(No Model.)

2 Sheets—Sheet 1.

H. R. MASON.

TRAIN SIGNALING APPARATUS.

No. 463,063. Patented Nov. 10, 1891.

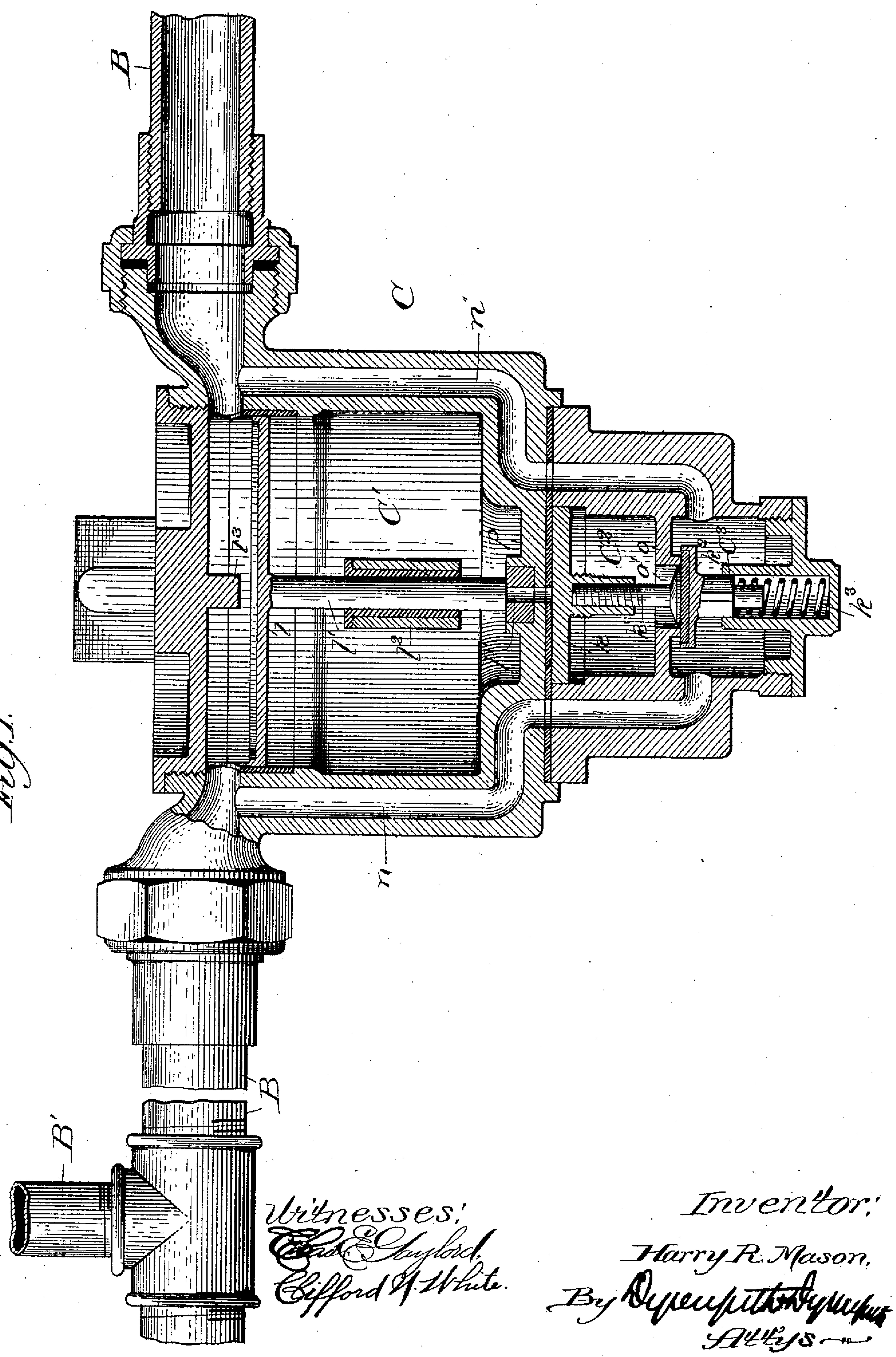

Fig. 1.

Witnesses:
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(No Model.) 2 Sheets—Sheet 2.

