No. 803,746. PATENTED NOV. 7, 1905.

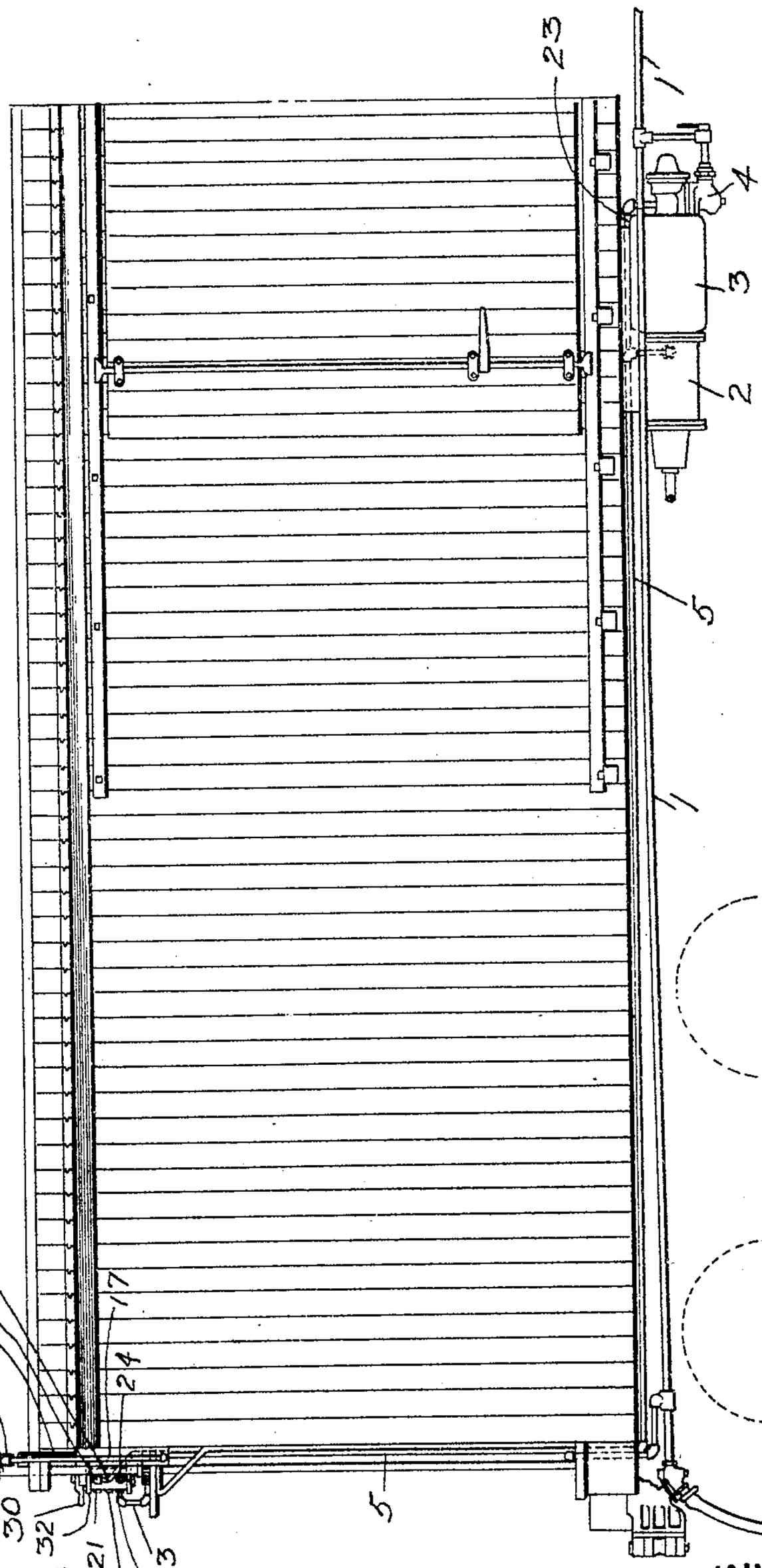
F. H. DUKESMITH.

AIR BRAKE RELEASE AND SIGNAL VALVE.

APPLICATION FILED MAY 6, 1905.

3 SHEETS—SHEET 1.

FIG. 1



WITNESSES.

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3 SHEETS—SHEET 2.

