe pressure at the rear end is not at first sufficient to move all the triple valves to release position. This condition of things is aggravated by the fact that in the meantime the head brakes have been released and all the feed grooves of such triple valves are open and drawing from the train pipe to recharge their auxiliary reservoirs. For this reason it is often very difficult to effect the prompt release of the brakes on the rear cars of a long train and many delays and break-in-twos have been caused by this condition. It is very desirable, therefore, to be able to effect a substantially simultaneous release of the brakes on all the cars of the train, and this result is secured according to the present invention by providing an additional inward movement of the slide valve of the triple valve device to a position for retarding the release, in which position the brake cylinder exhaust port is restricted, this movement of the valve from full release position to retarded release position being opposed by a yielding resistance device, such as a spring, which will also act to return the valve to full release position upon equalization of the pressures, whereby upon an increase in train pipe pressure the triple valves on the forward portion of the train, where the wave of increase is greatest, will overtravel the normal release position to retarded release position and restrict the brake cylinder exhaust opening, while the triple valves toward the rear of the train, where the rise of pressure is slower, will be moved only as far as the normal release position, giving a full opening to the brake cylinder exhaust. By this means, when an ordinary increase is made in train pipe pressure for the purpose of releasing the brakes, the triple valves at the forward portion of the train will move promptly over the full release position to a retarded release position, in which the brake cylinder exhaust is more or less restricted, while at the rear of the train the valves move more slowly and then only as far as full release position, the position of the valves along the train corresponding directly to the degree of train pipe pressure.

The period of time required to move the forward triple valves and to release the corresponding brake cylinders through the restricted exhaust ports is substantially the same as that required to effect the movement of the rear triple valves to full release position and the release of the air from these brake cylinders through said wide open ports, so that by thus retarding the release at the forward end a substantially simultaneous release is secured throughout the entire length of the train, thereby avoiding injurious shocks and securing a smooth and uniform action. And not only may the release be substan-

tially simultaneous, but it may also be effected more positively and in a much shorter time by having the feed grooves or passages between the train pipe and auxiliary reservoir also restricted, so as to be nearly or quite closed in the retarded release position of the triple valves. The wave of increase in train pipe pressure will then travel much more rapidly to the rear of the train, since the communication from the train pipe to the auxiliary reservoirs on the forward cars will be temporarily closed or restricted and the train pipe pressure will not be reduced by recharging these auxiliary reservoirs at that time.

In the accompanying drawings; Figure 1 is a sectional view of a triple valve device provided with my improvements; Fig. 2 a similar view showing a modified form of device for graduating the release; Fig. 3 a view similar to Fig. 1, but showing the parts in lap position; Fig. 4 a similar view showing the parts in retarded release position; Fig. 5 a view similar to Fig. 2, but showing the parts in lap position; Fig. 6 a plan view of the main slide valve seat; Fig. 7 a face view of the main slide valve; and Fig. 8 a broken sectional view showing a modified form of device for retarding the release, applied to a standard triple valve mechanism.

According to the construction shown in Figs. 1, 3 and 4, the triple valve device comprises a cap portion 2, having an opening 1 for connection with the train pipe, a body portion 3 having piston chamber 4, valve chamber 7 in open communication with the auxiliary reservoir, piston 5, piston stem 8, main slide valve 11 having graduating valve 9 and exhaust cavity 14 for coöperating with the brake cylinder port 12 leading to the pipe 15, and the exhaust port 13, all of which may be of standard construction and well understood by those familiar with the art. According to this form of my improvements a casing is mounted at the forward end of the triple valve and may conveniently extend within the auxiliary reservoir, as shown. Within this casing are two chambers, 21 and 22, separated by the piston 20, which engages the opposite stems 28 and 23 having springs 29 and 39 respectively which normally hold said piston in release position between the grooves 24 and 25 when the pressures are equal on opposite sides of the piston. The stem 28 extends through the casing into the valve chamber for operating the valve in graduating the release and is provided with a shoulder or flange 30 for engaging a seat on the casing and thereby making a tight joint to prevent leakage from the auxiliary reservoir to the chamber 21. This chamber 21 communicates with the brake cylinder by a passage 27. The stem 28 may act directly on the slide valve, but according to the preferred construction the stem is made hollow and contains the spring 32 and stem 33, which is provided with a collar 34 for engaging the cap 35 and extends through said cap for engaging the extension 37 of the slide valve 11 when the same is in full release position as shown in Fig. 1. When in this position the exhaust port 13 is open its full width to the exhaust cavity 14 and the piston 5 is at an intermediate position which is a slight distance away from its extreme inward position, the feed groove 6 also being fully open in this normal or full release position. When the piston travels to its inward position, called retarded release position, the spring 32 is compressed and the brake cylinder exhaust port 13, as well as the feed groove 6, is restricted so as to be nearly or quite closed, as shown in Fig. 4.

