No. 742,491. PATENTED OCT. 27, 1903.

T. J. QUIRK.

AIR BRAKE AND SIGNAL SYSTEM.

APPLICATION FILED JUNE 30, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

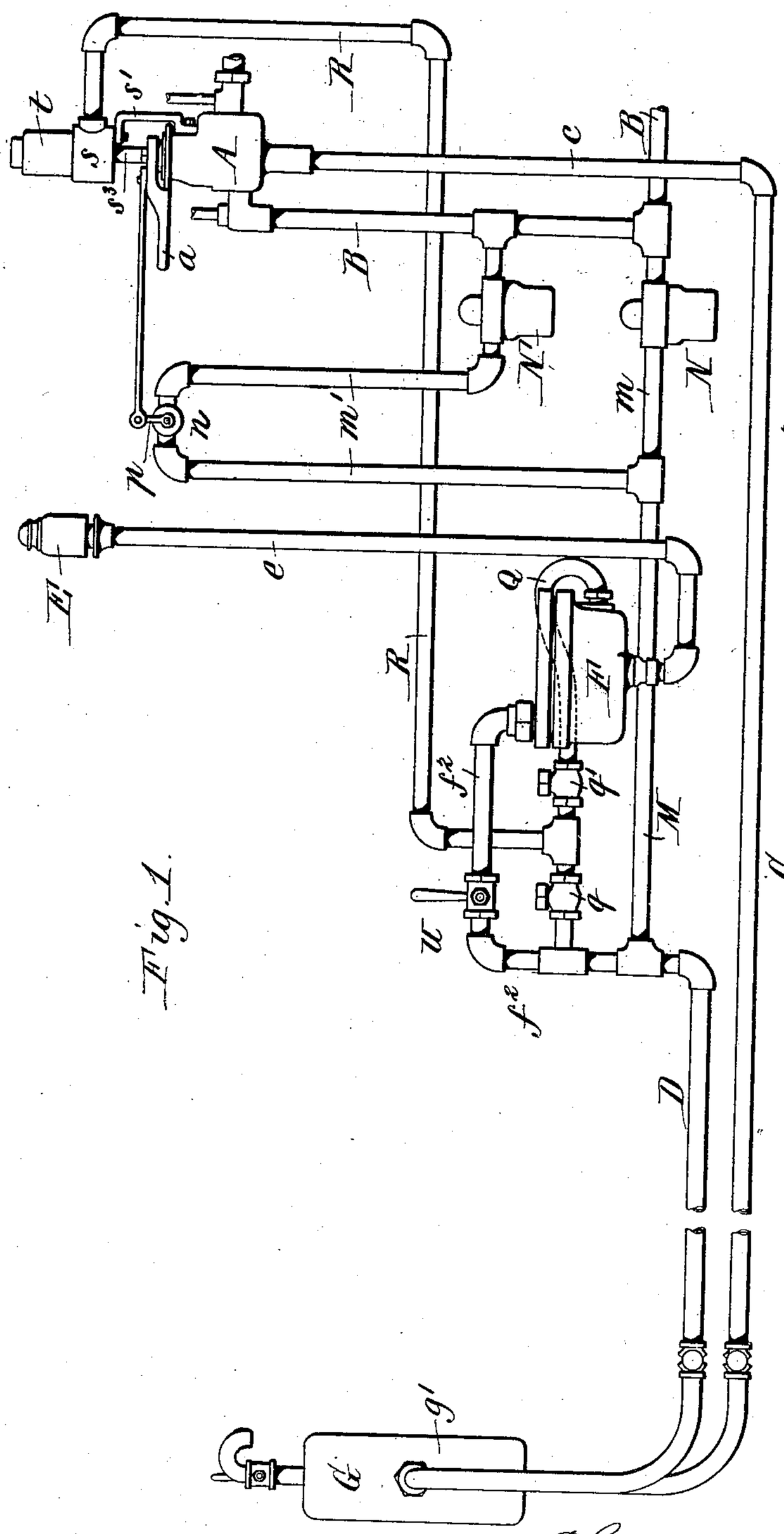

Fig. 1.

