(No Model.) 3 Sheets—Sheet 1.

# H. R. MASON.

## FLUID PRESSURE SIGNALING SYSTEM.

No. 512,889. Patented Jan. 16, 1894.

Fig. 1.

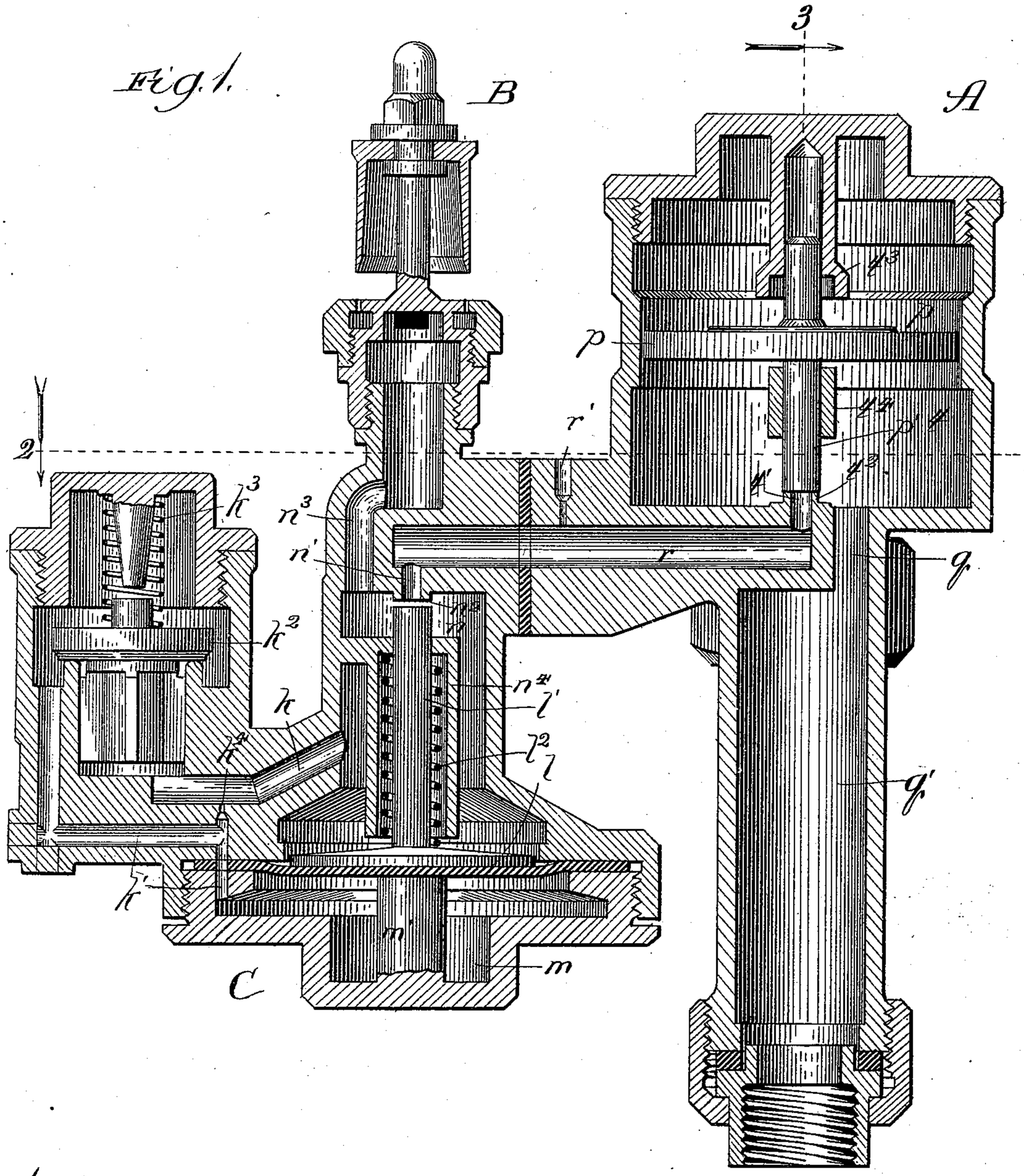


