

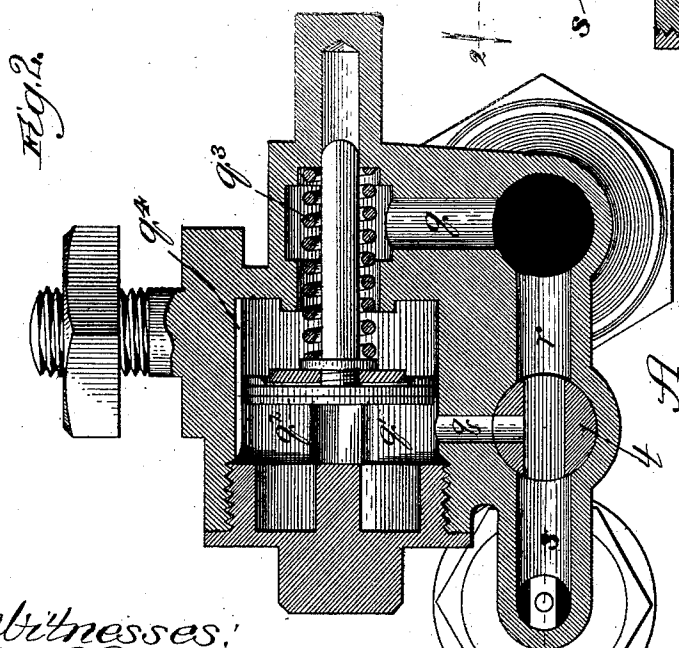
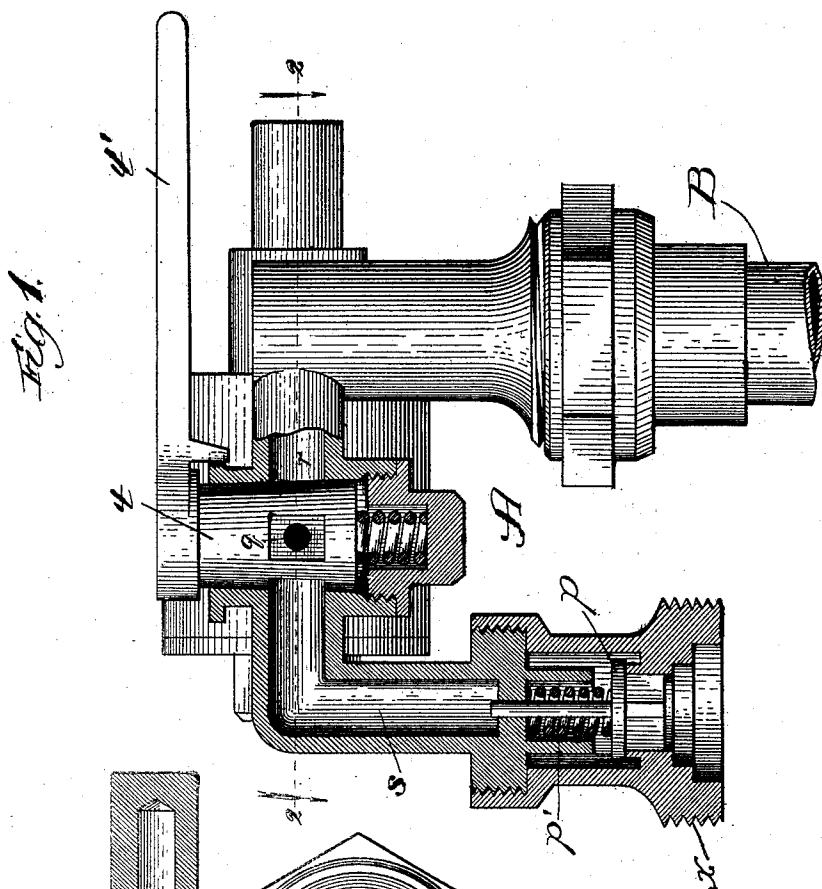
(No Model.)

