J. E. NORMAND.

QUICK ACTION AUTOMATIC RELEASE MECHANISM FOR AIR BRAKES.

APPLICATION FILED JAN. 13, 1904.

902,162. Patented Oct. 27, 1908.

6 SHEETS—SHEET 1.

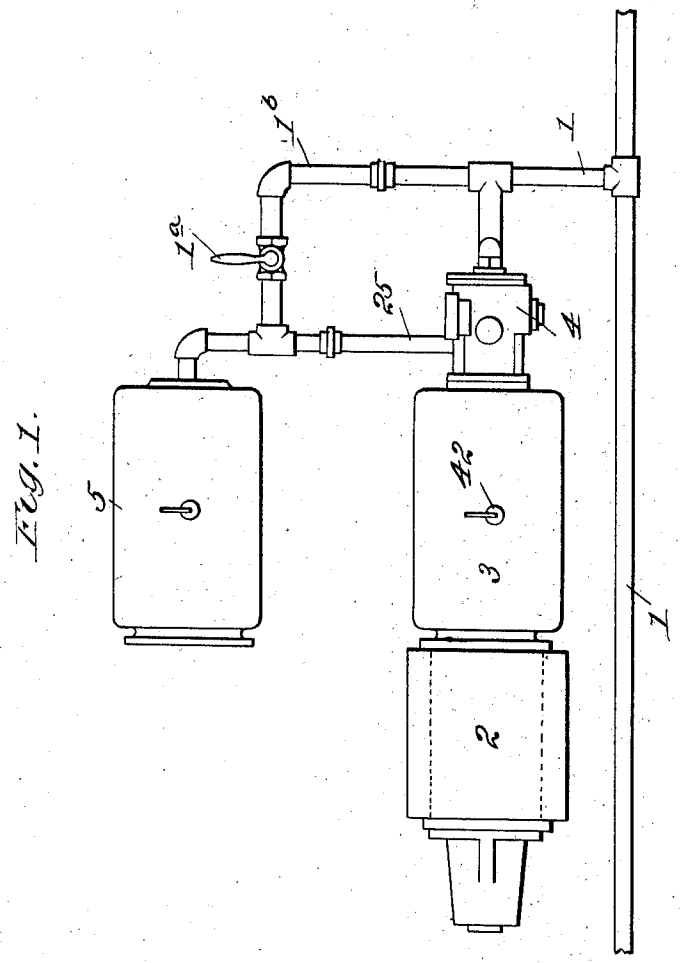


FIG. 1.

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6 SHEETS—SHEET 2

Fig. 2.

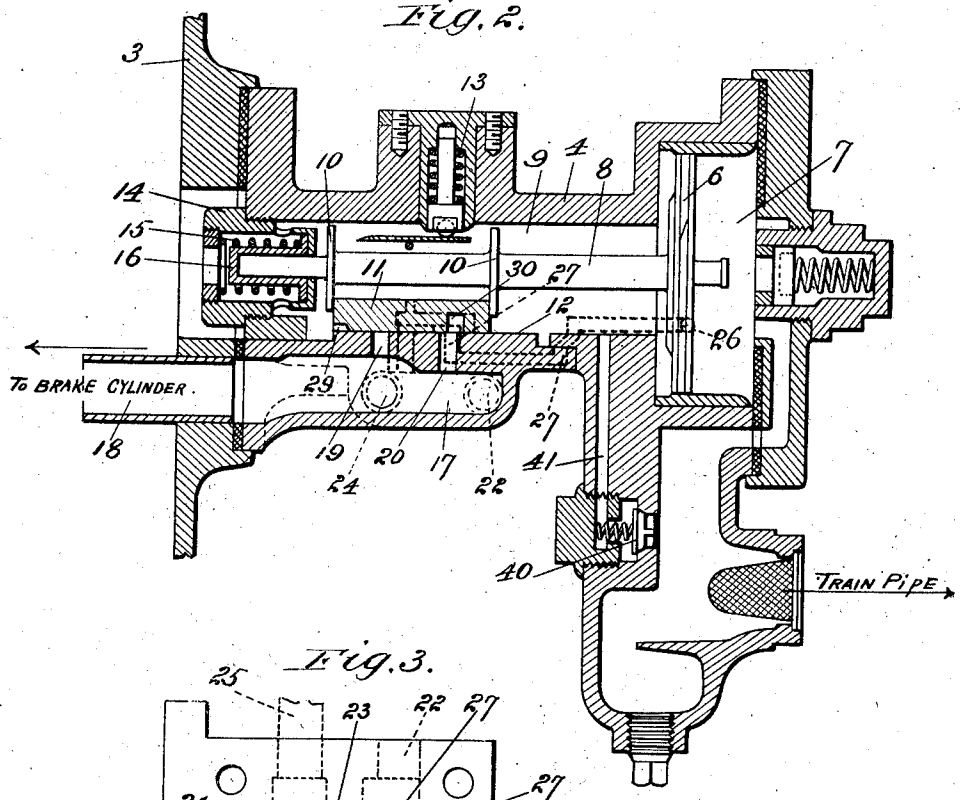


Fig. 3.

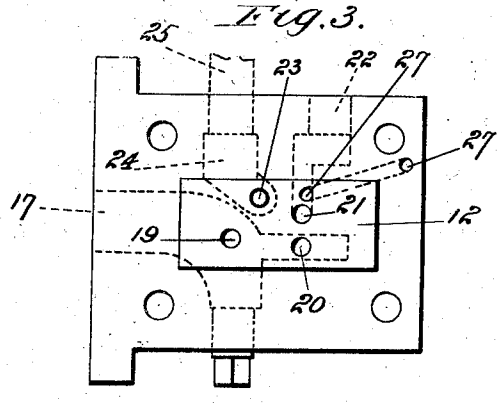


Fig. 4.

