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H. R. MASON.

TRAIN SIGNALING APPARATUS.

No. 493,437. Patented Mar. 14, 1893.

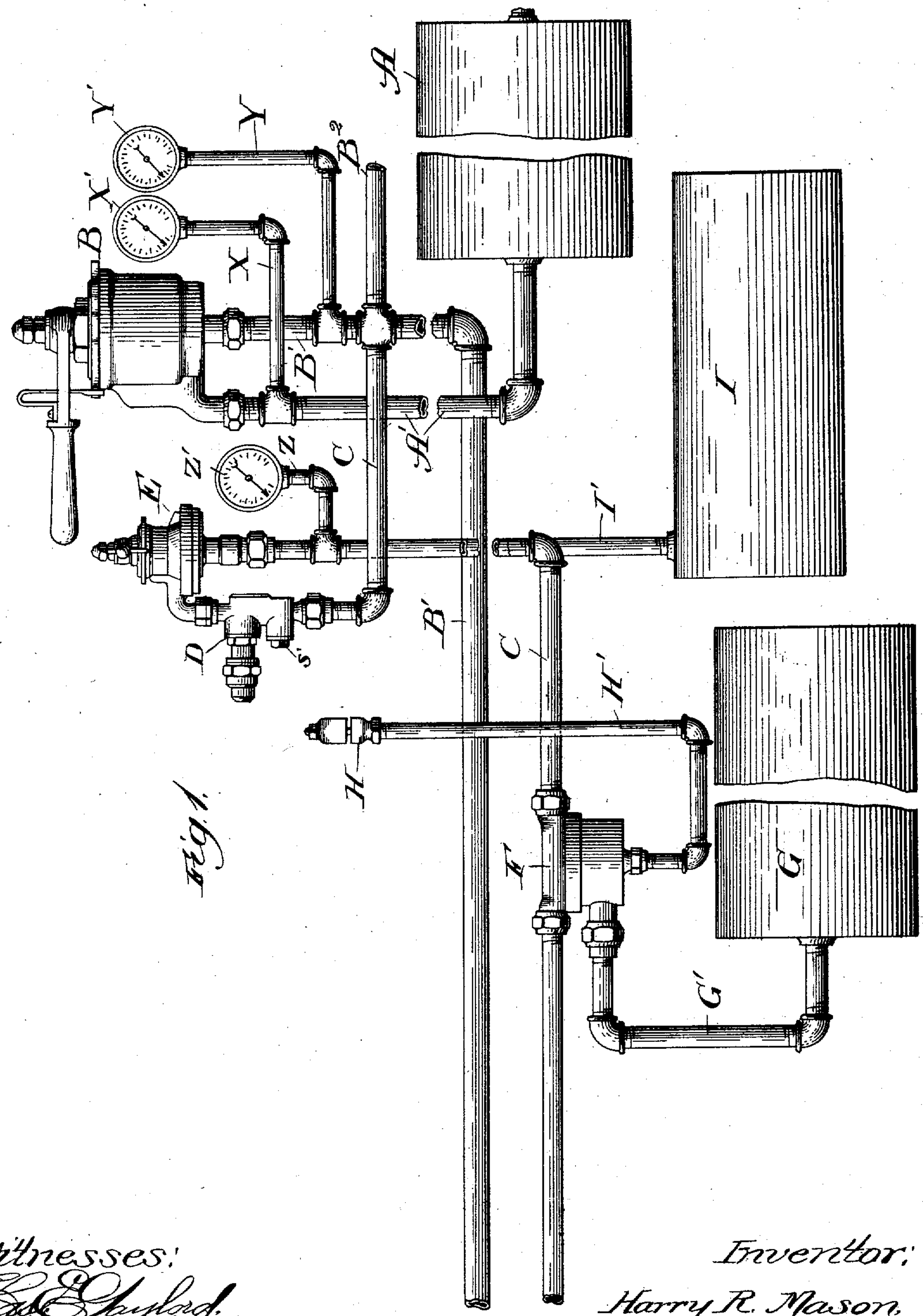

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Fig. 2.