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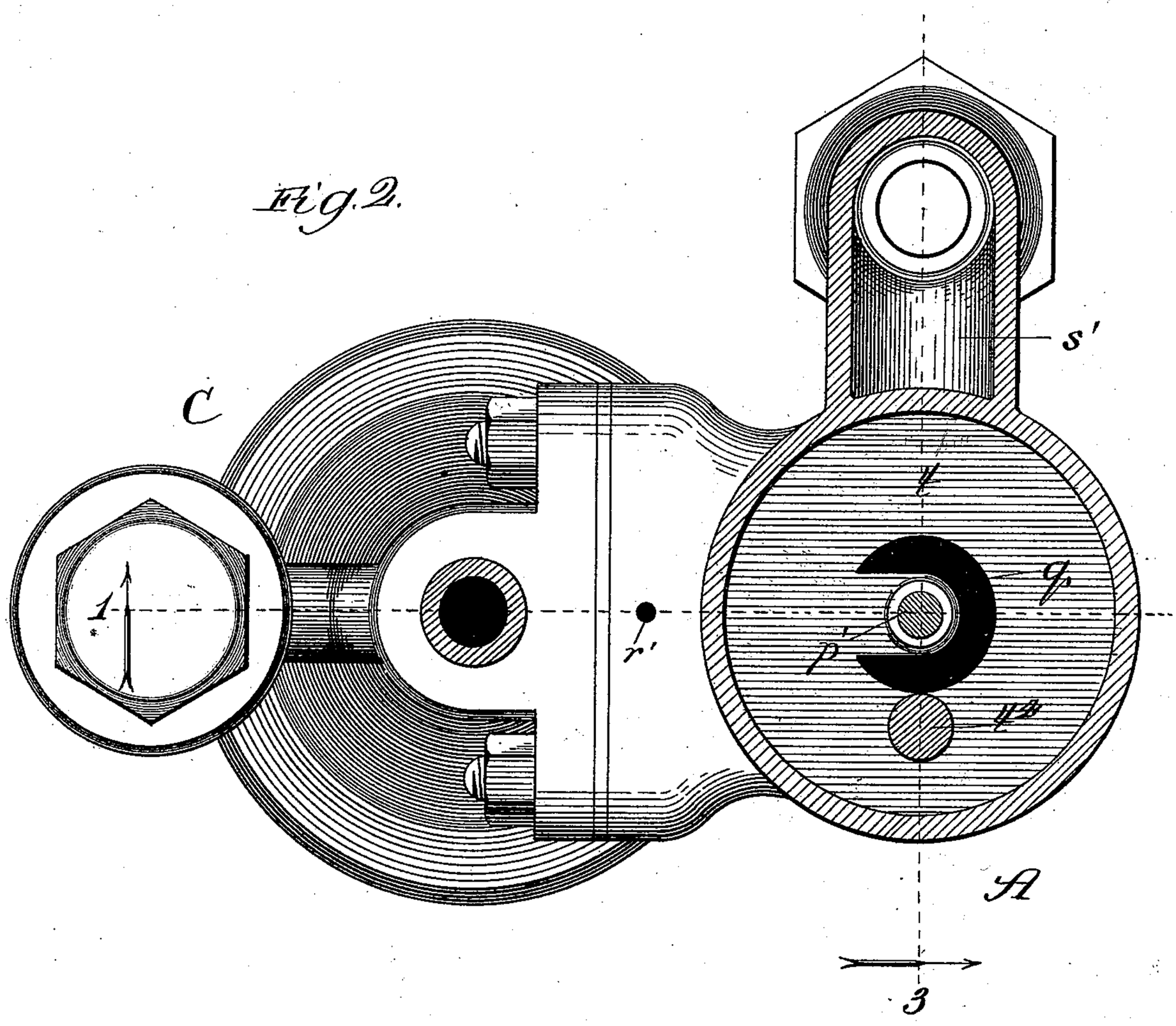
Fig. 2.

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## FLUID PRESSURE SIGNALING SYSTEM.