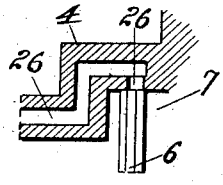
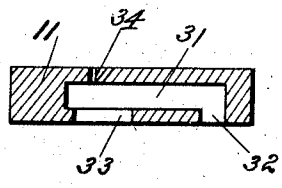


Fig. 4a



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6 SHEETS—SHEET 3.

Fig. 5.

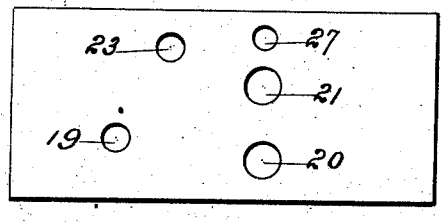


Fig. 6.

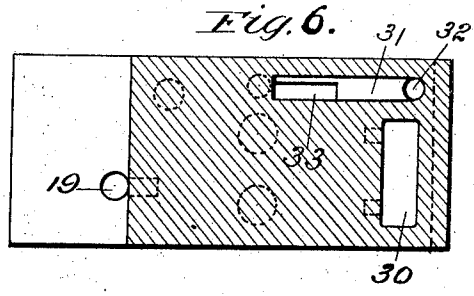


Fig. 7.

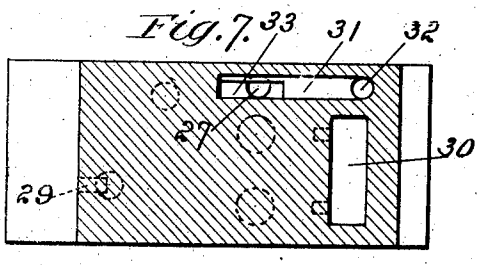


Fig. 8.

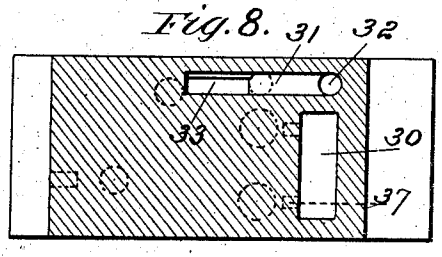


Fig. 9.

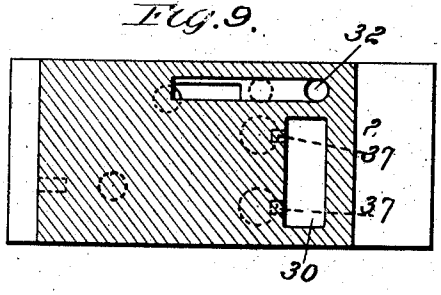


Fig. 10.

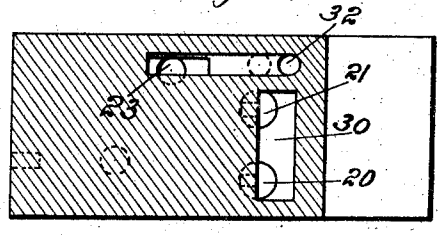
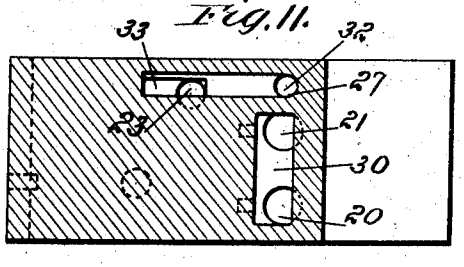


Fig. 11.



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6 SHEETS—SHEET 4.

Fig. 12.

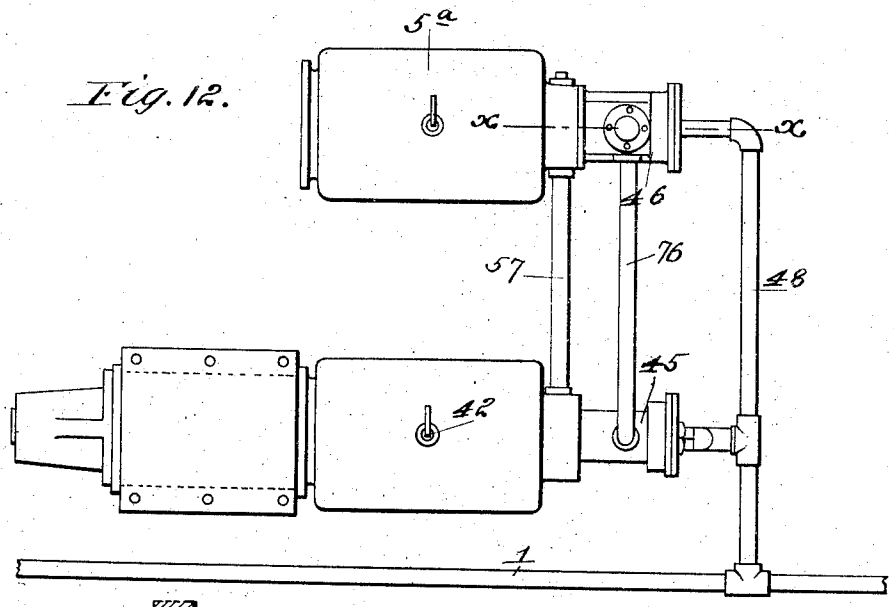


Fig. 13.