FIG. 2

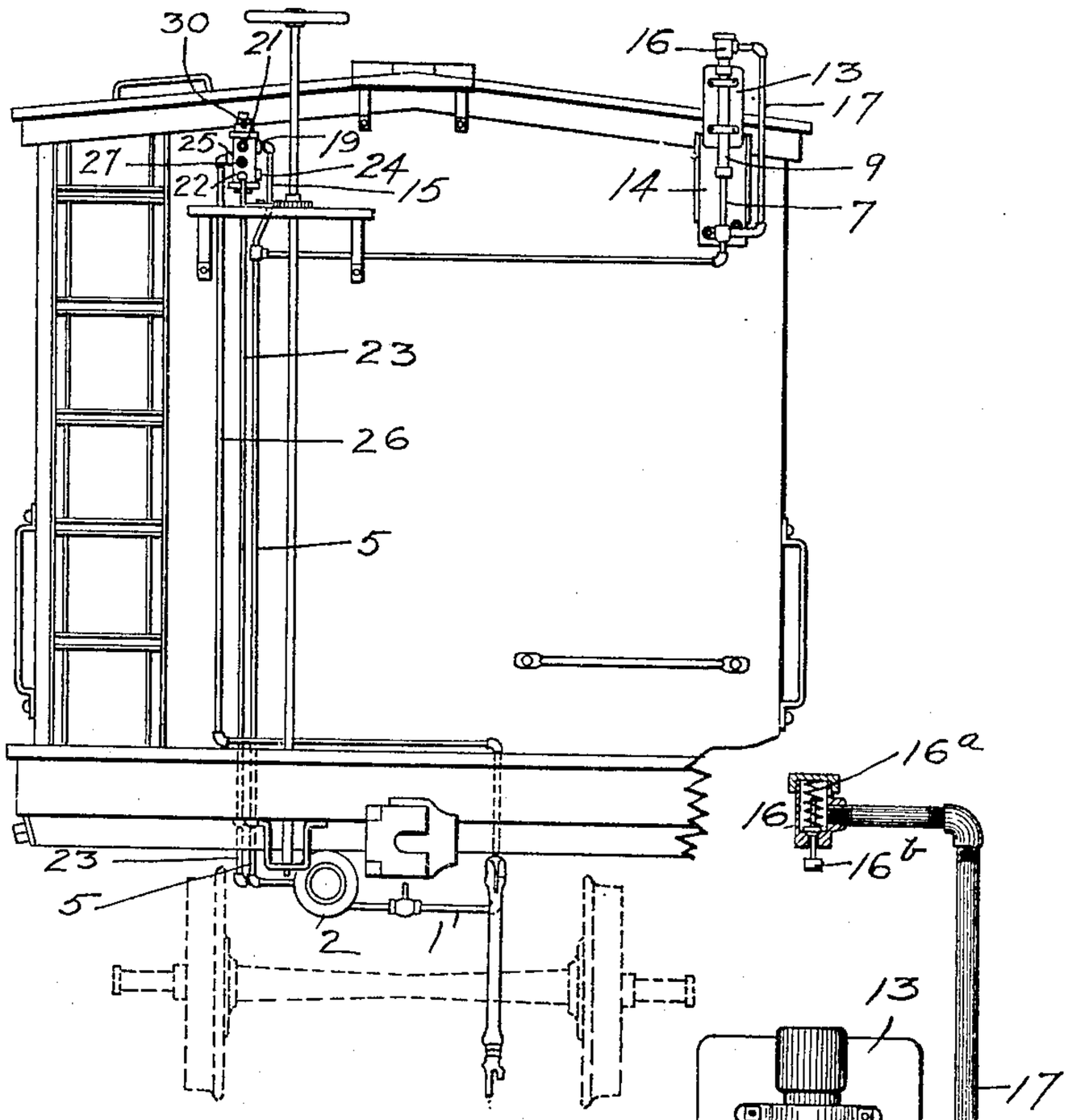
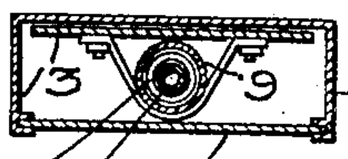


FIG. 9

FIG. 10



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AIR BRAKE RELEASE AND SIGNAL VALVE.

APPLICATION FILED MAY 6, 1905.

