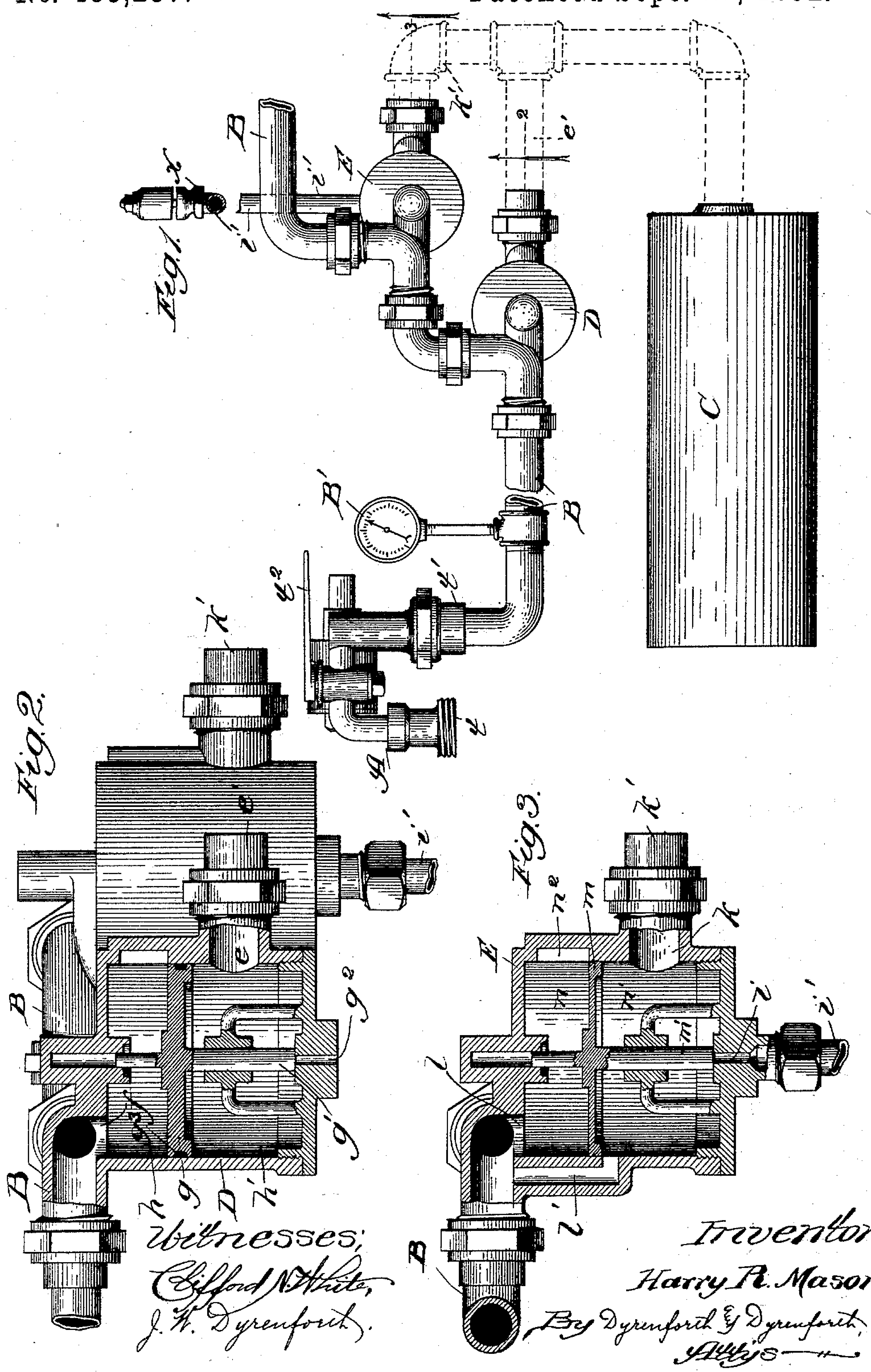
(No Model.)

H. R. MASON.

TRAIN SIGNALING APPARATUS.

No. 483,257. Patented Sept. 27, 1892.



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TRAIN SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 483,257, dated September 27, 1892.

