No. 836,705. PATENTED NOV. 27, 1906.

T. J. QUIRK.

AIR BRAKE SIGNAL SYSTEM.

APPLICATION FILED JUNE 20, 1906.

2 SHEETS—SHEET 1.

Fig. 1.

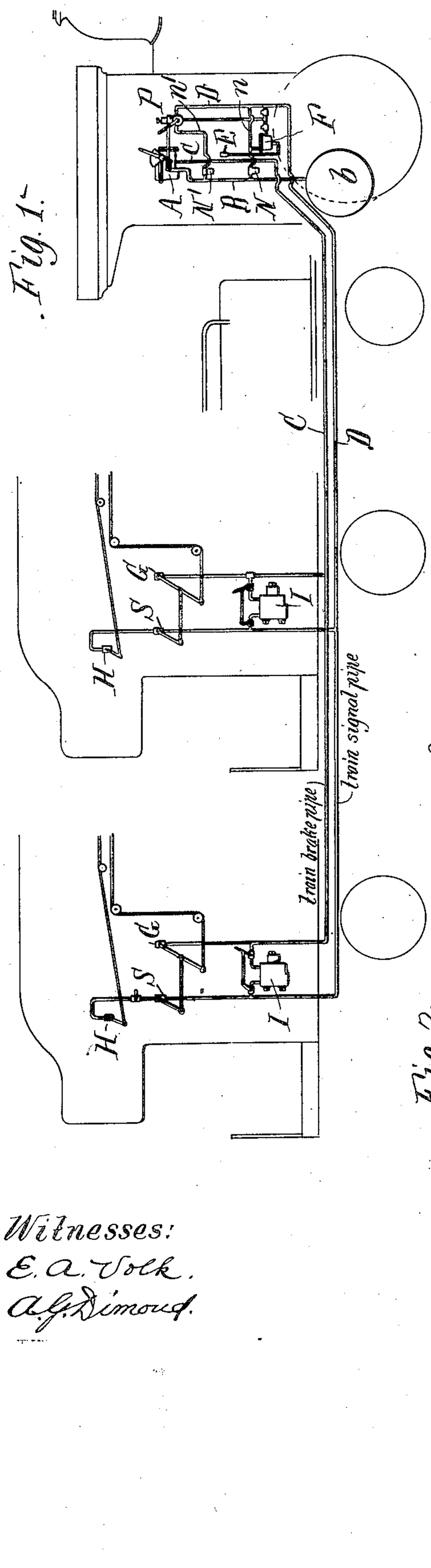

Fig. 9.

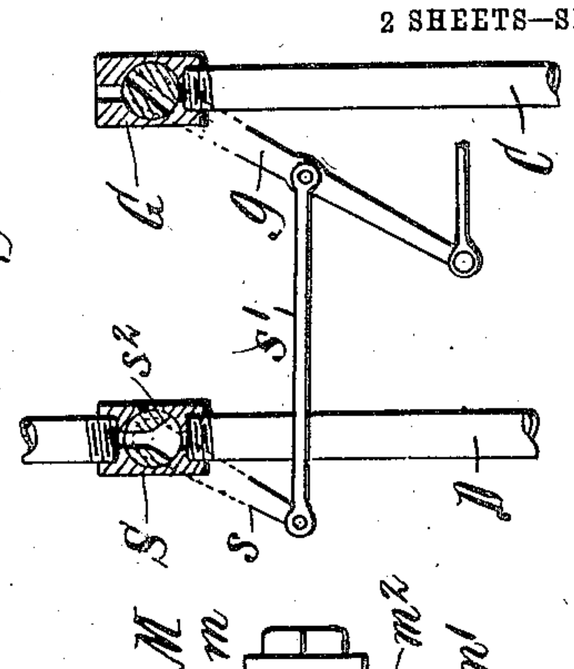

Fig. 3.

