(No Model.)

3 Sheets—Sheet 1.

H. R. MASON.

TRAIN SIGNALING APPARATUS.

No. 483,256.

Patented Sept. 27, 1892.

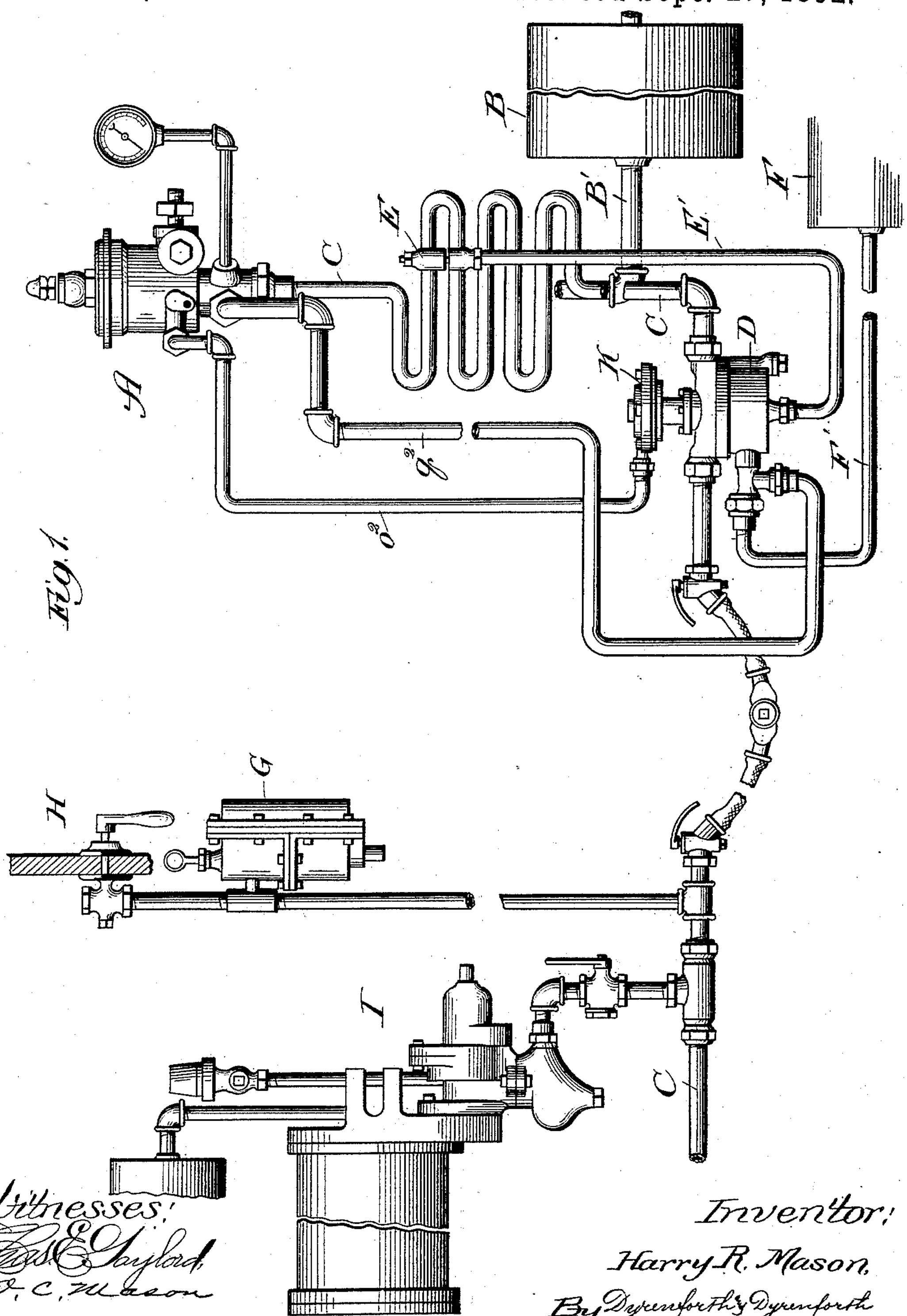

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Fig. 2.

