No. 803,815. PATENTED NOV. 7, 1905.

F. H. DUKESMITH.

AIR BRAKE SYSTEM.

APPLICATION FILED MAY 6, 1905.

2 SHEETS—SHEET 1.

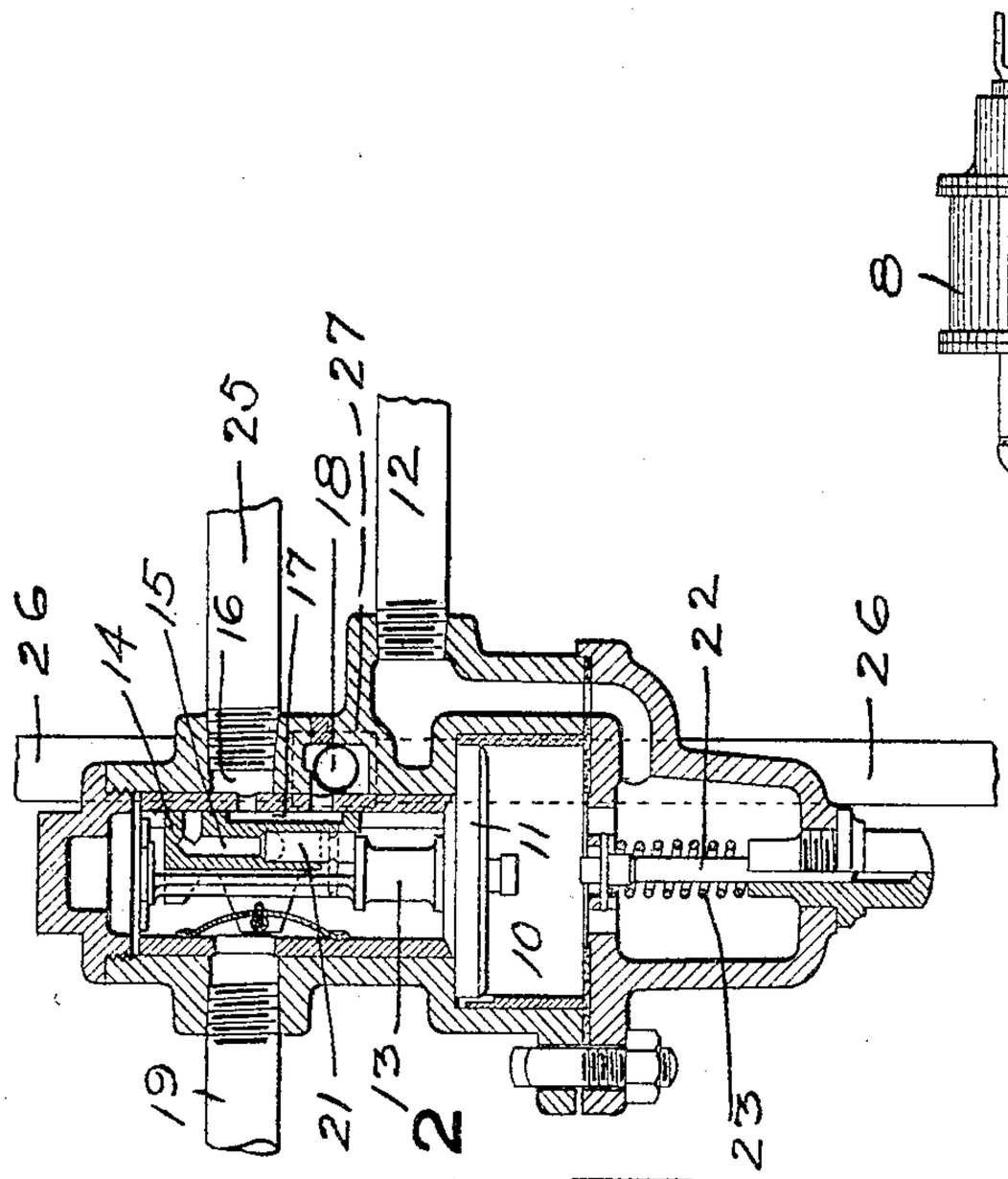

FIG. 2.