4 Sheets—Sheet 1.

H. R. MASON.
TRAIN SIGNALING APPARATUS.

No. 463,066.

Patented Nov. 10, 1891.



Witnesses:
Ezekiel Gaylord
Clifford A. White

Inventor.
Harry R. Mason.
By Dyrenforth & Dyrenforth
Attorneys

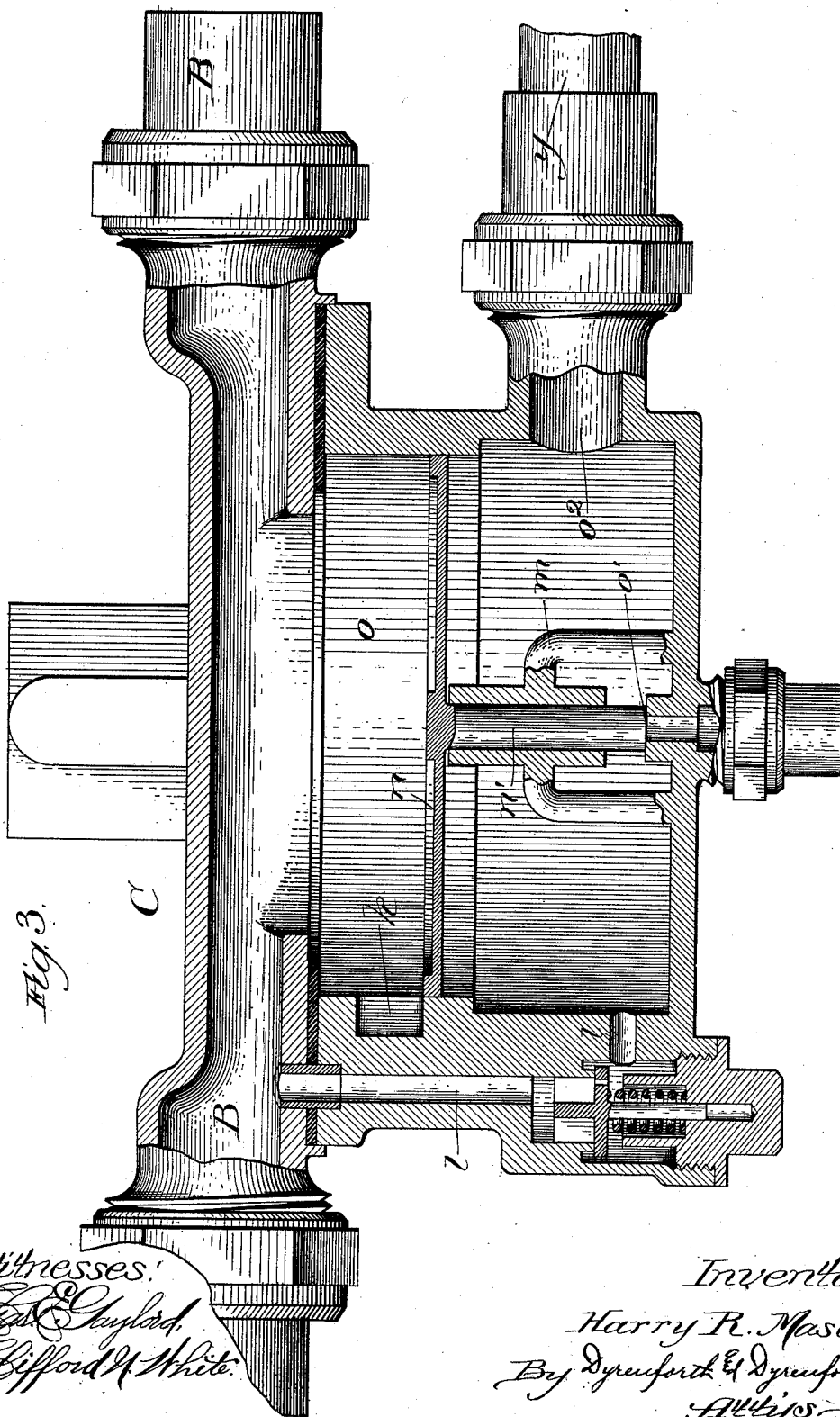
(No Model.)

