No. 869,637. PATENTED OCT. 29, 1907.

W. B. MANN.

SENSITIVE TRIPLE VALVE.

APPLICATION FILED DEC. 16, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

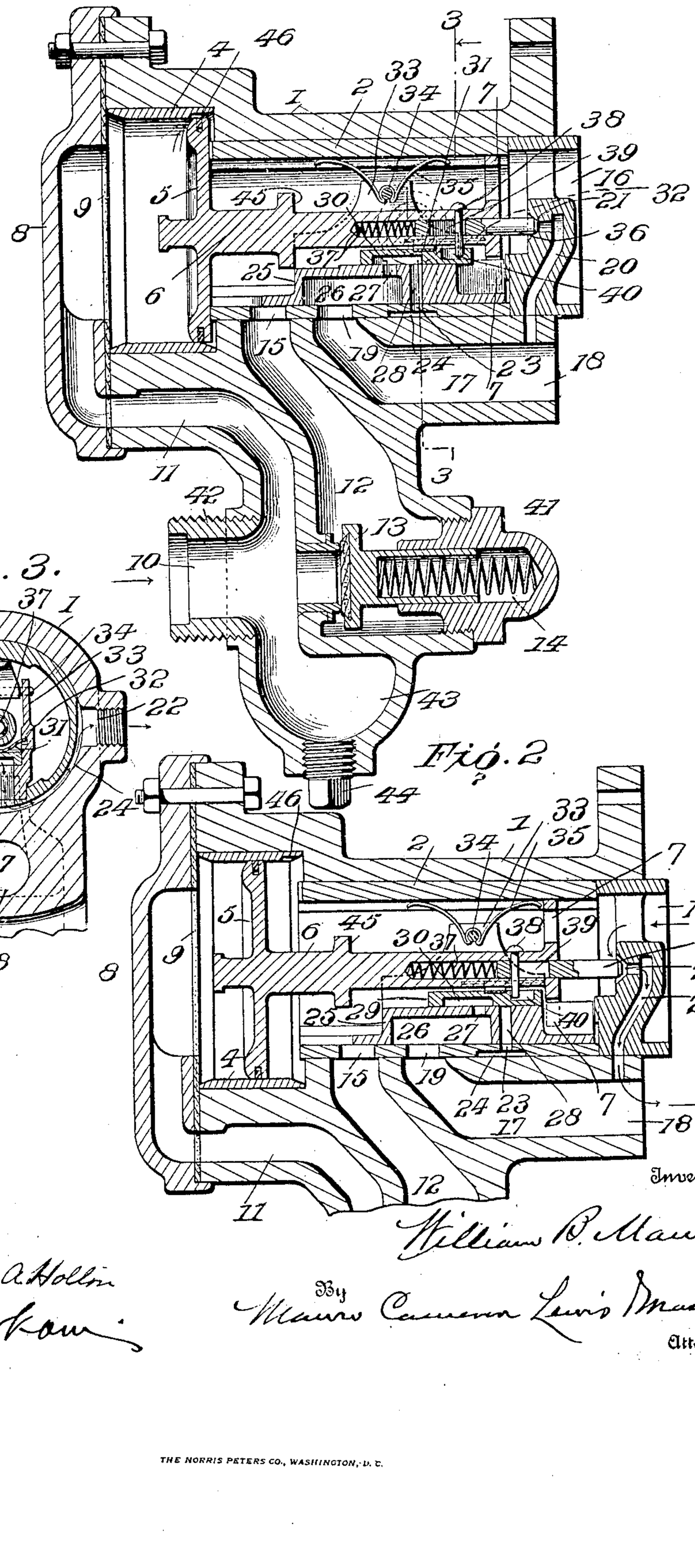

Fig. 3.

Fig. 2.

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2 SHEETS—SHEET 2.

Fig. 4.