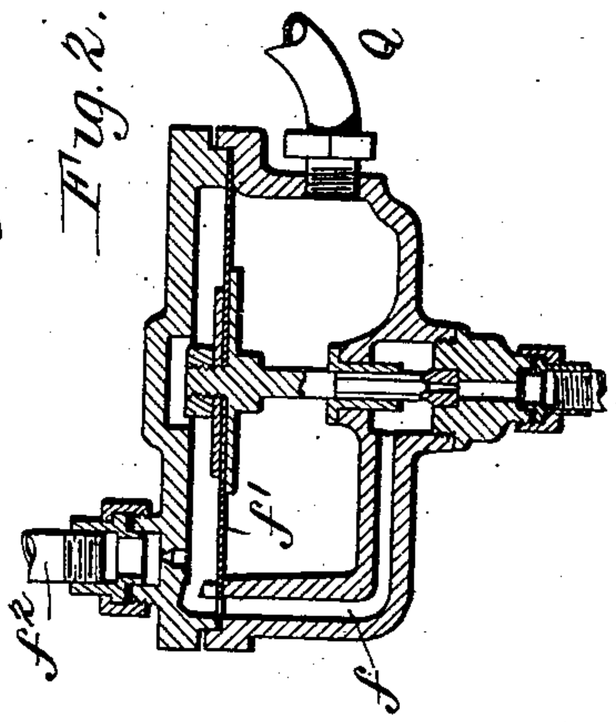

Fig. 2.

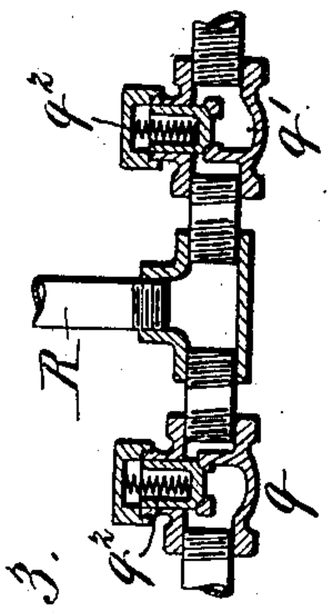

Fig. 3.

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NO MODEL.

2 SHEETS—SHEET 2.

Fig. 4.