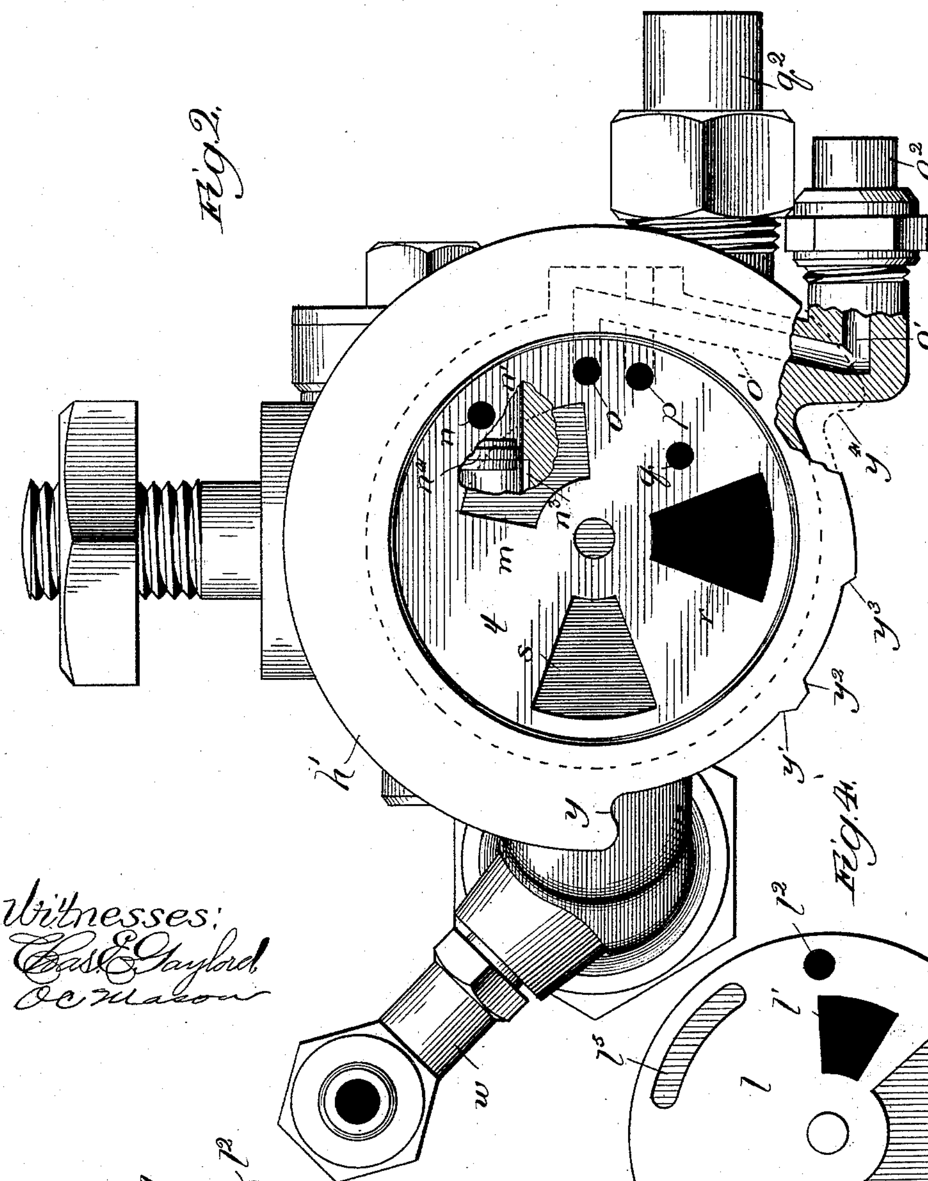

Fig. 4.