The operation of this form of my improvement is as follows: The system being charged to normal standard pressure and the parts in normal release position, as shown in Fig. 1, the brakes are applied in the usual manner by making a reduction in the train pipe pressure and at the same time that the brake cylinder is charged from the auxiliary reservior the same pressure is admitted through passage 27 to the chamber 21 and moving the piston over against the spring 39 equalizes through groove 24 into chamber 22, so that both chambers are charged with brake cylinder pressure and the piston 20 is returned to normal position. If, then, it be desired to grade down the brake cylinder pressure the brake valve is moved to open communication from the main reservoir to the train pipe and then turned back to lap position to cut off such communication. The wave of increased pressure travels down the train pipe and being greatest at the head end causes those triple pistons to move inward to the extreme position shown in Fig. 4, in which the brake cylinder exhaust is restricted or closed, thereby retarding the release. The pressure in the forward brake cylinders thereby begins to diminish slowly, while toward the rear of the train the valves are being shifted over to a position in which the brake cylinder exhaust is fully open, thereby permitting a more rapid rate of reducing the pressure in these brake cylinders, so that the pressure is diminishing in all of the brake cylinders throughout the train at substantially the same time. As the pressure falls a certain amount in the brake cylinder, and consequently in the chamber 21 on one side of the piston 20, said piston is actuated by the greater pressure remaining in chamber 22 to compress spring 29 and move the valve back to lap position, as shown in Fig. 3, thereby cutting off further exhaust from the brake cylinder. A stop, such as the adjustable nut 31, is provided for limiting the movement of the stem 28 and piston 20 in this direction, and as the pressure

then readily equalizes around the piston through the groove 25, the spring 29 returns the piston to its normal position. Further reductions in brake cylinder pressure may be made by repeating this operation or the pressure may be completely released at any time in the usual way by continuously increasing the train pipe pressure a sufficient length of time. The use of the device for retarding the release in combination with that for graduating the release, is very important on long trains, for the reason that it is necessary to make quite a heavy initial increase in train pipe pressure, in order to cause the rear triple valves to move to release position and without any means for retarding the release at the forward end of the train this heavy increase would be sufficient to hold the valves on the forward cars in release position a sufficient length of time to discharge all the air from the brake cylinder and thereby prevent any possibility of grading down the brake cylinder pressure throughout the train by the desired amounts. But while the use of the retarding device gives a greater uniformity of action in release on long trains, it will be evident that the improved means for securing a graduated release of the brake cylinder pressure may be used by itself and give a very efficient action especially on short trains.

In order to give a more positive and quicker action to the graduating release piston means may be provided, if desired, for positively varying the pressure on one side of said piston independently of the decrease in the brake cylinder pressure. As shown in Figs. 1, 3 and 4, such means comprises the additional ports 18 and 19 located in the slide valve seat and communicating with ports 17 and 26 respectively leading to the train pipe and the chamber 22, and the additional cavity 36 in the slide valve 11 so located as to establish communication between these ports as the valve is being moved from lap position to full release position and then closing the same, whereby a puff of air from the train pipe is admitted to chamber 22 to augment the pressure therein and cause a quicker movement of the piston 20 when the brake cylinder begins to exhaust, the pressure in chamber 22 then equalizing around the piston as the same is moved to lap the valve as before described.