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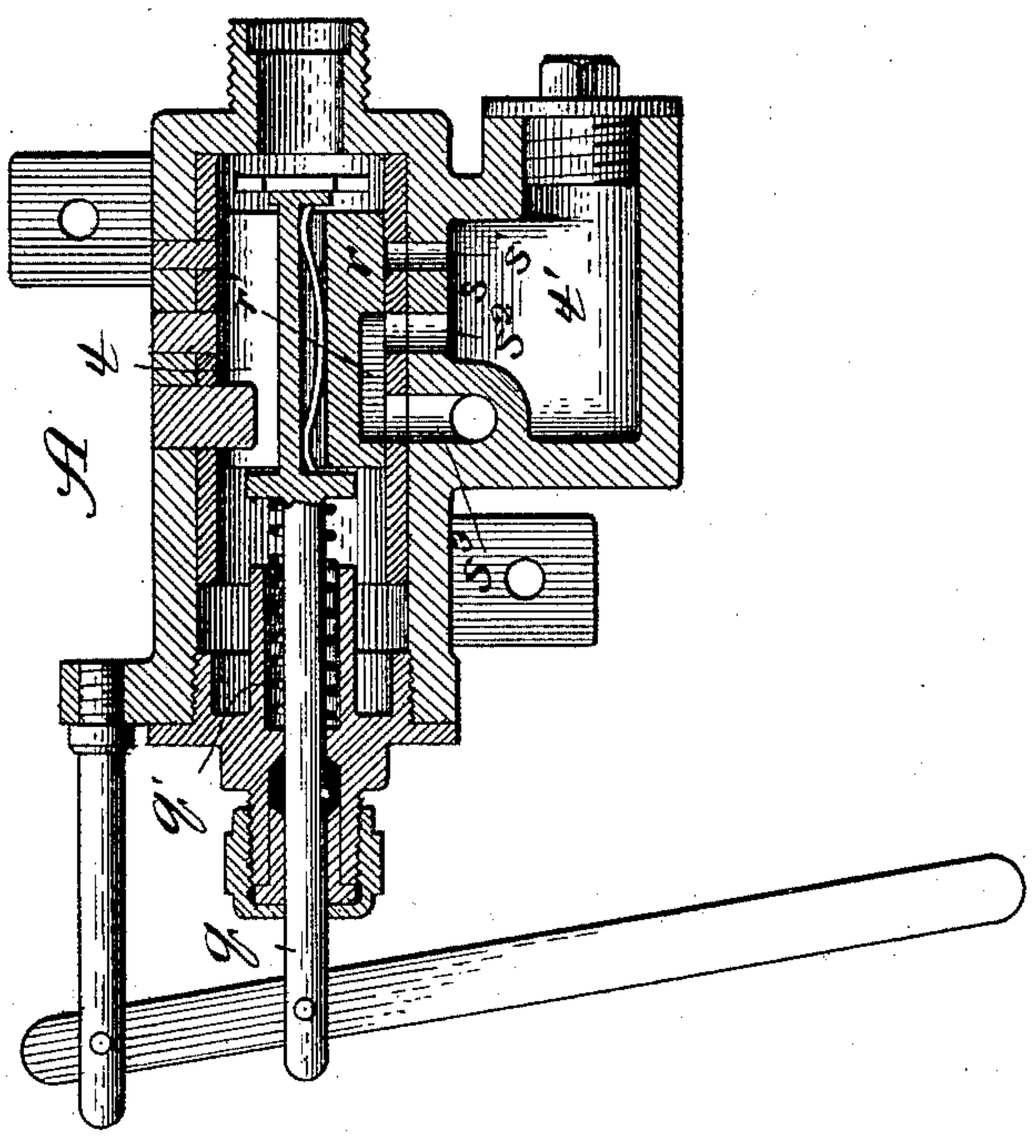

Fig. 3.