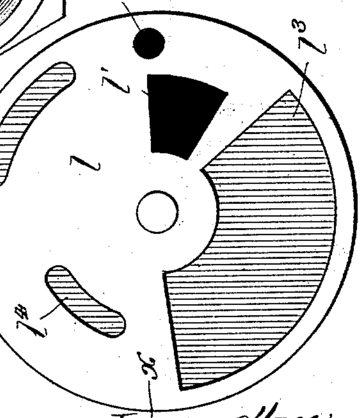

Fig. 3.

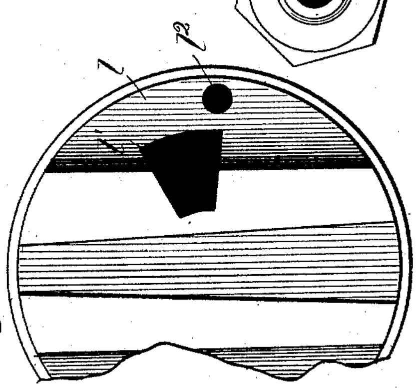

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Fig. 5.

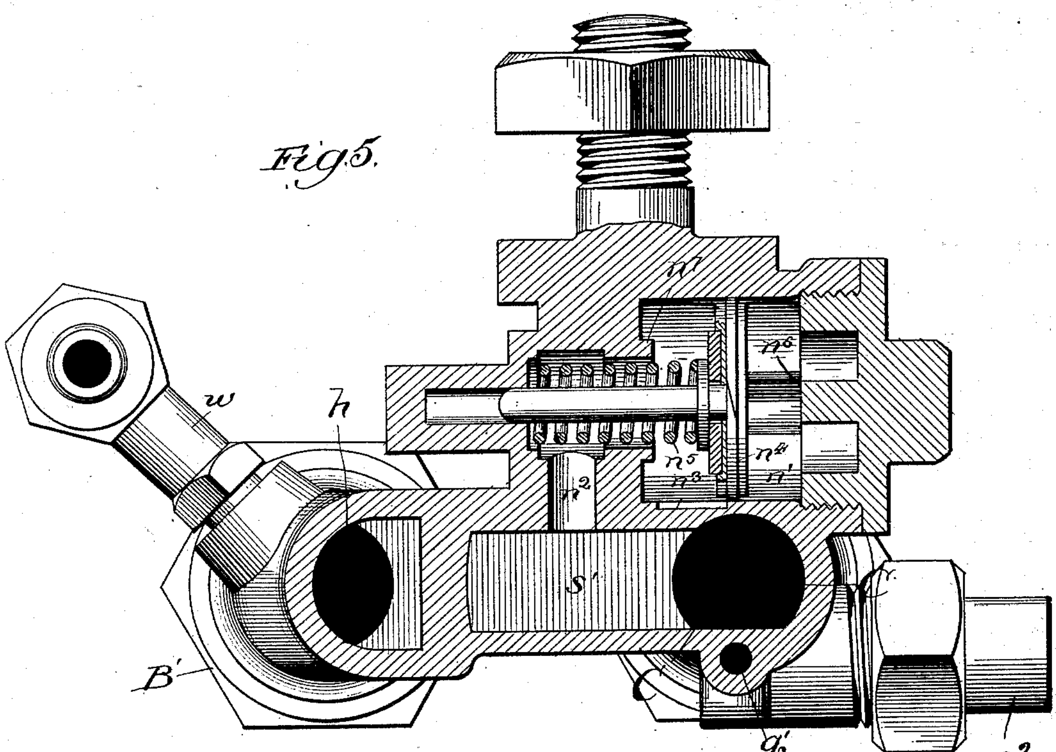
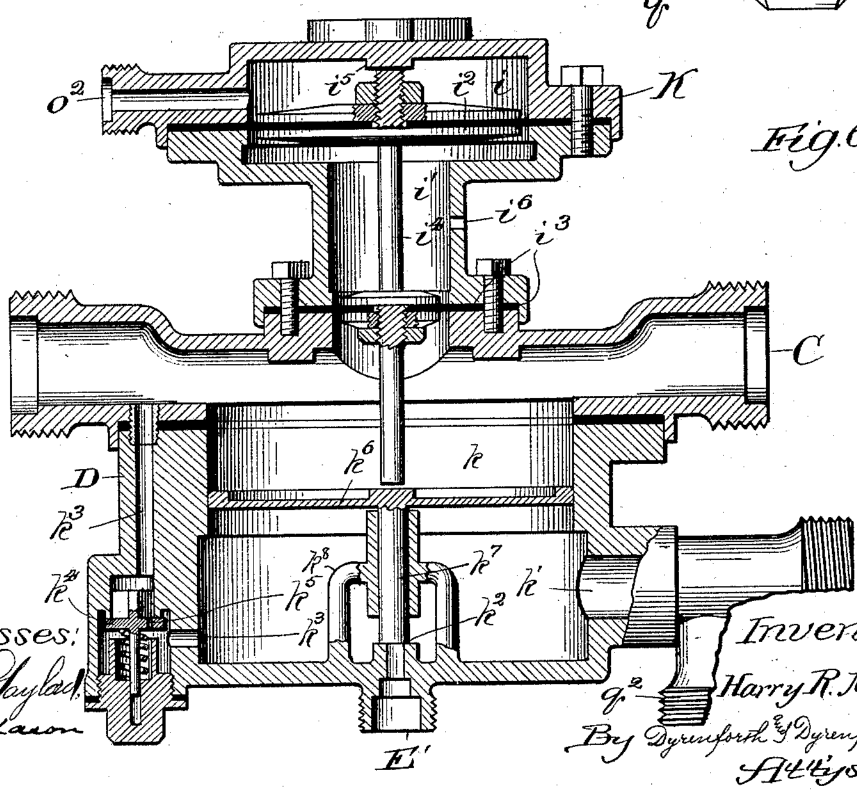