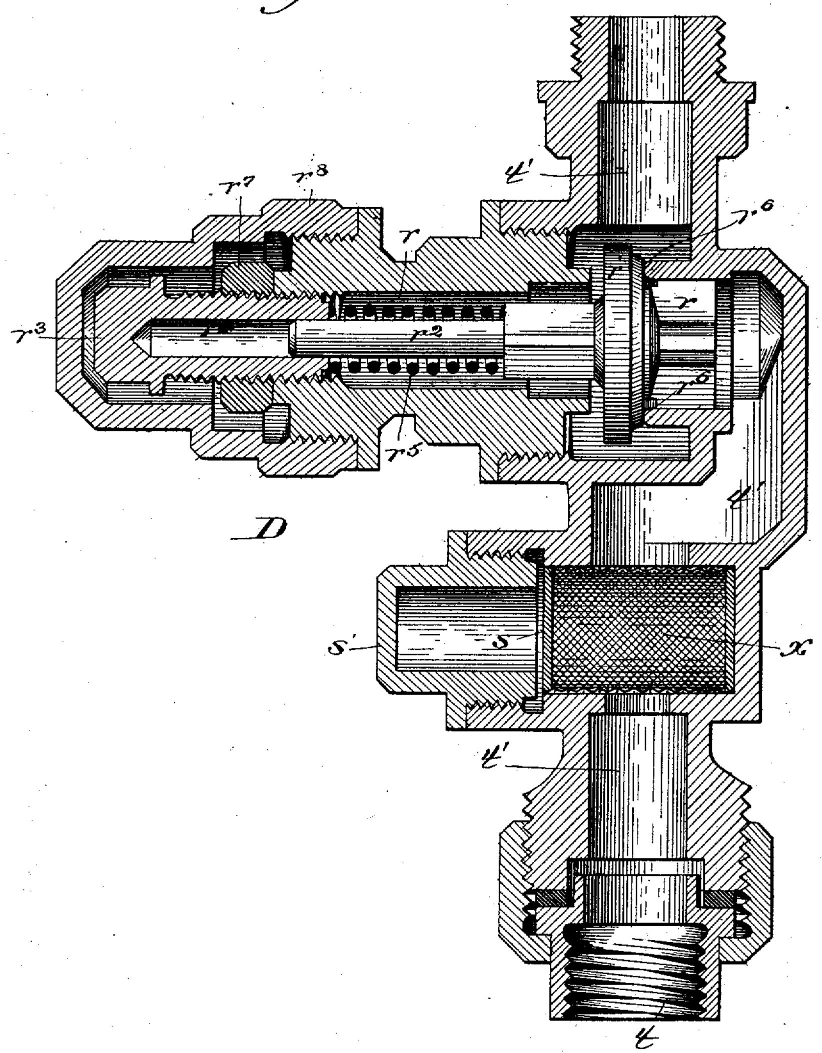

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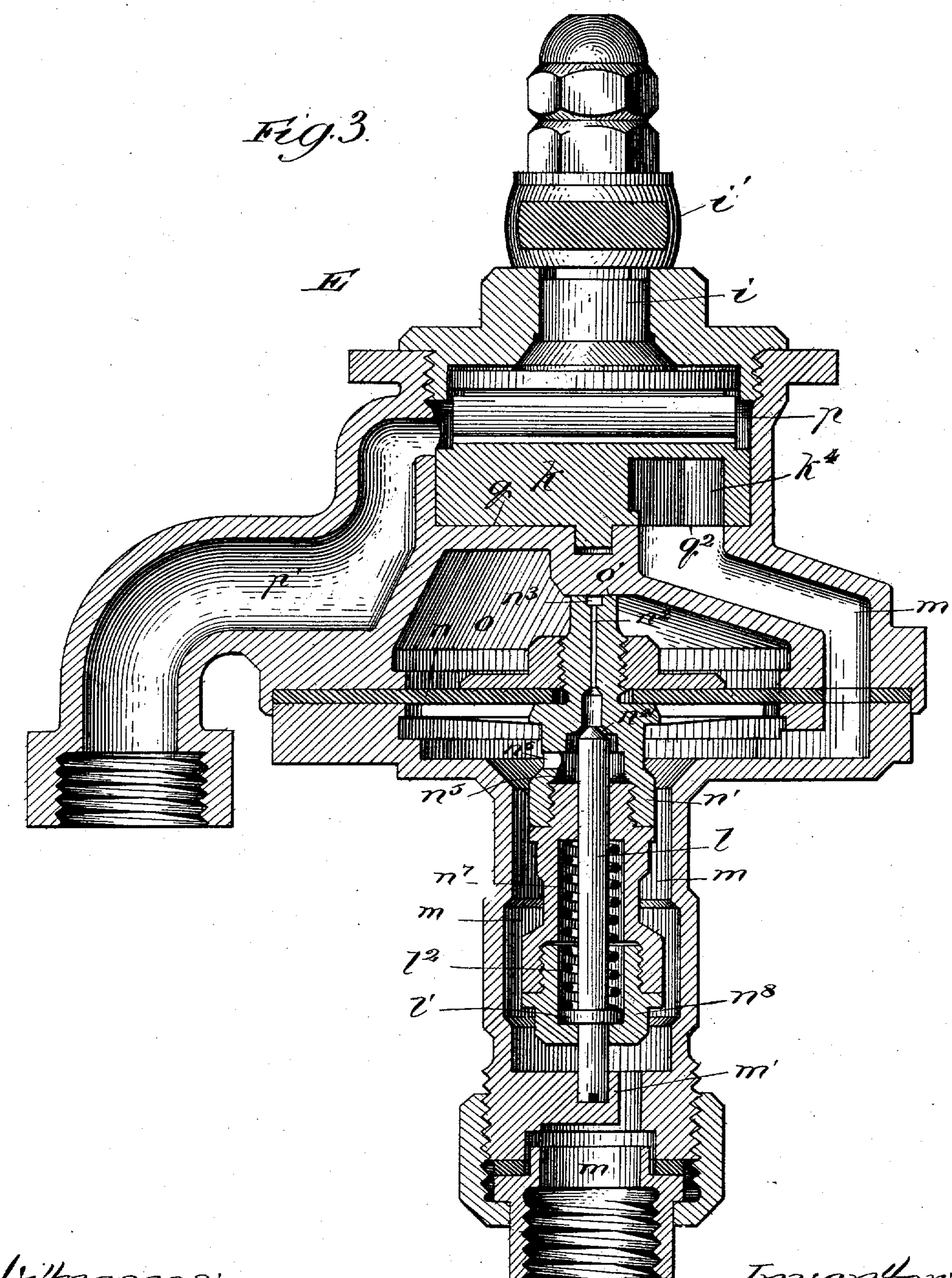
Fig. 3.