4 Sheets—Sheet 2.

H. R. MASON.
TRAIN SIGNALING APPARATUS.

No. 463,066.

Patented Nov. 10, 1891.



Witnesses:
 Geo. C. Gaylard,
 Clifford H. White.

Inventor:
Harry R. Mason
By Dymond & Dymond
Attys.

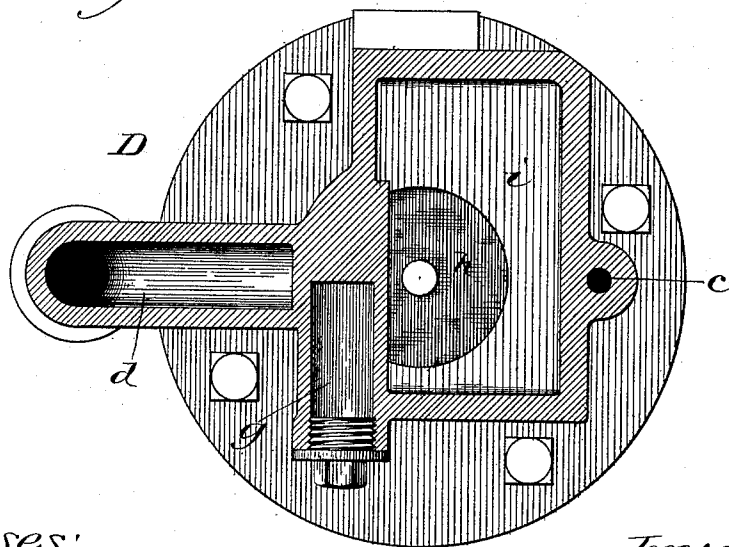
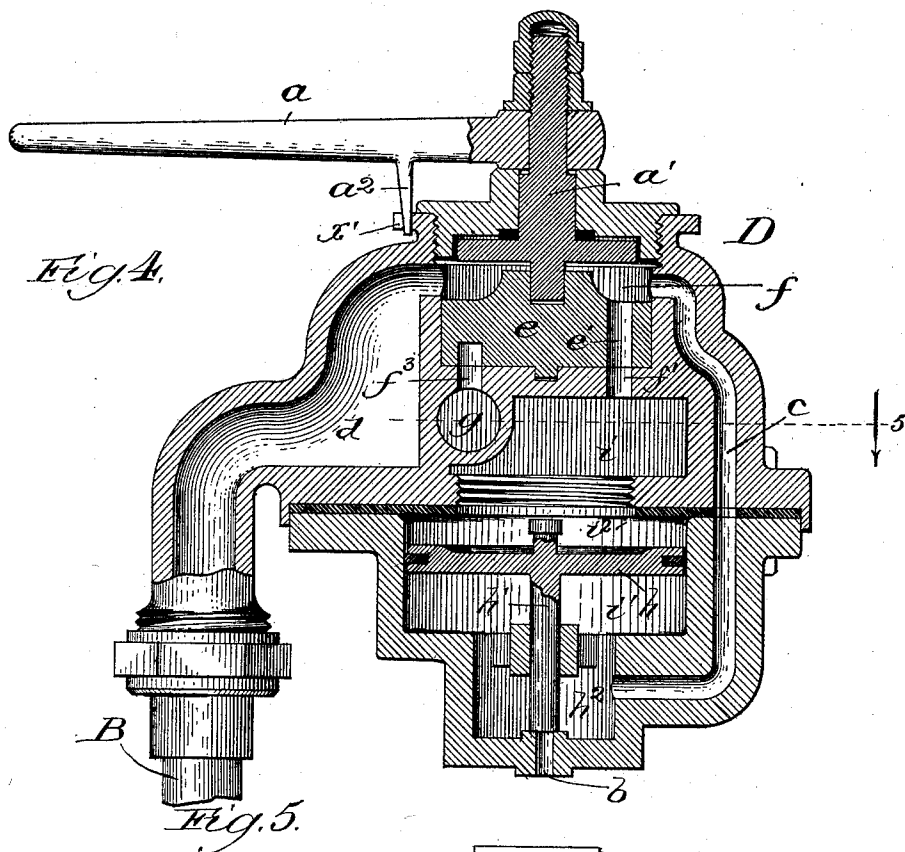
(No Model.)