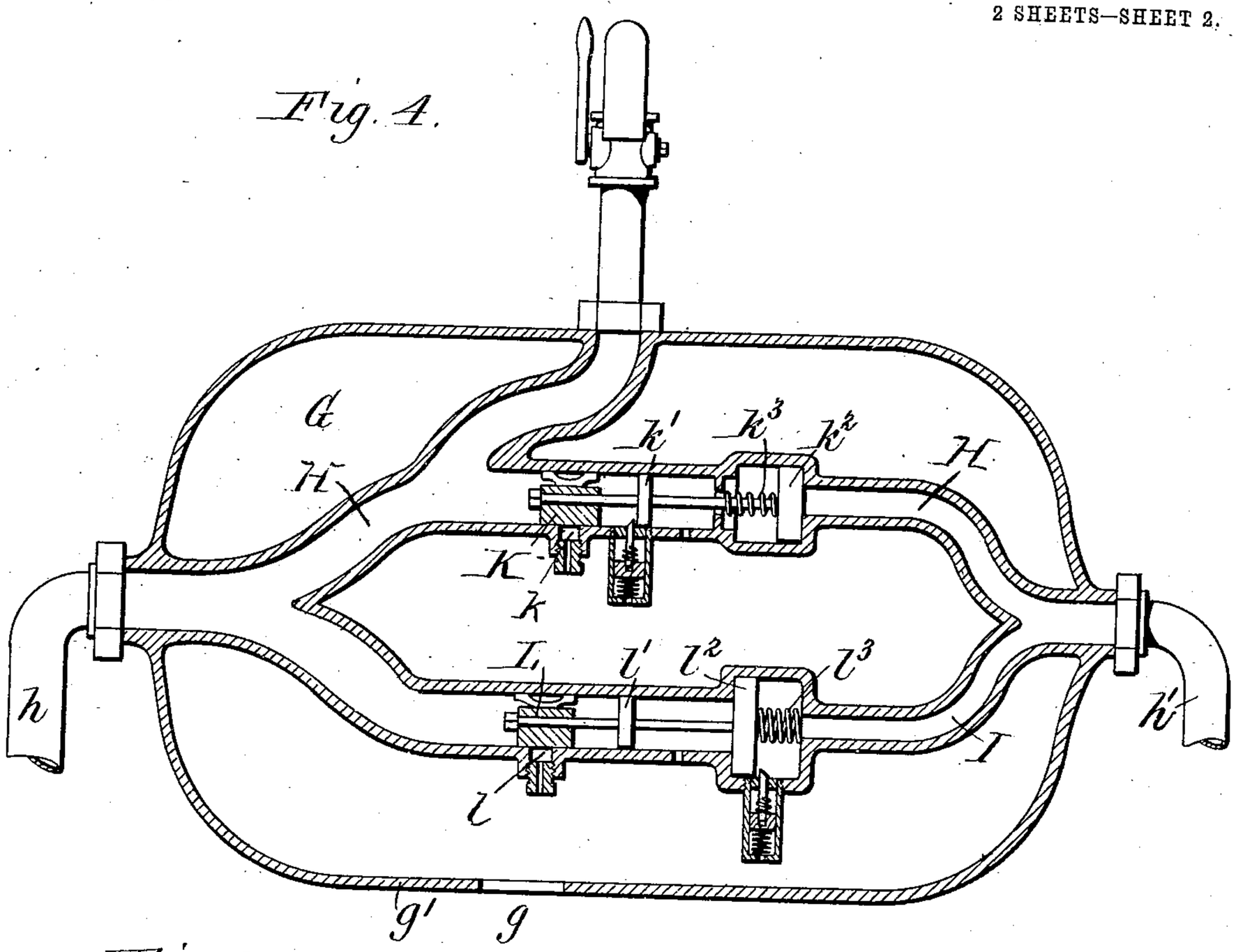


Fig. 6.