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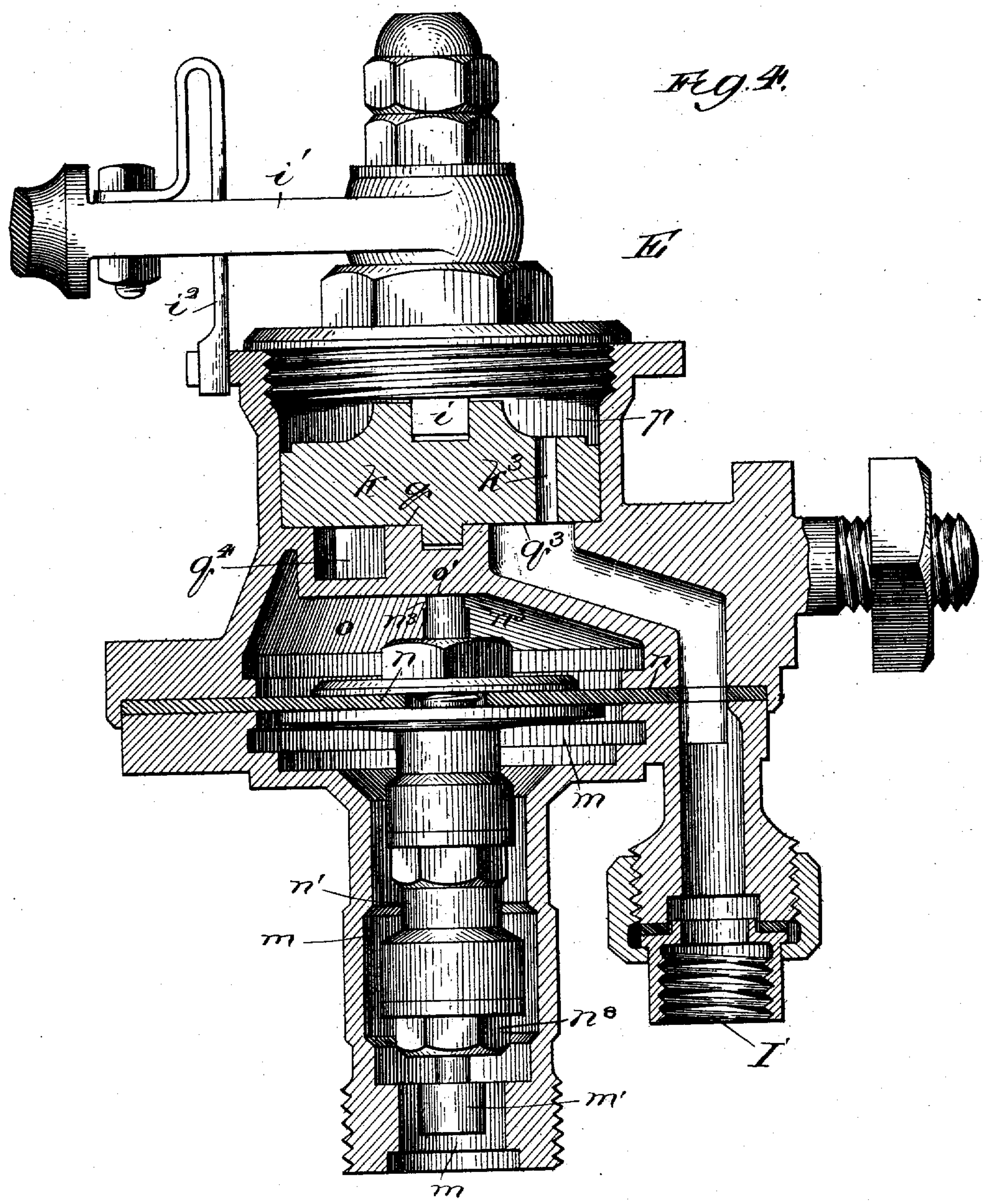

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(No Model.)