According to the modification shown in Figs. 2 and 5 the chamber 22 in the rear of the piston 20 is made of much smaller capacity and is in communication with the brake cylinder through port or passage 27, while the chamber 21 on the opposite side of the piston communicates through passage 26 with the port 19 in the valve seat and port 18 communicates with the exhaust passage 38 and the atmosphere. With this form of device the cavity 36 connects ports 18 and 19 in full release position of the valve, as shown in Fig. 2, and vents chamber 21 to the atmosphere. The operation is substantially the same as that before described, except that when the brakes are applied the brake cylinder pressure equalizes from chamber 22 around the piston through groove 25 into chamber 21 and the spring 29 returns the piston to its normal position; then when the train pipe pressure is increased by a certain amount for the purpose of grading down the brake cylinder pressure the chamber 21 is vented more or less to the atmosphere as the valve arrives at or passes over the full release position, whereby the brake cylinder pressur in chamber 22 preponderates and promptly moves the piston to its graduated release position and the main slide valve back to lap position, as shown in Fig. 5. The brake cylinder pressure then equalizes around the piston 20, the vent ports being closed, and the spring 29 returns the piston to its normal position. The chamber 21 being small will reduce to the atmosphere much more rapidly than the brake cylinder when the triple valve is moved to release position. The feature of retarding the release in this combination is substantially the same as before described in connection with the first modification.

While the use of the device for retarding the release in combination with graduating the release is very important, especially on long trains as above explained, it will be evident that the said device for retarding the release may also be applied to a triple valve device independently of the graduated release feature, and such a construction is shown in Fig. 8, wherein the triple valve casing is provided with a frame or yoke 40 carrying a support 41 in which is mounted the stem 42 for engaging the extension 37 of the slide valve 11 and having a head 46 for limiting the inward movement of the stem. A spring 43 is mounted between the adjustable nuts 44 on the stem and 45 on the support and tends to force the stem to its normal position, in which it engages the extension of the slide valve when the valve and piston is in normal full release position with the brake cylinder exhaust port and the feed groove open, as shown in Fig. 8. In order to give a definite amount of restricted opening to the exhaust in the extreme retarded release position of the valve, a small port 47 may be made in the slide valve and communicate with the exhaust cavity 14. In the operation of this form of my improvement, when the brakes are to be released upon long trains the train pipe pressure is increased in the usual way, with the result that the triple valves on the forward end of the train are moved inward against the resistance of the retarding spring 43 to retarded release position, in which the feed

groove is restricted and the exhaust from the brake cylinder closed or restricted. The amount to which the exhaust outlet is restricted and the retarding spring compressed depends upon the degree of train pipe pressure and consequently upon the distance of each triple valve from the forward end of the train, as before explained, the time required to effect the movement of the triple valve and the release from the brake cylinder being substantially the same at all points throughout the train, thereby producing a substantially simultaneous release of the brakes on all the cars. The retarding spring 43 forms a yielding resistance device for opposing the inward movement of the triple valve beyond the full release position, and acts to return the valve to said normal full release position upon a substantial equalization of pressures upon the opposite sides of the triple piston.

The passage or feed groove 6 for establishing communication from the train pipe to the auxiliary reservoir is preferably so arranged as to be open to its fullest extent when the triple piston is in its normal full release position and to be restricted when the piston is moved farther inward to a position for retarding the release, as shown in Fig. 8, and also other figures of the drawing. By this means the wave of increase in train pipe pressure travels more rapidly and with greater effect toward the rear of the train, since the feed grooves on the forward cars are restricted, consequently producing a quicker movement of the rear triple valves, and thereby securing a quicker as well as a simultaneous release of the brakes on all the cars of the train. Another important advantage derived from this construction is the prevention of the overcharging of the auxiliary reservoirs on the forward end of the train which often occurs with the present standard equipment when the brakes are released on long trains and causes the head brakes to reapply when the brake valve is returned to running position and before the normal pressure is restored at the rear of the train line. With my improvement this objectionable action is prevented, since the feed passages from the train pipe to the auxiliary reservoirs on the forward cars of the train are temporarily restricted so that the pressure is restored at substantially the same rate in all of the auxiliary reservoirs throughout the train.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In a fluid pressure brake, the combination with a valve and piston operating in response to variations in train pipe pressure for controlling the exhaust from the brake cylinder, of an independently movable abutment also acting on said valve and subject on one side to brake cylinder pressure, and means for varying the pressure on the opposite side of said abutment.

2. In a fluid pressure brake, the combination with a valve and piston operated by an increase in train pipe pressure for opening the brake cylinder exhaust, of a movable abutment also acting on said valve and exposed on one side to brake cylinder pressure, and means actuated directly by an increase in train pipe pressure for varying the pressure on the opposite side of said abutment.