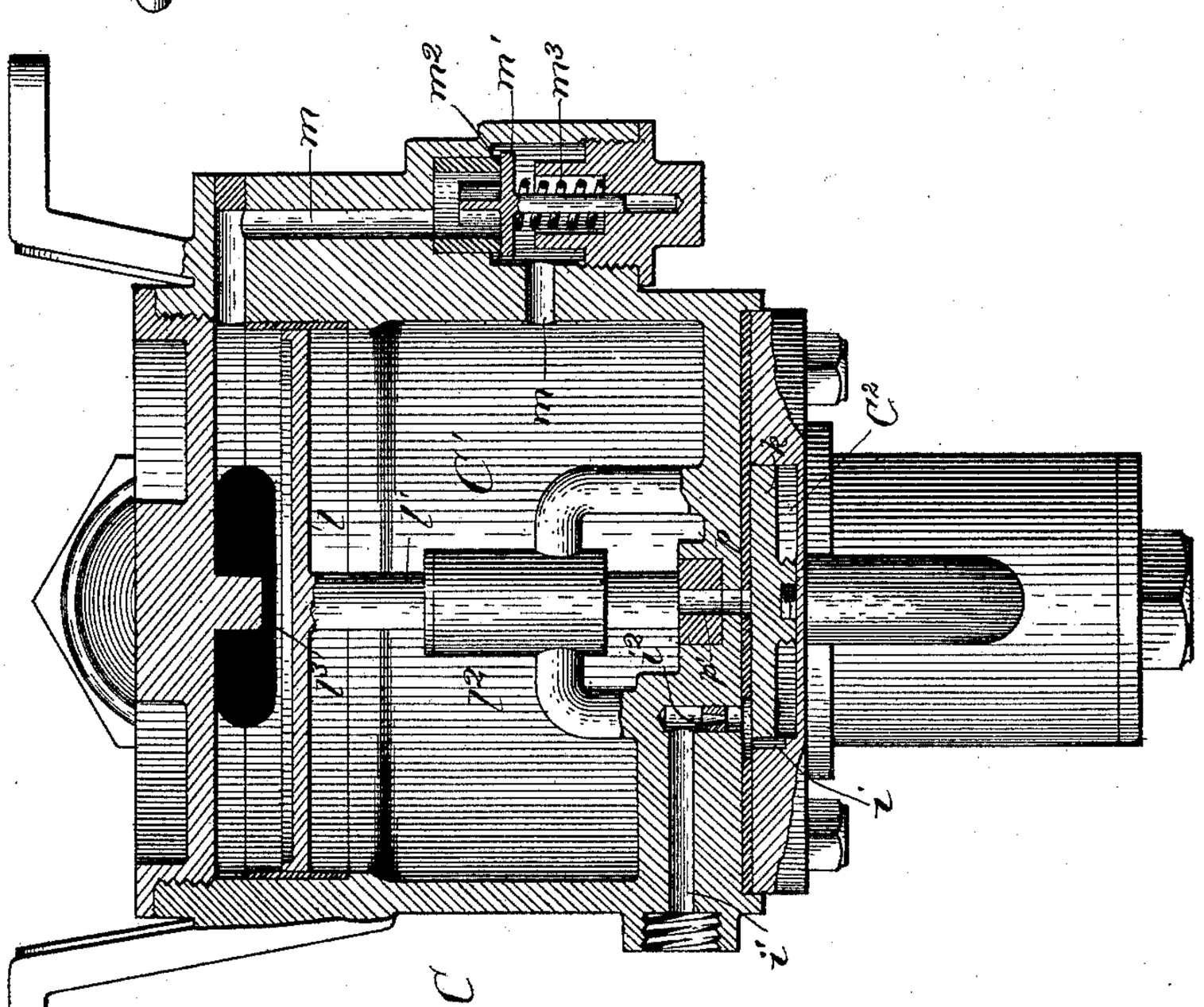

Fig. 2.

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UNITED STATES PATENT OFFICE.

HARRY R. MASON, OF CHICAGO, ILLINOIS.

TRAIN SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 463,063, dated November 10, 1891.

Application filed July 9, 1891. Serial No. 398,927. (No model.)

To all whom it may concern:

Be it known that I, HARRY R. MASON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Train Signaling Apparatus, of which the following is a specification.