3 SHEETS—SHEET 3.

FIG. 3

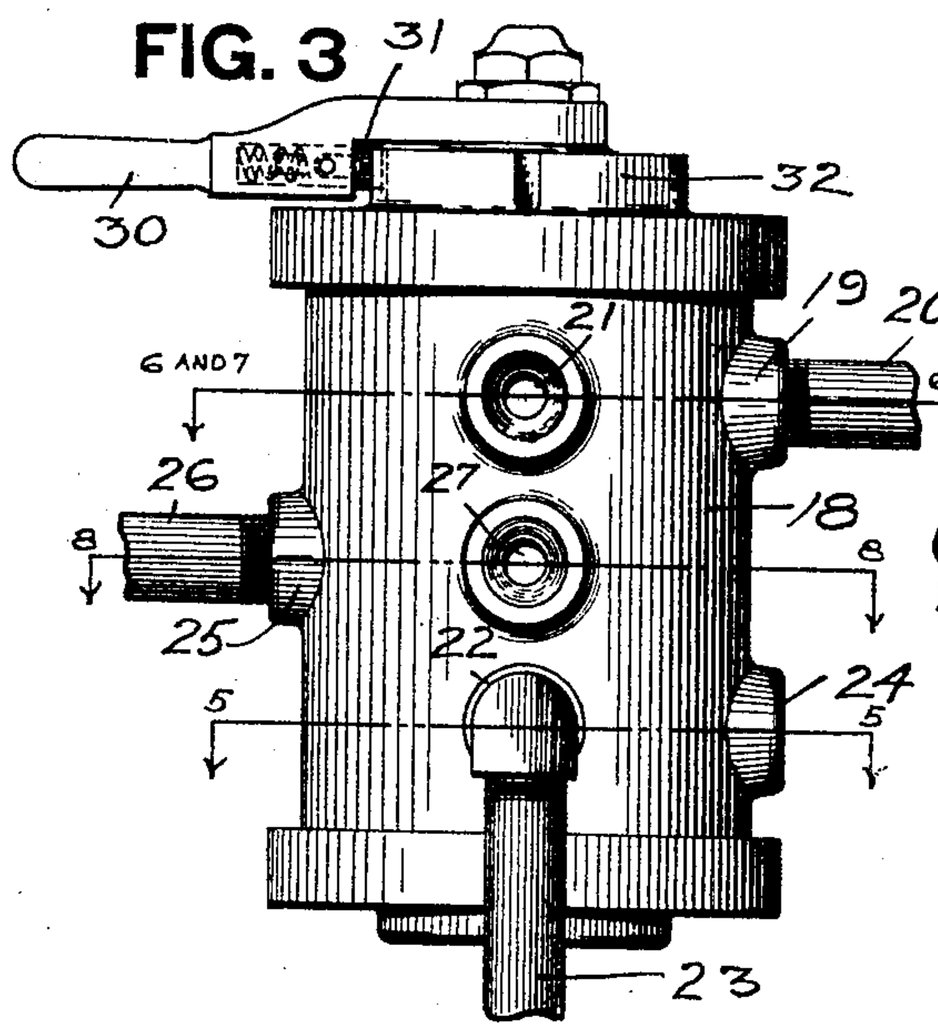


FIG. 4

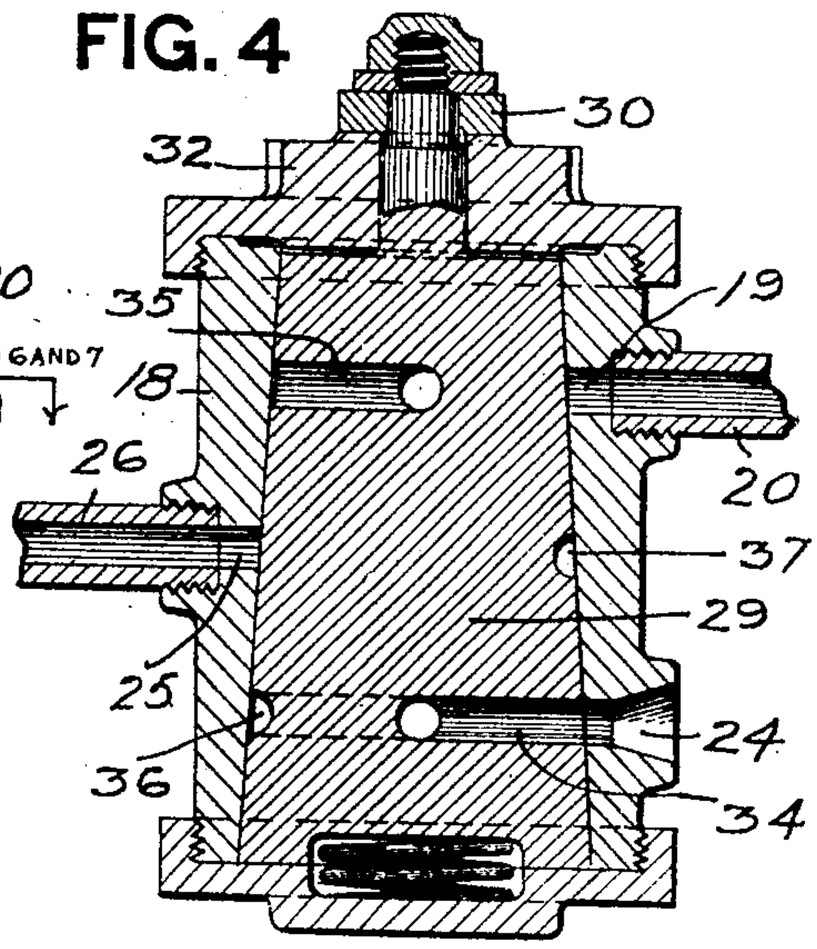


FIG. 5

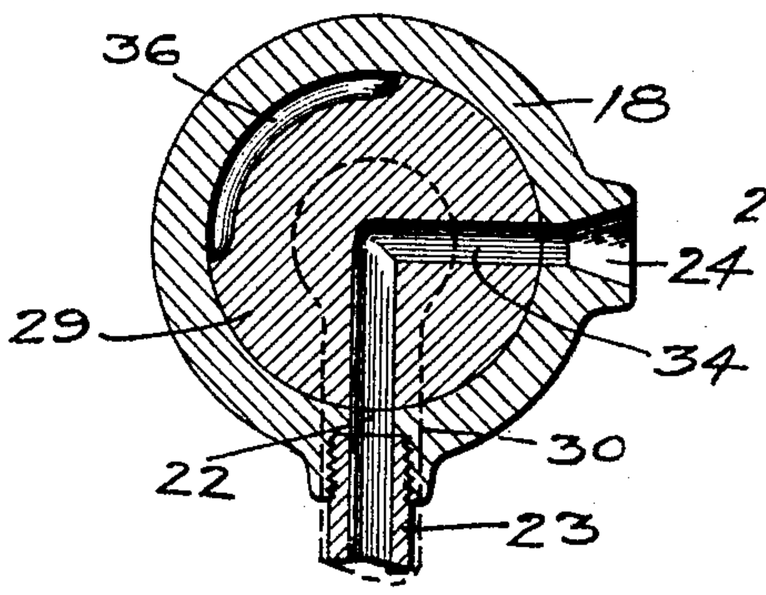