3. In a fluid pressure brake, the combination with a valve and piston operated according to variations in train pipe pressure for controlling the exhaust from the brake cylinder, of a movable abutment or piston also acting on said valve and subject to the opposing pressures of the brake cylinder and a chamber, and a yielding device for normally holding said abutment in release position.

4. In a fluid pressure brake, the combination with a valve and piston operated according to variations in train pipe pressure for controlling the exhaust from the brake cylinder, of a movable abutment or piston also acting on said valve and subject to the opposing pressures of the brake cylinder and a chamber, means for permitting an equalization of pressure from one side of said abutment to the other, and a spring for normally holding said abutment in release position when said pressures are equalized.

5. In a fluid pressure brake, the combination with a valve and piston operated according to variations in train pipe pressure for controlling the exhaust from the brake cylinder, of a movable abutment also acting on said valve and subject to the opposing pressures of the brake cylinder and a chamber, and means operated by the movement of said piston for varying the pressure in said chamber.

6. In a fluid pressure brake, the combination with a valve and piston operated according to variations in train pipe pressure for controlling the exhaust from the brake cylinder, of a movable abutment also acting on said valve and subject to the opposing pressures of the brake cylinder and a chamber, and ports controlled by said valve for varying the pressure in said chamber.

7. In a fluid pressure brake, the combination with a valve and piston operated according to variations in train pipe pressure for controlling the exhaust from the brake cylinder, of a movable abutment also acting on said valve and subject to the opposing pressures of the brake cylinder and a chamber, and means controlled by said valve for reducing the pressure in said chamber.

8. In a fluid pressure brake, the combination with a valve and piston operated according to variations in train pipe pressure for controlling the exhaust from the brake cylin-

der, of a movable abutment also acting on said valve and subject to the opposing pressures of the brake cylinder and a chamber, and a port governed by said valve for controlling the exhaust from said chamber.

9. In a fluid pressure brake, the combination with a valve and piston operating in response to variations in train pipe pressure for directly controlling the exhaust from the brake cylinder and from a fluid pressure chamber, of a movable abutment also acting on said valve and subject to the opposing pressures of the brake cylinder and said fluid pressure chamber, and means for permitting an equalization of the pressure from the brake cylinder around said abutment.

10. A triple valve device comprising a piston and valve mechanism for controlling the supply of air to and the exhaust from the brake cylinder, and having means operating under an increase in train pipe pressure for restricting the exhaust from the brake cylinder according to the variation in pressure in the train pipe from the head toward the rear of the train.

11. A triple valve device comprising a valve mechanism for controlling the brake cylinder service and exhaust ports and having an intermediate full release position, a piston operated by an increase in train pipe pressure for moving said valve to a further position for restricting the exhaust from the brake cylinder, and yielding resistance means for returning the valve to normal full release position.

12. A triple valve device comprising a valve for controlling the supply to and exhaust from the brake cylinder, a piston operated by an increase in train pipe pressure for moving said valve to a position for restricting the exhaust port, and yielding resistance means for returning said valve to its normal position.

13. A triple valve comprising a main valve, an auxiliary valve and a piston for controlling the supply of fluid under pressure to and its exhaust from the brake cylinder, the piston and auxiliary valve having a movement relative to the main valve, and yielding resistance means opposing the inward movement of the main valve beyond its normal full release position.

14. In a fluid pressure brake, the combination with a valve for controlling the brake cylinder service port and exhaust port and having a normal full release position, and a retarded release position in which the exhaust opening is restricted, of a piston operated by an increase in train pipe pressure for moving said valve to retarded release position and yielding resistance means for returning said valve to full release position.

15. In a fluid pressure brake, the combination with a valve operated by variations in train pipe pressure for controlling the supply to and the exhaust from the brake cylinder and having an intermediate full release position and an inner retarded release position for restricting the brake cylinder exhaust, and yielding resistance means for opposing the movement of the valve to the retarded release position.

16. A triple valve device having a valve and piston operated by variations in train pipe pressure for controlling the exhaust from the brake cylinder and having a full release position and a further inward movement for restricting the brake cylinder exhaust, and yielding resistance means opposing the further inward movement of the valve beyond full release position.