4 Sheets—Sheet 3.

H. R. MASON.
TRAIN SIGNALING APPARATUS.

No. 463,066.

Patented Nov. 10, 1891.



Witnesses:
Edw. C. Gaylord,
Clifford H. White

Inventor:
Harry R. Mason,
By Symfouth & Symfouth
Att'ys.

(No Model.)

4 Sheets—Sheet 4

H. R. MASON.
TRAIN SIGNALING APPARATUS.

No. 463,066.

Patented Nov. 10, 1891.

Fig. 6.

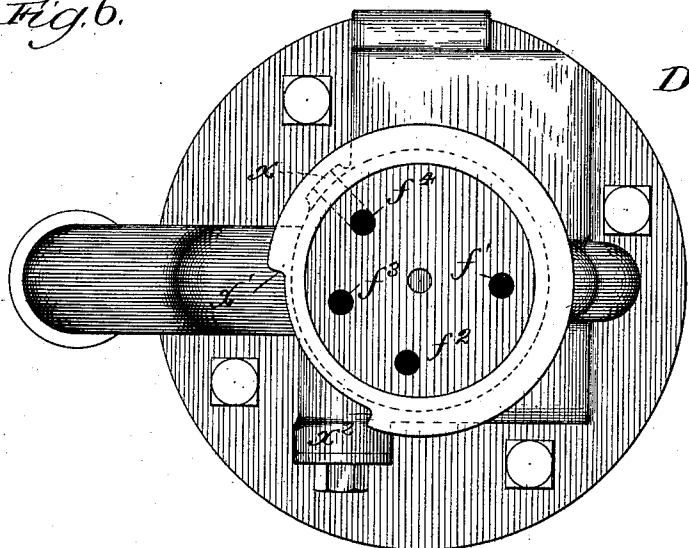


Fig. 7.

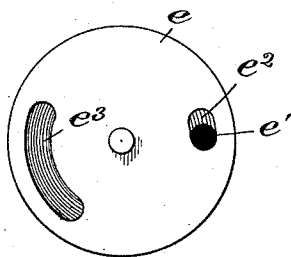
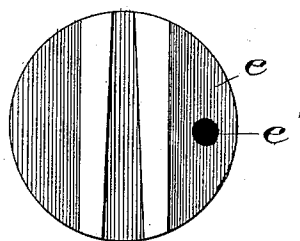


Fig. 8.



Witnesses:

Edw. Gaylord,
Clifford A. White

Inventor:

Harry R. Mason,
By Dyrupfirth & Dyrupfirth
Attys

UNITED STATES PATENT OFFICE.

HARRY R. MASON, OF CHICAGO, ILLINOIS.

TRAIN SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 463,066, dated November 10, 1891.

Application filed September 30, 1891. Serial No. 407,239. (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 use upon railway-trains in which a pipe extending along the train and charged with an artificially-created fluid pressure communicates with a signal upon the engine-cab and is provided upon one or more cars of the train with pressure-relief valves, or "conductor's signaling-valves," as they are called, which, when operated, effect a reduction of pressure in the train-pipe and create an impulse which is felt at the signal mechanism and actuates the latter. The train-pipe above referred to is in a certain train signaling system the same pipe as that employed for braking purposes, while in another system a line of train-pipe separate from the main train or brake pipe is provided and employed for signaling purposes only. In the last-named system as commonly employed both lines of pipe are charged with pressure from the same main reservoir on the locomotive, but to unequal degrees—that is to say, it is usual in practice to establish a standard of pressure at about seventy pounds to the square inch in the brake-pipe and about thirty pounds to the square inch in the signaling-pipe.