5 Sheets—Sheet 5.

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No. 493,437.

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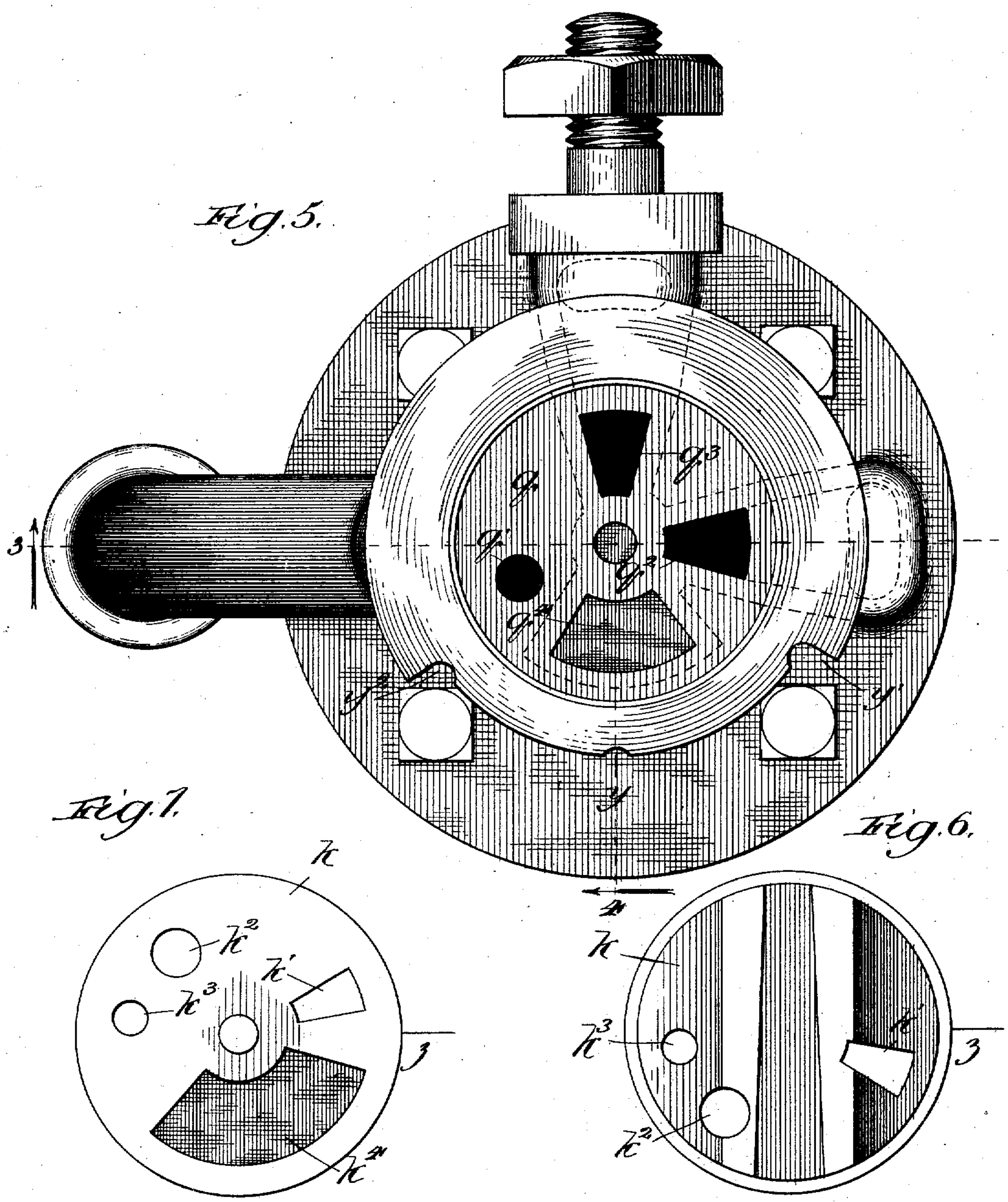

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UNITED STATES PATENT OFFICE.

HARRY R. MASON, OF CHICAGO, ILLINOIS.

TRAIN SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 493,437, dated March 14, 1893.