17. A triple valve device comprising a valve for controlling the brake cylinder exhaust and having a full release position and a retarded release position for restricting the brake cylinder exhaust, a piston operated by an increase in train pipe pressure for moving said valve to retarded release position, and yielding resistance means for opposing the movement of said valve from the full release position to retarded release position.

18. A triple valve device comprising a valve and piston subject to the opposing pressures of the train pipe and auxiliary reservoir for controlling the exhaust from the brake cylinder, said valve having a full release position with the exhaust fully open, and a further inward movement for restricting the brake cylinder exhaust opening, and a spring for opposing the further inward movement of the valve beyond full release position.

19. A triple valve device comprising a valve and piston for opening communication from the brake cylinder to the exhaust and from the train pipe to the auxiliary reservoir when in normal full release position, and having a further inward movement for restricting both communications, and yielding resistance means for opposing the further inward movement of the valve beyond full release position.

20. A triple valve device comprising a main valve controlling the brake cylinder exhaust, an auxiliary valve having a movement relative to the main valve for controlling a supply to the brake cylinder, said main valve having a full release position and a retarded release position, and a yielding resistance means for normally returning said main valve from the latter position to the former.

21. A triple valve device comprising main and auxiliary valves, means operated by an increase in train pipe pressure for actuating said valves to a position for retarding the release from the brake cylinder, and a yielding resistance means acting on the main valve for normally returning the same to full release position.

22. In a fluid pressure brake, the combination with a valve for controlling the exhaust from the brake cylinder, and a movable abutment subject to brake cylinder pressure for closing said valve, of means operated by an increase in train pipe pressure for restricting the exhaust from the brake cylinder.

23. In a fluid pressure brake, the combination with a valve for controlling the brake cylinder exhaust and a means operating automatically after an increase in train pipe pressure to close said valve, of means operated by an increase in train pipe pressure for temporarily restricting the exhaust from the brake cylinder.

24. In a fluid pressure brake, the combination with means operated by an increase in train pipe pressure for temporarily restricting the exhaust from the brake cylinder, of a valve for controlling said brake cylinder exhaust and a movable abutment operated by fluid pressure for automatically closing said valve after an increase in train pipe pressure.

25. In a fluid pressure brake, the combination with a valve and piston operating according to variations in train pipe pressure to control the exhaust from the brake cylinder and having a normal full release position and a further inward movement for restricting the brake cylinder exhaust, and yielding resistance means for opposing the further inward movement of said valve, of a movable abutment subject to brake cylinder pressure and also acting on said valve.

26. In a fluid pressure brake, the combination with a train pipe, brake cylinder, and a valve mechanism having main and auxiliary valves for controlling the supply of pressure to the brake cylinder and its release from the brake cylinder of a piston operated by an increase in train pipe pressure for moving the valve mechanism to a position for retarding the release from the brake cylinder, and a spring for normally returning said main valve to its full release position.

27. A triple valve device comprising a main valve for controlling the brake cylinder exhaust and having a full release position and a retarded release position, an auxiliary valve and piston having a movement relative to the main valve, and a resistance spring opposing the movement of said main valve to the retarded release position.

28. A triple valve device comprising a main valve, an auxiliary valve and piston operated by variations in train pipe pressure for controlling the supply to and exhaust from the brake cylinder, said main valve having a normal full release position and a further inward movement for retarding the release from the brake cylinder, and a spring acting on said main valve to oppose the further inward movement of the same beyond full release position.

29. A triple valve device comprising a piston, a valve mechanism governed thereby for controlling the supply of air to and the release of air from the brake cylinder, and means operating upon an increase in train pipe pressure for restricting the passage through which air is released from the brake cylinder, according to the variations in pressure in the train pipe from the head toward the rear of the train.

30. A triple valve device comprising a piston and valve mechanism for controlling the supply of air to the brake cylinder, and having means operated by the triple valve piston under an increase in train pipe pressure for restricting the passage through which air is released from the brake cylinder according to variations in the differential of pressures between the train pipe and auxiliary reservoir from the head toward the rear of the train.

In testimony whereof I have hereunto set my hand.

WALTER V. TURNER.

Witnesses:
R. F. EMERY,
JAS. B. MACDONALD.