My invention relates to improvements in train signaling apparatus for use upon railway-trains; and my object is to provide mechanism to supplement the train signaling mechanisms for which Letters Patent of the United States were granted to me April 14, 1891, and numbered, respectively, 450,333, 450,334, and 450,335. In the system to which the said patents relate, generally stated, a signal upon or near the engine-cab is actuated by a limited reduction of the air-pressure in the main train-pipe, which pipe also supplies the air-pressure to the auxiliary reservoirs which actuate the brakes, and this reduction of pressure is effected by the opening of a conductor's signaling-valve, which is constructed to vent only a limited degree of pressure from the train-pipe with each operation, the pressure thus vented being less than would be necessary to apply the brakes. In the use of my signaling apparatus described in those patents the conductor's signaling-valve was designed to vent from the train-pipe sufficient pressure to create an impulse which would be felt with sufficient force at the signal to actuate the latter, and while the conductor's signaling-valve shown and described in those patents answers all requirements where the train contains a limited number of cars—say nine or under—its action where a much greater number of cars are contained in the train is not so positive. It will be understood that to effect a given reduction of pressure in a long train of cars requires the venting of more air therefrom than for a fewer number of cars. Consequently to create an impulse at the rear end of a train of a large number of cars which will be felt to the required extent at the signal upon the locomotive an amount of pressure would have to be vented from the train-pipe which might apply the brakes, momentarily at least, at the rear end of the train. In my present invention I overcome this difficulty by providing along the train-pipe a series of propagating or repeating valves, which, when a conductor's signaling-valve is opened, will cause limited ventings of pressure from the train-pipe between the signaling-valve and signal to generate new impulses and cause the venting to be effected equally throughout the system.

In the drawings, which illustrate valves of the construction I prefer to employ in carrying out my invention, Figure 1 is a central section of a propagating or repeating valve interposed in the direct line of the train-pipe, which latter upon one side of the figure is shown to be in section, and on the other side in broken elevation; Fig. 2, a view, partly in section and partly in elevation, of the same valve, the section being taken centrally of the valve at a right angle to Fig. 1; and Fig. 3 a longitudinal central section of the conductor's signaling-valve.

The conductor's signaling-valve A is of substantially the same construction as that shown and described in Patent No. 450,333, above referred to. It is supported upon a branch pipe B′ of the main train-pipe B, and comprises a shell or casing containing two chambers t and t', divided from each other by a wall or diaphragm s, having two openings or passages s' s^2 through it, respectively. In line with the openings s' s^2 and adjacent to the latter is an outlet-passage s^3 from the chamber t to the outside air. In the chamber t is a slide-valve r on a stem q, which extends to the outside of the shell. In the face of the valve r is a groove r', which is caused to register normally with the passages s^2 and s^3 by a spring q'. The stem q is connected pivotally to an operating-lever q^2.

The operation of the valve is as follows: The pressure in the train-pipe B passes through the pipe B′ to the chamber t of the valve, and any reduction of pressure in the chamber t will be immediately overcome by the passage to it of air from the train-pipe. When the operating-lever q is moved, it slides the valve r until the latter passes the opening s', and at the same time closes the passage s^2. This causes the air in the chamber t to expand into the chamber t' and produce a consequent reduction of pressure in the train-pipe. The outlet s^2 being closed, no more

pressure can enter the chamber t' than would be necessary to fill the latter. When the lever q^2 is released, the valve r will be moved to its normal position to close the passage s' and open the passage s^2 to the outside air to vent the chamber.

A conductor's signaling-valve A is provided on each of the cars of a passenger-train, while in freight-trains one would be provided upon the caboose.

A propagating or repeating valve C should be provided under each car of the train, preferably in the direct line of the train-pipe. The valve C comprises a shell, which may, as shown, connect with the train-pipe D at opposite sides of its upper portion, and it is divided internally into three chambers, located one above the other. The upper chamber C′ is a piston-chamber, and is separated from the central chamber C^2 by a diaphragm p, having a central opening p' through it. The chamber C^2 is the expansion-chamber, and is separated from the lower chamber C^3 by a diaphragm o, having a central passage o' through it. Cored in the valve-shell are passages n n', which extend from the train-pipe at opposite sides to the chamber C^3. A passage m, also cored in the valve-shell, extends from the train-pipe to the lower part of the chamber C′, and interposed in the passage m is a check-valve m', which is held to its seat m^2 by a spring of slight resistance m^3. The check-valve m' operates normally to close the passage m in the direction of the train-pipe, and while it offers no material resistance to the passage of air from the train-pipe to the chamber C′ through the passage m, it forbids the retrogression of pressure from the chamber C′ to the train-pipe. In the chamber C′ is a valve or movable abutment l on a valve-stem l', which passes through a guide l^2, as shown. The valve l forms the top of the chamber C′ and fits closely around the side of the latter to prevent leakage. The valve-stem l' seats normally upon the wall p over the opening p' and closes the latter. Above the stem l' is a stop l^3, formed in the valve-casing, which limits the rise of the valve l. In the upper end of the chamber C^2 is a valve or movable diaphragm k upon a stem k', which carries another and smaller valve k^2 in the chamber C^3. Pressing against the stem k' in the chamber C^3 is a spring k^3 of slight resistance, which operates normally to force the stem k' upward, whereby the valve k is held to the opening p' to the chamber C′, and the valve k^2 closes the opening o' between the chambers C^2 and C^3.