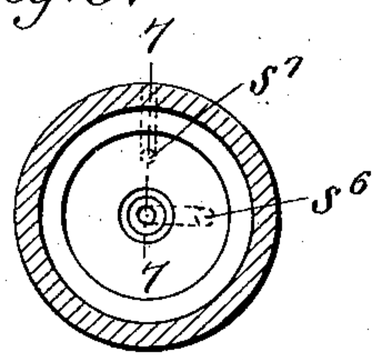


Fig. 5

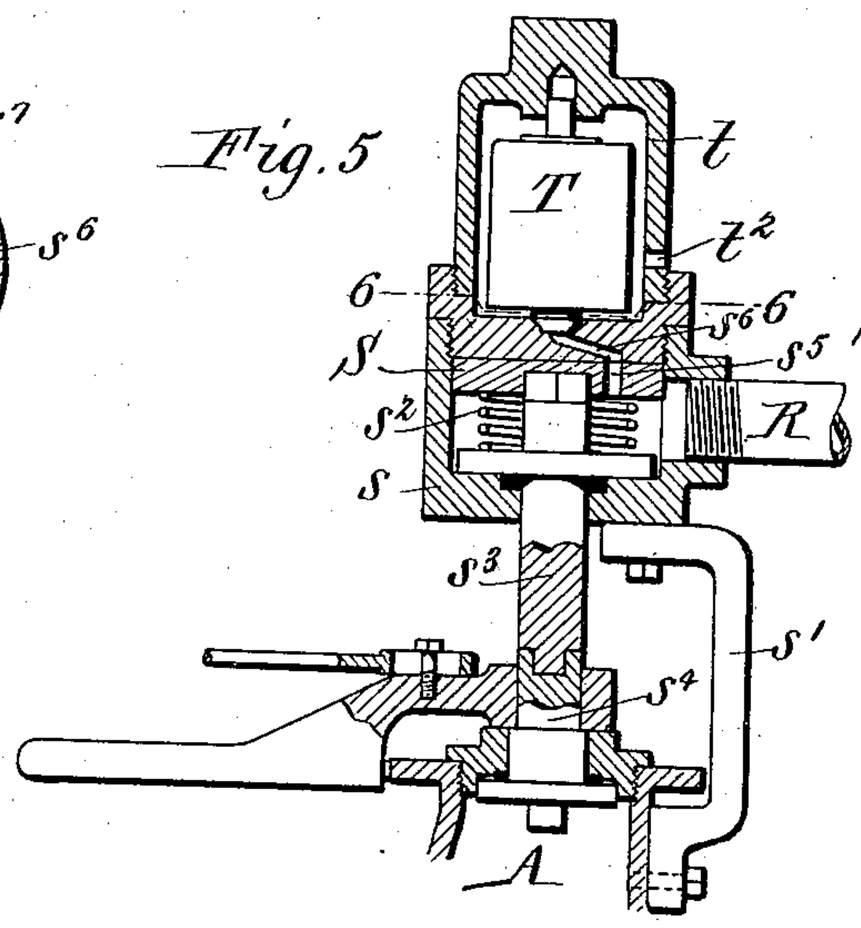
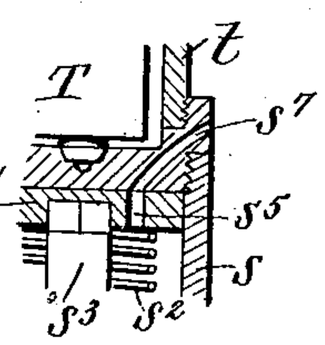


Fig. 7.



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No. 742,491. Patented October 27, 1903.

UNITED STATES PATENT OFFICE.

THOMAS J. QUIRK, OF BUFFALO, NEW YORK.

AIR-BRAKE AND SIGNAL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 742,491, dated October 27, 1903.

Application filed June 30, 1903. Serial No. 163,720. (No model.)

To all whom it may concern:

Be it known that I, THOMAS J. QUIRK, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Air-Brake and Signal Systems, of which the following is a specification.

This invention relates more particularly to improvements in an automatic air-brake and signal system of the kind disclosed in United States Letters Patent No. 726,459, granted to me April 28, 1903, and which embodies mechanism in communication with the brake and signal pipes at the rear end of the system, which is automatically operated by the air-pressure in the signal-pipe to set the brakes when the pressure in the brake-pipe is reduced below an effective point, and which also enables the engineer to set the brakes by reducing the pressure in the signal-pipe by hand when for any reason the brakes cannot be set by the brake-valve in the usual manner.

The object of the invention is to improve the air-brake and signal system described in said patent in certain respects, which will appear from the following description and claims.

In the accompanying drawings, Figure 1 is a diagrammatic elevation of portions of an air-brake and signal system embodying the invention. Fig. 2 is a detail section of the signal-valve. Fig. 3 is a detail section of the connection between the lower chamber of the signal-valve and the signal-pipe. Fig. 4 is a section of the device connecting the brake and signal pipes at the rear end of the system. Fig. 5 is a fragmentary section of the engineer's brake-valve and the regulating and pressure retaining valves. Fig. 6 is a horizontal section of the regulating-valve in line 6 6, Fig. 5. Fig. 7 is a fragmentary section of the regulating-valve in line 7 7, Fig. 6.

Like letters of reference refer to like parts in the several figures.

A represents the engineer's brake-valve; *a*, the operating handle or lever thereof; B, the supply-pipe which connects the brake-valve with the main reservoir (not shown) and supplies the brake and signal system with air under pressure; C, the train brake pipe or piping, which is connected with the brake-valve by a pipe *c;* D, the train signal pipe or piping, which is connected to the supply-pipe B in the manner hereinafter explained.

E represents the engineer's signal-whistle, located in the locomotive-cab and connected by a pipe *e* with the signal-valve F, which is of the usual construction, having upper and lower chambers communicating by a passage *f* and separated by a diaphragm *f'*, which is operated by a reduction of pressure in the upper chamber to admit air-pressure to the whistle-pipe and blow the whistle. The upper chamber of the signal-valve connects with the train signal-pipe by a pipe f^2. These parts are all common to the ordinary brake and signal system and perform the usual known functions.