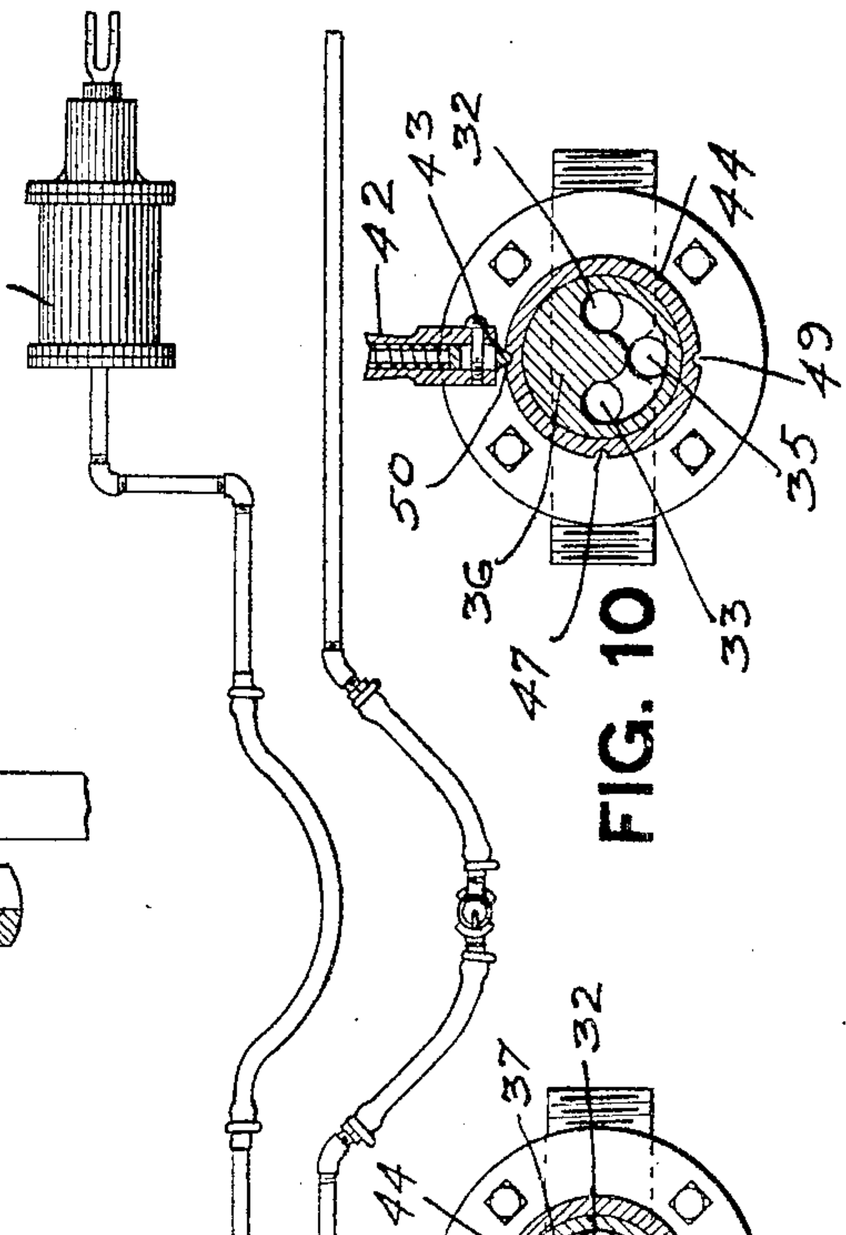

FIG. 10

FIG. 1

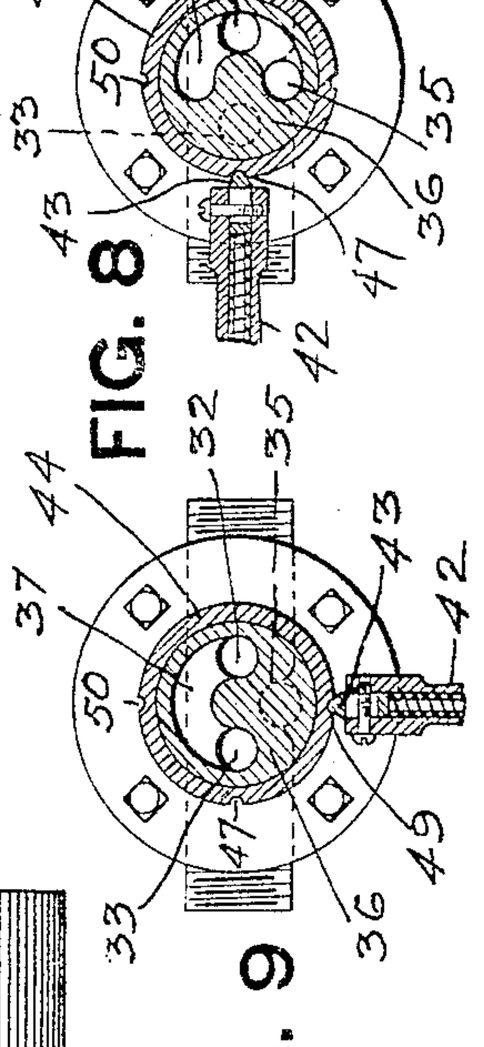

FIG. 8

FIG. 9

WITNESSES.

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2 SHEETS—SHEET 2.