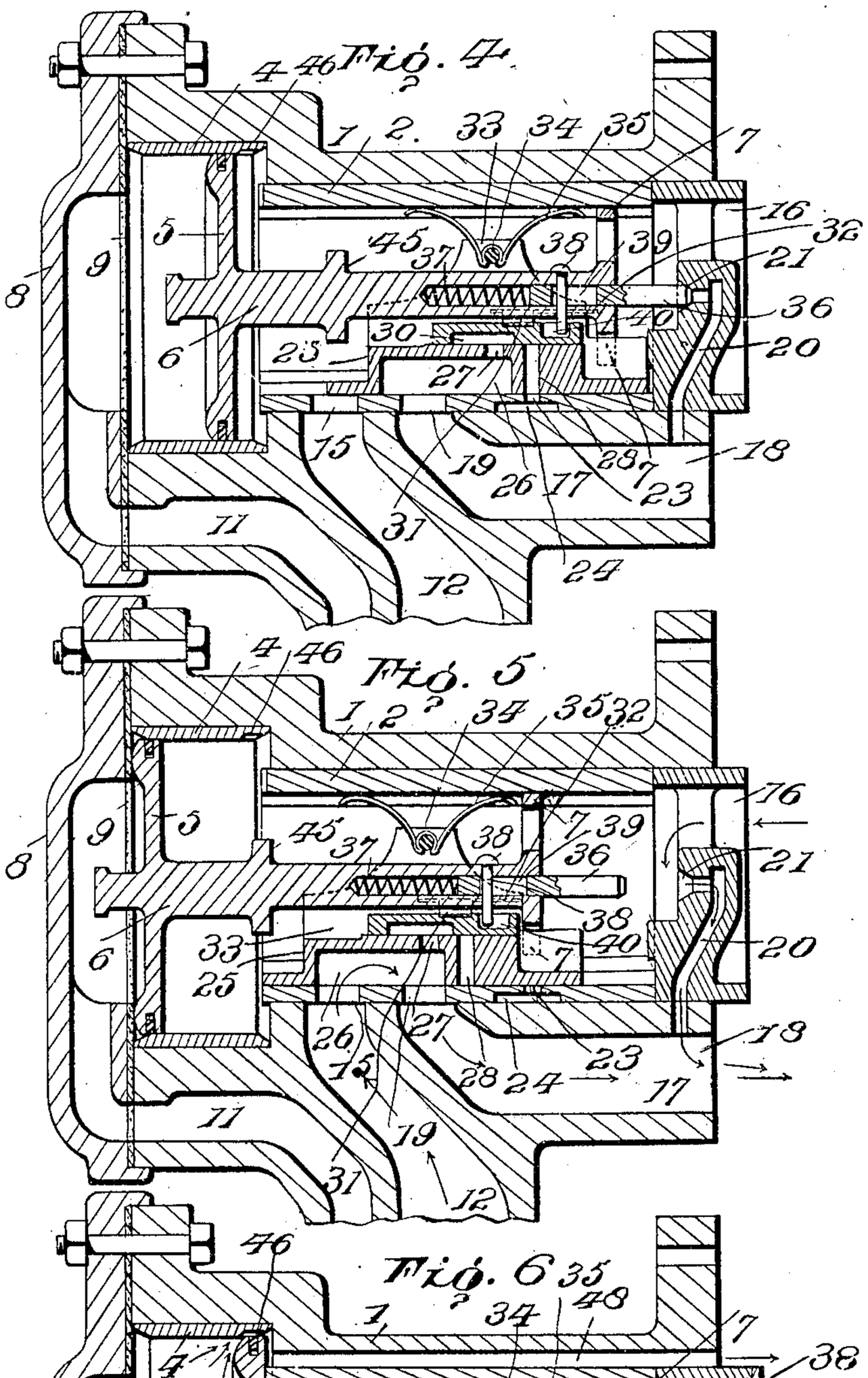

Fig. 5

Fig. 6

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WILLIAM B. MANN, OF BALTIMORE, MARYLAND.