G represents the apparatus operatively connecting the brake and signal pipes at the rear end of the system and which is intended to be removably supported in any suitable manner at the rear end of the last car of the train and detachably coupled to the rear ends of the train brake and signal pipes. This apparatus, which is fully described in my said patent, is shown in Fig. 4, and, briefly stated, is constructed and operates as follows: H and I are two passages, each connecting at opposite ends with the flexible pipes *h h'*, detachably connected, respectively, to the train brake-pipe C and train signal-pipe D. The passages H and I are provided with ports *k* and *l*, connecting said passages with the atmosphere through an opening *g* in the inclosing casing *g'* of the apparatus. The ports *k* and *l* are respectively controlled by valves K and L. The valve K is connected by a stem to a small piston *k'*, which is acted upon by the brake-pipe pressure, and a larger piston k^2, acted upon by the signal-pipe pressure. k^3 is a spring which tends to move the valve K in the same direction as the brake-pipe pressure to close the port *k*. The valve L is connected by a stem to a small piston *l'* and a larger piston l^2, respectively acted upon by the brake and signal pipe pressures. l^3 is a spring which tends to move the valve L in the same direction as the signal-pipe pressure acts to close its port *l*. With the normal brake-pipe pressure seventy pounds to the square inch, more or less, acting on the pistons *k' l'* and the normal signal-pipe pressure forty-five pounds to the square inch, more or

less, acting on the pistons k^2 l' the valves K and L are held in the position shown in Fig. 4, in which the ports k l are closed. In case the pressure in the brake-pipe is reduced below an effective point by the failure of the pump to properly supply the system, a stoppage in the brake-pipe caused by an incorrect position of any of the angle cocks, a choking of the pipes, a leak, or for any other unforseen reason, the signal-pipe pressure on the large piston k^2 will cause the same and the automatic valve K, connected thereto, to move to the left in Fig. 4 against the action of the spring k^3 and open the port k, thereby opening the brake-pipe to the atmosphere through the flexible hose h, passage H, port k, and opening g in the inclosing casing g'. The air thus escapes from the brake-pipe, reducing the pressure therein and setting the brakes in quick or service action, according to the size of the port k. The brakes are released after they have been set by the action of the automatic valve and the latter returned to its normal position by reducing the pressure in the signal-pipe and restoring the brake-pipe pressure in the manner explained in said patent.

When for any reason the engineer cannot set the brakes by the brake-valve in the usual manner, the valve L is operated to open the port l and exhaust the brake-pipe by reducing the pressure in the signal-pipe by means of the brake-valve, as fully described in my said patent.

The train signal-pipe is connected with the main supply-pipe B by a pipe M, Fig. 1, having branches m m', both connected to the main supply-pipe. The branches m m' are respectively provided with reducing-valves N N' of ordinary construction. The valve N' supplies air to the signal-pipe at the normal pressure of forty-five pounds, more or less, while the reducing-valve N' is adapted to maintain fifteen pounds pressure, more or less, in the signal-pipe when the pressure therein has been reduced to this extent.

n represents a valve or ordinary turn-plug arranged in the pipe m' between the forty-five-pounds reducing-valve and the signal-pipe and connected to a link p, which is connected loosely to the brake-valve handle, as shown in Fig. 5, or in any suitable manner, whereby the valve n will be closed and cut off said forty-five-pounds reducing-valve except when the brake-valve handle is turned to "full release" and "running" positions.

Q represents a pipe connecting the lower chamber of the signal-valve E with the train signal-pipe D through the pipe f^2, or otherwise, and provided with two oppositely-arranged check-valves q q', held to their seats by springs q^2.