FIG. 6

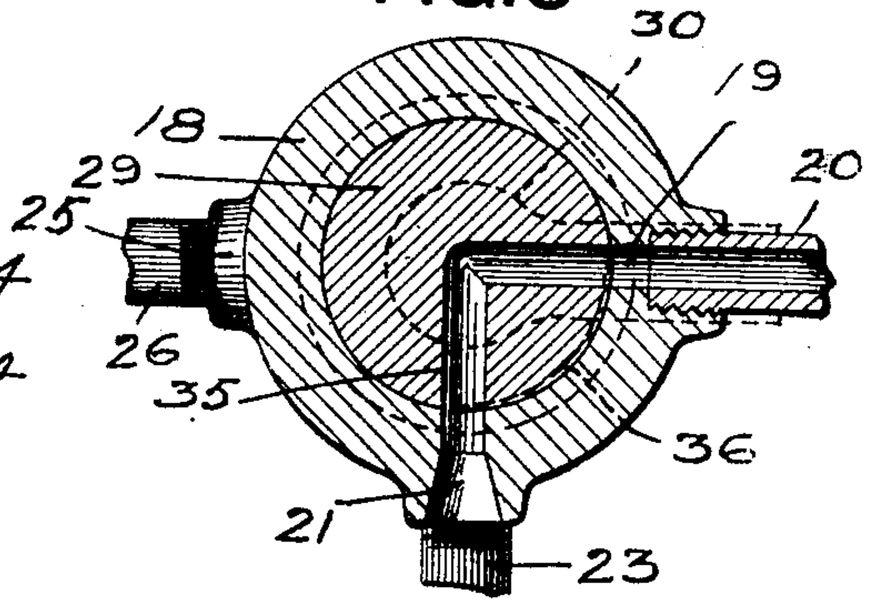


FIG. 7

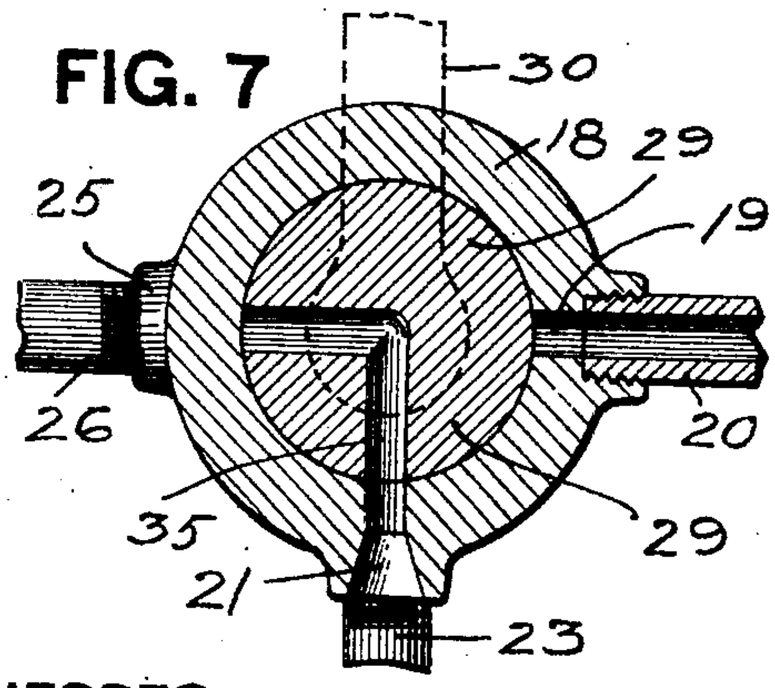
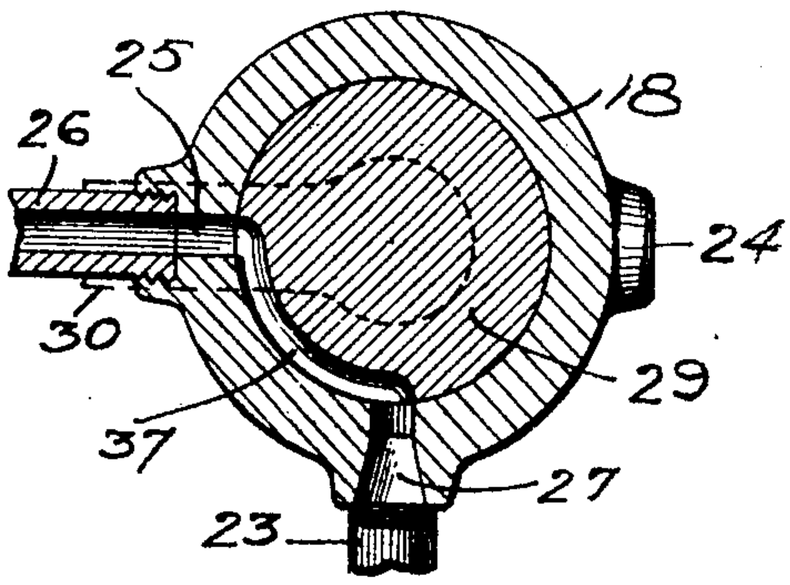