Fig. 6.



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UNITED STATES PATENT OFFICE.

HARRY R. MASON, OF CHICAGO, ILLINOIS.

TRAIN SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 483,256, dated September 27, 1892.

Application filed February 15, 1892. Serial No. 421,615. (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 an improvement upon apparatus for use more especially in connection with a signaling system for railway-trains in which the main train or brake pipe is employed for signaling purposes. In Letters Patent of the United States No. 450,335, granted to me April 14, 1891, I have described and shown means for preventing sounding of the signal when the engineer's brake-valve is turned from release to running position. Another means for the same purpose is described and shown in Letters Patent of the United States No. 463,065, granted to me November 10, 1891.

My present object is to provide mechanism for the same purpose of a construction somewhat more simple than that of my patent, No. 463,065, and which shall be equally effective in its operation.

My object is, further, to provide certain other changes in the construction described in Patent No. 463,065 to the end of adapting the same more perfectly to its purpose.

In the drawings, Figure 1 is a diagrammatic view, broken in places, and illustrating an air-brake and signaling system involving my improvements, the features to the right of the pipe-coupling shown being located upon the locomotive and the features to the left upon each of the cars of a passenger-train or the caboose of a freight-train. Fig. 2 is an enlarged top plan view of the lower portion of the engineer's brake-valve, parts being broken away for the purposes of illustration; Fig. 3, a broken top plan view of the rotary regulating-valve which seats upon the valve-face shown in Fig. 2; Fig. 4, a bottom plan view of the regulating-valve; Fig. 5, a plan sectional view of the engineer's brake-valve, the section being taken just below the valve-seat shown in Fig. 2 in a downward direction; and Fig. 6, a view, partly in section and partly in elevation, of the signal-valve and attachments therefor forming part of my present improvement.