SENSITIVE TRIPLE VALVE.

No. 869,637. Specification of Letters Patent. Patented Oct. 29, 1907.

Application filed December 16, 1905. Serial No. 292,111.

To all whom it may concern:

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

This invention relates to triple valves for air-brakes and has for its object to produce a valve of this class which shall efficiently control the passage of air from the train-pipe to the auxiliary reservoir, from the auxiliary reservoir to the brake cylinder, and from the brake cylinder to the atmosphere, and shall at the same time be absolutely interchangeable or work in conjunction with the standard air-brakes now employed upon railroads of the United States.

A further object is to produce a valve of the character indicated which shall be readily operated for service and graduating purposes by small variations of air pressure in the train-pipe; *i. e.*, a valve which is of a sensitive character and will readily and accurately respond to variations of train-pipe pressure.

In standard triple valves as heretofore constructed a valve-operating piston is employed having a partial traverse for service and graduating applications of the brakes, and a full or further traverse for emergency applications, and the throw of the piston upon the partial traverse has been limited or controlled by a spring-pressed abutment on the train-pipe side of the valve-operating piston. Besides involving additional expense and complication of construction, this spring-pressed abutment is objectionable because it has been found in practice that it is liable to get out of order and to more or less affect the efficiency of the valve as a whole.

The present invention has for a further object the elimination of this spring-pressed abutment and a construction whereby the partial traverse of the piston may be efficiently limited without the addition of any element outside of the regular valve mechanism.

With these objects in view the invention consists of a triple valve casing having a main valve, an exhaust valve acting in conjunction therewith and controlling the venting of the brake cylinder, and a graduating valve independent of said main and exhaust valves and controlling the passage of the air from the auxiliary reservoir to the brake cylinder, said exhaust valve and graduating valve having movement independent of the main valve, and the graduating valve being capable of movement independent of the exhaust valve for graduating purposes. The main valve is one of considerable size and presents a considerable surface to the pressure of the air in the valve casing, tending to hold it quite firmly to its seat when the auxiliary reservoir is charged, and its inertia is such that upon reductions of train-pipe pressure for service or graduated applications, it will serve to arrest the valve-operating piston at the proper limit of its partial traverse for such applications, but will enable it to readily respond to the movements of the valve-operated piston upon emergency applications of the brakes at which time the main valve, the exhaust valve and the graduating valve are all shifted from exhaust to full emergency position by said piston.

When quick re-charging from the train-pipe to the auxiliary reservoir is desired, the construction of the valve casing and arrangement of ports therein is substantially the same as that shown in my U. S. Patent No. 650,017, dated May 17, 1900, in which an always-open-one-way passage is provided around the valve-operating piston so that upon release of the brakes air instantly passes through the valve casing to the auxiliary reservoir to charge said reservoir very nearly to train-pipe pressure. If, on the other hand, slow charging of the auxiliary reservoir is desired, the usual leak-in port around the piston is provided, which port communicates with a passage independent of the valve chamber and leading directly to the auxiliary reservoir.

As herein shown, the valve is what is known as a "quick action" triple valve, *i. e.*, one in which the quick serial venting of the train-pipe is accomplished by permitting air to pass directly from the train-pipe to the brake cylinder upon an emergency application of the brakes, the air in such instances passing through the main valve on its way from the train-pipe to the brake cylinder, in substantially the manner shown in my patent aforesaid. Certain features of the valve, however, are applicable to triple valves which are not provided with emergency features.