FIG. 8



WITNESSES.

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UNITED STATES PATENT OFFICE.

FRANK H. DUKESMITH, OF MEADVILLE, PENNSYLVANIA.

AIR-BRAKE RELEASE AND SIGNAL-VALVE.

No. 803,746. Specification of Letters Patent. Patented Nov. 7, 1905.

Application filed May 6, 1905. Serial No. 259,182.

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 Release and Signal Valves; and I do hereby declare the following to be a full, clear, and exact description thereof.

This invention relates to air-brake systems; and its object is to provide devices for indicating the condition of the brake-cylinders, for releasing said cylinders in case the triple valve should stick, for retaining the pressure in the brake-cylinders when the auxiliary reservoirs are being recharged, for enabling the conductor or other train-hand to set the brakes, and for automatically releasing excessive pressures.

This invention is in part an improvement upon the device shown in my Patent No. 712,915, granted November 4, 1902, and this part consists in details and arrangements of parts in order to provide a more compact and efficient signaling device.

Another part of the invention consists in a valve which will not only serve to release the pressure in the brake-cylinder when the signal indicates that the triple valve has stuck, but which will also serve as a pressure-retaining valve and as a conductor's valve whereby to set the brakes.

One purpose of this invention is to signal the train-crew when the brake on any car remains set for any cause, such as the failure of the triple valve to work or because of leakage in the train-pipe or elsewhere, which will cause the brakes to automatically set.

In automatic air-brake systems the brakes are set by means of air-pressure admitted to the brake-cylinders by the triple valve on a reduction of the train-pipe pressure. I take advantage of the pressure in the brake-cylinder when the brakes are set to operate the signal, which signal is so arranged that upon release of pressure in the brake-cylinder it will become invisible. Should it not become invisible, it is an indication that the triple valve has failed to work, and said signal therefore notifies the train-crew that the brakes are sticking, so that they can by means of a release-valve vent the air from the brake-cylinder without stopping the train. An unreleased brake necessarily retards the motion of the train, and if sufficient brakes remain set they may even stall the train or cause it to pull apart. In any event they cause the wheels to heat, and this may reach such a degree as to result in their bursting, thus wrecking the whole train. My signal and release device notifies the train-crew of any sticking brakes and provides means for releasing the same without stopping the train, so that all of these dangers are avoided.

In all air-brake systems valves are connected to the exhaust-port of the triple valves, by the closing of which the pressure in the brake-cylinders will be retained when recharging the auxiliary reservoirs, as becomes necessary when descending long grades. Other valves are provided on each car whereby the engineer or brakeman may reduce the pressure in the train-pipe in order to set the brakes independently of the engineer, as may become necessary in case of emergency or the occurrence of conditions beyond the knowledge or control of the engineer. Another purpose of this invention is to provide a single valve mechanism whereby not only the pressure in the brake-cylinders may be retained when necessary, but which will also serve as a conductor's valve whereby to set the brakes and will further serve, in conjunction with the signal, as the release-valve for the brake-cylinder.

In some air-brake systems relief or safety valves are provided on the brake-cylinders to relieve excessive pressure. These valves are held seated against cylinder-pressure by means of a spring. As a consequence they are liable to be opened by a rush or surge of air even when the pressure in the brake-cylinder is below that to which the valve is adjusted. Another part of my invention consists in an automatically-opening relief-valve connected to the brake-cylinder and so arranged that it is held seated by brake-cylinder pressure, means being provided which is movable by brake-cylinder pressure and so arranged that upon excess movement it will cause the opening of the relief-valve. This movable means will preferably be the signaling device.