Referring to Fig. 1, A is the engineer's brake-valve; B, the main air-reservoir; C, the main train or brake pipe, which is also the signaling-pipe; D, the signal-valve; E, a signal; F, a supplemental or signal reservoir; G, a venting-valve or conductor's signaling-valve; H, a conductor's valve, (for braking purposes,) and I the triple valve, auxiliary reservoir, and brake-cylinder upon a car of the train.

Air from the main reservoir B passes through a pipe B′ to the engineer's brake-valve, entering the latter through a cored passage h, which terminates in a chamber above the regulating-valve. On the pipe B′ is a branch pipe w, to which is attached the main-reservoir pressure-gage. The valve-seat t of the engineer's brake-valve has a direct application and supply-port s, which communicates through a passage s' with the train-pipe C, a direct exhaust-port r, leading to the outside air, a service-stop exhaust-port q, which communicates through a passage cored in the valve-shell at q' with a pipe q^2, a small exhaust-port p, a port o, communicating with a passage o', which leads to a pipe o^2, and a service-feed or running position port n, leading to a chamber n', and thence through a passage n^2 and the passage s' to the train-pipe C. In the face of the valve-seat t is a segmental recess m. Extending through the regulating-valve l is a large passage l' and a small passage l^2, and in the lower face of the regulating-valve are segmental recesses l^3, l^4, and l^5. In the side wall of the chamber n' (see Fig. 5) is a groove n^3, and the chamber contains a valve n^4, which is maintained normally by a spring n^5 against a stop n^6. When seated against the stop n^6, the valve n^4 is beyond the end of the groove n^3 and operates to close communication between the port n and passage n^2. The spring n^5 should be capable of holding the valve n^4 in the position shown against a pressure, say, of twenty pounds to hold back that extent of pressure when the engineer's brake-valve is turned to running position, and thereby permit the main-reservoir pressure to be raised twenty pounds above the pressure in the train-pipe. In the end of the chamber n' opposite the stop n^6 is a seat n^7, against which the valve n^4 may be driven against the resistance of its spring to close the passage from the port n to the train-pipe.

The signal-valve D is substantially of the form shown and described in my aforesaid Letters Patent, No. 450,335, and comprises a shell provided with a chamber k, which at its upper end is in open communication with the train-pipe C. In the lower part of the chamber k is a port k', leading to a pipe F', which extends to the supplemental or signal reservoir F, and with the pipe q^2, which extends to the service-stop inlet-port q in the seat t of the engineer's valve. Centrally of the lower end of the chamber k is an outlet-port k^2, from which extends a pipe E' to the signal E. Cored in the shell of the valve D is a passage k^3, extending from the train-pipe C to the lower part of the chamber k, and in the said passage is a valve k^4, which opens under pressure exerted against it from the train-pipe and closes under pressure exerted against it from the signal-reservoir, as hereinafter described. Extending through the valve k^4 is a small open passage k^5, which prevents the valve when closed from shutting off entirely the flow of air through the passage k^3. In the chamber k is a diaphragm k^6 upon a stem k^7. The diaphragm k^6 is adjusted to prevent leakage of air past it, and its stem k^7 extends through a guide k^8 and seats at its lower end normally over the port k^2 to close the latter.

Upon the signal-valve device D is a valve device K, which, as shown in the drawings, may be constructed substantially integral with the signal-valve. It comprises a casing having chambers i and i', divided from each other by a movable diaphragm i^2, which is preferably a flexible diaphragm secured in the shell around its edge, as shown. The chamber i' is separated from the chamber k of the signal-valve by a diaphragm i^3, also preferably flexible and secured around its edge to the shell. The diaphragms i^2 and i^3 are secured at their centers to a stem i^4, which at its upper end abuts normally against a stop i^5 in the chamber i, and at its lower end terminates normally a short distance above the center of the movable diaphragm k^6 in the chamber k. The pipe o^2 leads to the chamber i above the diaphragm i^2. The diaphragm i^2 is of greater area than the diaphragm i^3, and the said diaphragms are held in the position wherein the stem i^4 abuts against the stop i^5 by pressure exerted against the diaphragm i^3 from the train-pipe C. The chamber i' is in open communication with the outside air through a passage i^6, whereby the said chamber is always at atmospheric pressure.