It will be understood that the inventive idea involved is capable of receiving a great variety of mechanical expressions, one of which, for the purpose of illustration, is shown in the accompanying drawings, in which

Figure 1 is a vertical central section showing the parts in release position, the construction being that employed for quick re-charging of the auxiliary reservoir; Fig. 2 is a like section with the parts in position to permit air to pass from the auxiliary reservoir to the brake cylinder for service application; Fig. 3 is a vertical transverse section on the dotted line 3—3 of Fig. 1; Fig. 4 is a view similar to Fig. 2, except that the graduating valve is seated so as to prevent the further passage of air from the auxiliary reservoir to the brake cylinder. This is the position employed for holding a desired braking pressure in the brake cylinder when the train is going down grades, and in like operations; Fig. 5 is a central vertical section showing parts in emergency position; and Fig. 6 is a view similar to Fig. 1 with the parts in exhaust or charging position, showing the construction employed when slow charging of the auxiliary reservoir is desired.

Referring to Figs. 1–5 of the drawings, in which like numerals indicate like parts, 1 is the valve casing

within which for facility of construction there is preferably arranged a sleeve or lining 2, the interior of which constitutes the valve chamber proper. One end of casing 1 is somewhat enlarged and is preferably provided with a sleeve or lining 4 constituting the cylinder of the valve-operating piston 5, which piston is provided with a stem 6 extending through a greater portion of the length of the valve chamber, and having on the end opposite the piston 5 a spider 7. The end of the piston cylinder and valve casing or casting proper is closed by a head 8 bolted or otherwise secured to the end of the valve casing, and provided with a suitable packing 9 to make the joint between the parts air-tight. The train-pipe port 10 is connected to the piston cylinder 4 by a passage 11, and it is also connected to the valve chamber by a passage 12 controlled by a valve 13 opening toward the valve chamber and normally held to its seat by a spring 14. The passage 12 communicates with the valve chamber through a large port 15 and said chamber is in open communication with the auxiliary reservoir through a large unobstructed port 16.

There is provided in the metal of the casing or casting 1 a passage 17 which at 18 leads to the brake cylinder and is in communication with the valve chamber through a large port 19. There is also provided in the metal of the casing or in the bushing inserted therein, as may be desired, a restricted passage 20 leading from the interior of the valve chamber to the passage 17 which is in open communication with the brake cylinder, said passage 20 being provided with a seat 21 for the graduating valve, as will be hereinafter described. The casing or casting 1 is provided with two atmosphere ports 22—22, one on each side and preferably in a horizontal plane passing through the axis of the valve chamber (see Fig. 3), and the sleeve 2 is provided with a port 23 on its lower side which communicates with a channel 24 cut in the exterior portion of the metal of the sleeve or bushing 2 and affording a passage from the port 23 to the atmosphere ports 22—22 in the casting or casing 1, all as will be readily understood from an inspection of Fig. 3. 25 is the main valve, provided with an elongated roomy channel 26 whose length is sufficient, when the parts are in emergency position, to connect ports 15 and 19, as will be shown from an inspection of Fig. 5.

Leading from the channel 26 through the metal constituting the upper wall of said channel is a port 27, clearly shown in Fig. 2. There is also a port 28 leading from the interior of the valve chamber through the main valve 25 and registering with the vent port 23 when the main valve is in the position which it occupies for exhaust, or during the service and graduated applications of the brakes. Seated upon the main valve 25 is an exhaust valve 29 provided with a channel or passage 30 of such length that it connects the ports 27 and 28 when the parts are in exhaust position, said exhaust valve being preferably held to its seat upon the main valve by a light spring 31, Fig. 3, elliptical in shape and resting in a shallow channel in the top of the exhaust valve, and having its ends guided in grooves 32, Fig. 3, formed in the interior sides of the upwardly projecting wings 33 of the main valve, which wings support a cross-pin 34 which affords a bearing for a spring 35 reacting between said pin and the upper wall of the valve chamber, whereby said spring serves to hold the main valve to its seat when there is no air pressure in said valve chamber.