My object is to provide a pressure-reducing valve of improved construction for use in train signaling systems employing a separate signaling-pipe between the signaling-pipe and the main reservoir.

My object is, further, to provide an improved conductor's signaling-valve.

In the drawings, Figure 1 is a view, partly in side elevation and partly in section, of my improved pressure-reducing valve, the section being taken on line 1 of Fig. 2 and viewed in the direction of the arrow; Fig. 2, a plan sectional view taken on line 2 2 of Fig. 1 in the direction of the arrows, but showing the regulating-valve turned to a position at right angles to that shown in Fig. 1; Fig. 3, a central vertical section of a "signal-valve," showing the pipes connected therewith in elevation;

Fig. 4, a vertical central section of my improved conductor's signaling-valve; Fig. 5, a section taken on line 5 of Fig. 4 and viewed in the direction of the arrow; Fig. 6, a top plan view of the conductor's signaling-valve, with its regulating-valve portion and operating-handle removed; and Figs. 7 and 8 bottom plan and top plan views, respectively, of the said regulating-valve.

The pressure-reducing valve A is provided with a regulating-valve *t*, which may be a plug-valve, as shown, or of any other suitable construction. Extending to the valve *t* is a passage *s* from the main-reservoir pipe, (not shown,) which pipe connects with the valve-shell at *x*. B is the signaling-pipe, which extends along the train in the usual manner. Extending between the regulating-valve *t* and signaling-pipe B are a direct or main passage R and an indirect or supplemental passage *q*. The regulating-valve *t* may be turned to the position shown in Fig. 2 to cause air-pressure entering from the main reservoir through the passage *s* to flow through the direct passage *r* to the signaling-pipe, or it may be turned from that position a quarter-revolution to the position shown in Fig. 1, to cut off the direct passage *r* from the passage *s* and cause the pressure to flow from the latter passage only through the indirect passage *q*. In the passage *s* is a pressure-reducing valve *p*, which seats in the direction of the main-reservoir pipe. The valve *p* is maintained normally against its seat by a spring *p'*, to cut off the flow of air from the main reservoir to the signaling-pipe. In practice the spring *p'* may have a resistance of, say, thirty-five pounds, and as it is usual in air-brake systems of this class to raise the pressure in the main reservoir to ninety pounds, the signaling-pipe will be charged through the pressure-reducing valve *p* with about fifty-five pounds pressure. Interposed in the indirect passage *q* is a valve-chamber *q'*, containing a valve or movable abutment *q²*, which seats in the direction of the signaling-pipe to close the passage *q* and is held normally away from its seat by a spring *q³* of, say, ten or fifteen pounds resistance. The valve *q²* shown fits and slides at its circumference against the wall of the chamber *q'*, and in the said wall is a longitudinally-extending groove *q⁴*, which,

while the valve q^2 is held away from its seat, affords a small open passage around that valve.

In operation the regulating-valve t is first turned to the position shown in Fig. 2 and the pressure from the main reservoir opens the reducing-valve p and fills the signaling-pipe with pressure up to that of the main reservoir, less the resistance of the valve p . The regulating-valve t should then be turned to the position shown in Fig. 1 to cut off the direct passage r and to direct the pressure from the passage s through the indirect or auxiliary passage q . When in this position, any variations of pressure between opposite sides of the valve q^2 less than the resistance of the spring q^3 will be overcome through the small open passage q^4 . The spring q^3 must be capable of maintaining the valve q^2 away from its seat against pressure from the passage s when the signaling-pipe pressure is reduced by operating the signal or by ordinary leakage. The function of the valve q^2 is to prevent the main reservoir from being unduly vented or exhausted of its pressure should the signaling-pipe be accidentally broken or one of its couplings between cars be parted. In the event of an accident of this nature the sudden great reduction of the pressure in the signaling-pipe will cause the reservoir pressure to overcome the resistance of the spring q^3 and close the valve q^2 . The plug-valve t shown is provided with a handle t' , by means of which it is operated.