The regulating-valve is turned by means of the usual handle provided with the usual spring indicator or catch which moves against the rim h' of the valve-casing of the engineer's brake-valve. The rim is formed with stops y, y', y^2, y^3, and y^4, with which the spring indicator or catch registers to indicate the position of the regulating-valve l with relation to the ports in the valve-seat t. The direction of extent of the operating-handle and the position of the indicator spring or catch thereon with relation to the regulating-valve is shown by the line x, Fig. 4. When the indicator is turned to the stop y, the valve is brought into release position, causing air from the main reservoir to pass through the opening l' of the regulating-valve to the groove m in the valve-seat, thence through the groove l^3 in the regulating-valve to the port s, and direct to the train-pipe. When in this position, the ports r, q, p, and n are blanked and the passage l^2 registers with the port o. Air from the main reservoir besides passing direct to the train-pipe, as described, will also flow through the passage o' and pipe o^2 to the chamber i of the valve device K. The pressure thus exerted against the diaphragm i^2 will cause it to reciprocate the stem i^4 downward against the diaphragm k^6 and prevent the latter from being raised to open the outlet-port k^2 to the whistle. When the indicator is turned to the stop y', the valve is at running position and the ports s, r, and q are blanked, the regulating-valve passage l^2 registers with the port n, and the recess l^5 opens communication between the port o and exhaust-port p. When the valve is in this position, the pressure in the chamber i of the valve device K retrogresses through the pipe o^2 and escapes at the port p, relieving the pressure against the diaphragm i^2 and causing the stem i^4 to be raised out of contact with the diaphragm k^6 by the pressure which is exerted against the diaphragm i^3 from the train-pipe. Air from the main reservoir flows through the passage l^2 in the regulating-valve and port n to the chamber n'.

In practice the engineer will not turn the valve from release position until he sees by his pressure-gages that sufficient pressure has flowed into the train-pipe to release the brakes. When the valve has been turned to running position, the brakes are all released, and the pressure in the main reservoir may be raised in excess of train-pipe pressure to an extent equal to the resistance of the valve n^4, which, as before stated, is usually twenty pounds. When the pressure in the main reservoir has been raised above twenty pounds in excess of the pressure in the train-pipe, the valve n^4 will be moved against the resistance of its spring n^5 and permit pressure to pass through the groove n^3 to the train-pipe. It is the ordinary practice to maintain a pressure of ninety pounds as standard in the main reservoir and a pressure of seventy pounds as standard in the train-pipe. When the main-reservoir and train-pipe pressures are at standard, therefore, the valve n^4 will balance between the two pressures and rest normally against the stop n^6. Any reduction of pressure in the train-pipe, due to ordinary leakage, or the slight venting of pressure for signaling purposes, will be overcome immediately through the valve n^4. In the event of the train-pipe being broken or a coupling parted between cars, the sudden great exhausting of the train-pipe will cause the pressure from the main reservoir to drive the valve n^4 to its seat n^7, and thus shut off the escape of pressure through n' n^2 to the train-pipe and prevent the main reservoir from being exhausted.

When the regulating-valve is turned so that the indicator engages the stop y^2, the valve is on lap and all the ports are blanked, except p and o, which still communicate through the recess l^5. Should the engineer turn the valve quickly from release to lap position, and thus pass running position, he will not prevent all the pressure from being discharged from the chamber i of the valve device K.