Mounted axially within the spider end of the valve stem 6 is a graduating valve 36 which valve is normally pressed outward towards its seat 21 by a spring 37. A pin 38 passes through the piston stem 6 and through a slot 39 in the graduating valve, thereby connecting said valve to the piston stem while at the same time permitting relative movement between said valve and stem. For the purpose of connecting the piston stem 6 to the exhaust valve 29 a lug projects downward from said stem into an elongated groove 40 cut in the top of said exhaust valve. Preferably this lug is in the form of the projecting end of the pin 38 so that the same element serves to connect the graduating valve and the exhaust valve to the piston stem 6.

It will be observed that the entire opening through the casing 1 which affords the space for the valve chamber and the piston cylinder has a common axis, and this affords ready means for machining of parts in the course of manufacture. The valve 13 is preferably constructed to be carried and held in position by a nut 41 connected by screw-threads to the depending portions of the casing 1, such connections being in axial alinement with the port connecting the passage 12 to the train-pipe. The train-pipe might be directly connected by a screw-thread or other coupling with the metal of the casing, but in order to facilitate construction and provide for ready repairs, a sleeve 42, screw-threaded on its exterior, is screwed into the metal of the casing, leaving a portion of the screw-threaded sleeve projecting by means of which the pipe is coupled to the casing or casting. In case the threads on said sleeve become stripped, said sleeve may be readily removed and another one substituted; whereas, if said sleeve were integral with the casting a stripping of the threads would involve the necessity of providing an entire new casting. This sleeve and its screw-thread connection with the casting is in axial alinement with the nut 41 supporting the valve 13, and with the opening or port connecting the train-pipe and the passage 12 to the end that the whole may be readily machined.

In the extreme lower portion of the casting 1 there is provided a drip cup 43 for the collection of dirt and moisture which may accumulate in the valve, and the nut 44 closes the bottom of this cup and by removing this nut the accumulated dirt and moisture may be withdrawn.

In addition to the spider 7 upon the forward end of the valve stem, said stem is also provided with a shoulder 45 which, when the parts are in charging or exhaust position, as shown in Fig. 1, bears upon the rear shoulders of the wings 33 of the main valve. It will be seen that the distance between the spider 7 and the shoulders 45 is somewhat in excess of this distance between the rear and the forward shoulders on the wings 33 of the main valve, so that the stem 6 is capable of a certain amount of movement without moving the main valve.

Operation.—When it is desired to charge the auxiliary reservoir air is admitted to the train-pipe and, if the parts are not already in the position indicated in Fig. 1, air passes by way of passage 11 to the piston cylinder on the train-pipe side thereof and forces the piston from left to right in Fig. 1, thus throwing the parts

into the position shown in said figure. The train-pipe pressure acts to lift the valve 13 against the tension of its spring 14, and air rushes via passage 12, port 15, the valve chamber, and port 16 to the auxiliary reservoir, instantly charging said reservoir to very nearly train-pipe pressure, the difference between the train-pipe and auxiliary reservoir pressure being only that equal to the tension or power of the spring 14. Air then passes by way of the leak-in port 46 around the piston 5 and auxiliary reservoir until the pressure on opposite sides of the piston 5 becomes equalized. In this position, and at this time, the auxiliary reservoir is charged to train-pipe pressure, and the exhaust valve 36 is resting firmly on its seat 21, closing the passage between the auxiliary reservoir and the brake cylinder, and the latter is in open communication with the atmosphere via port 18, passage 17, port 19, channel 26, and port 27 in the main valve, channel 30 in the exhaust valve, port 28 in the main valve and port 23 and channel 24 in the sleeve or lining 2, and ports 22 leading to the atmosphere.