FIG. 3

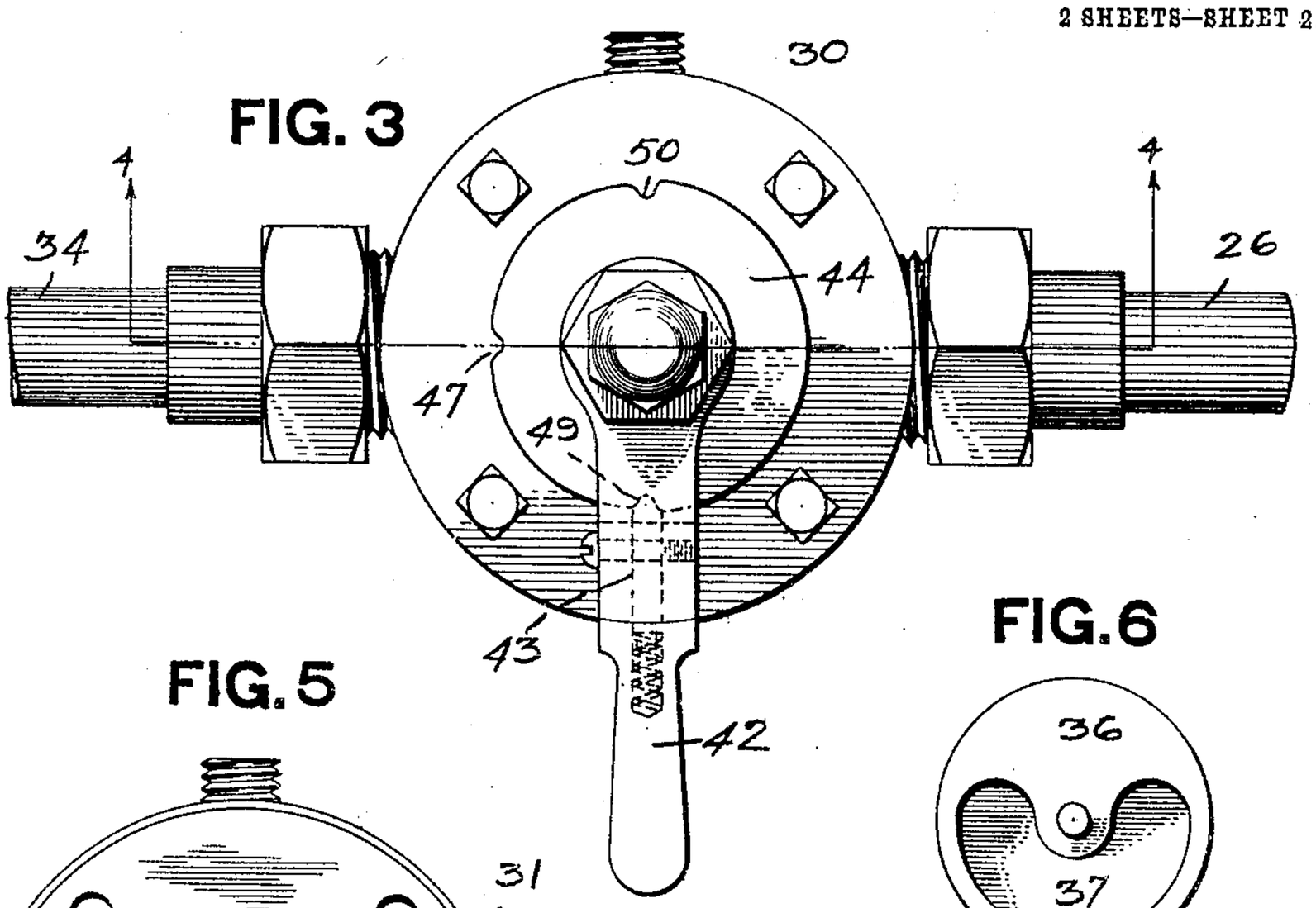


FIG. 5

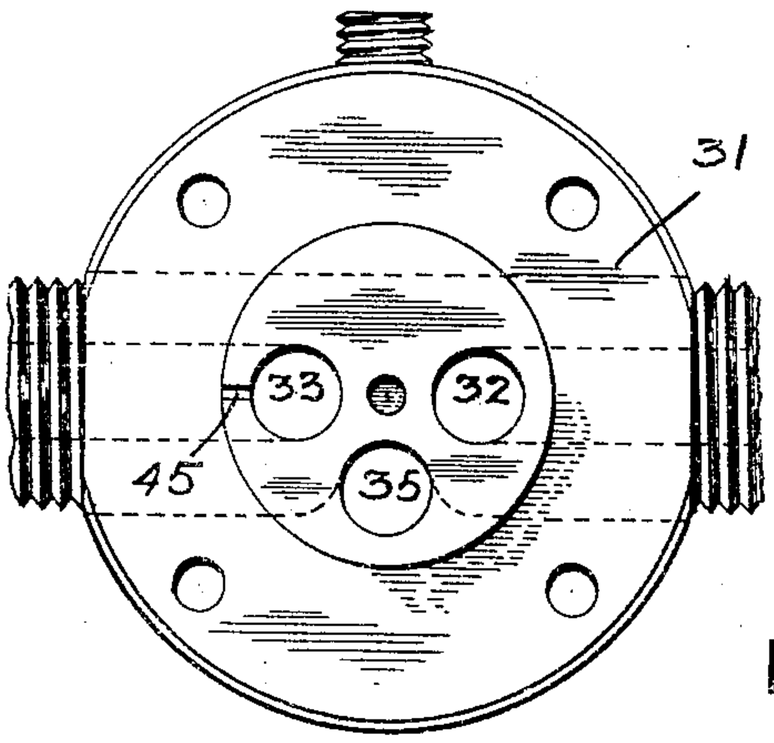


FIG. 6

FIG. 7

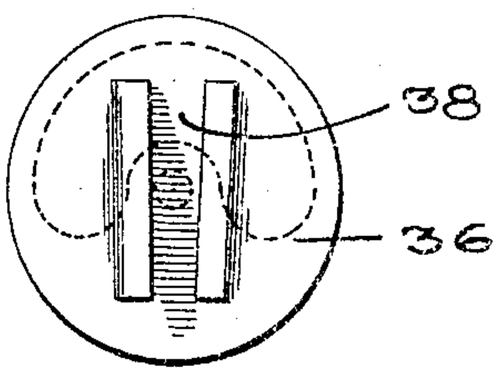
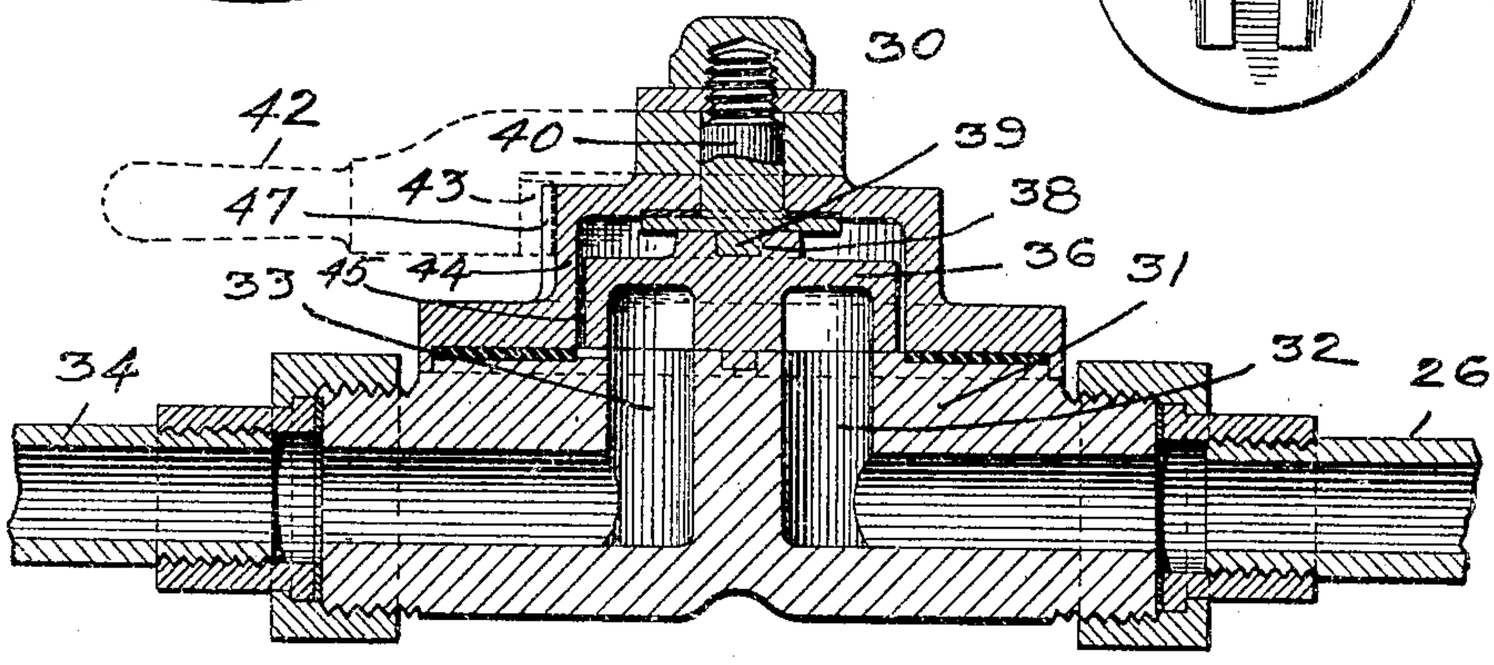


FIG. 4



WITNESSES.

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FRANK H. DUKESMITH, OF MEADVILLE, PENNSYLVANIA.

AIR-BRAKE SYSTEM.

No. 803,815. Specification of Letters Patent. Patented Nov. 7, 1905.

Application filed May 6, 1905. Serial No. 259,180.

To all whom it may concern:

Be it known that I, FRANK H. DUKESMITH, a resident of Meadville, in the county of Crawford and State of Pennsylvania, have invented a new and useful Improvement in Air-Brake Systems; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to air-brake systems for railway-cars; and its object, generally stated, is to provide a system wherein the engineer may control the locomotive driver and tender brakes separately from the train-brakes or in unison therewith, as may be desired.

A further object is to provide an air-brake system in which the usual triple valve for the locomotive-tender-brake cylinder is dispensed with, thus overcoming the annoyance from freezing and clogging, due to the condensation of the moisture in the compressed air and accumulation of dirt, &c., which ordinarily gathers at the tender triple valve.

A further object of the invention is to provide an air-brake system in which the engineer can at all times ascertain the condition and efficiency of the brakes on the locomotive and increase said efficiency, if necessary.

One of the defects of existing air-brake systems is the lack of independent control by the engineer of the locomotive-brakes and train-brakes. This defect gives rise to many serious conditions and results in much damage, such as pulled-out draw-heads, strained draft mechanism, jolting of the train, breaking apart of the train, or the sliding and heating of the driver-tires.

In bringing a train to a stop with the most improved automatic air-brake systems now in use the locomotive-driver brakes are applied simultaneously with the train-brakes, and if the application continues for a considerable period of time there is danger of overheating the driver-tires or causing the same to slide or loosen. When either of the latter conditions occurs, it is desirable to release the driver-brakes. With present systems, however, this cannot be done with the regular brake-valve without also releasing the train-brakes, and if the train should be descending a grade or in close proximity to obstructions on the track the train would get beyond control before the brakes can again be reapplied.

In going down long grades it is necessary to frequently recharge the train auxiliary reservoirs; but with existing systems this cannot be done without releasing all of the train-brakes, so that there is danger of the train getting beyond control of the engineer before the auxiliaries can be recharged and the brakes reapplied. In existing systems this is attempted to be overcome by providing pressure-retaining valves on each car, which, however, must be set by the brakeman before the train-brakes are released and after they are released or after the bottom of the grade is reached must be again turned down, so as to give the engineer control of the brakes on the entire train. These pressure-retaining valves are objectionable, as it makes it necessary to depend upon the trainman mentioned, whereas the ideal system should be so arranged that the entire control of the train even when going down long grades is in the hands of the engineer.