Application filed July 5, 1892. Serial No. 438,953. (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 pneumatic signaling apparatus for railway trains, and more especially to improvement in a signaling system in which a pipe, separate and distinct from the pipe used for braking purposes, extends along the train from the locomotive where it is charged with air under pressure from a suitable supply reservoir; and wherein the signaling is effected by venting pressure from the signaling pipe by means of conductors' signaling valves, upon the cars of the train, to produce impulses of reduction of pressure which act against a signaling valve communicating with the pipe, which signaling-valve when actuated produces the signal.

In a separate concurrent application filed by me February 15, 1892, and serially numbered 421,616, I have shown, described and claimed means for automatically preventing the signal from sounding more than once with any single operation of a conductor's signaling valve, by withdrawing air from the signaling reservoir to reduce the pressure, momentarily, behind the signal-valve.

One of my objects in the present application is to provide means which shall operate automatically to prevent more than one sounding of the signal when a conductor's signaling valve is opened, by reducing the force of the fluctuations at the signaling valve, following the first impulse.

It is also my object to provide other improvements in train-signaling apparatus, all as hereinafter described and claimed.

In the drawings—Figure 1 is a broken diagrammatic view showing my present improvements, and other valves, pipes and reservoirs forming part of a train signaling system, all the said apparatuses being upon the locomotive; Fig. 2, an enlarged longitudinal section of a reducing-valve of my improved construction; Fig. 3, a similar view of an engineer's signal-pipe valve; Fig. 4, a broken longitudinal section of the same engineer's valve, the section, however, being taken at right-angles to that in Fig. 3; Fig. 5, a plan view of the valve-seat of the said engineer's valve; Fig. 6, a top-plan view of the regulating valve which seats upon the valve-seat shown in Fig. 5; and Fig. 7, a bottom plan view of the said regulating valve.

Referring to Fig. 1, A is the main air-reservoir, of the usual construction which supplies air under pressure for braking purposes; B an engineer's brake-valve; A′ a pipe extending from the main-reservoir to the brake-valve; B′ the main train or brake-pipe extending from the brake-valve along the train and there connected with the usual brake setting and releasing mechanisms, B^2 a pipe extending from the brake-pipe to the pump-governor, not shown; X a pipe leading from the pipe A′ to the main-reservoir pressure-gage X′; Y a pipe leading from the pipe B′ to the train-pipe pressure-gage Y′; Z a pipe leading from the pipe C to the signal-pipe pressure-gage Z′; C the signaling-pipe which extends from the pipe B′; D a pressure-reducing valve of my improved construction; E an engineer's signal-pipe valve of my improved construction; F a signal or signal-actuating valve; G a signaling-reservoir, which communicates with the valve F through a pipe G′; H a signal which communicates with the valve F by means of a pipe H′; and I an equalizing reservoir which communicates through a pipe I′ with the valve E.

It will be seen by reference to Fig. 1 that the signaling-pipe C is connected to the main train or brake-pipe B′ on the side of the engineer's brake-valve B opposite the main-reservoir.

Hitherto, in signaling systems, it has been the practice to connect the signaling pipe directly to the main-reservoir; I find it preferable, however, to connect the signaling-pipe to the main train or brake-pipe.

In air-brake systems, it is usual to maintain, as standard, a pressure of seventy pounds in the brake-pipe, and a pressure of ninety pounds in the main reservoir; but, the extent of main-reservoir pressure is usually controlled, indirectly, by the pressure in the brake-pipe through the medium of the pump-governor. The pump-governor communicates with the brake pipe beyond the engineer's brake valve, that is to say, the engineer's brake valve is interposed in the brake-pipe between the point of communication of the pump-governor pipe B^2 and the main-reservoir.

In practice the pumps are caused to act whenever the brake-pipe pressure drops below seventy pounds, and, as a consequence, whenever a service or emergency stop is effected and the brake pipe pressure thus reduced, the pump is caused to act whether the main-reservoir pressure is up to standard or not. During all the time that the brakes are maintained applied, therefore, the pump will keep on raising the pressure in the main reservoir, and if the pump is not "shut off" by the engineer, it will raise the main-reservoir pressure to or nearly to the steam pressure actuating the pump, which may be one hundred and forty pounds or more. As will appear later on, I prefer to maintain as standard in the signaling pipe a pressure of about sixty pounds to the square inch. More than sixty pounds I believe to be neither necessary or desirable.

Between the signaling-pipe and its source of compressed air supply is a reducing-valve. Were the signaling pipe connected directly to the main-reservoir, this reducing valve would have to be regulated to reduce pressure, flowing from the main-reservoir to the signaling pipe, about thirty pounds, so that the signaling-pipe pressure would be maintained at sixty pounds when the main reservoir is at ninety. In the event of the main-reservoir pressure being raised above ninety pounds the signaling pipe pressure would rise accordingly, which is objectionable. By connecting the signaling pipe to the brake pipe beyond the engineer's brake-valve, as shown, I overcome the objections incident to supplying the signaling-pipe directly from the main-reservoir.