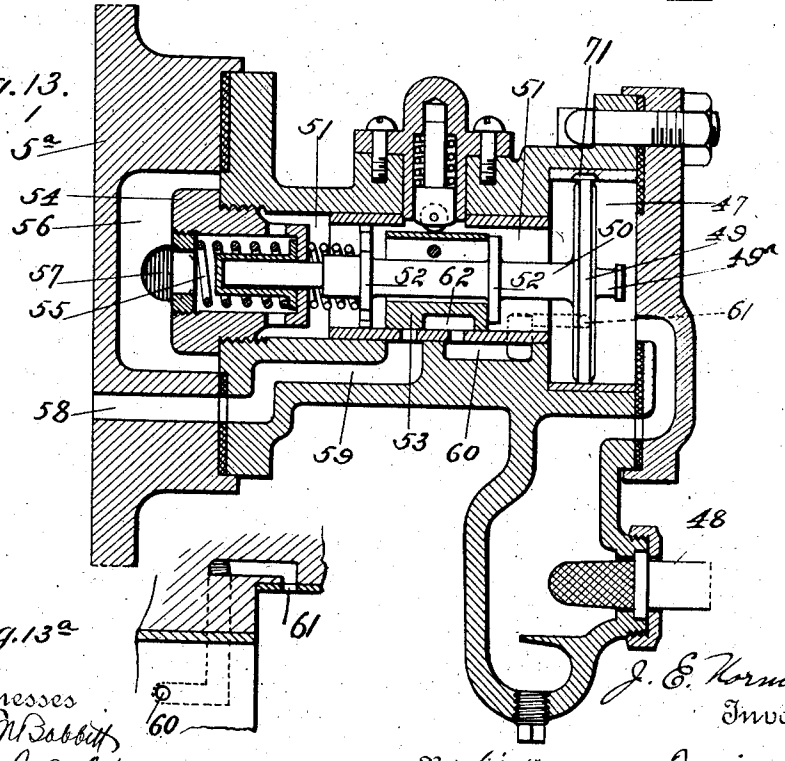


Fig. 13a

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6 SHEETS—SHEET 5.

Fig. 14.

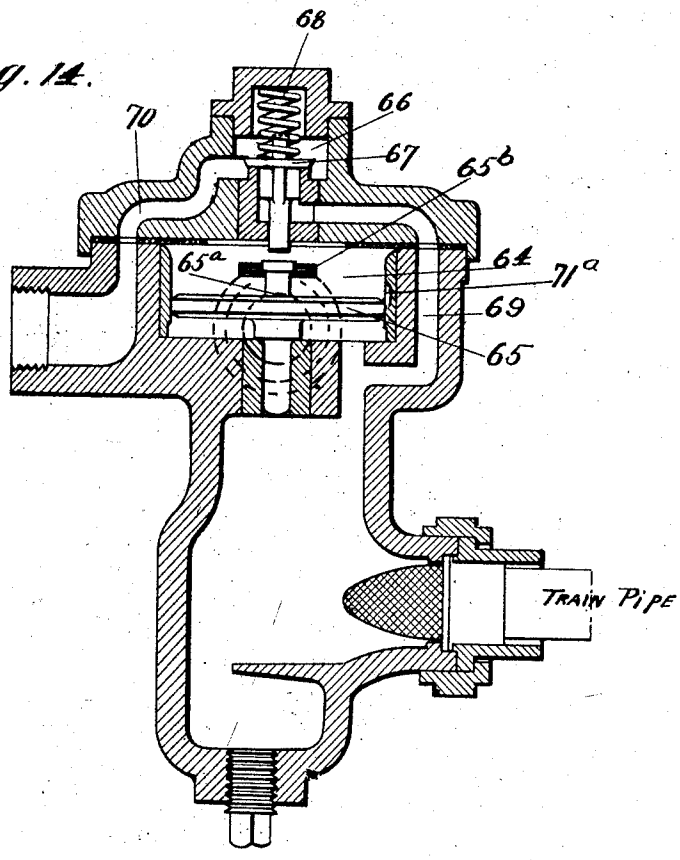
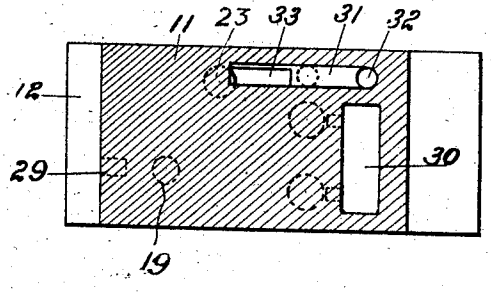


Fig. 15.



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6 SHEETS—SHEET 6.

Fig. 16.

