(No Model.) 2 Sheets—Sheet 1.

H. R. MASON.

SIGNAL VALVE FOR PNEUMATIC SIGNALS.

No. 493,438. Patented Mar. 14, 1893.

Fig. 1.

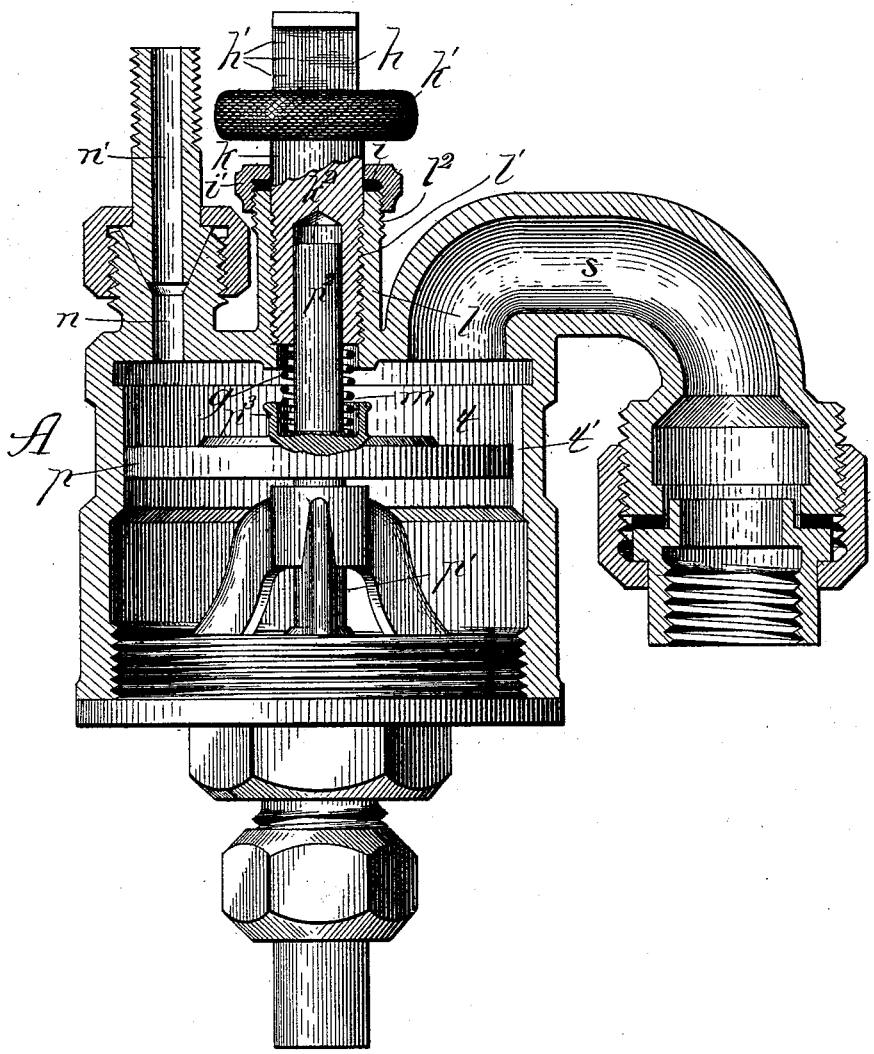

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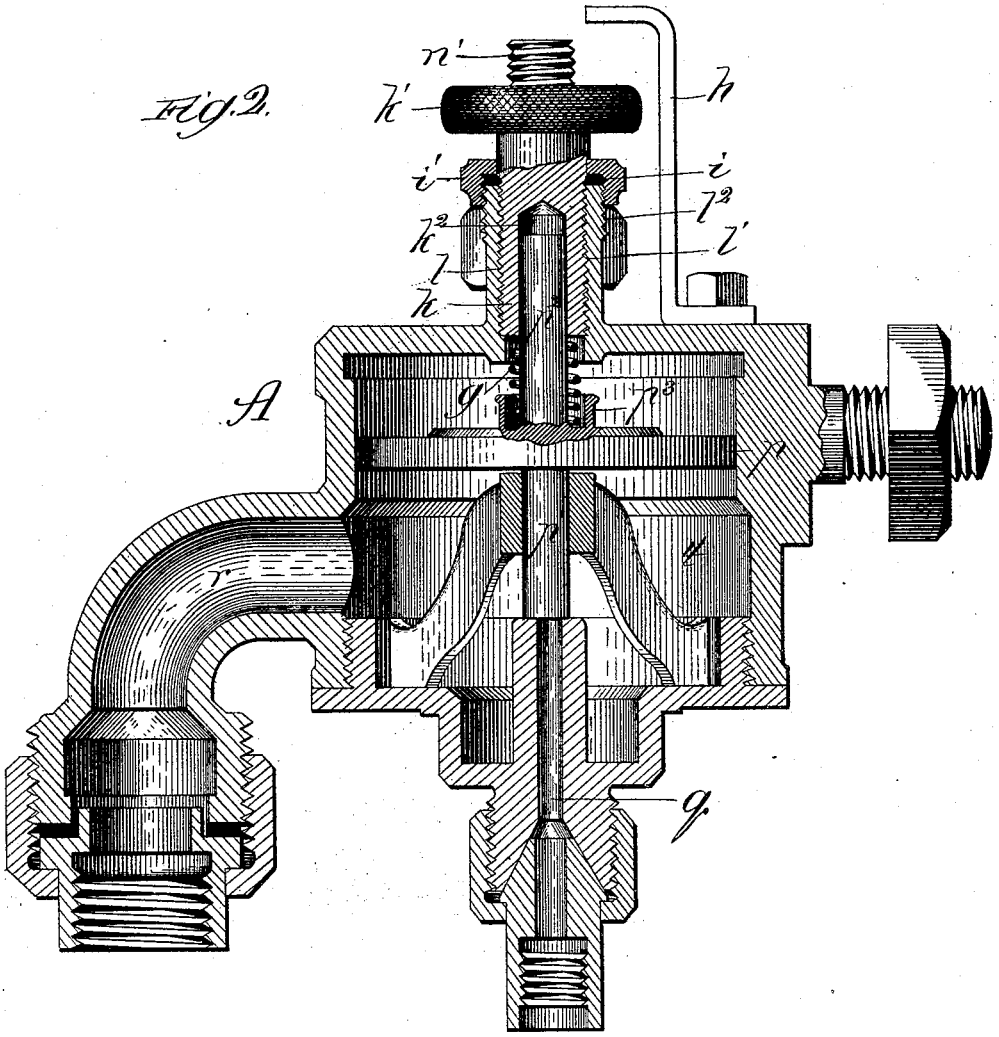
Fig. 2.



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UNITED STATES PATENT OFFICE.

HARRY R. MASON, OF CHICAGO, ILLINOIS.

SIGNAL-VALVE FOR PNEUMATIC SIGNALS.

SPECIFICATION forming part of Letters Patent No. 493,438, dated March 14, 1893.

Application filed October 28, 1892. Serial No. 450,238. (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 Signal-Valves for Pneumatic Signals, of which the following is a specification.

My invention relates to improvements in a certain signal-valve or signal actuating valve forming part of a pneumatic signal system for use, more especially, upon railway trains to enable the conductor to convey orders to the engineer. The system, broadly stated, comprises a signaling-pipe extending the length of a train and communicating at the locomotive with a compressed air reservoir, or other supply, which maintains the pipe charged with the desired extent of pressure. In the train of cars are one or more vent valves termed "conductor's signaling-valves," which, when opened, vent pressure from the signaling-pipe to create negative impulses which travel through the pipe. On the locomotive is a signaling reservoir communicating with the signaling-pipe, to be charged with pressure therefrom, and between the signaling-pipe and signaling reservoir is a signal valve, or signal actuating valve. The signal valve contains a diaphragm which is movable under differential pressure and is exposed on opposite sides respectively to pressure from the signaling-pipe and signaling-reservoir. In