The reducing valve D, I prefer to employ, and which as shown in detail in Fig. 2, is connected at its lower end t to that part of the signaling-pipe C which extends to the brake pipe B'. Extending through the valve is a passage, t'. In the passage t' is a chamber s containing a removable screen or strainer x, and closed by a screw-cap s'. The strainer x is cylindrical and fits the chamber s snugly, so that all air entering at t must pass through the strainer. It is necessary in practice that the strainer shall occasionally be removed and cleaned, and this may be done by unscrewing the cap s' and withdrawing the strainer from its chamber. By means of the construction shown, the removal and replacement of the strainer can be much more quickly and easily accomplished than in any other air-brake or signal-system of which I am aware, and is thus an important feature of my improvement.

In the passage t' above the chamber s is a chamber r containing a reducing valve r' upon the end of a stem r^2. The chamber r is closed at one end by a screw plug r^3. In the plug r^3 is a socket r^4 affording a guide-bearing for the outer end of the stem r^2; and confined between the inner end of the plug r^3 and a shoulder on the stem r^2 is a spring r^5. The spring r^5 operates, normally to press the valve r' against a seat r^6 to close the passage t' in the direction of the main reservoir. The plug r^3 is adapted to be screwed in the chamber r to tighten or loosen the tension of the spring r^5 and thus increase or diminish the resistance against opening of the reducing-valve r'. Upon the plug r^3 is a jam-nut r^7, which by bearing against the end of the shell of the chamber r tightens the plug in place; and extending over the end of the plug is a screw-cap r^8. On removing the screw-cap r^8 and loosening the jam-nut r^7 the plug r^3 may be turned to regulate the reducing-valve.

In the engineer's signal-pipe valve E is a valve-seat q above which is a chamber p communicating with a cored passage p' at which the valve E is attached to the upper end of the reducing valve D.

In the valve-seat q are ports q', q^2 and q^3, and a segmental groove or recess q^4, all in the relative positions shown in Fig. 5. The port q', which I term the running position port, opens into a chamber o below the valve-seat. The lower wall of the chamber o is a flexible diaphragm n secured around its edges in the valve shell. At the center of the diaphragm n is a stem n' which extends through the diaphragm, and is clamped securely thereto to have no movement independent of the diaphragm. At its upper end the stem n' abuts normally against a seat o' provided at the center of the upper wall of the chamber. Extending downward from the top of stem n' is a small passage n^2, which at its upper end communicates, through branch-passages n^3, with the chamber o. At its lower end the passage n^2 is flared outward to afford a valve seat n^4. Below the valve-seat n^4 is a chamber n^5 in the stem having an outlet opening n^6. In the stem below the chamber n^5 is a chamber n^7; and fitting into the lower end of the chamber n^7 is a screw-plug n^8, which constitutes the lower end of the stem n'. The port q^2 in the valve-seat q leads to a passage m which extends down at one side of the chamber o, forms a chamber below the diaphragm n, and extends thence down around the stem n' and out at the lower end of the shell.

In the passage m below the lower end of the stem n' is a lug or boss m' provided in its upper face with a socket which is in direct line with the passage n^2. Resting at its lower end in the said socket and extending upward centrally of the stem n' through the chamber n^7, and into the chamber n^5, is a rod l provided in the chamber n^7 with a fixed collar l'. At its upper end the rod l is rendered tapering to fit the valve-seat n^4 and close the passage n^2. It is, however, normally out of contact with the seat n^4, being maintained in the condition shown in Fig. 3 by a spring l^2, which is confined between the collar l', on the rod l, and the upper end of the chamber n^7. The spring l^2 operates to press the rod or valve l downward and maintain it firmly seated in the socket of the boss m', and to press the stem n' in the upward direction against the seat o', whereby the valve or rod l is out of contact with the seat n^4, and the passage n^2 n^6 is maintained normally open. From the foregoing description it will be seen that pressure in the chamber o, when it exceeds the pressure in the passage m, below the diaphragm n, by more than the resistance of the spring l^2, will force the diaphragm n downward and close the passage n^2 by pressing the valve-seat n^4 down upon the upper end of the valve or rod l; and, when pressure in the chamber o exceeds pressure in the passage m by less than the resistance of the spring l^2, air will enter the passage n^2 through the branch passages n^3 and escape into the passage m through the chamber n^5 and outlet n^6. The port q^3 in the valve-seat q communicates with the pipe I′ and through the latter with the equalizing-reservoir I.