When the indicator is turned to the stop y^3, the engineer's brake-valve is at service-stop. In this position the recess l^4 will open communication between the ports q and r. All the other ports are virtually blanked. The recess l^5 will register with the ports o and n, and while this will cause the small amount of air under pressure between the ports o and valve n^4 to expand into the passage o' it will not be sufficient to disturb the diaphragm i^2 in the chamber i. When the valve is turned to service-stop, as described, pressure retrogresses from the train-pipe through the passage k^3 of the signal-valve, opens the check-valve k^4, and passes through the pipe q^2 to the port q and out at the port r. The supplemental or signal reservoir will be vented at the same time and in practice somewhat faster than the train-pipe, so that when the engineer's valve is turned back to lap the cutting off of the flow of pressure from the train-pipe to the service-stop inlet-port q will cause no rebound which might lift the diaphragm k^6 and actuate the signal.

Turning of the indicator to the stop y^4 brings the valve to emergency-stop, which causes all the ports, except r and s, to be blanked, and opens communication between the ports s r through the recess l^3. Turning of the valve to emergency-stop, as described, causes the pressure in the train-pipe to retrogress rapidly from the pipe C and escape through s l^3 r to the outside air.

In Fig. 1 the train-pipe C is shown to be convoluted between the engineer's brake-valve and the signal-valve D. These convolutions are for the purpose of elongating the pipe to increase the distance between the engineer's brake-valve and the signal-valve. It has been found in practice that by thus increasing the length of the train-pipe C a better operation of the signal-valve and sharper and clearer sound of the whistle are produced than where the pipe is not thus elongated. In practice I prefer to lengthen the pipe C between the engineer's brake-valve and the signal-valve to about sixty feet, although I do not limit myself to any particular length.

In operation when a conductor's signaling-valve G on a car is opened a limited amount of air only is vented from the train-pipe, and the impulse thus generated travels to the signal-valve D. The reduction produced on the upper side of the diaphragm k^6 causes the signal-reservoir pressure to exert its force against the under side of the diaphragm k^6 before pressure can retrogress through the small open passage k^5. The rise of the diaphragm k^6 opens the outlet-port k^2 to the signal, and that port will remain open until the pressure in the reservoir F has escaped through the port k^2 and retrogressed through the opening k^5 sufficiently to lower that pressure and permit the diaphragm k^6 to drop again. In its rise the diaphragm k^6 strikes the lower end of the stem i^4. When the engineer's brake-valve is at running position, any reduction of pressure which takes place in the train-pipe is overcome by the passage of pressure thereto through the port n, which opens the valve n^4 and passes through the groove n^3, as before described. If the signal-valve is close to the engineer's brake-valve, the impulse of reduction effected in the train-pipe when a conductor's signaling-valve is opened is felt at the valve n^4 at very nearly the same time as it is felt at the diaphragm k^6. As a consequence the train-pipe pressure upon the signal-diaphragm is brought up to standard almost instantly and the port k^2 closed. It is desirable that the whistle shall give a sharp clear sound, and to effect this the outlet k^2 must not be closed too suddenly. By increasing the length of the train-pipe C between the signal-valve D and the engineer's break-valve the distance which the impulse has to travel beyond the former to reach the latter and friction both contribute to delay replenishment of pressure over the diaphragm k^6 from the main reservoir, and thus increase the time during which the signal will sound.

It will be understood from the foregoing description that when the engineer's brake-valve is at release position the chamber i is filled with pressure from the main reservoir, causing the stem k^7 to be pressed to its seat at the outlet k^2 by the stem i^4. The effect of this is to prevent sounding of the signal when the engineer's brake-valve is being turned from the release position. As I stated in my patent, No. 463,065, in the sudden cutting off of the flow of pressure from the main reservoir to the train-pipe the inertia of the air that has entered the train-pipe will cause it momentarily to decrease in pressure at the forward end of the train. A momentary reduction of the pressure is thus created over the diaphragm k^6, and the momentary superior pressure of the supplemental or signal reservoir F will raise the diaphragm k^6 and open the port k^2 to sound the signal.