Application filed February 15, 1892. Serial No. 421,616. (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 in signaling apparatus particularly applicable to railway-trains, in which a pipe charged with an artificially-created fluid-pressure extends along the train from the locomotive, where the signal-actuating mechanism is located, to pressure-venting or "conductor's signaling-valves" upon one or more cars of the train. The system, broadly stated, involves the employment of a main reservoir, from which the train-pipe extends along the train, an engineer's valve operative to open or shut off communication between the main reservoir and train-pipe, a signal-valve interposed in the train-pipe upon the locomotive and operated by impulses of reduction of pressure in the said pipe to actuate the signal and conductor's signaling-valves upon the cars of the train, which when opened vent a limited extent of pressure from the train-pipe to generate an impulse which produces the signal.

In a passenger-train each car is provided with a conductor's signaling-valve, in order that the conductor or other person having authority to convey signals to the engineer may have the means for signaling close at hand, no matter in what part of the train he may be. The conductor's signaling-valves are preferably all constructed alike, in order that they may all when operated vent an equal extent of pressure from the train-pipe. The standard is placed high enough to cause each conductor's signaling-valve to vent an extent of pressure with each operation which will generate an impulse capable of actuating the signal from the end of a train, however long it is desirable that the train should be. In order that the extent of pressure thus vented with each operation from the train-pipe by the conductor's signaling-valve may be as limited as possible, the signal-valve is made as sensitive as circumstances will permit.

It is necessary in the construction of signaling systems to provide mechanism which will operate equally well on a long train and a short train—that is, the limit of the length of a passenger-train being given, say, as one thousand feet, the signal should operate equally well when a conductor's signaling-valve is opened on any car of a train of the greatest length or upon any car of a short train.

It has been found hitherto in practice that in the use of signaling mechanism of the above description constructed to operate satisfactorily on a long train there is a difference between the action upon the signal-valve of an impulse generated by the conductor's signaling-valves and that of an impulse generated by conductor's signaling-valves in certain locations in a shorter train. As a result of this difference in action there is danger in a short train that the signal will sound more than once when a conductor's signaling-valve in a certain portion of the train is opened.

My present object is to provide the signaling system with mechanism which will overcome the above objections, whereby the signaling mechanism may be caused to operate equally well upon a train of any length. I have shown my improved mechanism for the above purpose in connection with a signaling system in which the train-pipe used for signaling purposes is separate from the main train-pipe employed for braking purposes. At the same time the improved mechanism for preventing the occurrence of more than one sounding of the signal with each operation of the conductor's signaling-valve is equally applicable to train signaling systems wherein the main train or brake pipe is also employed for signaling purposes.

Referring to the drawings, Figure 1 is a broken diagrammatic view of parts of my improved mechanism which are upon the locomotive, certain features being shown in elevation and others by top plan view; Fig. 2, an enlarged broken section taken on line 3 of Fig. 1 and viewed in the direction of the arrow; and Fig. 3, a section taken on line 3 of Fig. 1, enlarged, and viewed in the direction of the arrow.

A is a pressure-reducing and engineer's signaling-pipe valve; B, the signaling-pipe;

B', the signaling-pipe pressure-gage; C, the signaling-reservoir; D, a pressure-relief valve, and E the signal-valve.

The pressure-reducing valve A communicates at its end t with the compressed-air supply, which may be the main reservoir of a brake system or the main train or brake pipe, (not shown,) and at its end t' the valve A communicates with the signal-pipe.

In its general construction the valve A shown is similar to the pressure-reducing and engineer's signaling-pipe valve for which Letters Patent No. 463,066 were granted me November 10, 1891. The handle t^2 may be turned to open or close communication between the compressed-air supply and pipe B, and the valve operates to reduce the pressure flowing from the compressed-air supply to the said pipe.

The valve A forms no part of my present improvement and any other suitable valve mechanism which will answer in its place the requirements of a signaling system may be employed in its stead.