In the accompanying drawings, Figure 1 is a side view of a portion of a freight-car, showing my invention applied thereto. Fig. 2 is an end view of the same. Fig. 3 is a side view of the combined release, retaining, and conductor's valve. Fig. 4 is a vertical section through the same. Figs. 5, 6, 7, and 8

are horizontal sections taken, respectively, on the lines 5 5, 6 6, 7 7, and 8 8, Fig. 3, and showing the different positions of the valve. Fig. 9 is an elevation of the signal device with a portion of the casing removed; and Fig. 10 is a horizontal section thereof on the line 10 10, Fig. 9.

The train-pipe is shown at 1, the brake-cylinder at 2, the auxiliary reservoir at 3, and the triple valve at 4, these being connected in the usual manner, so that the brakes will be automatically set by reductions in train-pipe pressure and automatically released by increase in train-pipe pressure, all as is common in automatic air-brake systems. The particular form of these parts illustrated is the standard type of Westinghouse freight-car equipment; but this has been selected for purposes of illustration merely, as my invention is equally applicable to any other type or form of automatic air-brake system.

Connected to the air end of the brake-cylinder—that is, the end at which the air is admitted in order to set the brakes—is a pipe 5, leading to the signal 6. The latter consists of a hollow stationary piston-rod 7, adapted at one end to be connected to the signal-pipe 5 and carrying on its opposite end the packing or piston proper, 8. Over this hollow piston is fitted a movable cylinder 9, provided at its lower end with a bushing 10, having an inwardly-projecting flange 11, surrounding the hollow piston-rod 7 and serving to prevent the cylinder from being forced off said piston. Coiled around the piston-rod and interposed between the flange of the bushing 10 and the piston 8 is a helical spring 12, which serves to return the cylinder to its normal position and which resists the air-pressure in said cylinder. Connected directly to this movable cylinder is the target 13, which will be of any suitable size and color. By making the piston stationary and cylinder movable and connecting the target directly to the cylinder the device is very much shorter and occupies less space vertically than in the arrangement shown in my prior patent. To protect the device from injury, the cylinder and target are inclosed in a suitable casing 14, which is provided on one side with a removable cover 14[a], whereby access can be had to the interior for repair and inspection. This casing is of sufficient height and size so that when the target and cylinder are depressed they are entirely concealed in said casing. When pressure is admitted to the brake-cylinder, it will pass through the pipe 5 to the single cylinder and will raise the target 13. The distance to which this target is raised will depend upon the pressure in the brake-cylinder, a high target indicating a high brake-cylinder pressure and a low target indicating a low brake-cylinder pressure. Consequently the target is an index of the efficiency of the brake-cylinder. Should the target gradually settle while the brakes are set, it indicates that there is a leak in the brake-cylinder and that therefore its efficiency is impaired, while a quick drop of the target indicates a leak in the auxiliary reservoir. In this manner the condition of the train-brakes will be known to the trainmen, and if the leak on any one car is very great that particular brake-cylinder may be cut out. The spring 12 is of such strength that for full-service application of the brakes the pressure will raise the target to its full height, whereas with a lesser reduction of train-pipe pressure the target will be only partially raised. The extent to which the target is raised, therefore, indicates to the engineer the amount of pressure carried in the brake-cylinders. Should the travel of the brake-piston be too great, it will result in a correspondingly lower pressure in the brake-cylinder, and this will be indicated by a correspondingly low raising of the target. This signal device will be placed on each car and may also be placed in the engine, so that the engineer will at all times be advised of the condition of all of the brakes on the train. If the target fails to drop when the brakes are released, it indicates that that particular triple valve has not operated, and in order to prevent the heating of the wheels and other difficulties above referred to the brake-cylinder will be released by hand. To permit this to be done conveniently and without stopping the train, I provide the signal-pipe 5 with a branch pipe 15, having therein a suitable release-valve, upon the opening of which the pressure in the brake-cylinder will be vented to the atmosphere, thus releasing the brakes and permitting the target to drop to invisible position. The release-valve may be any form of valve or cock and may, if desired, be in a branch pipe 17, leading from the lower end of the hollow piston-rod 7, as shown in Fig. 9. The release-valve shown in Fig. 9 is an ordinary puppet-valve seating outwardly and held to its seat by a spring 16[a] and also by the brake-cylinder pressure. It is provided with a projecting stem 16[b] and is located above the cylinder 9 in position to be unseated by said cylinder on excessive movement of the latter. The spring 12 is of such strength that under normal working pressures in the brake-cylinder the signal will not be elevated sufficiently to contact with the stem of the valve 16; but when excess pressure gets into the brake-cylinder the signal will be raised sufficiently to contact with the stem of the valve 16, thus unseating the latter and permitting the escape of the excess pressure. As soon as this escapes the spring 12 will lower the signal, thus permitting the valve to close. Since the valve 16 is held seated by brake-cylinder pressure, it cannot be unseated by surges or rushes of air, and since the spring 12 must be fully compressed before the valve is opened this

gives time for the surges to equalize and prevents the valve being opened until the pressure in the brake-cylinder has reached the maximum to which the spring 12 is graduated.