In the present construction the pressure in the chamber i operates to hold the stem k^7 seated until the engineer's brake-valve, when turned from release position, arrives at running position, by which time the fluctuations of pressure over the diaphragm k^6 will have ceased or become reduced to an extent which will render them harmless. When the engineer's brake-valve reaches running position, the pressure from the chamber i escapes and the stem i^4 is raised out of contact with the diaphragm k^6, as before described. In this way the signal-valve is "locked" when pressure is directed into the chamber i' and "unlocked" when pressure is vented from the chamber i.

The term "locked" is used advisedly and in the sense of maintaining the signal-actuating valve closed by a positive force independent of the train or signal pipe and signal-reservoir pressures, whereby such preponderance of pressure as there may be for a time in the signal-reservoir cannot open the valve.

I do not confine my invention to a signaling system in which the signaling-pipe is also employed for train-braking purposes nor to the particular construction of the valves shown and described for the reason that valves of any other form which in their operation would be substantially the equivalents of those shown may be employed instead.

My invention involves a new method of preventing the untimely operation of the signal by the fluctuations of pressure at the signal-actuating valve following the cutting off of the inflow of compressed air to the signal-pipe, and the method consists in automatically locking the said valve before the fluctuations commence to render the valve for the time being inoperative and then automatically releasing the valve to place it in operative condition again after the fluctuations have ceased or become sufficiently reduced to be harmless.

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

1. The combination, with a pipe, means for charging the same with fluid under pressure, and a signal-actuating valve communicating with the pipe and operated by impulses of reduction of pressure in the pipe, of automatic locking mechanism connected with the said valve and operating, as described, to lock the said valve when the inflow of charging-pressure to the pipe is cut off, substantially as set forth.

2. In a pneumatic signaling system, the combination, with the signal-pipe and signal-actuating valve communicating therewith, of signal-valve automatic locking mechanism and a valve governing said locking mechanism, said governing-valve operating in its movement to actuate the locking mechanism and thus throw the signal-valve into and out of operation, substantially as described.

3. In a signaling system, the combination, with the signaling-pipe, compressed-air-supply valve governing the inflow of pressure from the said supply to the pipe, venting-valve upon the pipe, and signal-actuating valve communicating with the pipe and operated by impulses generated at the said venting-valve, of locking mechanism for the signal-actuating valve, controlled by movement of the said governing-valve, substantially as and for the purpose set forth.

4. In a signaling system for railway-trains, the combination, with the train-pipe and the engineer's brake-valve and signal-valve communicating therewith, of signal-valve-locking mechanism controlled from the engineer's brake-valve and operated thereby in its movement to and from release position to lock and unlock the signal-valve, substantially as and for the purpose set forth.

5. In a signaling system for railway-trains, the combination, with the train-pipe and the engineer's brake-valve and signal-valve communicating therewith, of signal-valve-locking mechanism comprising a chamber provided with a diaphragm movable under air-pressure, having a stem which extends into the signal-valve to engage and release the valve mechanism therein in the movement of said diaphragm, the said diaphragm-chamber communicating with the engineer's brake-valve to be charged with pressure when said brake-valve is turned to release position to lock the signal-valve and be vented of pressure when the said brake-valve is turned from release position to unlock the signal-valve, substantially as and for the purpose set forth.

6. In a signaling system for railway-trains, the combination, with the train-pipe and engineer's brake-valve, of a signal-valve having a chamber communicating with the train-pipe, containing a valve movable by differential pressure, and an escape-port from said chamber to the signal controlled by said valve, and a shell containing a diaphragm-chamber communicating with the engineer's brake-valve, to be charged with and vented of pressure thereby when said brake-valve is turned to and from release position, and having a diaphragm moved in one direction by pressure entering its chamber and movable in the opposite direction when pressure is vented from its chamber, and provided with a stem which extends into the signal-valve chamber to engage and lock the valve therein when moved by pressure entering said diaphragm-chamber and to release said valve when pressure is vented from said diaphragm-chamber, substantially as and for the purpose set forth.

HARRY R. MASON.

In presence of—

M. J. FROST,

J. W. DYRENFORTH.