The signal-valve E is substantially like the signal-valve described in my patent No. 463,066 and other patents granted to me. It comprises a shell divided into two chambers n and n' by a movable diaphragm m upon a stem m'. The chamber n and upper side of the diaphragm m are open to the signaling-pipe through a large passage l, and the lower chamber n' and under side of the diaphragm m communicate with the signaling-pipe through a small passage l'. In the chamber n' is a port k, which communicates through a suitable pipe coupled to the valve at k' with the signaling-reservoir C. The chamber n' is also provided with an outlet-port i, which communicates by means of a pipe i' with the signal X, which is preferably a whistle. The stem m' seats normally upon and closes the port i. In operation pressure from the signaling-pipe fills the chamber n through the large passage l and the chamber n' and signaling-reservoir through the small passage l', thus establishing an equilibrium of pressure on the opposite sides of the diaphragm m. When pressure in the signaling-pipe is reduced by the opening of a conductor's signaling-valve, pressure retrogresses much more quickly from the chamber n through the passage l than the larger body of air under pressure in the chamber n' and signaling-reservoir can reduce through the small passage l'. Consequently the signal-reservoir pressure exerts itself against the under side of the diaphragm m and raises it, causing its stem m' to open the port i and permit pressure to escape to the signal. To hasten the re-establishment of an equilibrium of pressure between opposite sides of the diaphragm m when it is raised, I prefer to provide a groove n^2 in the chamber n, which opens a passage between opposite sides of the diaphragm when the latter is raised. In the signal-valve shown the diaphragm m and its stem, when pressures in the chambers n n' are equal, are maintained seated to close the outlet i by gravity alone. If desired, however, the action of gravity may be supplemented by a spring of slight resistance interposed between the diaphragm and top of the chamber n. As before stated, it is desirable that the signal-valve E shall be so sensitive that an impulse generated at the rear end portion of a long train by venting only a small extent of pressure shall be capable of causing the diaphragm m to be raised by the signal-reservoir pressure. I have found in practice while employing a signal-valve of the kind shown and conductor's signaling-valve constructed to operate the signal satisfactorily from any part of a three-fourths-inch pipe one thousand feet long, charged with from forty to sixty pounds pressure, that on reducing the pipe to, say, one-half that length any impulse generated by conductor's signaling-valves between, say, two hundred and three hundred and fifty feet from the signal-valve will sound the signal twice. The first sound is produced by the direct impulse from the signaling-valve, and the second sound apparently by the rebound of pressure from the end of the train. It would appear that the reason why an impulse generated beyond the said intervening space does not sound the signal twice is because the rebound is too much reduced before it reaches the signal, and the reason why the opening of a conductor's signaling-valve forward of the said intervening space sounds the signal but once appears to be because the rebound follows so closely upon the action of the direct impulse that the signal-valve diaphragm has not time to close.

The reasons above given are of course in a measure theoretical, but they are based upon observations made of the movements of the signal-pipe pressure-gage.

I may by enlarging the outlet-passage i in the signal-valve vent enough air in sounding the signal to reduce the signaling-reservoir pressure below that produced by the rebound; but enlarging the passage i increases the surface of the lower end of the stem m', exposed to atmospheric pressure, and thus decreases the sensitiveness of the signal-valve. Further, when the signal employed is a whistle it has to be adjusted to sound under a strong or light blast, and the blast will be so much stronger when the signal-valve is operated from the forward part of a long train than when operated from the rear thereof that it is hard to construct a whistle which would sound equally well under both circumstances.