Upon the valve seat q is a regulating valve k, shown in detail in Figs. 6 and 7. The regulating-valve is maintained upon its seat by the pressure of air entering the chamber p through the passage p'. Engaging the regulating valve is a stem i which extends upward through a screw-cap, at the top of the valve shell, where it is provided with a handle i', carrying the usual spring indicator i^2. Extending through the regulating valve k are openings k', k^2 and k^3, and in the under face of the regulating valve is a segmental recess k^4. Upon the shell of the valve E are stops y, y', y^2 with which the spring indicator i^2 on the operating handle engages. The position of the indicator with relation to the regulating valve is indicated in Figs. 6 and 7 by the lines z.

In operation air from the main train or brake-pipe enters the valve-device D and passes thence into the valve-device E, through the passage p', to the chamber p above the regulating valve k. Assuming that the normal brake pipe pressure is to be seventy pounds and the signaling pipe pressure sixty pounds, the reducing valve r' will be regulated to reduce the incoming pressure ten pounds. When the spring indicator is turned to the stop y, the opening k' of the regulating valve will register with one side of the recess q^4, of the valve-seat q, and the recess k^4 will register with the recess q^4 and with the port q^2; and the opening k^3 will register with the port q^3. When the regulating valve is in the position described its opening k^2 and the port q' will be blanked. Thus pressure entering the chamber p will pass down through the opening k^3 and port q^3 and fill the equalizing reservoir I. Pressure will also flow through the opening k' and passage formed by the recesses q^4 k^4 to the port q^2 and thence through the passage m to the signaling pipe C, which is connected to the lower end of the valve-device E, as shown in Fig. 1. The equalizing reservoir I and signaling pipe C will thus be charged with sixty pounds' pressure. When the indicator i^2 is turned to the stop y' the valve is at "short train running-position;" the opening k^2 will register with the port q', the openings k' k^3 will be blanked, and the recess k^4 will open communication between the ports q^2 q^3. When the regulating valve is in the position described, air will pass through the opening k^2 and port q' to the chamber o and fill the latter up to sixty pounds. I prefer to provide a spring l^2 which will withstand an excess of pressure of twenty pounds upon the upper side of the diaphragm n. Any reduction of pressure in the signaling pipe due to the venting of air for signaling purposes, or to leakage, (when such leakage does not exceed twenty pounds,) will be replenished through the passages n^2, n^6, m. In the event of a breakage of the signaling pipe or a parting of one of its couplings, the sudden venting of the signaling pipe will cause the diaphragm n to be pressed down and close the passage n^2, thereby preventing the escape of pressure from the brake-pipe, which might have the effect of setting the brakes. The regulating valve recess k^4 by registering with the ports q^2 q^3 has the effect of throwing the equalizing reservoir I into direct communication with the signaling-pipe through the passage m. When the spring indicator is turned to the stop y^2 the opening k' registers with the running position port q'; the opening k^2 registers with the port q^3; and the opening k^3 and port q^2 are blanked. When in this condition the valve is at "long train running-position."

The signal-valve F, signaling-reservoir G and signal H are substantially the same as those first shown and described in my patent No. 450,334, granted April 14, 1891. An impulse of reduction, generated at a conductor's signaling valve (not shown) upon any car of the train by venting a limited extent of pressure from the signaling pipe, will travel to the signal-valve F, and, by reducing the pressure in front of the signal-valve below the pressure exerted against the opposite side thereof from the signaling reservoir, cause the valve to open and sound the signal. In a signaling pipe of a certain length, when the various valve mechanisms are constructed to operate in a pipe of a much greater length, pressure vented, by a conductor's signaling valve, at any point within a certain intermediate space between the forward and rear ends of the pipe, will cause an impulse to travel to the signal and actuate the same, and then cause a rebound of impulse, to actuate the signal a second time (if means are not provided to obviate this difficulty) the interval between the direct impulse and rebound being of sufficient length to permit the signal-valve to close. Pressure vented however at a point forward of the said intermediate space will actuate the signal but once, the rebound apparently following upon the direct impulse so rapidly that the signal valve has not time to close.

In constructing a signaling system for general passenger train purposes, it is considered necessary in fixing a standard, to provide mechanism which will operate satisfactorily from any part of a train one thousand feet long, that being the limit of length required, so far as I am aware, by any railroad. It is also desirable that the mechanisms shall be constructed with a view to economy in the use of compressed air. The signal-valve I employ is therefore purposely made sensitive, so that a comparatively slight reduction in, or venting of, pressure from the signaling-pipe will cause the valve to be opened by pressure from the signaling-reservoir; and the conductor's signaling-valves are so gaged that when opened they will generate an impulse which can actuate the signal valve through a three-quarter inch pipe from a distance of one thousand feet.