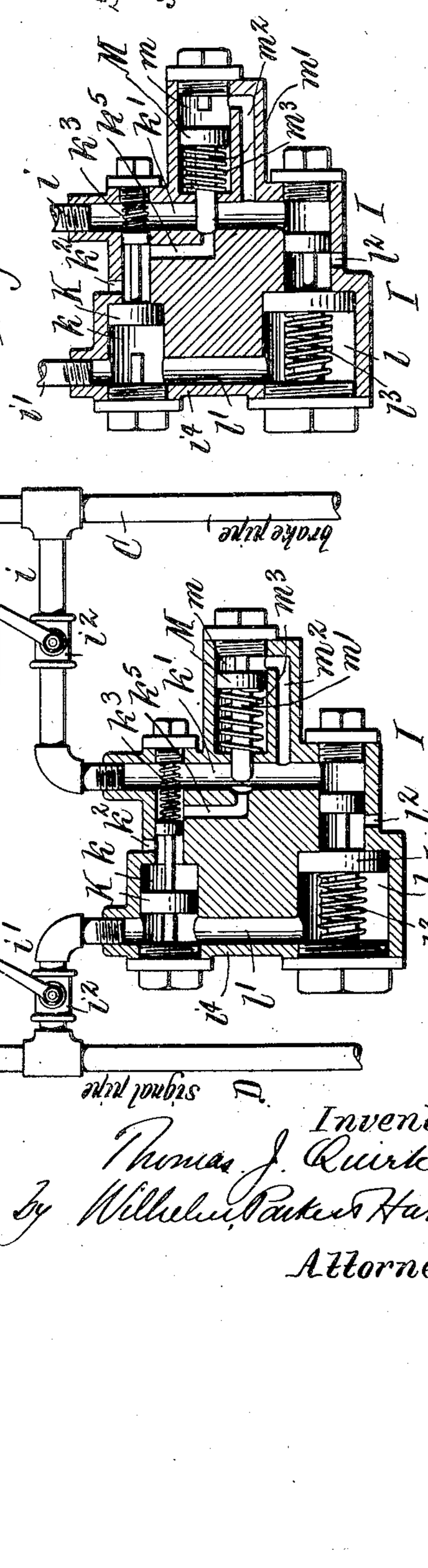

Fig. 2.

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2 SHEETS—SHEET 2.

Fig. 4.