In the wall of the chamber C^2, at the top of the same, is a groove or recess i, which communicates with a passage i', cored in the valve-shell and leading to the outside air. The passage i from the chamber C^2 to the outlet-passage i' is normally open, and is closed by the movement of the valve k from its seat. As will hereinafter appear, the egress of air through the passage i' must be rendered slower than the ingress of air through the opening p' from the chamber C′, and to effect this I reduce the passage i' by inserting into it a perforated plug or bushing i^2. The opening through the plug is made slightly flaring in the direction of the outer end of the passage to render it self-cleaning, and thus prevent clogging.

The operation is as follows: The pressure from the train-pipe enters through the passages n and n' to the chambers C^3, and is prevented from passing to the chamber C^2 by the valve k^2. The chamber C′ is also filled with air from the train-pipe through the passage m, whereby the pressure on opposites sides of the diaphragm l is rendered substantially equal. The chamber C^2 is normally open to the outside air through the passage i i'. When pressure in the train-pipe is reduced, the excess of pressure in the chamber C′ will raise the diaphragm l to its seat l^3, and thus open the passage p'. The escape of pressure through the opening p' from the chamber C′ will force the valve k down and open the valve k^2 against the resistance of the spring k^3. In its descent the valve k closes the outlet-passage i. The opening of the valve k^2 causes pressure from the train-pipe to expand into the chamber C^2, thus reducing the pressure in the train-pipe. When the pressures on opposite sides of the diaphragm l are equalized, the diaphragm will drop and close the outlet p', and the escape of air from above the valve k through the passage i', rendered comparatively slow owing to the smallness of the opening through the plug i^2, will permit the spring k^3 to raise the valve k and k^2 to close the latter and cause the former to open the passage i. The pressure in the chamber C^2 then escapes through the passage i i' and the chamber C^2 is thus reduced to atmospheric pressure.

In practice the chamber t of the conductor's signaling-valve A need be no larger than is necessary to vent the train-pipe to the extent of causing the nearest propagating or repeating valve C to act as described. The reduction of pressure thus effected in the train-pipe by this valve C will produce an impulse or limited reduction of pressure which will be felt at the valve C on the car next adjacent sufficiently to cause it to operate, and in like manner the valves C will be operated consecutively until the reduction or impulse is felt at the signal. The action of the valves is so rapid that the impulses follow upon each other very quickly, and a signal will be transmitted from the end of a train of fifty cars in a second or two.

Although I prefer to construct the propagating or repeating valves as shown and described, this construction may be varied without departing from the spirit of my invention. I do not therefore limit myself to the construction shown and described, nor do I

confine my invention to the use of the propagating or repeating valves in connection with the main train-pipe, or "brake-pipe," as it is also called, as the valves may be used in systems which employ a separate train-pipe for signaling purposes.

When the propagating or repeating valves are upon the main train or brake pipe, they will tend incidentally, under an impulse created by the reduction of pressure in the pipe on turning the engineer's brake-valve to "service-stop," to produce limited ventings along the train-pipe, which will render the application of the brakes more rapid without increasing the force of their application to an extent beyond the control of the engineer. There is therefore a wide distinction between the operation of these valves and the operations of what are known as "train-pipe-release" valves, now commonly employed in air-brake systems to effect a rapid exhausting of the train-pipe pressure when the engineer's brake-valve is opened for an emergency-stop.