R represents a pipe connected with the pipe Q between said check-valves and leading to a regulating-valve S, arranged in the locomotive-cab and operatively connected to the engineer's brake-valve. The casing s of the regulating-valve is arranged directly above the brake-valve casing and is supported by a bracket s', secured to the brake-valve casing. The regulating-valve is in the form of a circular disk arranged horizontally in said casing below the top thereof, against which the valve is held by the air-pressure and a spring s^2 beneath the valve. The latter is loosely supported on the upper end of a vertical stem s^3, which passes downwardly through the bottom of the casing and is detachably connected by interlocking parts or in any other suitable manner to the upper end of the usual stem s^4 of the brake-valve A, so that the regulating-valve is turned with the brake-valve. The regulating-valve is provided with a port s^5, which registers in different positions with two passages s^6 s^7 in the top of the casing of the regulating-valve. The passage s^7 leads to the atmosphere, while the passage s^6 leads to a pressure-retaining valve-chamber formed by a casing t, supported by the regulating-valve casing.

T represents an ordinary pressure-retaining valve in the form of a weight vertically movable in the casing t and provided with a portion which controls the passage s^6. The casing for the pressure-retaining valve is provided with an opening t^2, connecting the valve-chamber with the atmosphere. The port in the regulating-valve and the passages s^6 s^7, with which it connects, are so arranged relative to each other that when the brake-valve is turned to "lap" and "service" braking positions the passage in the regulating-valve will connect with the passage s^6, leading to the pressure-retaining valve, as shown in Fig. 5. The air in the signal-pipe and pipe R will then lift the pressure-retaining valve T and escape through the opening t^2 until the signal-pipe pressure is reduced to approximately fifteen or twenty pounds, when the weight of the valve will seat it and prevent further escape of the air past the pressure-retaining valve. The signal-pipe pressure is thus reduced to prevent the operation of the automatic valve K at the rear of the system while the engineer is applying the brakes by means of the brake-valve; but sufficient pressure is retained in the signal-pipe to enable the conductor to signal the engineer. When the brake-valve is turned to "emergency" position, the passage in the regulating-valve will register with the passage s^7 leading to the atmosphere, as shown in Fig. 7, thereby reducing the signal-pipe pressure. Thus the engineer can by turning the brake-valve to emergency position return the automatic valve K to its normal position after it has operated to apply the brakes or operate the valve L at the rear of the system to apply the brakes when the brakes cannot be applied in the usual manner.

As the pipe R connects with the pipe Q between the check-valves q q' when the regulating-valve is operated to exhaust the signal-pipe, the pressure is reduced equally and simultaneously from the lower chamber of the

signal-valve through the pipe Q past the check-valve q' and from the upper chamber of the signal-valve through the pipes f^2 and Q past the check-valve q. The tension of the springs q^2 for the check-valves is just sufficient to hold the valves to their seats when the pressure on both sides thereof is equal, and the valves lift from their seats whenever the pressure between them is reduced. When, therefore, the engineer operates the regulating-valve, as above explained, the pressure in both chambers of the signal-valve is reduced equally and the signal-valve does not operate to produce a blast on the signal-whistle. The train signal-pipe, however, is in direct connection with the upper chamber of the signal-valve, thus enabling the conductor to signal the engineer in the usual manner. As the passage f, connecting the two chambers of the signal-valve, communicates with the lower chamber by a restricted opening, if the pipe R, leading to the regulating-valve, were connected directly to the upper chamber of the signal-valve the pressure in the upper chamber would be reduced in advance of the pressure in the lower chamber, which would result in a blast of the whistle, which is objectionable.

The valve n in the pipe connecting the forty-five pounds reducing-valve with the signal-pipe is open when the brake-valve is in "full release" and "running" positions, so that the forty-five pounds reducing-valve maintains the normal pressure of forty-five pounds, more or less, in the signal-pipe at such times. When, however, the brake-valve is turned to lap and service braking positions, the valve n is operated to cut out the forty-five pounds reducing-valve. The fifteen pounds reducing-valve then operates to maintain the signal-pipe pressure at fifteen pounds, more or less—that is, at the point to which it is reduced by the operation of the pressure-retaining valve. Sufficient pressure is therefore maintained in the signal system to enable the conductor to signal the engineer; but there is no escape or blowing off of air at the retaining-valve, which is apt to be objectionable and confusing to the engineer.