Service application.—To secure a service application of the brakes the train-pipe pressure is reduced slightly, say from 2 to 4 pounds, whereupon the superior pressure in the auxiliary reservoir and valve chamber causes the piston to move from right to left, as shown in Fig. 2, until the spider 7 impinges upon the shoulders at the right-hand ends of the wings 33 on the main valve, whereupon the inertia of the main valve interrupts the further movement of the piston. During this partial traverse of the piston, it moves at first without imparting movement to either the graduating valve or the exhaust valve, the former being held to its seat by its spring 27 and the latter remaining stationary by reason of the play which the pin 38 has in the groove 40. Before the pin 38 reaches the rear side of the groove 39 in the graduating valve the projecting end of said pin picks up the exhaust valve and shifts it from right to left, see Fig. 2, thereby closing the exhaust port 28 in the main valve and just after this is effected the pin 38 reaches the rear or left-hand end of the groove 39 in the graduating valve and withdraws said valve slightly from its seat. Immediately after the graduating valve has been lifted from its seat, the spider 7 strikes the shoulders on the main valve and the further traverse of the piston is arrested. In this position the communication between the brake cylinder and the atmosphere is closed, and air passes from the auxiliary reservoir, past the graduating valve, through the channel 20 to the brake cylinder, as shown by the arrows in Fig. 2. This passage of air continues until the pressure in the auxiliary reservoir falls slightly below that in the train-pipe, whereupon the piston moves a very slight distance towards the auxiliary reservoir, thus permitting the spring 37 to again force the graduating valve to its seat and interrupting the passage of air from the auxiliary reservoir to the brake cylinder. During this movement of the piston to permit the seating of the graduating valve, no movement is imparted to the exhaust valve, since the projecting end of the pin 38 moves in the groove 40 in said exhaust valve from the position shown in Fig. 2 to that shown in Fig. 4, in which latter figure parts are shown in the position where braking pressure of the desired amount has been permitted to pass to the auxiliary reservoir and is retained there without any increase of pressure, communication with the atmosphere being closed by the exhaust valve and communication from the auxiliary reservoir being closed by the graduating valve. Should it be desirable for any reason to further increase the pressure in the brake cylinder, the engineer slightly reduces the train-pipe pressure, when the valve-operating piston and the graduating valve will return from the position shown in Fig. 4 to that shown in Fig. 2. As soon as the pressure on opposite sides of the valve-operating piston again becomes equalized by the passage of air from the auxiliary reservoir to the brake cylinder, the parts will again move to the position shown in Fig. 4. This graduating operation may be continued until the pressures in the auxiliary reservoir and the brake cylinder become equalized.

Emergency application.—When an emergency application is desired the engineer makes a large reduction in train-pipe pressure, whereupon the valve-operating piston makes a full traverse from the position shown in Fig. 1, or the position shown in Fig. 2 or Fig. 4 as the case may be, to the position shown in Fig. 5, carrying the main valve with it. In this position the right-hand end of the main valve closes the exhaust port 27 and the channel 26 in said main valve connects the ports 15 and 19, whereupon the pressure of the air in the train-pipe lifts the valve 13 and air passes directly from the train-pipe to the brake cylinder via passage 12, port 15, channel 26, port 19 and passage 17, and air at the same time passes from the auxiliary reservoir via passage 20 to the brake cylinder, all as clearly indicated by the arrows in Fig. 5.

Referring to Fig. 6, 47 is a cap or screw plug which closes the auxiliary reservoir end of the valve chamber so that no air may pass from said chamber to the auxiliary reservoir, or vice versa, and 48 is a passage formed in the casing 1 leading from the auxiliary reservoir side of the piston 5 to the auxiliary reservoir. When the parts are in charging or release position, as shown in Fig. 6, the air passes through the leak-in port 46 around the piston 5 and via passage 48 direct to the auxiliary reservoir. Upon a reduction of train-pipe pressure the valve-operating piston shifts precisely as in the construction of Figs. 1–5, and air passes into the valve chamber from the auxiliary reservoir by way of passage 48. With the exception of the manner of charging the auxiliary reservoir, the construction and arrangement of the valves and other parts are the same as that described in connection with Figs. 1–5.