The terms "propagating" or "repeating" valves which I have applied to my improved valves for the want of better terms are therefore generic in so far as they apply to valves which will act after a comparatively slight reduction of the pressure in the pipe to effect further limited reductions therein as distinguished from train-pipe-release valves, which act only after the pressure in the pipe has been greatly reduced to vent therefrom an indefinite or uncontrolled extent of pressure.

While I have described my improvements as applied to the pipes of a railway-train, I do not wish to be limited thereto. The propagating or repeating valves may be applied to any pipes that are charged with fluid under an artificially-created pressure to actuate a signal or other desired mechanism which is connected with the pipe to propagate or repeat impulses created by a suitable valve.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a signaling apparatus for railway-trains, the combination, with the train-pipe charged with an artificially-created fluid-pressure, of a signal actuated by a reduction of pressure in the train-pipe, a conductor's signaling-valve connected with the train-pipe, and one or more impulse propagating or repeating valves connected with the train-pipe between the said signaling-valve and signal, substantially as and for the purpose set forth.

2. In a signaling apparatus for railway-trains, the combination, with the train-pipe charged with an artificially-created fluid-pressure, of a signal actuated by a reduction of pressure in the train-pipe, a conductor's signaling-valve connected with the train-pipe operating when actuated to vent only a limited extent of pressure from the train-pipe, and one or more impulse propagating or repeating valves communicating with the train-pipe between the signaling-valve and signal and operating when the signaling-valve is actuated to vent a further limited degree of pressure from the train-pipe, substantially as and for the purpose set forth.

3. In a signaling apparatus for railway-trains, the combination, with the train-pipe charged with an artificially-created fluid-pressure and signal and conductor's signaling-valve connected with the train-pipe, of an impulse propagating or repeating valve connected with the train-pipe between the signal and said signaling-valve, comprising a shell provided with an expansion-chamber having an opening o' to the train-pipe and an opening i to the outside air, a valve at the opening o' normally closed and a valve at the opening i normally open, a chamber C′, supplied with pressure from the train-pipe, and a movable diaphragm between the chamber C′ and train-pipe and exposed at opposite sides to their respective pressures to be moved from its seat when pressure in the chamber C′ exceeds that in the train-pipe and operating by said movement to open the valve at the opening o' and close the valve at the opening i, substantially as and for the purpose set forth.

4. In a signaling apparatus for railway-trains, the combination, with the train-pipe charged with artificially-created fluid-pressure and signal and conductor's signaling-valve connected with the train-pipe, of an impulse propagating or repeating valve connected with the train-pipe, comprising a shell having a chamber C′, supplied with pressure from the train-pipe, and an expansion-chamber C^2, communicating with the chamber C′ through a passage p', an inlet o' from the expansion-chamber to the train-pipe and an outlet i from the expansion-chamber to the outside air, a movable diaphragm k in the expansion-chamber at the passage p', connected with valve mechanism normally closing the inlet o' and opening the outlet i, and a movable diaphragm l between the chamber C′ and train-pipe exposed at opposite sides to their respective pressures normally closing the passage p' and to be moved from its seat when pressure in the chamber C′ exceeds that in the train-pipe, whereby when a reduction of pressure takes place in the train-pipe the diaphragm l will be moved to open the passage p' and pressure from the chamber C′ will move the diaphragm k to open the inlet o' and close the outlet i, substantially as and for the purpose set forth.

5. The combination, with a pipe charged with an artificially-created fluid-pressure, of an impulse propagating or repeating valve communicating with the pipe and operated by variations of pressure on the opposite sides of a movable abutment to vent a limited extent of pressure from the pipe, substantially as described.

6. In an air-brake and signaling system for railway-trains, in which the signal is actuated by impulses created by reductions of press-

ure in the main train or brake pipe, the combination, with said pipe, of a conductor's signaling-valve operating when actuated to vent a limited extent of pressure from said pipe, and an impulse propagating or repeating valve communicating with said pipe and operating when the said signaling-valve is actuated to vent a further and limited extent of pressure from said pipe, the pressure thus vented being less than it is necessary to vent from the pipe to apply the brakes.

HARRY R. MASON.

In presence of—
J. W. DYRENFORTH,
M. J. FROST.