As stated, it has been usual heretofore in signaling systems employing a line of pipe separate from the main train or brake pipe to maintain in that pipe as a standard pressure at about thirty pounds to the square inch. I have found from experience that impulses due to a given reduction of pressure created at a conductor's signaling-valve travel more rapidly and act more positively upon the signal mechanism where the standard of pressure is high in the signaling-pipe than where it is lower, and this is especially noticeable in long trains.

With my improved pressure-reducing valve I am enabled to maintain as high a standard of pressure in the signaling-pipe as desirable, for the reason that the valve p when closed shuts off all communication between the signaling-pipe and main reservoir and will prevent retrogression of pressure should the pressure in the main reservoir fall below the signaling-pipe standard. Therefore in a long freight-train, for example, employing my signaling system the main reservoir may be vented of more than thirty-five pounds of its pressure in releasing brakes without actuating the signal. It will be understood that if the valve p did not prevent retrogression of pressure, as described, a reduction in the main reservoir which would bring its pressure below that in the signaling-pipe would cause the pressure in the latter to reduce with that of the main reservoir and actuate the signal.

The signal-valve C illustrated in Fig. 3 is

substantially the same as the signal-valve shown and described in Letters Patent of the United States Nos. 450,334 and 450,335, granted to me April 14, 1891. It comprises a shell provided with a chamber o , which at its top is open to the signaling-pipe B. At the center of the base of the chamber o is an opening o' to the signal, (not shown,) and in the lower part of the said chamber is a port o^2 , leading to a pipe y , which communicates with a supplemental air-reservoir. (Not shown.) In the chamber o and fitting and sliding at its circumference against the inner wall of the latter is a valve or movable abutment n upon a stem n' . The stem n' moves in a guide m , and seats at its end normally over the outlet-opening o' to effectually close the same. Around the valve n is a small constantly-open passage l , which communicates at one end with the signaling-pipe and at its opposite end with the chamber o below the valve n . In the wall of the chamber o , above the normal position of the valve n , is a groove k of a length somewhat greater than the thickness of that valve. When the pipe B is charged with pressure from the main reservoir, as described, the pressure exerts itself against the top of the valve n and presses the latter down to cause its stem to seat over the opening o' . At the same time the pressure flows down through the passage l and fills the chamber o , below the valve n , and the supplemental reservoir through the port o^2 and pipe y . Air will flow through the passage l , as described, until the pressure behind the valve n —that is to say, in the supplemental reservoir and lower part of the chamber o —will be the same as that in front of or above the valve n . When the pressure in the pipe B is suddenly reduced, the superior pressure then existing in the supplemental reservoir and lower part of the chamber o will raise the valve n before the pressure can escape through the passage l , and in raising the valve n it opens the passage o' , permitting the escape of pressure to the signal to actuate the latter. As the valve n is raised it registers with the groove k , and thus opens an additional and larger passage around said valve, through which the pressures on opposite sides thereof will be quickly equalized and permit the valve to drop again to its seat. The construction and operation of this valve are so similar to the signal-valves shown and described in my aforesaid Letters Patent that further description thereof in the present connection is thought to be unnecessary.

The conductor's signaling-valve D is provided with upper and lower chambers i, i' , divided from each other by a movable abutment h , and with an expansion or limiting chamber g . Above the said chambers is a chamber f , the base of which affords a valve-seat for a regulating-valve e . In the said valve-seat is a port f' , communicating with the chamber i , a port f^2 , also communicating with the chamber i , a port f^3 , communicating