the valve shell of the signal-valve, on the reservoir side of the movable diaphragm, is an outlet communicating with an audible signal, preferably a whistle, and the said outlet is normally closed by the diaphragm. The passage which affords communication between the signaling-pipe and signaling reservoir is small as compared with the signaling-pipe, so that the passage of air between the pipe and reservoir is comparatively slow. In operation when an impulse of reduction is created at a conductor's signaling-valve it travels to the signal-valve and effects a reduction of the pressure against the signaling-pipe side of the movable diaphragm, which causes the superior pressure in the signaling reservoir to exert itself against the diaphragm and open the outlet to the whistle. The whistle is sounded by the air which escapes from the reservoir side of the diaphragm through the said outlet. When the pressures on opposite sides of the diaphragm are equalized, the diaphragm is returned to its normal position and closes the outlet opening to the whistle.

The conductor's signaling valves which I prefer to employ are so constructed that with each operation they will vent only a certain predetermined volume of air from the signaling-pipe, the volume of air thus vented being sufficient to create an impulse which will actuate the signal-valve in a signaling-pipe one thousand or more feet long. It has been found in practice that the same conductor's signaling-valve employed upon a signaling-pipe, say five hundred feet long, creates an impulse which has the effect of actuating the signal-valve twice. The first movement of the signal valve diaphragm is due to the action of the direct impulse, and the second movement of the diaphragm is due to the rebound of the impulse in the signaling-pipe.