One of the objects of my invention is to overcome these defects and to provide a system wherein the locomotive-brakes can be either entirely or partially released while still holding the train-brakes, thus preventing overheating, loosening, or sliding of the locomotive-driver tires, or whereby the train-brakes may be released while still holding the locomotive-brakes, thus giving the engineer absolute control of his train in going down grades and enabling him to recharge the train auxiliary reservoirs without liability of the train getting beyond control. Good brakes on the locomotive and tender are equal to the brake-power on from six to ten cars.

Another defect with existing systems is due to the fact that after a train has been slowed up and the brakes are released those on the forward end of the train release sooner than those on the rear, this being due to the serial or successive operation of the triple valves from the front to the rear of the train. This results in giving a jerk to the train, not only jolting and damaging merchandise and passengers, but also imposing a severe strain on the draft mechanism, frequently pulling out the draw-heads or otherwise breaking the train in two, the latter being due to the fact that the rear end of the train is held by the brakes which are still applied, while on the front end the brakes are released. By my system of independent control of the locomotive-brakes it is possible to retain the brakes on the locomotive while the train-brakes are released, thus causing the slack of the train to bunch on the locomotive, and as soon as the brakes for the entire length of the train

have been released the locomotive-brakes can be released, thus overcoming the jolt to passengers and merchandise which usually occurs with the existing systems and entirely obviating any tendency to strain the draft mechanism or pull the train in two.

With all air-brake systems the compressed air when it leaves the pump is at a comparatively high temperature, and as it expands and cools the moisture contained therein is condensed and precipitated. This condensation, together with the dust in the air, will clog at the first enlargement in the train-pipe back of the locomotive, which in existing systems is the triple valve of the tender. As a consequence much difficulty is experienced with tender triple valves. In cold weather the condensation and dirt freezes and entirely stops the operation of the valve. To avoid this trouble, a drip-bag is placed in the train-pipe on the tender.

Another improvement in my system consists in dispensing entirely with the tender triple valve and so arranging the parts that the tender-cylinder is controlled from the same triple valve as the driver-cylinders. As a consequence the condensation taking place in the train-pipe is collected at the usual bulb or drip-cup in advance of the triple valve of the first car of the train or at the rear of the tender, thus preventing the liability of freezing and otherwise clogging the triple valves of the train.

A further object of my invention is to provide a signal device for the driver-brakes by means of which the engineer is at all times informed as to the condition of the driver-brakes, so that he can either increase the efficiency when deficient, or at least will be informed of the deficiency and will, therefore, not depend on those brakes.

To the accomplishment of the foregoing improvements, my invention consists in the arrangement of parts, as hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a diagrammatic view showing my improved arrangement of air-brake mechanism. Fig. 2 is a sectional view of the triple valve. Fig. 3 is a plan view of the driver-brake-controlling valve. Fig. 4 is a vertical section therethrough. Fig. 5 is a plan view of the valve-seat. Fig. 6 is a bottom view of the valve. Fig. 7 is a top view of the same; and Figs. 8, 9, and 10 are sectional views of the valve, showing the different positions thereof.

In my system the present arrangement on the individual cars need not be altered, and consequently I have shown only so much of the apparatus as is located on the locomotive and tender.

In the drawings I have shown my invention applied to a standard Westinghouse air-brake system, this being the one most extensively in use; but my invention is equally applicable to any other automatic system, and I wish it understood that the specific illustration and description is not to impose any limitations on the terms of the claims hereinafter made.

In the drawings the main reservoir is shown at 1, with a pump connection at 2. This main reservoir is connected, by means of a pipe 3, with an engineer's valve 4, which is shown as the standard type of Westinghouse engineer's valve, and which is provided with the usual operating-handle 5, by means of which the brakes can be set either for full service, graduated service, or emergency application, as is now the practice with the most approved systems. Inasmuch as there are known to those skilled in the art a number of engineer's valves which will accomplish these purposes, I have not deemed it necessary to specifically illustrate the same. This engineer's valve is connected to the usual train-pipe 6, which runs throughout the length of the train and which is connected on each car to the usual triple valve and through the latter with an auxiliary reservoir and brake-cylinder. All of this part of the system will be understood without further illustration or description.

The locomotive-driver cylinders are indicated at 7, one on each side of the locomotive, as is now the practice. The tender-brake cylinder is indicated at 8. Both the driver and tender cylinders are controlled from the same triple valve, the latter being shown at 9 and being illustrated in Fig. 2 as of the standard Westinghouse type, such as now used for controlling driver-brakes. As is well known, this triple valve comprises a chamber 10, in which works the triple-valve piston 11, the outer end of said chamber being connected to the train-pipe by a connection 12. The piston-stem 13 carries the usual slide-valve 14, having a port 15 for connecting the valve-chamber to the brake-cylinder connection 16, and also having a recess 17 for putting said brake-cylinder connection into communication with the exhaust-port 18. The valve-chamber is provided with a connection 19, which communicates with the locomotive auxiliary reservoir 20, which is of sufficient size to supply three brake-cylinders. This triple valve will be provided with the usual graduating-valve 21, graduating-stem 22, and graduating-spring 23, all as are common with standard triple valves. The mode of operation of this valve is identical with that of the standard Westinghouse triple valve and is well understood by those skilled in the art. In my improved system this triple valve serves to control both the driver and tender brake-cylinders, and in the drawings the connection 16 is shown connected to the driver-brake cylinders by means of a pipe 25, while the tender-brake cylinder has connected thereto a pipe 26, which is connected by means of a branch 27 with the exhaust-port 18 of the triple valve.