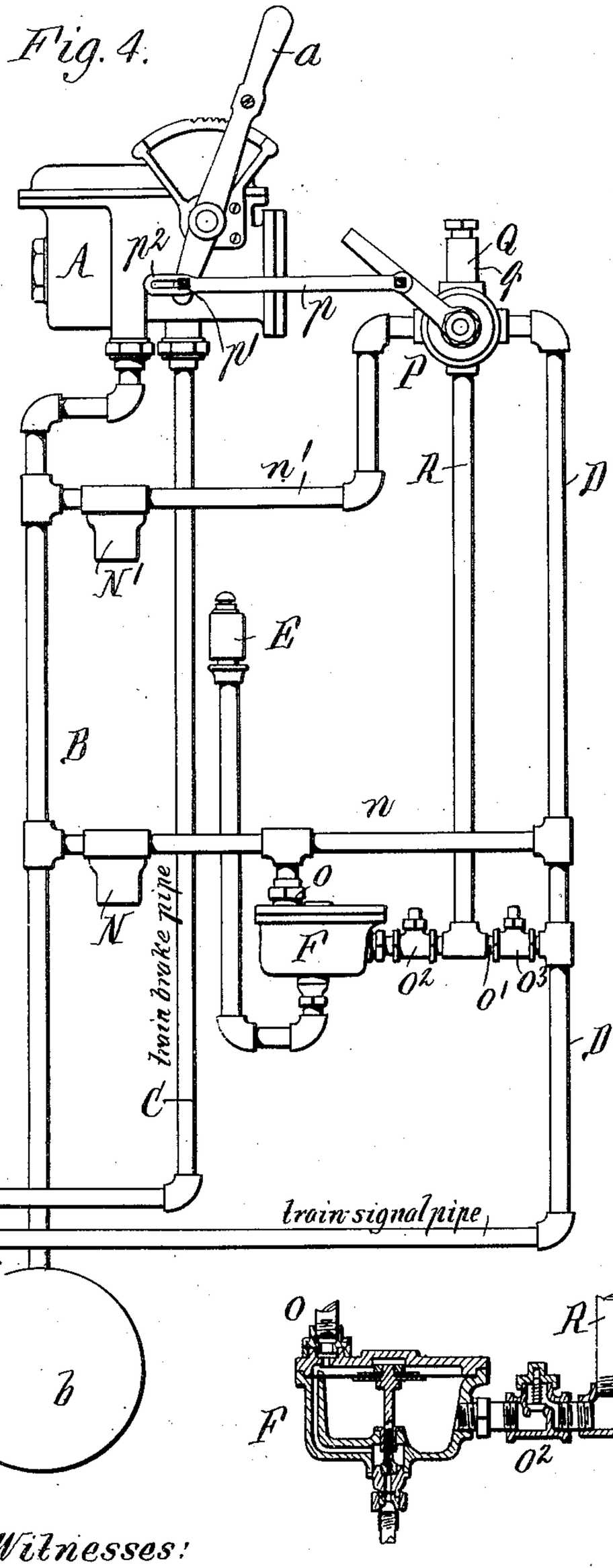

Fig. 5.

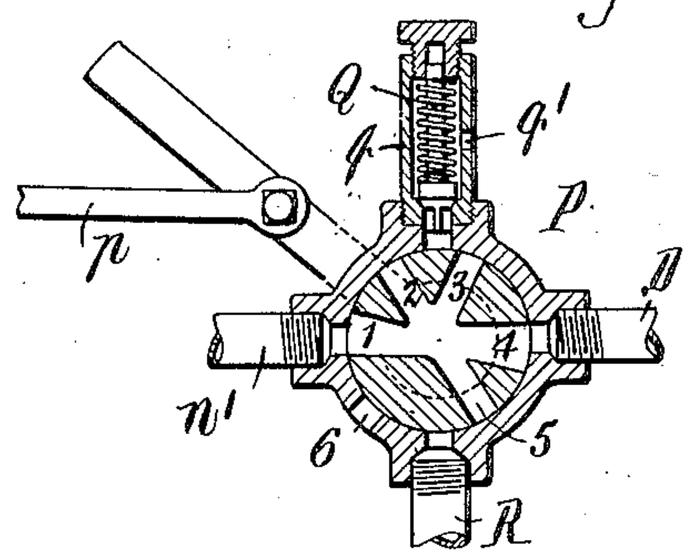

Fig. 6.

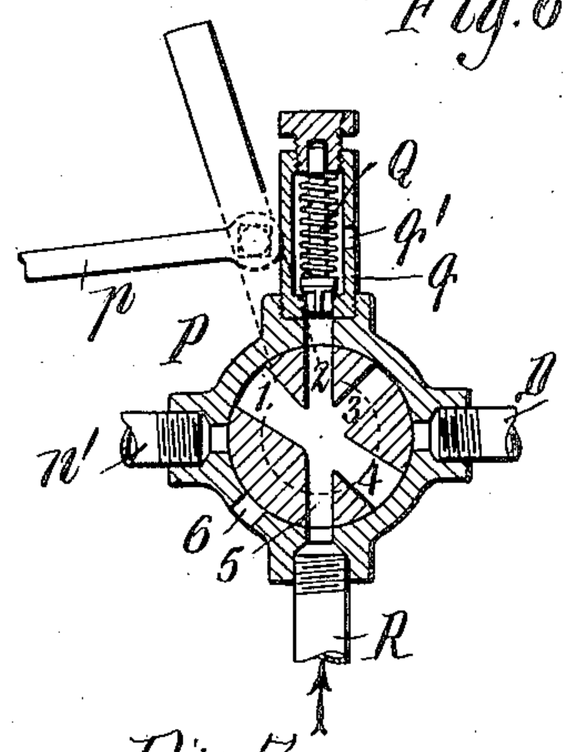

Fig. 7.