The projecting stem 16[b] of the valve 16 serves as a means for releasing the brake-cylinder pressure by hand. Any other hand-operated valve or cock will also answer this purpose. I prefer, however, to have a single valve which will not only serve as a release-valve, but also as a pressure-retaining valve and as a conductor's valve, and it is so shown in Figs. 1 to 8. In these figures the valve-casing is indicated at 18, having a port 19, connected, by means of a branch pipe 20, to the signal-pipe 5; a companion port 21, communicating with the atmosphere; a port 22, connected, by means of a pipe 23, with the exhaust-port of the triple valve; a companion port 24, communicating with the atmosphere; a port 25, connected, by means of a pipe 26, with the train-pipe, and a companion port 27, communicating with the atmosphere. In this casing is a suitable valve 29, which is shown in the form of a taper plug, but obviously may be of any other form. This is provided with a suitable operating-handle 30, carrying a spring-pressed detent 31, coöperating with the notched disk 32 for indicating the different positions of the valve. This valve is provided with a number of grooves or passages for effecting different connections of the several ports in the valve-casing, the particular valve shown having a passage 34, cored or bored out in its body and adapted to connect the ports 22 and 24 of the casing in one position of the valve; a groove or passage 35, bored or cored out in its body and adapted to connect the ports 19 and 21 in another position of the valve; a groove or passage 36, cut in the face of the valve and adapted to connect the ports 22 and 24 in the same position of the valve, and a groove or passage 37, bored or cored out in the body of the valve and adapted to connect the ports 25 and 27 in still another position of the valve. This valve is adapted to have four positions, as follows: First, normal or running position, this being indicated in Fig. 5, in which the plug-valve is so positioned that its groove or passage 34 connects the ports 22 and 24, thus maintaining the triple-valve exhaust-port open to the atmosphere. All of the other ports are closed or lapped in this position. When in this position, the air-brakes on the train may be set and released by the engineer's valve in the ordinary way and will not in any manner be affected by my controlling-valve, the only difference being that the exhaust from the brake-cylinder must first pass through the pipe 23 and this valve instead of being vented directly to the atmosphere. Second or brake-cylinder release position, (shown in Fig. 6:) Should the target fail to drop when the brakes are released after any application thereof, it indicates that the triple valve on that particular car has failed to operate, and that consequently the brakes are still applied on that car. The brakeman or other train-hand will then operate the valve 29 and place the same in the position shown in Fig. 6, in which the passage or groove 35 in the plug connects the ports 19 and 21, thus venting the brake-cylinder pressure to the atmosphere and releasing the brakes and permitting the signal to drop to invisible position. In this position of the valve it serves the same purpose as the release-valve 16. (Shown in Fig. 9.) In this position of the valve the groove 36 also connects the ports 22 and 24, so that should the triple valve go to release position a portion of the pressure from the brake-cylinder will be vented through this exhaust-port by means of the groove 36, thus getting a quick release of the brakes. Third or pressure-retaining position, (shown in Fig. 7:) In descending long grades it frequently becomes necessary to recharge the auxiliary reservoirs. As is well known, this cannot be done without forcing the triple valve to release position, thus releasing the brakes on the entire train. When it becomes necessary to recharge the auxiliary reservoirs under these conditions, the brakeman or other train-hand will place the plug-valve 29 in the position shown in Fig. 7, in which all of the ports in the casing are lapped or closed, so that when the triple valve is forced to release position by increase of train-pipe pressure the pressure in the brake-cylinder will be retained, thus holding the brakes while the auxiliary reservoir is being recharged. Fourth or emergency position, (indicated in Fig. 8,) in which the groove or passage 37 in the valve-plug 29 connects the ports 25 and 27, thus venting the train-pipe to the atmosphere and applying the brakes in the usual way. In this position the valve serves the function of the ordinary conductor's valve and gives him control of the car-brakes independently of the engineer.

In freight-car equipment the combination-valve described will preferably be located at the end of the car and slightly below the top thereof, so as to be protected to some extent, yet be easy of access for manipulation. It will be placed in its different positions by properly manipulating the handle 30. In passenger-cars the valve may be placed at the end of the car, and a cord running through the train will be connected to the handle, so that on pulling the cord it will throw the valve to the fourth or emergency position, thus enabling the conductor to set the brakes on the entire train by merely pulling on the train-cord.

The valve described serves not only, in conjunction with the signal, as a release-valve for the brake-cylinders to release the brakes in case of sticking of the triple valves, but also

takes the place of ordinary pressure-retaining valve and engineer's valve now commonly employed. The specific form of valve may be changed widely without departing from my invention, and, in fact, this valve mechanism might consist of a number of independent valves or cocks suitably connected so as to move in unison from a single operating-handle. All such modifications I wish to include within the scope of the claims herein made.

What I claim is—

1. In air-brake apparatus, the combination of a brake-cylinder and its triple valve, and controlling-valve mechanism having a connection with the brake-cylinder and with the triple-valve exhaust-port and arranged on one position to open the triple-valve exhaust-port to the atmosphere, in another position to open the brake-cylinder to the atmosphere, and in a third position to keep both closed.