In order to control the tender and driver

brakes independently of the train-brakes, I provide a driver-brake-control valve, (shown at 30.) This valve may be of various forms, and, in fact, might be an ordinary three-way cock. It is provided with a casing having therein a valve-seat 31, provided with three ports. One port 32 is connected to the pipe 26, leading to the triple-valve exhaust and tender-brake cylinder, a second port 33 is connected, by means of a pipe 34, with the driver-brake cylinders, while the third port 35 leads to the atmosphere. Mounted on this seat is a rotary valve 36, provided with a recess 37, by means of which the ports 32 and 33 can be put in communication with each other or the port 32 or either or both ports 32 and 33 put in communication with the exhaust-port 35. This valve 36 may be operated in any desirable way, and, as shown in the drawings, it is provided with a seat 38 for receiving a rib 39 on a valve-stem 40, which passes out through a suitable packed opening in the upper side of the casing and to which stem is connected an actuating-handle 42. This handle is provided with a yielding pawl or detent 43, which coöperates with a notched disk 44, held stationary relative to the valve-casing and which indicates the different positions of the lever 42 and the valve connected thereto. A port 45 leads from one of the main ports 32 or 33 to the chamber above the valve 36, so that pressure may be admitted to the upper face to hold it to its seat. This controlling-valve will be placed in close proximity to the ordinary engineer's valve, so that the engineer may conveniently operate both of said valves. This valve is intended to have three positions, which may be designated as follows: First, triple-valve-release position, (shown in Fig. 8,) in which the position of the lever-detent will be in the notch 47, and the recess 37 of the valve will connect the port 32 with the exhaust-port 35. When in this position the exhaust-port of the triple valve, when the latter is in release position, will be open to the atmosphere, and the engineer can control the brakes of the entire train, including the driver-brakes, in the usual way by properly manipulating the handle 5 of the engineer's valve. Second, lap position, (shown in Fig. 9,) in which position the lever-detent will rest in the notch 49, and the recess 37 will connect the ports 32 and 33, while the port 35 will be lapped or closed. When the controlling-valve is in this position and the train-pipe reduction is made, the brakes on the entire train will be applied in the usual way, including the driver-brakes, as well as the tender-brakes. In this position the driver-brake cylinders will be supplied with air from the auxiliary reservoir 20 through the triple valve 9 in the usual way, and as the controlling-valve connects ports 33 and 32 this pressure will pass, by means of the pipe 34, through the valve 9 and pipe 26 into the tender-brake cylinder 8, thus applying the latter as well as the driver-brake cylinders. In this position of the controlling-valve the engineer has independent control of his train and locomotive brakes. Should he desire to release the locomotive-brakes without releasing the train-brakes, which he would want to do in case of slipping or overheating of the driver-tires, or in case of bursting of the hose, he will move the lever 42 to the third position—namely, cylinder-release position, (shown in Fig. 10.) in which position the lever-detent is in the notch 50, and the recess 37 in the valve 36 connects both the ports 32 and 33 with the exhaust-port 35. The pressure from both the driver-brake cylinder 7 and tender-brake cylinder 8 will then escape directly to the atmosphere, thus releasing the driver and tender brakes, but holding all of the other brakes on the train. When the driver-brakes are again to be applied, the lever 42 will be moved, so as to bring the valve back to lap position. When the valve is in lap position, the engineer is also enabled to release his train-brakes without releasing the tender or driver brakes. To do this, he will simply maintain the valve 36 at lap position and will then, through the usual engineer's valve, increase the train-pipe pressure in the usual way, so as to drive the triple-valve pistons to release position. This will release the brakes on the entire train except on the tender and locomotive. The triple valve 9 will also, of course, be driven to release position; but inasmuch as its exhaust-port is connected, by means of the pipe 27, to the pipe 26 and as the exhaust-port 35 in the controlling-valve is lapped the pressure from the tender and driver brake cylinders cannot escape. As a consequence the brakes on the locomotive and tender will be retained, while the brakes on the remainder of the train will be released. The engineer can therefore recharge the auxiliary reservoirs of the entire train, including the reservoir 20 on the locomotive, without danger of the train getting beyond his control. This operation will also, preferably, be made when bringing a train to a stop, thereby enabling the slack of the train to bunch up on the locomotive and preventing the jolting or jarring which occurs with ordinary brake systems. This operation will also be employed when slowing down a train and prior to releasing the brakes—that is, the train will be slowed down in the usual way with the controlling-valve 36 at lap, then when it is desired to again speed up by means of the engineer's valve the train-brakes will be released while still holding the locomotive-brakes with the controlling-valve, and the latter will be left on lap until all of the train-brakes are fully released, and then by moving said valve to either triple-valve-release position or cylinder-release position the driver and tender brakes will also be taken off. This will entirely do away with the danger of

straining the draft mechanism or pulling the train apart.

The usual running position of the valve 36 will be on lap, so that independent control of the locomotive and train brakes will be insured by the mere manipulation of the engineer's valve, and after the brakes have been set by the engineer's valve the releasing thereof by the engineer's valve will affect only the train-brakes, whereas by leaving the engineer's valve on lap position and operating the control-valve 36 the train-brakes can be retained while the tender and locomotive brakes are released, thus giving the engineer absolute control of the train under all conditions. If the engineer should desire to only partially set the locomotive-brakes while the train-brakes are fully set, he will leave the valve 36 on cylinder-release position while the first train-pipe reduction is being made, so that the first pressure entering the driver-brake cylinders will escape to the air. Then he will move the valve 36 to lap position and make a second reduction in train-pipe pressure, which second reduction will add to the pressure in the train-brake cylinders, while the only pressure retained in the driver-brake cylinders will be that which went in after the valve 36 had been placed on lap.