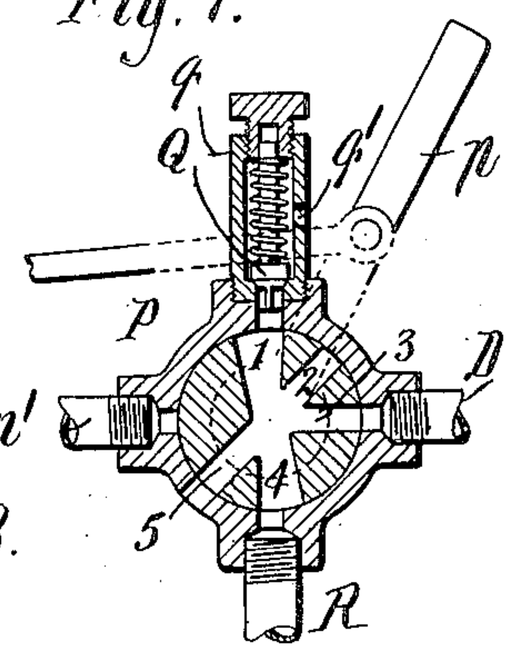

Fig. 8.

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UNITED STATES PATENT OFFICE.

THOMAS J. QUIRK, OF BUFFALO, NEW YORK.

AIR-BRAKE SIGNAL SYSTEM.

No. 836,705. Specification of Letters Patent. Patented Nov. 27, 1906.

Application filed June 20, 1906. Serial No. 322,587.

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 a new and useful Improvement in Air-Brake and Signal Systems, of which the following is a specification.

This invention relates more particularly to improvements in automatic air-brake and signal systems of the character disclosed in Letters Patent Reissue No. 12,158 and No. 742,491, granted to me, respectively, September 22, 1903, and October 27, 1903. These systems embody a device communicating with the train brake and signal pipes at the rear end of the train supplemental to the usual appurtenances of the brake and signal systems for automatically setting the brakes by means of the signal-pipe pressure in the event that the pressure in the brake-pipe falls below an effective point for any reason, and means whereby the engineer can bleed the air-brake pipe and set the brakes through the medium of said device by emptying the signal-pipe in the event that the brakes cannot for any reason be applied by the operation of the engineer's brake-valve in the usual manner, the supplemental devices and their operation not interfering with the usual functions and operation of the brake and signal systems.

The objects of this invention are to simplify and increase the efficiency of such systems, to provide means whereby the conductor can set the brakes and stop the train when this is necessary and the engineer for any reason fails to do so and which enable the conductor to apply the brakes in rear of an obstruction in the train-brake pipe which would prevent the brakes from being set by the engineer's brake-valve, to adapt the supplemental apparatus for use with either the Westinghouse or New York air-brake systems, to prevent loss of air-pressure from the system in resetting the automatic device after the automatic operation thereof to apply the brakes, and to improve such systems in the respects hereinafter described, and set forth in the claims.

In the accompanying drawings, Figure 1 is a broken diagrammatic view of portions of an air-brake and signal system embodying the invention. Fig. 2 is a sectional elevation, on an enlarged scale, of the automatic apparatus connecting the train-brake and signal pipes. Fig. 3 is a similar view of the same, showing different positions of the automatic and pressure-saving valves. Fig. 4 is an elevation, on an enlarged scale, of the parts of the apparatus located on the engine. Figs. 5, 6, and 7 are similar sectional elevations, on an enlarged scale, of the engineer's controlling-valve, showing, respectively, different positions thereof. Fig. 8 is a sectional elevation, on an enlarged scale, of the engineer's signal-valve and associated parts. Fig. 9 is a sectional elevation, on an enlarged scale, of the conductor's brake-valve and car-discharge valve.

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

A represents the engineer's brake-valve, (hereinafter termed the "brake-valve;") *a*, the operating handle or lever thereof; B, the supply-pipe leading from the main air-reservoir *b* to the brake-valve for supplying the brake and signal system with air under pressure; C, the train-brake pipe or piping extending from the brake-valve to the rear end of the system; D, the train-signal pipe or piping which is connected with the supply-pipe, as hereinafter explained, and extends to the rear end of the system; E, the engineer's signal-whistle; F, the whistle-operating or signal valve; G, the conductor's brake-valves which are located in the cars and connected to the train-brake pipe, and H the car discharge-valves, which are also located in the cars, preferably adjacent to the conductor's brake-valves, and are connected to the train-signal pipe. These parts, except as hereinafter explained, are all of well-known construction and operation.