with the chamber g , and an exhaust-port f^4 , communicating with the outside air, all the said ports being in the relative positions shown in Fig. 6. Extending through the regulating-valve e is a passage e' , rendered flaring on the under side of said valve by a groove e^2 , extending in the direction shown in Fig. 7. On the under side of the regulating-valve e is a groove e^3 , located with relation to the opening e' in the position shown and of the relative dimensions shown. A passage d , cored in the valve-shell, communicates at its outer end with the signaling-pipe B and at its opposite end with the chamber f , above the regulating-valve e ; also, cored in the valve-shell is a passage c , extending from the chamber f above the regulating-valve to the lower part of the chamber i' . At the center of the lower part of the chamber i' is an outlet-opening b to the outside air. The movable abutment or piston h is provided with a stem h' , which moves in a guide h^2 , and at its lower end seats normally over the opening b to close the latter. In the chamber i , above the piston h , is a seat i^2 for the valve h , to limit the rise of the latter. The regulating-valve e is operated by a handle a through the medium of a stem a' , which extends through the upper part of the valve-shell and engages the said valve. On the handle a is an indicator a^2 , which moves against the rim x of the valve-shell between two stops x' x^2 , formed thereon. When the indicator is turned to the stop x' , the passage e' of the regulating-valve registers with the port f' , the port f^2 is blanked, and the ports f^3 and f^4 are brought into communication by the groove e^3 . When the regulating-valve is in the position stated, pressure from the signaling-pipe flows through the passage d to the chamber f and down through the passage e' and port f' to the chamber i , filling the said chamber and pressing the piston h down, so that its stem effectually closes the outlet b . At the same time the pressure will pass from the chamber f through the passage c to the chamber i' and fill the latter with pressure equal to that in the chamber i . The pressures on opposite sides of the piston h are thus at an equal standard corresponding with that of the signaling-pipe. The ports f^3 f^4 , being in communication, as described, open the limiting-chamber g to the outside air, whereby its pressure will be the same as that of the surrounding atmosphere. When the indicator a^2 is turned to the stop x^2 , the ports f' f^4 and the passage e' will be blanked and the ports f^2 f^3 brought into communication by the groove e^3 . This cuts off the chamber i from the signaling-pipe and opens the said chamber to the limiting-chamber g , whereby its pressure will expand into the latter chamber and be thereby reduced. The relative sizes of the chambers i and g should be such that the expansion described will effect a reduction of pressure in the chamber i of, say, two pounds, though this figure is purely ar-

bitrary. When the pressure in the chamber i is reduced, as described, it will be two pounds less than the signaling-pipe pressure exerted through the passage c and chamber i' against the under side of the piston h . The piston h will thus be driven upward against its seat at i^2 and remain in that position until the pressure escaping from the signaling-pipe through the passage c and outlet b falls below the pressure in the chamber i , when the latter pressure will force the piston h down again until its stem closes the outlet b . It will be seen that whatever reduction of pressure is effected in the chamber i will produce a substantially corresponding reduction in the signaling-pipe B without reference to the length of that pipe—in other words, while in a longer pipe more air will have to escape to produce a reduction of two pounds therein than where the pipe is shorter. The outlet-opening b will remain open until this reduction takes place. Each time the conductor's signaling-valve is opened the signaling-pipe pressure will be reduced, say, two pounds, as before stated, and will cause the movable abutment n in the signal-valve C to be raised to actuate the signal.

In practice the outlet-opening b of the conductor's signaling-valve will have a greater area than the small passage q^4 in the pressure-reducing valve A. Consequently the pressure in the signaling-pipe will be reduced through the outlet b more rapidly than it can be raised through the groove q^4 . The groove e^2 in the regulating-valve e is provided in order that the passage e' may register with the port f' , even if the indicator a^2 is not turned completely to the stop x' . After the indicator a^2 has been turned to x^2 to open the conductor's signaling-valve, the valve should be permitted to remain open until the escape of air through the outlet-port b has ceased and then closed.

It will be seen that no matter how quickly or slowly the handle is turned from x' to x^2 , the amount of pressure vented from the signaling-pipe will be the same. This is an important feature, because all other conductor's signaling-valves of which I am aware which vent directly from the signaling-pipe to the outside air permit more pressure to escape when the valve is opened slowly than when it is quickly opened, and in consequence the degree of venting is left to the judgment of the operator. My improved conductor's signaling-valve is adapted for use in the system wherein the signaling-pipe and brake-pipe are the same, as well as in the system employing an extra line of pipe for signaling purposes.