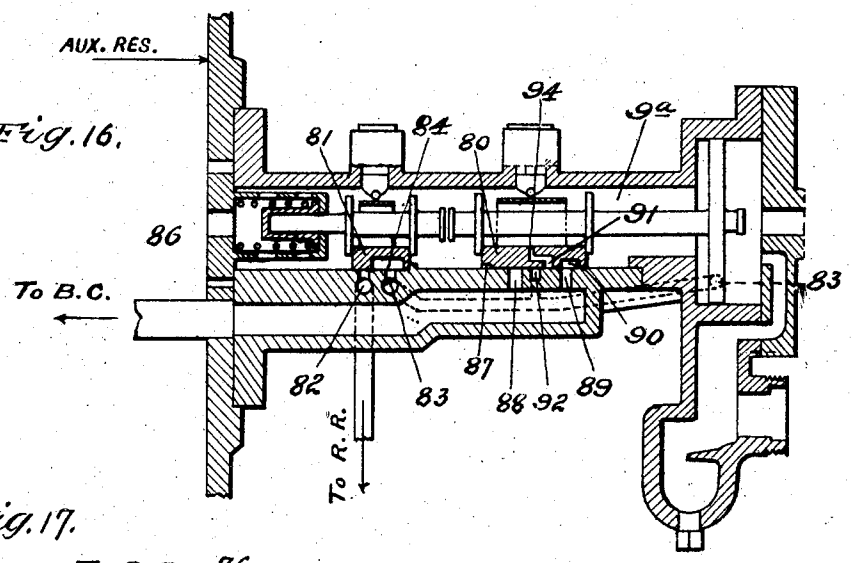
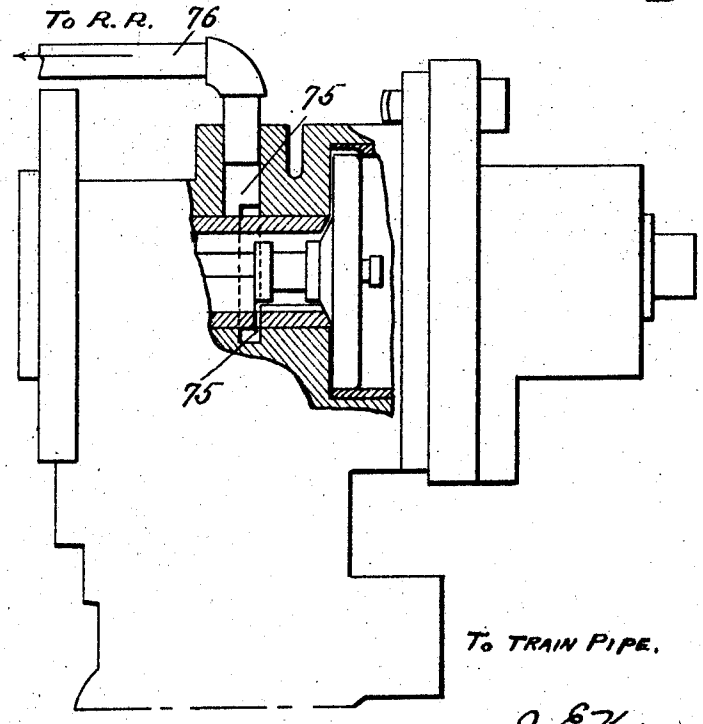


Fig. 17.



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QUICK-ACTION AUTOMATIC RELEASE MECHANISM FOR AIR-BRAKES.

No. 902,162. Specification of Letters Patent. Patented Oct. 27, 1908.

Application filed January 13, 1904. Serial No. 188,833.

To all whom it may concern:

Be it known that I, JOSEPH E. NORMAND, a citizen of the United States, residing at Hoboken, county of Hudson, State of New Jersey, have invented certain new and useful Improvements in Quick-Action Automatic Release-Valve Mechanism for Railway Air-Brake Systems, of which the following is a specification, reference being had therein to the accompanying drawings, in which—

Figure 1 is a diagrammatic plan view of a fluid pressure brake equipment for a car; Fig. 2 a longitudinal vertical sectional view of the triple valve and quick release valve mechanism; Fig. 3 a plan view of the valve seat of the triple valve; Fig. 4 a detail horizontal sectional view showing the port 26; Fig. 4ª a detail vertical sectional view of the slide valve of the triple valve; Fig. 5 a diagrammatic view of the seat of the slide valve of the triple valve; Figs. 6 to 11 inclusive, diagrammatic views showing the relative location of the main slide valve on its seat in emergency application, service application, lap, partial release, full release and quick action release positions respectively; Fig. 12 a diagrammatic view of an air brake system slightly different in form from that shown in Figs. 1 and 2 and wherein the quick release valve mechanism is separate from the triple valve; Fig. 13 a longitudinal vertical section of the quick release valve mechanism taken on the line X—X of Fig. 12; Fig. 13ª a detail sectional view showing the port 61; Fig. 14 a vertical sectional view of a slightly different form of quick release valve mechanism; Fig. 15 a view similar to Fig. 11 showing the valve in position to recharge the auxiliary reservoir from the reinforcing reservoir; Fig. 16 a longitudinal vertical sectional view of still another form of quick release mechanism; and Fig. 17 a partial sectional view of the triple valve used in the form of apparatus shown in Fig. 12.

In the well known system of applying brakes by means of air pressure, a triple valve mechanism is used, said valve having three functions, namely, to put the auxiliary reservoir in communication with the brake cylinder to apply the brakes in what is known as a service application; to bring the train pipe in direct communication with the brake cylinder for what is known as an emergency application; and to put the train pipe in communication with the auxiliary reservoir and the brake cylinder to exhaust to release the brakes and recharge the auxiliary reservoir thereby restoring the apparatus to its normal condition and in position for further application of the brakes. To secure the release of the brakes it is necessary to raise the air pressure in the train pipe and this is done by permitting air to flow therein from the main storage reservoir on the locomotive, as is well known, the air in this reservoir being of a considerably higher pressure than the air in the train pipe and auxiliary reservoir.

It has been found in practice that it requires considerable time to release the brakes on a long train by increasing the train pipe pressure from the main reservoir of the locomotive; and it has happened that trains have been parted or broken in two because of the failure of the apparatus to quickly release the brakes on the rear cars of the train.