To provide for the direct application of pressure to the driver-brakes, I provide a connection 52 between the main-reservoir pipe 3 and the driver-brake cylinders. In this connection is the usual cut-off cock 53 for admitting air directly from the main reservoir to the brake-cylinders. I also preferably locate in said connection a pressure-reducing valve 54, which may be of any usual type, in order that the pressure in the brake-cylinders can be kept below that of the main reservoir. The direct application is made by momentarily opening the cock 53, the controlling-valve 36 meanwhile being on lap or triple-valve-release position. The brakes will be released by bringing the valve 36 to cylinder-release position.

To enable the engineer to know the condition of the locomotive-brakes, I connect to the driver-brake cylinders, and preferably to the pipe 34, a signal device 55. This may be of various forms, that shown in the drawings comprising a cylinder 56, connected to a branch pipe 57, leading from the pipe 34. In this cylinder is a piston 58, having a piston-rod 59, which projects above the upper end of the cylinder and serves to indicate the condition of the locomotive-brakes. A spring 60 normally holds the piston and piston-rod in depressed position and also resists the pressure in the brake-cylinders. This signal cylinder 56 is operated directly by the pressure in the driver-brake cylinders 7, and the piston-rod will be in plain view of the engineer at all times, so that he can tell the exact worth of his driver-brakes. If there is a leak in the cylinders 7, it will be indicated by a slow downward movement of the piston, while a leak from the auxiliary reservoir on the locomotive will be indicated by a quick drop of the piston. If the piston is raised high, it indicates a high pressure in the brake-cylinders, while a low piston indicates a low pressure in said cylinders.

It is the present practice to provide brake-cylinders with safety-valves to relieve the cylinders of excessive pressures. These safety-valves, as is well known, are held seated against cylinder-pressure by means of a spring and are located directly on the cylinders. As a consequence they are liable to be opened by a rush or surge of air even when the pressure on the brake-cylinder is considerably below that to which the valve is adjusted, thus wasting the air. I avoid this by providing an automatic relief-valve operated by the signal device. To this end I make the piston 58 and piston-rod 59 hollow and placing in the upper end of the latter a valve 62, held to its seat by a spring 63 and having a stem 64 projecting beyond the end of the piston-rod. In the path of this valve-stem is a stationary stop or lug 65, against which the valve-stem 64 will strike when the piston is projected to its maximum. In practice the spring 60 is graduated to the pressure to be held in the brake-cylinders. Should this pressure be exceeded, the piston will be projected to such an extent that the valve-stem 64 will strike the stop 65, thus unseating the valve 62 and permitting the excess pressure to escape. As soon as this escapes the spring 60 will depress the piston and permit the valve 62 to seat. The valve 62 seats outwardly and is held seated by the pressure on the brake-cylinder. Hence it cannot be unseated by a sudden rush or surge of air. It cannot be opened until the spring 60 has been fully compressed, hence giving time for rushes or surges of air to equalize and preventing the opening of the valve until the pressure in the cylinder has actually reached the amount to which the spring is graduated. If the driver-brakes should stick for any reason due to the lack of operation of the triple valve, they can be released by bringing the valve 36 to cylinder-release position. By means of this signal device, therefore, the engineer will be at once advised of any defect in his locomotive-brakes, so that he can either remedy the defect, or at least will not depend upon these brakes.

What I claim is—

1. In an air-brake system, the combination of a main reservoir, a driver-brake cylinder, a tender-brake cylinder, a triple valve connected to both of said cylinders, a train-pipe connected to said triple valve, an engineer's valve connecting the train-pipe and main

reservoir, and a driver-brake-control valve arranged to connect the driver-brake cylinder to the atmosphere.

2. In an air-brake system, the combination of a main reservoir, a driver-brake cylinder, a tender-brake cylinder, a triple valve connected to both of said cylinders, a train-pipe connected to said triple valve, an engineer's valve connecting the train-pipe and main reservoir, and a driver-brake-control valve connected to the exhaust from said triple valve.

3. In an air-brake system, the combination of a main reservoir, a driver-brake cylinder, a tender-brake cylinder, a triple valve connected to both of said cylinders, a train-pipe connected to the triple valve, an engineer's valve connecting the train-pipe and main reservoir, and a driver-brake-control valve connected to the exhaust from the triple valve and having connections to the driver-brake cylinder.

4. In an air-brake system, the combination of a main reservoir, a train-pipe, an engineer's valve connecting said reservoir and train-pipe, a driver-brake cylinder, a tender-brake cylinder, an auxiliary reservoir, a triple valve connecting the auxiliary reservoir and driver-brake cylinder, connections between the tender-brake cylinder and exhaust-port of the triple valve, and a driver-brake-control valve arranged to connect the exhaust-port of the triple valve with the atmosphere.

5. In an air-brake system, the combination of a main reservoir, a train-pipe, an engineer's valve connecting the main reservoir and train-pipe, a driver-brake cylinder, a tender-brake cylinder, an auxiliary reservoir, a triple valve connecting said auxiliary reservoir and said brake-cylinders, and a driver-brake-control valve connected to the exhaust-port of the triple valve and arranged to connect the said exhaust-port with the atmosphere or close the same.