It will be observed that by placing all of the channels or portions of the casing which have to be machined in actual alinement that the machining is very much simplified. Furthermore, by casting the entire casing integral instead of in a plurality of parts, as heretofore, the drip cup and the attachment for the train-pipe to the casing is directly connected to the main valve casing without the necessity of any joint, and consequently without the necessity of packing. By this means the expense of making the joints and the leaks consequent upon the presence of such joints are avoided. Moreover, the abutment and the spring therefor heretofore employed for ar-

resting the valve-operating piston upon its partial traverse are entirely eliminated, and there is presented a valve whose simplicity and cheapness of construction are of a high order, and in which the parts may be readily and rapidly removed for cleaning, inspection and repairs.

What is claimed is:

1. In a 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 the atmosphere to release the brakes, an exhaust valve controlling the ventage from the brake cylinder through said main valve, and a graduating valve which controls the passage of air from the auxiliary reservoir to the brake cylinder independently of the main valve, with a triple-valve-operating piston having a partial traverse for service applications of the brakes, and a full or further traverse for emergency applications.

2. In a triple valve, the combination of a main valve which controls the venting of the train pipe for emergency applications of the brake, a graduating valve controlling the passage of air from the auxiliary reservoir to the brake-cylinder independent of the main valve, an exhaust valve which controls the passage of air from the brake-cylinder to the atmosphere, and a triple-valve-operating piston having a partial traverse for service applications of the brakes and a full or further traverse for emergency applications.

3. In a triple valve, the combination of a valve casing having ports leading to the train pipe, the auxiliary reservoir and the atmosphere and a plurality of ports leading to the brake cylinder, with a main valve through which air passes from one brake-cylinder port to the atmosphere port for exhaust and from the train-pipe port to the said brake cylinder port for emergency, a graduating valve independent of the main valve and controlling the other brake cylinder port, an exhaust valve controlling the brake-cylinder exhaust through the main valve, and a triple-valve-operating piston operably connected to all three of said valves.

4. In a triple valve, a valve casing having an open-one-way passage from the train pipe to the auxiliary reservoir when the parts are in release position, a main valve through which the brake cylinder is vented to the atmosphere, an exhaust valve controlling the ventage through the main valve, a graduating valve independent of the main valve, and a piston operably connected to all three of said valves.

5. In a triple valve, the combination of a main valve movable only on emergency application of the brakes, an exhaust valve and a graduating valve each movable on either service or emergency applications, said graduating valve being independent of the main valve, and a triple-valve-operating piston whose partial traverse is arrested by the inertia of the main valve for service applications but which makes a full or further traverse for emergency applications and carries the main valve with it.

6. In a triple valve, the combination of a main valve immovable except on emergency applications of the brakes and through which exhaust from the brake cylinder passes, an exhaust valve capable of movement independent of the main valve, and controlling the exhaust through the latter, a graduating valve capable of movement independent of the main and exhaust valve, and a triple-valve-operating piston in operative relation with all three of said valves.

7. In a triple valve, the combination of a cast valve casing having a triple valve-chamber and a piston cylinder in alinement, a triple valve and a piston in said chamber and cylinder respectively, a passage from said cylinder to the train pipe, a passage from said chamber to the train pipe, a valve controlling said last named passage, a nut or bushing seated in an opening in said casting and supporting said valve, and a train pipe port in alinement with said last named opening and the seat for said last mentioned valve.

8. In a 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 the atmosphere to release the brakes, an exhaust valve sliding on a seat on said main valve and controlling the exhaust from the brake cylinder, a valve-operating piston in operative relation with both of said valves but moving said exhaust valve relative to the main valve, and a graduating valve independent of the main valve and carried by said piston.

9. In a triple valve, the combination of a valve chamber having a train pipe port, a brake cylinder port and an exhaust port, with a main valve having a channel connecting the train pipe port and the brake cylinder port on emergency applications, and through which channel air passes from the brake cylinder port to the exhaust port upon release of the brakes, an exhaust valve controlling the passage of exhaust through said channel, and a valve operating piston in operative relation with both of said valves but moving the main valve only on emergency applications.

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

WILLIAM B. MANN.

Witnesses:
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