In Letters Patent of the United States No. 483,257, granted September 27, 1892, for train signaling apparatus, I have shown one means for preventing the rebound of an impulse from actuating the signal more than once, by causing the direct impulse, when of greater negative force than is necessary to actuate the signal valve, to open a valve which vents pressure from the signaling reservoir and thus, by reducing the pressure on the reservoir side of the diaphragm, prevents the rebound of impulse from moving the latter. A second means for preventing the signal valve from being actuated by a rebound of impulse, is shown and described in a separate pending application for improvement in train signaling apparatus, filed by me July 5, 1892, and bearing Serial No. 438,953. In this latter construction I employ an equalizing reservoir to be used when the signaling-pipe is short, to increase the capacity of the latter and thus "equalize" a short pipe with a long signaling-pipe.

My object in the present connection is to provide a third means, which shall be under the control of the engineer, for preventing a single impulse created at a conductor's signaling-valve from actuating the signal-valve more than once.

In the drawings—Figure 1 is a central vertical section of a signal valve or signal-actuating valve involving my improvements; and Fig. 2 a central vertical section of the same taken at right angles to the section in Fig. 1.

A is the shell of the valve containing a chamber t, which at its upper side communicates through a passage s with the signaling-pipe, not shown, and at its lower side through a passage r with the signaling reservoir, not shown. At the center of the base of the chamber t is an outlet passage q, which communicates with a pipe leading to a whistle, not shown. In the chamber t is a diaphragm p, which fits and slides against the wall of the chamber. Extending downward from the center of the diaphragm p is a stem p', which at its lower end seats over and closes the outlet q. Extending upward from the diaphragm p is a stem p^2 which moves in a guide in the upper part of the valve-shell. In the wall of the chamber t is a small groove t', affording an open passage for air between opposite sides of the diaphragm p.

The construction thus far described is substantially like the signal-valve first shown and described in Letters Patent for train signaling apparatus, No. 450,334, granted to me April 14, 1891.

When the signaling-pipe is initially charged with pressure from the compressed air supply, air enters the chamber t from the pipe through the passage s and feeds through the groove t' to the lower part of the chamber t, and thence through the passage r to the signaling reservoir, until the chamber t, at both sides of the diaphragm p, and signaling reservoir are charged with the same pressure as that of the signaling-pipe. In practice, slight or slow reductions of pressure in the signaling-pipe due to leakage at couplings between cars or from other parts of the pipe, will cause air to retrogress to the pipe from the signaling-reservoir through the groove t', so that the pressure against opposite sides of the diaphragm will remain substantially equal. When a conductor's signaling-valve is opened, the impulse of reduction, thus generated, will travel to the valve A and cause such sudden material reduction of pressure at the upper side of the diaphram p, that the superior pressure from the signaling-reservoir against the under side of the diaphragm will lift the latter, before a material amount of the compressed air can retrogress to the signaling-pipe through the small groove t', and open the outlet passage q to the whistle.

At the top of the chamber t is an opening n communicating with a pipe n' which carries a pressure-gage, not shown. The gage upon the pipe n', indicates the pressure against the upper side of the diaphragm p, and will by the movement of its pointer indicate the degree of fall of pressure, over the diaphragm p, under the action of a signaling impulse.

In practice when, for example, the signaling-pipe is about one thousand feet long and charged with sixty pounds pressure, opening of the conductor's signaling-valve on the third from the last car of the train (the preferred "testing" point) will cause the pointer of the gage on the pipe n', which registers normally sixty pounds to move substantially as follows: First to, say, fifty-eight pounds, then back to nearly sixty pounds, then to say fifty-nine and one-half pounds and back again more slowly to sixty pounds. The first drop indicated by the gage is due to the action of the direct impulse, the subsequent rise to the equalization of pressure after the direct impulse, and the second drop to the rebound of impulse in the system. The escape of air to the whistle from the signaling reservoir when the diaphragm rises under the direct impulse reduces the pressure against the under side of the diaphragm below fifty-nine and one-half pounds so that the second drop, due to the rebound, does not cause the diaphragm to be lifted. With the same mechanism upon a pipe say five hundred feet in length it is otherwise, for under an impulse generated at a conductor's signaling-valve (at the test point) the gage will indicate a drop to say fifty-six pounds, then a rise to say fifty-nine pounds, then a second drop, under the rebound, to say fifty-seven and one-half pounds and then a final rise. The second drop in this case will be lower than the signaling-reservoir pressure, causing the latter to lift the diaphragm and sound the signal a second time.

The above figures appear to vary under different conditions, but they may be taken as a fair illustration of the movements of the gage.