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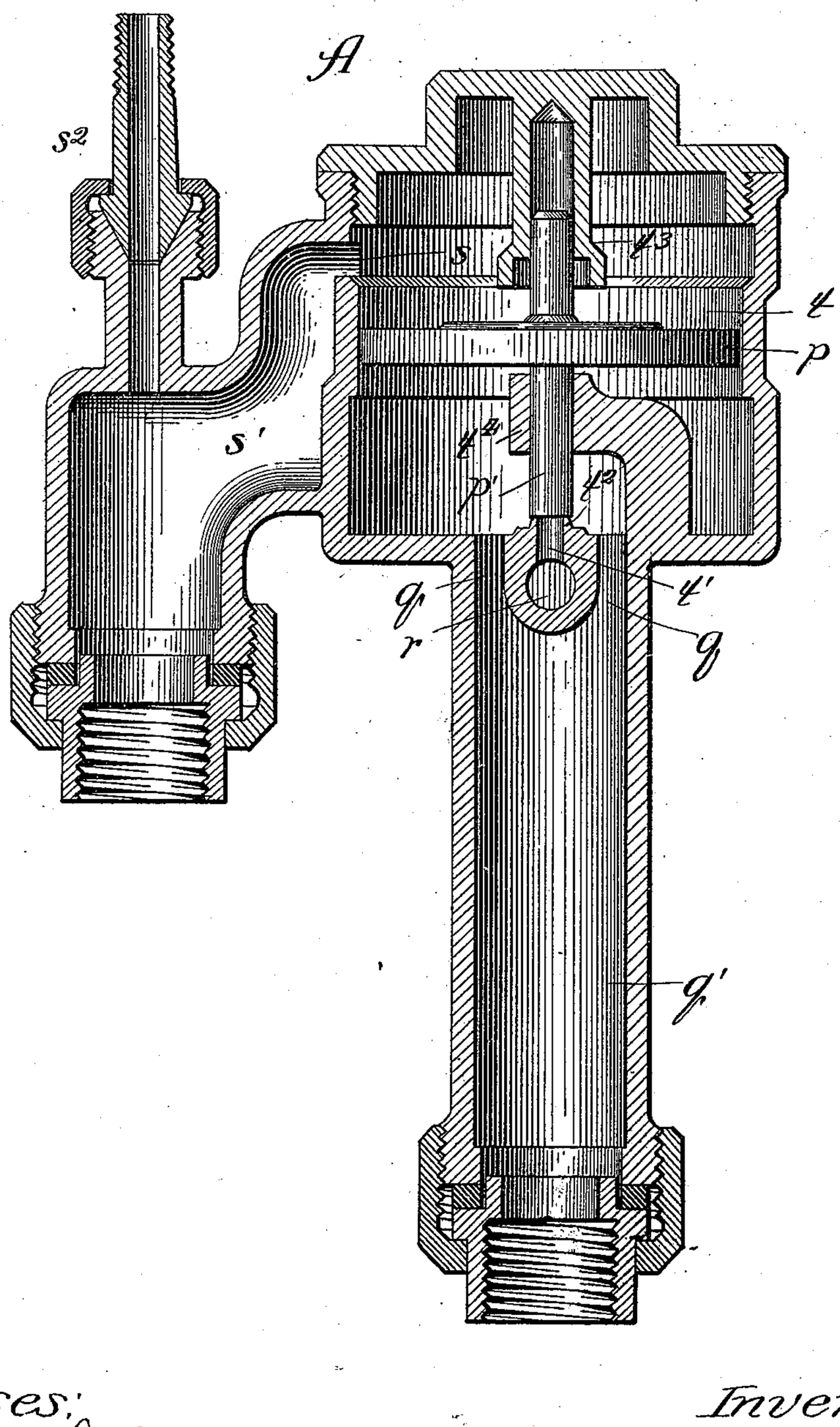
Fig. 3.

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# UNITED STATES PATENT OFFICE.

HARRY R. MASON, OF CHICAGO, ILLINOIS.

## FLUID-PRESSURE SIGNALING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 512,889, dated January 16, 1894.

Application filed August 29, 1893. Serial No. 484,291. (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 Fluid-Pressure Signaling Systems, of which the following is a specification.