The present invention has for one of its principal objects to provide a reinforcing or supplemental reservoir for the storage of air under the maximum pressure, and a valve mechanism controlled through the triple valve whereby said reinforcing reservoir may be put in communication with the train pipe for the purpose of raising the pressure therein and effecting a quick release of the brakes without depleting the main storage reservoir on the locomotive. As one of these reinforcing or supplemental reservoirs is placed on each car it will be seen that the train pipe pressure will not only be increased from the main reservoir on the locomotive but will also be increased at various points down the train so that the wave of increased pressure will pass almost instantly down the train pipe said wave increasing in speed and pressure as it travels along the train, and as each succeeding reinforcing reservoir is brought into communication with the train pipe.

A further object of the invention is to provide means whereby the auxiliary reservoir pressure may be increased and said reservoirs recharged while the brakes are applied without releasing the air brake cylinder pressure. This recharging of the auxiliary reservoir is accomplished by means controlled by a slight and gradual increase

in the train pipe pressure. This increase in train pipe pressure operating suitable valve devices whereby the train pipe may be placed directly in communication with the auxiliary reservoir, or whereby the reinforcing reservoir is brought into communication with the auxiliary reservoir. This latter method has many advantages in that the reinforcing reservoir pressure may be thus utilized through the auxiliary reservoir for the purpose of reinforcing the auxiliary reservoir quickly in going down a long grade to be used in applying the brakes in case of an emergency, thereby reserving the air pressure in the main reservoir for use in a quick release. This method of recharging the auxiliary reservoir has also the advantage that said reservoirs may be very quickly recharged. It will be readily seen that where the recharging air must pass from the main reservoir on the locomotive the entire length of the train, it may frequently happen on long trains that the auxiliary reservoirs at the rear end will not be recharged at the proper time.

It is a further object of the invention to provide means whereby the reduction of pressure in any one of the auxiliary reservoirs elsewhere than to the brake cylinder will release the brakes on all the cars of the train. This may be accomplished by any suitable valve mechanism, the ordinary bleeding valve commonly used on auxiliary reservoirs being sufficient.

Other and equally important objects and advantages of the invention will appear hereinafter.

Referring to the various parts by numerals 1 designates the train pipe, 2 the brake cylinder, 3 the auxiliary reservoir, 4 the triple valve casing, and 5 the supplemental reservoir. The triple valve piston 6 travels in the usual chamber 7 of the triple valve casing and carries the valve rod 8 which extends horizontally through the valve chamber 9. This valve rod is provided with collars 10 which are spaced at suitable distances apart and hold between them the slide valve 11, this valve working on a suitable valve seat 12. The slide valve fits closely between the collars 10 so that it moves with the valve rod, there being no lost motion between these parts; and a spring device 13 is provided for yieldingly holding the slide valve to its seat. In the inner end of the valve chamber 9 is screwed a hollow open ended plug 14 within which is confined a coil spring, 15, said spring being compressed by the valve rod through the cup 16 when the piston of the triple valve is moved to slide valve is formed a chamber 17 which is in communication through pipe 18 with the brake cylinder, said pipe 18 extending through the auxiliary reservoir. The chamber 17 is in communication with the valve chamber 9 through the inlet port 19 and the exhaust port 20 and said chamber 17 is in communication with the atmosphere through the exhaust ports 21 and 22. The valve seat is also formed with a port 23 which opens into a chamber 24, this latter chamber being in communication with the supplemental reservoir 5 through pipe 25.

The train pipe communicates with the valve chamber 9 through the port 26 which opens into the piston chamber 7 at its outer end and is in communication with the port 27 formed in the valve seat, the inner end of this port opening through the valve seat into the valve chamber 9. The outer end of the port 26 is closed by the piston 6 when said piston is in its normal position, that is, when the air pressure in the auxiliary reservoir and train pipe are equalized. The spring 15 is so disposed as to maintain the piston 6 on the port 26 and to cut off communication between ports 27 and 32 when the air pressure is equalized in the train pipe and auxiliary reservoir.

The slide valve 11 is provided in its under side at its rear end with an under cut port 29 which is adapted to communicate with the inlet port 19 leading into the chamber 17 when the train pipe pressure is reduced sufficiently to secure a service application. This action of the apparatus puts the auxiliary reservoir in communication with the brake cylinder. Near the forward end of the slide valve and in its under side is formed the long transverse port or channel 30 which when the train pipe pressure is increased to secure a release of the brakes, is in communication with the exhaust ports 20 and 21 and puts the brake cylinder in communication with the atmosphere through said ports 20 and 21 and port 22. Formed in the slide valve near one side thereof is a longitudinally extending port 31, the forward end of this port opening through the bottom of the slide valve by means of a port 32, the rear end of said port opening through the bottom of the slide valve by means of a port 33 said end of the passage also opening through the top of the slide valve into the valve chamber 9 through a small port 34. The port 32 is adapted to register at the proper point in the travel of the slide valve with the port 27; and the port 33 is adapted to register at the proper time with the inlet port 23 from the sup-

21 and before the port 32 is in register with the port 27, for a purpose which will appear hereinafter. The slide valve is provided on its under side with very shallow under cut grooves 37 which communicate at their rear ends with the exhaust ports 20 and 21. The small port 29 and grooves 37 are provided in order that the slide valve may have considerable movement without increasing the amount of feed or exhaust of air through said ports.

The supplemental reservoir is connected directly to the train pipe by a pipe 1^b, in which is arranged a hand valve 1^a. By means of this valve the train pipe pressure may be increased from the supplemental reservoir and the brakes released without bleeding an auxiliary reservoir.