The purpose of my present invention is to provide means under the ready command of the engineer, whereby he may increase or diminish the resistance against movement of the signal-valve diaphragm and thus so adjust it with relation to the length of his train, that a direct impulse will be able readily to raise the diaphragm, but so that the subsequent rebound can not. To this end I provide a confined spring m between the diaphragm and top of the chamber t, which tends, normally, to maintain the diaphragm seated, and means for tensioning the spring to regulate the resistance against movement of the diaphragm. Integral with the shell, and extending upward from the center of the chamber t is a hollow cylindrical projection l, provided with an internal screw-thread l' and an external screw-thread l^2. Extending downward through the top of the projection l is a screw-plug k fitting and working in the thread l', and provided at its upper end with an integral hand-wheel k'. The screw-plug k contains a socket k^2, which extends part way through it from the lower end, and affords the guide for the stem p^2 of the diaphragm p. Around the screw-plug at the top of the projection l is a gasket i clamped in place by a cap-nut i', which is screwed upon the thread l^2, and serves with the gasket to prevent leakage at

the plug. The internal thread l' terminates at a point a short distance above the lower end of the projection l marking the lowest limit to which the plug may be screwed; and fastened upon the top of the valve-shell is an arm h which at its upper end projects over the path of the hand-wheel and affords a stop which limits the upward movement of the plug k. On the diaphragm p around the stem p^2 is an annular stop p^3 which by striking the top of the chamber t limits the rise of the diaphragm under the action of a signaling impulse. Around the stem p^2 and confined between the diaphragm p and lower end of the screw-plug k is a suitable graduating spring g, which presses downward upon the diaphragm and resists the rise of the latter. The tension of the spring g is regulated by the screw-plug k.

In practice when the locomotive is coupled to a train equipped with my improved system, the signal is tested to make sure that it is in running order. For the purpose the conductor's signaling-valve on the last car but two of the train is opened to create a signal impulse. The last car but two is selected as the place of test or "test point," for the reason that it has been found, in practice that if the signal works satisfactorily from that point, it is sure to work satisfactorily from all other parts of the train. When a signal is given, as described, the engineer may determine, by the movement of the pointer of the gage on the pipe n', the amount of tension to give to the spring g, and to aid him in his judgment the inner side of the arm h may be marked with a scale h'. Thus, for example, if the train is long and the gage under a direct impulse indicates a drop of only two pounds, the engineer will screw the plug up to the top of the scale to relax the spring h as much as possible and thereby impose the least resistance against the rise of the diaphragm, to insure its operation. If the train is short and the direct signaling impulse causes the gage to indicate a drop of, say, five pounds, the engineer may screw the plug k down to the lowest point, and so increase the resistance of the spring that while it will not prevent the rise of the diaphragm under a direct signaling impulse, it will not permit the diaphragm to leave its seat under the action of the weaker force of the subsequent rebound. When the direct impulse is of intermediate force the engineer will cause the hand-wheel to register with an intermediate point upon the scale h'. While the test above described may be employed, it is not necessary, except for the purpose of determining in a general way that the system is in running order, because an engineer will be able to judge with sufficient accuracy how to regulate the tension of the spring g, by noting the number of cars in his train.

The regulating mechanism described affords a simple and positive means for so adjusting the signal valve that it will operate equally well upon a train of any length, and, while the construction shown is the one I prefer to employ it is subject to modifications without departing from the spirit of my invention.

The present means for preventing the sounding of the signal more than once under a single generating impulse, differs, broadly stated, from the means for the same purpose described in my above mentioned patent and pending application, in the respects that the other inventions contain, the one, means whereby an impulse of greater force than is necessary to actuate the signaling diaphragm will effect an abnormal reduction of the signaling-reservoir pressure, and the other means for "equalizing" the force of an impulse generated in a short train, with that of an impulse generated in a long train; while, in the present case, I provide the diaphragm with means whereby its resistance against movement may be increased or diminished at will.

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

1. In a pneumatic signaling system, the combination, with a pipe charged with air under pressure, vent-valve upon the pipe for creating signaling impulses, and signal-valve, communicating with the pipe, containing a signal-actuating diaphragm movable under the said impulse, of regulating means at the said diaphragm adjustable at will to increase or diminish the resistance of the diaphragm to movement, substantially as described.

2. In a pneumatic signaling system, the combination, with a pipe charged with air under pressure, vent-valve upon the pipe for creating signaling impulses, and signal-valve, communicating with the pipe, containing a normally seated signal-actuating diaghragm movable from its seat under the said impulses, of a spring upon the said diaphragm, and means for regulating the tension of the spring at will to increase or diminish the resistance of the diaphragm to movement from its seat, substantially as described.

3. In a signal-valve A, having the properties described, the combination with a valve-shell and normally seated signal-actuating diaphragm, of a screw-plug extending through the shell, a spring confined between the said plug and diaphragm and means for turning the said plug, from without the shell, to adjust the tension of the spring and thereby regulate the resistance of the diaphragm against movement, substantially as and for the purpose set forth.

HARRY R. MASON.

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