Should it ever be found desirable to increase the capacities of the chambers i and g , or either of them, beyond the limits of the valve-shell, this may of course be done by providing a special reservoir for such chamber or chambers, each reservoir to act in effect as a part of the chamber with which it

communicates and augment the capacity of the latter.

While the valves and other features of my improvement are shown as I prefer to construct them, these constructions may of course be modified in any manner which will not depart from the spirit of my invention, as defined by the claims.

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

1. In a train signaling system, the combination, with the main reservoir and signaling-pipe, of valve mechanism interposed between said reservoir and pipe and operating automatically to reduce the pressure flowing from said reservoir to said pipe and to prevent the retrogression of pressure from said pipe to said reservoir, substantially as and for the purpose set forth.

2. In a train signaling system, the combination, with the main reservoir and signaling-pipe, of a valve device between said reservoir and signaling-pipe having a direct passage and an indirect passage both extending between the said reservoir and signaling-pipe, a regulating-valve in said valve device operating to direct pressure from the main reservoir to the signaling-pipe through either said passage, and a supplemental valve in said indirect passage operating by abnormal reduction of back-pressure in the signaling-pipe to shut off communication between said pipe and the main reservoir through the said indirect passage, substantially as described.

3. In a train signaling system, the combination, with the main reservoir, signaling-pipe, and pressure-reducing valve interposed between said reservoir and pipe, of a valve device between said reservoir and pipe having a direct passage and an indirect passage both extending between the said reservoir and signaling-pipe, a regulating-valve in said valve device operating to direct pressure from the main reservoir to the signaling-pipe through either said passage, and a spring-controlled supplemental valve held normally open by its spring and operating by abnormal reduction of back-pressure in the signaling-pipe to shut off communication between said pipe and the main reservoir through said indirect passage, substantially as described.

4. In a train signaling system, the combination, with the signaling-pipe and signal actuated by a reduction of pressure in the signaling-pipe, of a conductor's signaling-valve connected with the signaling-pipe and provided

with regulating mechanism operating automatically when actuated to vent a controlled extent of pressure from said pipe by withdrawing air therefrom to an extent governed by the capacity of the pipe, substantially as described.

5. In a train signaling system, the combination, with the signaling-pipe and signal actuated by a reduction of pressure in the signaling-pipe, of a conductor's signaling-valve connected with the signaling-pipe and provided with mechanism operating when said valve is opened to open and then close communication between said pipe and the outside air without reference to the time consumed in operating said valve, substantially as described.

6. In a signaling system, the combination, with the conduit-pipe charged with an artificially-created fluid-pressure, of a conductor's signaling-valve D, having an inlet from said pipe, an exhaust-port to the outside air, a chamber *i*, a regulating-valve operative at will to charge the chamber *i* with pressure from said pipe or vent pressure from the chamber *i*, a movable abutment normally closing the said exhaust-port and exposed on opposite sides, respectively, to pressure from the chamber *i* and said pipe, whereby when the regulating-valve is moved to vent pressure from the chamber *i* pressure from the said pipe will move the said abutment and escape at the exhaust-port, substantially as described.

7. In a signaling system, the combination, with the conduit-pipe charged with an artificially-created fluid-pressure, of a conductor's signaling-valve D, having an inlet from the said pipe, a chamber *i*, a limiting-chamber *g*, and an outlet *b*, valve mechanism in the valve D, operating when moved to one position to direct pressure from said pipe to the chamber *i* and exhaust the chamber *g* and when moved to another position to close communication between said pipe and the chamber *i* and open communication between the chambers *i* and *g*, and a movable abutment governing the outlet *b* and exposed on opposite sides, respectively, to pressures from said pipe and chamber *i*, whereby when the pressure in the chamber *i* is reduced by expansion into the chamber *g* pressure from said pipe will move said abutment and open the outlet *b*, substantially as and for the purpose set forth.

HARRY R. MASON.

In presence of—

J. W. DYRENFORTH,

M. J. FROST.