U represents a valve or cock in the pipe f^2, connected with the signal-pipe and located in the locomotive-cab. This cock is for the purpose of bleeding the signal-pipe to set the brakes by means of the valve L at the rear end of the system and for returning the automatic valve K to its normal position, as explained in said patent.

I claim as my invention—

1. In an air-brake and signal system, the combination with brake and signal pipes, of mechanism in connection with said pipes whereby the brakes are applied by a change of pressure in the signal-pipe, a signal device operated by an inequality of pressures acting thereon, means for changing the pressure in said signal-pipe to operate said mechanism, and means for causing a substantially simultaneous and equal change in the pressures acting on said signal device, substantially as set forth.

2. In an air-brake and signal system, the combination with brake and signal pipes, of a device operated automatically by the signal-pipe pressure to apply the brakes upon a reduction of pressure in the brake-pipe, means for changing the signal-pipe pressure when applying the brakes to prevent the operation of said automatic device, a signal device operated by an inequality of pressures acting thereon, and means for causing a substantially simultaneous and equal change in the pressures acting on said signal device, substantially as set forth.

3. In an air-brake and signal system, the combination with brake and signal pipes, of a device in connection with said pipes whereby the brakes are applied automatically upon a change of pressure in the brake-pipe, means for changing the pressure in said signal-pipe to prevent the operation of said automatic device in the ordinary application of the brakes, a signal device operated by an inequality of pressures acting thereon, means for changing the pressure in said signal-pipe to operate said mechanism, and means for causing a substantially simultaneous and equal change in the pressures acting on said signal device, substantially as set forth.

4. In an air-brake and signal system, the combination with brake and signal pipes, of mechanism in connection with said pipes whereby the brakes are applied by a change of pressure in either of said pipes, a signal-valve having two chambers both in communication with said signal-pipe, and check-valves in the connection between one chamber of said signal-valve and the signal-pipe, whereby a simultaneous equal change of pressure in both chambers of said signal-valve is produced by a change of pressure between said check-valves, substantially as set forth.

5. In an air-brake and signal system, the combination with brake and signal pipes, of a device in connection with said pipes whereby the brakes are applied automatically upon a change of pressure in the brake-pipe, means for changing the pressure in said signal-pipe to prevent the operation of said automatic device in the ordinary application of the brakes, devices for maintaining different pressures in said signal-pipe, means for changing the signal-pipe pressure, and means for cutting off one of said pressure-maintaining devices when the pressure in said signal-pipe is changed, substantially as set forth.

6. In an air-brake and signal system, the combination with brake and signal pipes, of a mechanism in connection with said pipes whereby the brakes can be applied by a change of pressure in said signal-pipe, devices for maintaining different pressures in said signal-pipe, means for changing the signal-pipe pres-

sure, and means for cutting off one of said pressure-maintaining devices when the pressure in said signal-pipe is changed, substantially as set forth.

7. In an air-brake and signal system, the combination with brake and signal pipes, of a mechanism in connection with said pipes whereby the brakes can be applied by a change of pressure in said signal-pipe, means for reducing the signal-pipe pressure, a pressure-retaining device for limiting the reduction of pressure in said signal-pipe, a device for maintaining the signal-pipe pressure at substantially the limit at which it is held by said retaining device, and a device for maintaining a higher pressure in said signal-pipe and which is cut off from said signal-pipe when the pressure thereof is reduced, substantially as set forth.

8. The combination of an engineer's brake-valve, a casing supported above the same, a horizontally-rotatable valve located above the brake-valve in said casing, and a vertical stem for said rotatable valve connected directly to and operated by the stem of said engineer's brake-valve, substantially as set forth.

9. In an air-brake and signal system, the combination with brake and signal pipes, and the engineer's brake-valve, of a valve-casing supported above said brake-valve and in communication with said signal-pipe, a valve in said casing and controlling said signal-pipe, and a stem for said valve connected to and operated by said engineer's brake-valve, substantially as set forth.

Witness my hand this 26th day of June, 1903.

THOMAS J. QUIRK.

Witnesses:
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C. M. BENTLEY.