To prevent the signal from sounding more than once when a conductor's signaling-valve on an intermediate car of a train is opened, I prefer, therefore, to take advantage of the increased force at the signal-valve of an impulse generated near the front of the train over that of an impulse generated farther toward the rear by providing pressure-relief-valve mechanism near the signal-valve, which will be opened to vent pressure from behind the signal-valve when an impulse stronger than that necessary to operate the signal-valve reaches the latter. The pressure-relief valve D, I prefer to employ is constructed substantially like the signal-valve E. It comprises a shell having chambers h h', divided from each other by a movable diaphragm g upon a stem g', seating normally over an outlet-opening g^2. The chamber h communicates directly with the signaling-pipe through a passage f; but the chamber h' has no direct communication with the signaling-pipe. In the chamber h' is a port e, communicating through a pipe coupled to the valve at e' with the signaling-reservoir C. The only material points of difference between the valves D and E are that the former has no passage corresponding with the passage l', the diaphragm g is heavier than the diaphragm n and has a packing-ring g^3, and the outlet g^2 leads to the surrounding atmosphere, while the outlet i leads to the signal. The effect of having the diaphragm g of the valve D heavier than the diaphragm n of the valve E is that it requires a stronger impulse of reduction to produce movement of the former than it does of the latter. In practice I make the diaphragm g so heavy that it will only be moved after the diaphragm of the signal-valve has moved, and then only under the force of an impulse generated as far forward in the train as, say, the seventh car. The resistance against operation of the valve D may, if desired, be increased by placing a spring between the diaphragm and top of the chamber h, and the spring may be provided whether the diaphragm g is made heavy, as shown, or of the same weight as the diaphragm m. The same effect would naturally be produced by having pistons, say, of equal weight in the valves D and E and having the outlet-opening g^2 in the valve D larger than the outlet-opening i in valve E, whereby the area of the lower end of the stem g^2, exposed to atmospheric pressure, would be enlarged over that of the stem m, and the resistance against the rise of the diaphragm g, produced by the suction effect of the surrounding atmosphere, would be proportionately increased. In operation, when a conductor's signaling-valve, not too far from the signal-valve, is opened the impulse thus generated will act upon the signal-valve and in the same manner upon the relief-valve D, causing pressure to be vented from the signaling-reservoir to the outside air through the outlet g^2. The pressure thus vented from the signaling-reservoir will so far reduce the pressure behind the signal-valve—that is to say, against the under side of the diaphragm m—that the rebound of impulse from the end of the train will not reduce the pressure in the chamber n above the diaphragm m sufficiently to carry it below the pressure in the chamber n'. Under the rebounding impulse, therefore, the signal will not be actuated. By venting pressure from behind the signal-valve, as described, under an impulse of reduction generated in the forward cars of a train, the action of that valve upon a whistle is rendered substantially the same whether the impulse is generated toward the front or rear of a long train, and the sound of the whistle in both cases will be about equally sharp and prolonged.

If desired, more than one pressure-relief valve D may be employed, and if more than one is provided I construct them of gradually-increasing resistance—that is to say, the first to open under an impulse of a certain force, the second only under an impulse of a greater force than that necessary to actuate the first, and so on—whereby under a certain impulse one will open, under an increased impulse that and another will open, and so on in the same manner, as has been described, that the valve D follows the action of the signal-valve.

My improvement is of course adapted to any signaling system having the characteristics of the system described, whether employed upon a railway-train or in any other connection. The name "conductor's signaling-valve" is not to limit my improvement to a train signaling system, but means any valve employed for generating impulses for the purpose of actuating the signal.

I have shown and described pressure-relief mechanism for venting air from behind the signal-valve of the form I prefer to employ. I do not, however, limit my invention to the use of that particular construction, because any mechanism which would accomplish substantially the same results in substantially the same way would be within 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 signaling system, the combination, with the signaling-reservoir and signaling-pipe both charged with fluid under pressure, of two or more valve devices provided with movable diaphragms exposed on opposite sides, respectively, to pressure from the said pipe and reservoir, and vent-openings for the reservoir normally closed by the said diaphragms, the diaphragms of the respective valve devices being of gradually-increasing resistance and movable by reductions of pressure in the said pipe to open the said vent-openings, substantially as described.

2. In a signaling system, the combination, with the signaling-pipe charged with artificially-created fluid-pressure, signal-valve, and conductor's signaling-valve, of pressure-relief-valve mechanism communicating with the signal-pipe and supplementing the action of the signal-valve to vent pressure from behind the same when the signal-pipe pressure is reduced, substantially as described.

3. In a signaling system, the combination, with the signaling-pipe charged with artificially-created fluid-pressure, signal-valve, signal-reservoir, and conductor's signaling-valve, of pressure-relief-valve mechanism

communicating with the signal-pipe and signal-reservoir and supplementing the action of the signal-valve to vent pressure from the signal-reservoir when the signaling-pipe pressure is reduced, substantially as described.

4. In a signaling system, the combination, with the signaling-pipe charged with artificially-created fluid-pressure, signal-valve, signaling-reservoir, and conductor's signaling-valve, of pressure-relief-valve mechanism communicating with the signaling-pipe and signaling-reservoir, the moving parts of which offer a greater resistance than those of the signal-valve, whereby the said pressure-relief-valve mechanism is operated only by impulses of reduction of pressure in the signaling-pipe greater than those necessary to operate the signal-valve to vent pressure from the signaling-reservoir, substantially as described.

HARRY R. MASON.

In presence of—
J. W. DYRENFORTH,
W. N. WILLIAMS.