6. In an air-brake system, the combination of a main reservoir, a train-pipe, a driver-brake cylinder, a tender-brake cylinder, an auxiliary reservoir, a triple valve connecting the auxiliary reservoir and said brake-cylinders, and driver-brake-control-valve mechanism connected to the exhaust-port of the triple valve and to the driver-brake cylinder and arranged to connect both the driver-brake cylinder and triple-valve-exhaust port with the atmosphere.

7. In an air-brake system, the combination of a main reservoir, a train-pipe, an engineer's valve connecting said main reservoir and train-pipe, a driver-brake cylinder, a tender-brake cylinder, an auxiliary reservoir, a triple valve connecting said auxiliary reservoir and driver-brake cylinder, and driver-brake-control-valve mechanism arranged to connect the driver-brake cylinder with the tender-brake cylinder, or either thereof with the atmosphere.

8. In an air-brake system, the combination of a main reservoir, a train-pipe, a driver-brake cylinder, a tender-brake cylinder, an auxiliary reservoir, a triple valve connecting said auxiliary reservoir and brake-cylinders, and driver-brake-control-valve mechanism arranged to connect the driver-brake cylinder with the triple-valve-exhaust port or both thereof with the atmosphere.

9. In an air-brake system, the combination of a main reservoir, a train-pipe, an engineer's valve connecting said main reservoir and train-pipe, a driver-brake cylinder, a tender-brake cylinder, an auxiliary reservoir, a triple valve connecting said auxiliary reservoir and driver-brake cylinder, connections between the tender-brake cylinder and the exhaust-port of the triple valve, and driver-brake-control-valve mechanism arranged to connect the driver-brake cylinder with the tender-brake cylinder, or either thereof with the atmosphere.

10. In an air-brake system, the combination of a main reservoir, a train-pipe, an engineer's valve connecting said main reservoir and train-pipe, a driver-brake cylinder, a tender-brake cylinder, an auxiliary reservoir, a triple valve connecting said auxiliary reservoir and driver-brake cylinder, connections between the tender-brake cylinder and the exhaust-port of the triple valve, and driver-brake-control-valve mechanism arranged to connect the driver-brake cylinder with the exhaust-port of the triple valve, or both thereof with the atmosphere.

11. In an air-brake system, the combination of a main reservoir, a train-pipe, an engineer's valve connecting said main reservoir and train-pipe, a driver-brake cylinder, a tender-brake cylinder, an auxiliary reservoir, a triple valve connecting the auxiliary reservoir and driver-brake cylinder, connections between the tender-brake cylinder and the exhaust-port of the triple valve, and driver-brake-control-valve mechanism arranged to connect said driver-brake cylinder and tender-brake cylinder, or connect the exhaust-port of the triple valve with the atmosphere.

12. In an air-brake system, the combination of a main reservoir, a driver-brake cylinder, a tender-brake cylinder, a triple valve connected to both of said cylinders, a train-pipe connected to the triple valve, an engineer's valve connecting the train-pipe and main reservoir, and a signal device connected to the driver-brake cylinder.

13. In an air-brake system, the combination of a main reservoir, a train-pipe, an engineer's valve connecting the main reservoir and train-pipe, a driver-brake cylinder, a tender-brake cylinder, an auxiliary reservoir, a triple valve connecting the auxiliary reservoir and driver-brake cylinder, connections between the tender-brake cylinder and the exhaust-port of the triple valve, driver-brake-control-valve mechanism arranged to connect the driver-brake cylinder with the tender-brake cylin-

der, or to connect the driver-brake cylinder with the atmosphere, and a signal device connected to the driver-brake cylinder.

14. In an air-brake system, the combination with the main reservoir, a train-pipe, an engineer's valve connecting the reservoir and train-pipe, a driver-brake cylinder, a tender-brake cylinder, an auxiliary reservoir, a triple valve connecting the auxiliary reservoir and driver-brake cylinder, driver-brake-control-valve mechanism connected to the brake-cylinder and to the exhaust from said triple valve, a direct air connection from the main reservoir to the driver-brake cylinder, and a valve in said connection.

15. In an air-brake system, the combination of a main reservoir, a train-pipe, an engineer's valve connecting said reservoir and train-pipe, a driver-brake cylinder, an auxiliary reservoir, a triple valve connecting said auxiliary reservoir and driver-brake cylinder, driver-brake-control-valve mechanism connected to the exhaust-port of said triple valve and to the driver-brake cylinder, a direct air connection from said main reservoir to the driver-brake cylinder, a pressure-reducing valve in said connection, and a valve in said connection.

16. In an air-brake system, the combination of a driver-brake cylinder, a relief-valve connected to the brake-cylinder and located in position to act as signal to the engineer, and means moved by the brake-cylinder pressure and serving on excess movement to cause the opening of said relief-valve.

17. In an air-brake system, the combination of a brake-cylinder, a cylinder and piston connected to said cylinder, and having its movable element provided with a relief-vent, a valve normally closing said vent, and a fixed stop in the path of said movable element and arranged on excess movement to open said valve.

18. In an air-brake system, the combination of a brake-cylinder, a cylinder connected thereto, a piston and hollow piston-rod in said cylinder, a valve arranged to close the opening in said hollow piston-rod, and having a projecting portion and a fixed stop in the path of said projecting portion and against which it will start on excessive movement.

In testimony whereof I, the said FRANK H. DUKESMITH, have hereunto set my hand.

FRANK H. DUKESMITH.

Witnesses:

F. W. WINTER,

ROBERT C. TOTTEN.