It may be stated that I have found in my experiments, without the reservoir I, upon a rack with devices constructed substantially as described and employing a three-quarter inch pipe, charged with from forty to sixty pounds of pressure, that in a train more than five hundred and fifty feet long, there is no danger of the signal being sounded more than once under an impulse generated at any conductor's signaling valve on the train; while in a train less than five hundred and fifty feet long any impulse generated between one hundred and ninety-three and three hundred and fifty feet from the signal-valve will sound the signal twice. By changing the sizes of valves, ports &c. from those I employ the distances stated may be caused to vary. I have also found that by employing in a short train a reservoir, like the reservoir I, in open communication with the signaling pipe, the backward flow of pressure from the reservoir following an impulse of reduction at the signal valve will neutralize or reduce fluctuations at the latter valve to an extent which will prevent their unduly sounding the signal. The reservoir I thus operates to equalize the action of an impulse upon the signal valve when the train is short with that of the action of an impulse when the train is long. In the case of a long train the reservoir I, or equalizing reservoir as I term it, is unnecessary, and in fact might tend, by replenishing pressure too rapidly above the signal valve, to weaken the force of the signal. Therefore, while I employ the equalizing reservoir where the train is short, I prefer to cut it out when the train is long. The engineer will be readily able to determine by the length of his train after he has charged the signaling pipe, by turning his regulating-valve to the stop y, whether to turn the latter to the short train running position stop y', or the long train running position stop y^2.

It may be stated that in practice I construct the various appliances of my system so that they will act readily when the signaling pipe pressure is reduced to forty pounds, though the normal signaling pipe pressure, as before stated, should be sixty pounds. It is true that when the engineer's brake valve is turned to release position the reservoir pressure of ninety pounds or more flowing into the brake pipe may raise the train pipe pressure at the point where it communicates with the signaling pipe to ninety pounds or more. This would not, however, have the effect of materially increasing the pressure in the signaling pipe, for the reason that more than ninety pounds reduced ten pounds by the reducing valve would still be more than twenty pounds above that present in the signaling pipe, and would have the effect of pressing down the diaphragm n and closing the opening n^2. When the engineer's brake valve is turned from release to lap or running position the pressure will, by distributing itself through the brake pipe, soon fall to normal at the point where it is joined by the signaling pipe, so that the diaphragm n will be raised by its spring and open the passage n^2. Were the signaling pipe connected directly to the main reservoir, and, after a service or emergency stop, were the reservoir pressure to be raised more than thirty pounds above the signaling pipe pressure, the supply of air to the signaling pipe would be cut off and remain cut off until the main reservoir pressure is reduced. In the meantime, ordinary leakage, or undue leakage owing to a defective coupling, might cause the signaling pipe to be reduced so far below forty pounds as to render the signaling system inoperative.

While I prefer to provide an "equalizing reservoir" which may be thrown into and out of communication with the signaling pipe, it is not necessary that the said communication shall be controlled by the engineer's signal-pipe valve, although I consider that to be the most desirable construction. The equalizing reservoir may communicate with the signaling-pipe at any suitable point in the latter with relation to the signal-valve, and an independent valve may be provided for throwing it into and out of operation when desired.

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

1. In an air-brake and signaling system, the combination with the main-reservoir, brake-pipe, and engineer's brake-valve, of a signaling pipe, separate from the brake-pipe and communicating therewith, beyond the engineer's brake-valve, to be charged with pressure from the brake-pipe, substantially as described.

2. In an air-brake and signaling system, the combination with the main-reservoir, brake-

pipe, and engineer's brake-valve, of a signaling-pipe, separate from the brake-pipe and communicating therewith, beyond the engineer's brake-valve, to be charged with pressure from the brake pipe, and a check valve between said pipes to prevent the retrogression of pressure from the signaling-pipe to the brake-pipe, substantially as described.

3. In an air-brake and signaling-system, the combination with the main-reservoir, brake-pipe and engineer's brake-valve, of a signaling pipe charged with pressure from the brake-pipe, and communicating therewith beyond the engineer's brake-valve, and a pressure-reducing valve between the said pipes, substantially as described.

4. In a pneumatic signaling system, the combination with the signaling-pipe, means for charging the same with air under pressure, signal-valve operated by signaling impulses and conductor's signaling valve, for creating said impulses of an equalizing reservoir connected with the signaling pipe, to increase the volume of air subject to said impulses and means for throwing the said pipe and reservoir into and out of communication, substantially as and for the purpose set forth.

5. In a pneumatic signaling system for railway trains, the combination with the signaling-pipe, signal-valve and conductor's signaling valve, of an equalizing-reservoir, and an engineer's signal-pipe valve device between the signaling-pipe and source of compressed-air supply, having a quick feed port and a slow feed port both leading to the signaling-pipe, a port leading to the equalizing reservoir, and means for directing, at will, air from the supply to the signaling pipe, through either the quick feed or slow feed ports, and for throwing the equalizing reservoir into and out of communication with the supply and signaling-pipe alternately, substantially as and for the purpose set forth.

HARRY R. MASON.

In presence of—
M. J. FROST,
J. N. HANSON.