2. In air-brake apparatus, the combination of a brake-cylinder and its triple valve, and a controlling-valve provided with a casing having one port connected to the triple-valve exhaust-port, another port connected to the brake-cylinder, and a valve in said casing arranged to connect either of said ports with the atmosphere or to keep both closed.

3. In air-brake apparatus, the combination of a brake-cylinder and its triple valve, of a signal-cylinder connected to said brake-cylinder, and controlling-valve mechanism connected to the brake-cylinder and to the triple-valve exhaust-port and arranged in one position to open the triple-valve exhaust-port to the atmosphere, in another position to open the brake-cylinder to the atmosphere, and in a third position to keep both closed.

4. In air-brake apparatus, the combination of a brake-cylinder and its triple valve, a signal-cylinder, a pipe connecting the same with the brake-cylinder, and a controlling-valve having a casing provided with one port connected to said signal-pipe and another port connected to the triple-valve exhaust-port, and a valve in said casing arranged to connect either of said ports with the atmosphere or keep both closed.

5. In air-brake apparatus, the combination of a train-pipe, a brake-cylinder and its triple valve, and controlling-valve mechanism having connections to said brake-cylinder and with said train-pipe and arranged in one position to connect the brake-cylinder to the atmosphere, in another position to connect the train-pipe to the atmosphere, and in a third position to keep both connections closed.

6. In air-brake apparatus, the combination of a train-pipe, a brake-cylinder and its triple valve, and controlling-valve mechanism having connection with the train-pipe and with the triple-valve exhaust-port and arranged in one position to connect the train-pipe to the atmosphere, in another position to connect the triple-valve exhaust-port with the atmosphere, and in a third position to keep both connections closed.

7. In air-brake apparatus, the combination of a train-pipe, a brake-cylinder and its triple valve, and controlling-valve mechanism having connection with the train-pipe, with the brake-cylinder and with the triple-valve exhaust-port, and arranged in one position to connect the train-pipe to the atmosphere and keep the other connections closed, in a second position to connect the brake-cylinder to the atmosphere and keep the train-pipe connection closed, in a third position to connect the triple-valve exhaust-port with the atmosphere and keep the other connections closed, and in a fourth position to keep all of said connections closed.

8. The combination with a brake-cylinder, of a signal including a hollow piston connected to the brake-cylinder, a cylinder movable thereon, and a signal operated by said movable cylinder.

9. The combination with a brake-cylinder, of a signal including a hollow piston connected to said brake-cylinder, a cylinder movable on said piston, and a target carried by said movable cylinder.

10. The combination with a brake-cylinder, of a signal arranged for operation by brake-cylinder pressure, a branch pipe from the signal-pipe, and a release-valve in said branch pipe.

11. The combination with a brake-cylinder, of a signal-cylinder, a signal operated by said cylinder, a pipe connecting the brake-cylinder and signal-cylinder, and a release-valve connected to said pipe.

12. An air-brake signal and release device, comprising a hollow piston arranged at one end for connection to a brake-cylinder, a cylinder fitting over the other end of said piston, a spring arranged to move said cylinder onto said piston, and a signal arranged to be operated by said cylinder.

13. An air-brake signal and release device, comprising a hollow piston arranged at one end for connection with a brake-cylinder, a cylinder fitting over the other end of said piston, and a target carried by said cylinder.

14. An air-brake signal and release device, comprising a cylinder arranged to be connected to said brake-cylinder, a target connected to said cylinder, and a casing in which said cylinder and target are housed.

15. An air-brake signal and release device, comprising a stationary hollow piston, a signal-pipe connected to said hollow piston, a movable cylinder, a target connected to said movable cylinder, a branch pipe from the signal-pipe, and a release-valve in said branch pipe.

16. In an air-brake system the combination of a brake-cylinder, a relief-valve connected to said cylinder, and means moved by brake-

cylinder pressure and arranged on excess movement to cause the automatic opening of the relief-valve.

17. In an air-brake system the combination of a brake-cylinder, a relief-valve connected to said cylinder, and a cylinder and piston connected to brake-cylinder and arranged on excessive movement to cause the automatic opening of the relief-valve.

18. In an air-brake system the combination of a brake-cylinder, a relief-valve connected to said cylinder and provided with a stem, and a cylinder and piston connected to the brake-cylinder and arranged on excessive pressure to contact with the relief-valve stem and open the same.

19. In an air-brake system the combination of a brake-cylinder, a relief-valve connected to said cylinder, a signal device arranged to be moved by brake-cylinder pressure and arranged upon excessive movement to cause the automatic opening of the relief-valve.

20. In an air-brake system the combination of a brake-cylinder, a relief-valve connected to said cylinder, and a signal cylinder and piston connected to the brake-cylinder and arranged on excessive pressure to cause the automatic opening of the relief-valve.

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

FRANK H. DUKESMITH.

Witnesses:

F. W. WINTER,

ROBERT C. TOTTEN.