In the triple valve casing preferably in the rear wall of the drip cup is provided a double seated check valve 40 which is adapted to put the train pipe in communication with the passage 41 which opens into the valve chamber 9. This check valve is so constructed that a sudden increase in train pipe pressure will cause it to seat on its back seat and thereby close the passage 41, but a slight and gradual increase in train pipe pressure will hold it between its two seats and thereby open communication between the train pipe and the chamber 9, and through said chamber to the auxiliary reservoir.

The operation of this form of the apparatus may be briefly described as follows: When charging the apparatus, the piston of the triple valve will be forced to its innermost position and the brake cylinder will be in communication with the atmosphere through the ports 20, 21, and 22; the train pipe will be in communication with the auxiliary reservoir through ports 26, 27, 31, 32 and 34; and the supplemental reservoir will be in communication with the auxiliary reservoir and valve chamber 9 through ports 23, 33, and 34, so that said reservoirs and train pipe will be charged with maximum pressure. The passage 34 is much smaller than ports 26, 27, 31, 32 and 33, so as to raise the train pipe pressure in advance of the auxiliary reservoir pressure, in releasing, where air is admitted from the supplemental reservoir to the train pipe and auxiliary reservoir. As soon as the desired pressure is secured in the apparatus and the pressure is equalized the spring 15 will move valve 11 to cut communication between ports 27 and 32. The apparatus is now in position to apply the brakes. For a service application train pipe pressure is reduced in the usual way and the operation is similar to the operation of an ordinary triple valve, the auxiliary reservoir being put in communication with the brake cylinder through the ports 29 and 19 as shown in Fig. 7. In Fig. 6 the valve is shown in position for a full application. It will, of course, be understood that the transverse port 30 has been moved out of register with the exhaust ports 20 and 21 before port 29 registers with port 19. When it is desired to release the brakes the train pipe pressure is increased and the port 30 brought into communication with the ports 20 and 21 as shown in Figs. 9 and 10. Should a quick release of the brakes be desired the train pipe pressure is suddenly increased to move the triple valve piston to its innermost position. This action will not only put the brake cylinder in communication with the atmosphere but will bring the supplemental reservoir in communication with the train pipe through the ports 23, 33, 31, 32, 27 and 26, as shown in Fig. 11, thus increasing the train pipe pressure at each valve mechanism on the train. It will be thus seen that as the pressure of each supplemental reservoir is discharged in succession into the train pipe, a wave of increased pressure will pass down the train pipe increasing in speed and pressure as it moves, securing a very rapid and practically a simultaneous release of all the brakes on the train and without increasing the air pressure in the train pipe at any one point beyond what is perfectly safe for the apparatus. In Fig. 8 the valve is shown as in the lap position in which all the parts are closed.

Should it be desired to recharge the auxiliary reservoir while the brakes are applied this may be done by slowly increasing the train pipe pressure. By this operation the slide valve of the triple valve may be brought to such a position as to put the supplemental reservoir in communication with the auxiliary reservoir through the ports 23, 33, 31 and 34, as shown in Fig. 15, the port 34 leading from the port 31 to the main slide valve chamber, as shown in Fig. 4^a. It will be of course understood that the piston of the slide valve during this operation must not be moved sufficiently to bring the exhaust ports into register. By this means the auxiliary reservoir pressure will be increased rapidly from the supplemental reservoir and without depleting the air pressure in the main reservoir to any great extent, it being understood however, that the train pipe pressure must be gradually increased to maintain an equilibrium with the increasing pressure in the auxiliary reservoir, these two pressures going up together. Air may also be forced into the auxiliary reservoir without releasing the brakes through the valve 40 and the passage 41, in the usual manner, by increasing the train pipe pressure slowly, this valve 40 constituting what is ordinarily known as a recharging device. The apparatus is so constructed that air will pass into the auxiliary reservoir from the train pipe through recharging device 40.

and into said reservoir from the supplemental reservoir simultaneously at a given pressure in the train pipe.

Should, for any reason, the pressure in the main reservoir be so depleted as to prevent the engineer securing a quick release of brakes by overcoming the auxiliary reservoir pressure, the pressure in one of said auxiliary reservoirs may be suddenly and excessively reduced elsewhere than to the brake cylinder, preferably to the atmosphere through an ordinary bleeding valve 42, one of said valves being connected to each of the auxiliary reservoirs. By bleeding one of these auxiliary reservoirs, it will be readily understood that the triple valve piston will be moved to its inner position by the train pipe pressure thus bringing the supplemental reservoir in communication with the train pipe, as previously described, and thereby securing the quick release of all the brakes on the train.

The apparatus as so far described is similar in many respects to that shown and described in my application filed April 28, 1903, Serial No. 154,706.

As shown in Figs. 1 to 11 inclusive, communication between the supplemental reservoir and the other parts of the apparatus are controlled entirely through ports formed in the slide valve of the triple valve. A separate and independent valve mechanism may be employed for this purpose, however, such as a valve mechanism operated by or controlled by the triple valve. This form of the apparatus is illustrated in Figs. 12, 13 and 14. Referring to Figs. 12 and 13, 45 designates the ordinary triple valve casing, the triple valve therein being of the usual and ordinary form; and 46 a supplemental valve casing which is secured to one end of the supplemental reservoir 5^a. In one end of the casing 46 is formed a piston chamber 47 which is in open communication with the train pipe through pipe 48. In this chamber 47 is mounted a piston 49 which carries a horizontal valve rod 50, said rod extending longitudinally through a valve chamber 51 formed in the casing 46. On this valve rod is formed two collars 52 between which is mounted a slide valve 53, said valve being slightly shorter than the distance between the collars 52 so that the piston 49 may have slight independent movement. The rear end of the chamber 51 is closed by a hollow plug 54 in which is inclosed spring 55 which normally forces forward a cup in which the rear or inner end of the valve rod 50 fits. The spring and cup are so disposed that an inward movement of the valve rod will compress the spring.