My invention relates to improvements in fluid-pressure signaling systems more especially of a certain class in use upon railway trains as a medium for the transmission of signals from cars of the train to the locomotive cab. In signaling systems of the class referred to a signaling pipe extending the length of the train is fed with air under pressure at the locomotive, and kept charged, preferably, to a standard of about sixty pounds to the square inch. On each car of the train, and communicating with the signaling pipe, is a vent-valve, or conductor's signaling valve, which when opened vents air from the pipe to generate an impulse of reduction, or negative pulsation, which travels through the pipe; and on the locomotive cab is a signal-valve which is operated by said impulses to actuate a, preferably, audible signal, such as a whistle. The signal-valve contains a movable piston, diaphragm or abutment, which normally closes an outlet port leading to the whistle, and is exposed on opposite sides to pressure from the signaling-pipe and a signaling-reservoir respectively. The signaling reservoir is charged with pressure from the signaling-pipe, and when under the action of a signaling impulse the pressure on the signaling pipe side of said piston or diaphragm is reduced, the then superior pressure in the signaling reservoir lifts the said movable piston or diaphragm, and permits air to escape from the reservoir to the whistle to sound the latter.

The object of a train-signaling system is to enable the conductor of a train to transmit orders to the engineer, the code practiced being based upon the number of sounds of the whistle. It is necessary, therefore, that the whistle shall sound once, and only once, each time a conductor's signaling valve is actuated. When a signaling impulse is generated at a conductor's signaling valve, it is followed by pulsations which may be attributed to the rebounding back and forth, in the pipe, of the original impulse. It is found in practice that, under certain conditions, which it is not necessary to describe in the present specification, a single impulse, generated at a conductor's signaling valve, will cause the signal to be sounded two or even three times in rapid succession. In Letters-Patent of the United States, hitherto granted to me, I have shown and described means for preventing the signal from sounding more than once under a single generated impulse; and the principal object of my present invention is to provide an improved, particularly simple and automatically operating, means for the same purpose.

It is further my object to provide certain improvements in the construction of the signaling valve, all as hereinafter described and claimed.

In the drawings—Figure 1, is a central sectional view of my improved signal-valve, provided with means, as I prefer to construct them, for preventing the whistle from sounding more than once under a single generated signaling impulse, the section being taken on line 1 of Fig. 2; Fig. 2, a plan section on line 2 of Fig. 1; and Fig. 3, a section taken on line 3 of Figs. 1 and 2, and viewed as indicated by the arrows.

A is the signal-valve, B the signal, and C the mechanism, as I prefer to provide it, for automatically preventing the signal from sounding more than once, under a single signaling impulse, by momentarily shutting off communication between the signal-valve and signal after the direct impulse has acted to sound the latter. The shell of the signal-valve contains a chamber $t$ communicating at its upper side through a port $s$ and cored passage $s'$ with the signaling-pipe, not shown; and mounted upon the shell at $s^2$ is the usual signaling-pipe pressure-gage, not shown. At the center of the base of the chamber $t$ is a port $t'$, which communicates with a cored passage $r$. The port $t'$ is surrounded by a valve-seat $t^2$. Partially surrounding the seat $t^2$ is a port $q$ leading to a pipe $q'$, which communicates with a signaling reservoir, not shown. The signaling-valve piston $p$ is mounted upon a central stem $p'$, movable in guides $t^3$ $t^4$, and normally resting at its lower end upon the seat $t^2$ to close the port $t'$. The circumferen-

tial measurement of the piston $p$ is slightly less than that of the surrounding wall of the chamber $t$, whereby an annular space, in practice about the hundredth part of an inch in width, is left between the piston and wall to afford an open passage for air under pressure between the signaling pipe and signaling reservoir.