In the above-mentioned patented systems the train brake and signal pipes are connected at the rear end of the system by a device for applying the brakes automatically or at the will of the engineer through the medium of the signal-pipe pressure. In the present system one of these devices I is located at a suitable place in each car and connected with the train brake and signal pipes C and D, for example, by pipes i i', respectively, provided with ordinary stop-cocks or valves i^2. These stop-cocks are preferably connected to be operated together, as by a link i^3 joining their handle-levers.

The several devices I are alike, and only the one at the rear end of the train is used, the others being cut out of the system by

turning the stop-cocks i^2 to close the pipes connecting them with the train brake and signal pipes.

The device I is preferably constructed and operates as follows, (see Figs. 2 and 3:) The casing i^4 thereof has two valve-chambers k l, each connecting at opposite ends with the train brake and signal pipes through passages k' l' and the pipes i i'. The valve-chambers k l connect with the atmosphere by exhaust-ports k^2 l^2, respectively. K L represent piston-valves located in said valve-chambers and controlling said ports. Each valve has faces or ends of different area, the larger face thereof being exposed to the signal-pipe pressure and the smaller face to the greater pressure in the brake-pipe. The valve K will be hereinafter called the "automatic" valve. A spring k^3 assists the brake-pipe pressure to hold the automatic valve K in the position shown in Fig. 2, and a spring l^3 assists the signal-pipe pressure to hold the other valve L in the position shown in the same figure. With the normal brake-pipe pressure—say, for instance, seventy pounds per square inch—acting on the small faces of the valves and the normal signal-pipe pressure—say, for instance, forty-five pounds per square inch—acting on the large faces of the valves they will remain in the position shown in Fig. 2, in which they close the ports k^2 l^2—that is, prevent the escape therethrough of the air from the brake-pipe. If the pressure in the train-brake pipe falls below an effective point from any cause—such, for example, as the failure of the pump to properly supply the system, a stoppage in the brake-pipe caused by an improper position of the angle-cocks, the choking of the pipes or a slow leak therein, or the brake-valve handle being left "on lap"—the predominating signal-pipe pressure will move the automatic valve K to the position shown in Fig. 3, thereby placing the train-brake pipe in communication with the exhaust-port k^2 through the passage k' and an auxiliary passage k^5. The air will then escape from the train-brake pipe through said exhaust-port k^2 and set the brakes in quick or service action, depending upon the size of said port. The brakes can be released after being thus automatically set and the automatic valve K returned to its normal position by reducing the pressure in the train-signal pipe, as hereinafter explained, and restoring the pressure in the train-brake pipe. As thus far described the apparatus is similar in principle to the apparatus disclosed in said patents.

In order to prevent the air from blowing out of the port k^2 when the pressure is restored in the train-brake pipe, and thus causing a needless waste of air-pressure, a pressure-saving valve M, Figs. 2 and 3, is provided. This valve preferably consists of a piston working in a chamber m and having a plunger m', which extends loosely through a hole in one end of the chamber and is adapted to close the auxiliary passage k^5. The other end of the valve-chamber m connects with the passage k', leading to the train-brake pipe, as by a passage m^2. Pressure can leak into the valve-chamber m through the hole for the plunger m', and this pressure, aided by a suitable spring m^3, will hold the valve M in the position shown in Fig. 2 against the opposing pressure on the opposite side of the valve. When the automatic valve K opens the exhaust-port k^2 and reduces the train-pipe pressure, as above explained, the pressure will also fall in the valve-chamber on opposite sides of the pressure-saving valve M. When air is again admitted to the train-brake pipe to restore its normal pressure for releasing the brakes, it will rush into the chamber m in rear of the pressure-saving valve M through the inlet-passage m^2 much faster than it can leak into the opposite end of the chamber through the plunger-hole, and the pressure-saving valve M will be quickly moved to close the auxiliary passage and prevent the loss of air-pressure. The pressure will then build up to the normal in the train-brake pipe and connecting-passage k' and return the automatic valve to the normal position (shown in Fig. 2) and shut off the exhaust-port k^2. The air will also gradually enter the chamber of the pressure-saving valve through the plunger-hole until the pressure is great enough for the pressure-saving valve to be returned by its spring m^3 to the normal position (shown in Fig. 2) to again open the auxiliary passage k^5. The parts of the device I will then be in position to repeat the automatic application of the brakes, as described.