The supplemental reservoir at the point where it is connected to the casing 46 is formed with a chamber 56 which is in communication with the auxiliary reservoir through the pipe 57 so that the air pressure in the valve chamber 51 will be equal to the pressure in the auxiliary reservoir. The supplemental reservoir is also provided with a port 58 which is in communication with a port 59 formed in the casing 46. The casing 46 is also provided with a port 60 which registers with a port 61 which opens into the piston chamber 47. In the bottom of the valve 53 is formed a cavity 62 which at the proper position of the piston 49 puts the supplemental reservoir in communication with the train pipe through the ports 59, 60 and 61. In this form of the apparatus means are provided whereby the supplemental reservoir may be slowly recharged through the triple valve, when the triple valve proper is moved to its full release position. To accomplish this said triple valve casing is formed with an outlet port 75 which is connected to the supplemental reservoir by means of a pipe 76 as shown clearly in Fig. 17.

The operation of this release valve mechanism will be readily understood but may be briefly described as follows: A decrease in train pipe pressure for a service application will cause the piston 49 to move forward until its projection 49^a contacts with the cover plate of said chamber. This will not cause any material movement of the slide valve 53 because of the lost motion between said valve and the valve rod 50. An increase in train pipe pressure for a quick release will move the piston to its innermost position and put the supplemental reservoir in communication with the train pipe through the ports 59, 62, 60 and 61.

The piston 49 of the quick release valve is held on the port 61 by means of the spring 55 until the quick release is desired and the pressure in the train pipe is increased sufficiently to overcome said spring. It will be observed that by slowly increasing the pressure in the train pipe the pressure on both sides of the piston 49 will be equalized through the by-pass port 71, and that in order to recharge the supplemental reservoir through port 61 there must be a sudden increase in train pipe pressure in order to move the piston to close the by-pass port 71.

By providing an additional recharging port 75, controlled by the main slide valve, the supplemental reservoir may be supplied with air from the valve chamber with the triple valve in full release position.

When it is desired to quickly recharge the supplemental reservoir this may be done by increasing the train pipe pressure sufficiently to uncover the port 61. By this means the said reservoir may be charged through the quick release valve, as well as through the triple valve.

It will thus be seen that the quick release

action may be as readily obtained through an independent release valve mechanism controlled by the triple valve mechanism as well as through the slide valve of the triple valve, although I prefer the latter form as it reduces very materially the number of working parts, and also reduces the liability of leaks.

In Fig. 14 is shown another form of quick release valve, whereby the supplemental reservoir is put in communication with the train pipe. In this form of the apparatus the supplemental valve casing is provided with a piston chamber 64, in which is mounted a vertically moving piston 65, said chamber below the piston being in communication with the train pipe. Above the piston chamber the valve casing is formed with a small chamber 66 in which is mounted a puppet valve 67 said valve being seated by means of a spring 68 which bears on the upper side thereof. The train pipe is in communication with the puppet valve chamber below said valve through a port 69; and the supplemental reservoir is in communication with said puppet valve chamber, above the said valve, through a port 70. The operation of this valve mechanism is substantially the same as that shown in Fig. 13. A quick increase in train pipe pressure will lift piston 65 and cause the upward extending stem 65^a to lift the puppet valve and thereby open communication between port 70, and 69 and put the supplemental reservoir in communication with the train pipe. The piston chamber 64 above the piston 65 is in communication with the auxiliary reservoir through the port 65^b so that the movement of the piston 65 will be controlled through the triple valve.

In order to recharge the auxiliary reservoir while the brakes are applied through the apparatus shown in Figs. 13 and 14 the train pipe pressure must be gradually increased to bring the pistons to open the by-pass ports 71 and 71^a in the piston chambers 47 and 64 respectively. In this position of the pistons, air from the train pipe may pass through the by-pass ports and into the valve chambers 30 and 66, and thence to the auxiliary reservoirs.

By reference to Fig. 16 it will be noted that the valve chamber 9^a of the triple valve is considerably elongated, and that two slide valves are mounted therein. One of said valves, 80, performs the functions of the slide valve of the ordinary triple valve, and the other, 81, serves as a quick release valve. It will be noted that the quick release valve will be moved by the triple valve when this latter valve is moved to its inner full release position to put the supplemental reservoir in communication with the train pipe through ports 82 and 83 and the cavity 84 in the slide valve. The spring 86 maintains the quick release valve in its normal closed position. In this form of the apparatus the brake cylinder is charged through ports 87 and 88, and is exhausted through ports 89 and 90, these latter ports corresponding to similar ports 20 and 30, shown in Fig. 2. The slide valve of the triple valve is provided with a feeding port 91 which in the full release position of the said valve registers with the port 92 which is in communication with the supplemental reservoir. The air from port 91 passes upward through port 94 into the valve chamber and thence to the auxiliary reservoir, this port 94 being much smaller than the port leading to the train pipe so that the train pipe pressure will be maintained in advance of the auxiliary reservoir pressure both in recharging and in the quick release action. The port 83 is normally closed by the piston of the triple valve, as shown in the drawing, when the pressure of the train pipe and auxiliary reservoir are equalized.