The shell of the device C contains a chamber $n$, communicating at its upper side through a port $n'$ with the passage $r$. Around the port $n'$ is a valve-seat $n^2$, and at one side of the valve-seat is a cored passage $n^3$ leading to the whistle B. Below the chamber $n$ is a chamber $m$, the chambers being divided from each other by a flexible diaphram $l$. Rising from the center of the diaphragm $l$ is a stem $l'$ movable in a guide $n^4$ in the chamber $n$, and shaped at its upper end to fit the valve-seat $n^2$ and close the port $n'$. The guide $n^4$ affords a housing for a confined spring $l^2$ which surrounds the stem or valve $l'$ and bears against the diaphragm $l$ to press the latter normally to a stop $m'$ in the chamber $m$, whereby the stem $l'$ is normally close to, but out of contact with, the seat $n^2$. Extending from the chamber $n$ around the diaphragm $l$ to the chamber $m$ is a passage, formed in two lengths $k$ and $k'$ respectively, between which is interposed a check or non-return valve $k^2$, which is seated by a spring $k^3$, of very slight resistance, in the direction of the chamber $n$. Extending between the passage lengths $k$ and $k'$, and therefore between opposite sides of the valve $k^2$ is a comparatively small leakage passage $k^4$.

In operation, when a signaling impulse is generated at a conductor's signaling valve and travels to the signal valve A, the piston $p$ is lifted by the pressure from the signaling reservoir, and the port $t'$ thus opened momentarily to allow compressed air to escape from the under side of the piston and reservoir through the passage $r$ to the chamber $n$. On entering the chamber $n$ the compressed air escapes simultaneously through the passage $n^3$ to the whistle, and through the passage $k\,k'$ to the chamber $m$, lifting on its way the check-valve $k^2$. The action of the compressed air is so quick that the chamber $m$ is filled with pressure equal to that in the chamber $n$ at the instant the whistle commences to sound, and as the pressure in the chamber $n$ is lowered by the escape of air to the whistle, the pressure in the chamber $m$ exerting itself against the diaphragm $l$ lifts the latter and causes the stem or valve $l'$ to close the port $n'$. The port $n'$ will remain closed until the pressure in the chamber $m$, which can not retrogress through the valve $k^2$, leaks through the small passage $k^4$, to an extent sufficient to lower the pressure in the chamber $m$ below that exerted by the spring $l^2$, when the diaphragm $l$ will drop and cause the valve $l'$ to open the port $n'$. The ports and passages are of such size, with relation to each other, that the pressure entering the chamber $m$ will maintain the valve $l'$ seated for about a second after the whistle has sounded. In the meantime fluctuations of pressure in the signaling-pipe will have so far subsided that there will be no danger of their unseating the stem or valve $p'$. While the port $n'$ is closed, opening of the port $t'$ causes the pressure escaping through the valve to exert itself against the end of the valve $l'$; but the area of the port $n'$ is so small as compared with that of the diaphragm $l$, that comparatively little pressure in the chamber $m$ will withstand the force of the signaling reservoir pressure against the end of the valve $l'$. Normally the passage $r$, chamber $m$ and all parts of the mechanism C are at atmospheric pressure, and the relative suction at the port $t'$ is depended upon to maintain the valve $p'$ seated against slight variation of pressure between opposite sides of the piston, and the jarring effect upon the latter while the train is in motion. In order that the valve $p'$ may be held to its seat with substantially the same force while the port $n'$ is closed, I prefer to provide the passage $r$ with a small outlet or leakage-port $r'$, which causes air in the said passage to drop quickly to atmospheric pressure after the valve $p'$ has opened and closed.

The gist of my invention lies in secondary valve-mechanism, for momentarily shutting off the signal after it has been once sounded under the action of the direct impulse, and operating to prevent sounding of the signal under the action of the rebounding impulses which follow the direct impulse; and, while I prefer to construct the mechanism for carrying out my invention in every detail substantially as shown and described, said mechanism may be modified in construction without departing from the spirit of my invention as defined by the claims. In the construction shown, the passage between opposite sides of the piston $p$, and through which pressure is supplied from the signaling-pipe to the signaling reservoir, is formed, as described, by providing a piston of slightly less diameter than the surrounding wall of the chamber $t$. In former constructions the passage in question was formed by drilling a hole through the piston or by providing a groove in the wall of the chamber. The present construction is preferable, because it is not liable to become clogged by dust and cinders, and renders the piston more free to act by dispensing with friction at its circumference. In the construction shown, furthermore, the passage from the signal-valve to the whistle is cored in the shell, instead of being afforded, as hitherto, by a bent pipe extending from the under side of the shell and carrying the whistle. In the former construction the jarring of the train caused the pipe to vibrate,

which at times affected the tone of the whistle and rendered it less distinct. Vibration is prevented in the present construction.