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

1. In a fluid pressure brake system, the combination with a train pipe, auxiliary reservoir, brake cylinder and supplemental reservoir, of a valve device for opening communication from the supplemental reservoir to the auxiliary reservoir when the brakes are applied, whereby the auxiliary reservoir may be recharged from the supplemental reservoir without releasing the brakes.

2. In a fluid pressure brake system, the combination with a train pipe, auxiliary reservoir, brake cylinder and supplemental reservoir, of a valve device for controlling communication between the supplemental and auxiliary reservoirs when the brakes are applied, and a release valve mechanism operated by an increase in train pipe pressure for opening communication from the supplemental reservoir to the train pipe.

3. In a fluid pressure brake system the combination, with a train pipe, a brake cylinder, an auxiliary reservoir, a supplemental reservoir, and a valve mechanism operated by an increase of pressure in the train pipe to recharge the auxiliary reservoir from the supplemental reservoir, without releasing the brakes.

4. In a fluid pressure brake system the combination, with a train pipe, brake cylinder, an auxiliary reservoir, supplemental reservoir, and triple valve, of means whereby the auxiliary reservoir may be recharged from the supplemental reservoir through the slide valve of the triple valve, without releasing the brakes.

5. A fluid pressure brake system comprising, a train pipe, a brake cylinder, an auxiliary reservoir, a triple valve, a supplemental reservoir, an independent valve con-

trolling communication between said supplemental reservoir and the train pipe, a piston for operating said valve and subject to train pipe pressure on one side and auxiliary reservoir pressure on the other, whereby communication between the supplemental reservoir and the train pipe is controlled by variations in pressure between the auxiliary reservoir and train pipe.

6. A fluid pressure brake system comprising a train pipe, a brake cylinder, an auxiliary reservoir, a triple valve, supplemental reservoir, and an independent valve controlled by and moving simultaneously with the triple valve for controlling communication between the supplemental reservoir and the train pipe, and means for reducing the pressure in the auxiliary reservoir elsewhere than to the brake cylinder, and means whereby said reduction in pressure will secure the release of the brakes.

7. In a fluid pressure brake system the combination with a train pipe, brake cylinder, auxiliary reservoir, supplemental reservoir, of a valve mechanism controlled by train pipe pressure whereby the air of the supplemental reservoir may be delivered into the auxiliary reservoir to apply the brakes, or into the train pipe to release the brakes.

8. In a railway brake system, the combination with a train pipe, a brake cylinder, an auxiliary reservoir, a triple valve, a supplemental reservoir, and a quick release valve mechanism, of means whereby the supplemental reservoir may be slowly recharged through the slide valve of the triple valve by means of a gradual increase in train pipe pressure when the triple valve is in its full release position.

9. In a railway brake system, the combination, with a train pipe, a brake cylinder, an auxiliary reservoir, a triple valve, a supplemental reservoir, and a quick release valve mechanism, of means whereby the supplemental reservoir may be recharged through the slide valve of the triple valve when said valve is in its full release position, and means whereby said reservoir may be recharged through the quick release valve mechanism by a sudden increase in train pipe pressure.

10. A railway brake system comprising a train pipe, a brake cylinder, an auxiliary reservoir, a triple valve, a supplemental reservoir, a quick release valve for controlling communication from the supplemental reservoir to the train pipe, and means whereby the auxiliary reservoir may be recharged through the slide valve of the triple valve when the brakes are applied.

11. In a railway brake system the combination, with a train pipe, a brake cylinder, an auxiliary reservoir, a triple valve, a supplemental reservoir, a quick release mechanism, of means whereby the supplemental reservoir may be slowly recharged through the slide valve of the triple valve by means of a gradual increase in train pipe pressure.

12. In a railway brake system the combination, with a train pipe, a brake cylinder, an auxiliary reservoir, a triple valve, a supplemental reservoir, a quick release valve mechanism, of means whereby the supplemental reservoir may be recharged through the slide valve of the triple valve when said valve is in its full release position, and means whereby said reservoir may be recharged through the quick release valve mechanism by a sudden increase in train pipe pressure.

13. A railway brake system comprising a train pipe, a brake cylinder, an auxiliary reservoir, a triple valve, a supplemental reservoir, a quick release valve, and means whereby the auxiliary reservoir may be recharged through the slide valve of the triple valve when the brakes are applied.

14. In a fluid pressure brake, the combination with a train pipe, brake cylinder, auxiliary reservoir, triple valve, and a supplemental reservoir, of a valve for controlling communication from the supplemental reservoir to the train pipe, and an actuating abutment, subject to the opposing pressure of the train pipe and the auxiliary reservoir for actuating said valve.

15. In a fluid pressure brake, the combination with a train pipe, brake cylinder, auxiliary reservoir, triple valve, and a supplemental reservoir, of a release valve mechanism subject to train pipe pressure for controlling communication from said supplemental reservoir to the train pipe.

16. In a fluid pressure brake, the combination with a train pipe, brake cylinder, auxiliary reservoir, triple valve, and a supplemental reservoir, of a release valve mechanism subject on one side to train pipe pressure, and operated by an increase in train pipe pressure for opening communication from said supplemental reservoir to the train pipe.

17. In a fluid pressure brake, the combination with a train pipe, brake cylinder, auxiliary reservoir, triple valve, and a supplemental reservoir, of a release valve mechanism for controlling communication from said supplemental reservoir to the train pipe independently of the triple valve.

In testimony whereof I hereunto affix my signature in the presence of two witnesses this 12th day of January 1904.

JOSEPH E. NORMAND.

Witnesses:
WM. R. DAVIS,
JOHN G. PEARSE.