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

1. In a fluid-pressure signaling-system, in which a signal is actuated through an impulse of reduction traveling through a signaling-pipe to a signal-valve, the combination with valve-mechanism, in the signal-valve, operated by said impulses to sound the signal, of normally open secondary valve-mechanism in the passage to the signal and following the action of the signal-valve to close and then open, and while closed to shut off the signal temporarily, whereby the signal is prevented from being sounded by fluctuations of pressure in the signaling-pipe following upon the direct impulse, substantially as described.

2. In a fluid-pressure signaling-system, in which a signal is actuated through an impulse of reduction generated in a signaling-pipe, the combination with signal-valve mechanism movable under differential pressure, under the action of said impulse, to cause sounding of the signal, of normally open secondary valve-mechanism in the passage to the signal, also movable under differential pressure and following the action of said signal-valve mechanism, to close and then open and when closed to shut off the signal temporarily, substantially as and for the purpose set forth.

3. In a fluid-pressure signaling-system, in which the signal is actuated through reduction of the pressure in front of a movable diaphragm, the combination with the signal-valve, containing said diaphragm, and the signal, of secondary valve-mechanism, actuated by pressure escaping from behind the diaphragm, to render the signal temporarily inoperative after it has once sounded, substantially as described.

4. In a fluid-pressure signaling-system, in which the signal is actuated through reduction of the pressure in front of a movable diaphragm, the combination with the signal-valve, containing said diaphragm, signal, and passage between said valve and signal, of secondary valve-mechanism, controlled through and actuated by the pressure entering said passage to sound the signal, to shut off the signal against repeated sounding thereof under the action of fluctuations of pressure, in front of said diaphragm, following the direct signaling impulse, substantially as described.

5. In a fluid-pressure signaling-system, the combination with the signal-valve and signal, of secondary-valve mechanism, between the signal-valve and signal, provided with a valve-controlling diaphragm, movable under differential pressure to cause its valve to close and then open the signal to the action of the signal-valve, and operated by the pressure escaping from the signal-valve when actuated, substantially as and for the purpose set forth.

6. In a fluid-pressure signaling-system, the combination with the signal-valve, signal and passage between said valve and signal, of a chamber interposed in said passage, a second chamber communicating with the said first chamber through a passage containing a check-valve, which seats in the direction of the said first chamber, a diaphragm between said chambers movable under differential pressure, a normally open valve, at the said passage between the signal-valve and signal, actuated by movement of said diaphragm to close the passage, and a leakage opening between said chambers, the whole being constructed to operate substantially as and for the purpose set forth.

7. In a fluid-pressure signaling system, the combination with the signal-valve and signal, of a passage, $r$, extending from the outlet port of the signal-valve, a chamber, $n$, communicating with the passage $r$, a valve-seat, $n^2$, in said chamber at said passage, an outlet passage, $n^3$, from the chamber $n$ to the signal, a chamber $m$, a diaphragm $l$, between said chambers, movable under differential pressure, a valve $l'$ movable with said diaphragm to close against the seat $n^2$, a spring $l^2$, pressing the diaphragm normally in the direction of the chamber $m$ and maintaining the valve $l'$ normally open, a passage between the said chambers, a check-valve, $k^2$, in said passage seating in the direction of the chamber $n$, and a leakage opening between the chambers, the whole being constructed and arranged to operate substantially as and for the purpose set forth.

8. The combination, with the signal-valve, signal, signal-valve outlet passage $r$ and valve-mechanism for closing communication between the passage $r$ and signal, substantially as described, of a leakage-port $r'$ at the passage $r$, as and for the purpose set forth.

9. The combination, with the shell of a signal-valve provided with a signaling-pipe port and an outlet-port, leading to the signal, of a piston, movable in a guide in said shell, normally closing said outlet-port, and smaller in circumference than the surrounding wall of the shell to afford an air passage between the piston and wall, substantially as described.

HARRY R. MASON.

In presence of—
J. W. DYRENFORTH,
J. R. BILLINGS.