The train-signal pipe D is connected to the air-supply pipe B by two branches, such as n n', Fig. 4, provided, respectively, with reducing-valves N N'. The train-signal pipe D (see Figs. 4 and 8) is also connected to the upper chamber of the signal-valve F by the branch pipe n and a connection o and to the lower chamber of the signal-valve, for instance, by a pipe o', provided with oppositely-acting check-valves o^2 o^3. These parts are all disclosed in said Patent No. 742,491 and are for the purpose therein described. Instead of the several valves described in said patent controlling these connections, a single engineer's controlling-valve is employed, which is preferably constructed as follows, (see Figs. 4–7:) P represents the valve, the casing of which is arranged between and communicates with the train-signal pipe D and branch pipe n'. A pressure-retaining valve Q of ordinary construction works in a chamber q, which also connects with the casing of the controlling-valve and has a discharge-port q', and a pipe R connects the controlling-valve casing with the pipe o', leading to the lower chamber of the

signal-valve between the check-valves o^2 o^3 therein. The controlling-valve is connected in any suitable manner to the brake-valve, whereby it will be operated when the brake-valve is moved to "service-braking" and "emergency" positions and returned to "full-release" position, but will not be effected when the brake-valve is moved to the other usual positions. As shown in Fig. 4, a link p is pivoted to the handle of the controlling-valve P and is connected to the brake-valve handle by a pin and slot p' p^2. The controlling-valve has connecting-passages 1, 2, 3, 4, and 5, and the valve-casing has an exhaust-port 6. In the normal position of this valve (shown in Fig. 5) the passages 1 and 4 will connect the train-signal pipe with the branch pipe n', leading to the supply-pipe B, and air will be supplied to the signal system through the reducing-valve N' at the normal pressure—for instance, forty-five pounds per square inch. The slotted-link connection between the brake-valve and controlling-valve will allow the latter to remain stationary in this position when the brake-valve is moved in either direction, either to full-release, "running," or "lap" positions. When, however, the brake-valve is moved to service-braking position, the controlling-valve P will be moved to the position shown in Fig. 6, in which its passages 2 and 5 connect the pipe R, leading from the lower chamber of the signal-valve, with the pressure-retaining valve Q. The air-pressure in the pipe R will then lift the pressure-retaining valve Q and permit the escape of the air from the train-signal pipe through the pipe R and discharge-port q' of the pressure-retaining valve until the signal-pipe pressure is reduced a predetermined amount, when the pressure-retaining valve will be closed by its spring. The signal-pipe pressure is thus reduced to prevent the above-described operation of the automatic valve K at the rear end of the system while the engineer is applying the brakes in the usual manner by the brake-valve. With the controlling-valve P in this position the forty-five pounds reducing-valve N' will be cut off from the signal system, and the latter will be supplied with air at a suitable lower pressure—for instance, thirty-five pounds per square inch—by the other reducing-valve N in the branch pipe n, so that pressure will be maintained in the signal system to enable the conductor to signal the engineer. As the pipe R connects with the pipe o' between the oppositely-acting check-valves o^2 o^3 and this pipe communicates with the lower chamber of the signal-valve F and with the upper chamber thereof through the signal-pipe D and branch pipe n, the pressure will be simultaneously and equally reduced in both chambers of the signal-valve, and the latter will not operate to produce a blast on the signal-whistle; but as the train-signal pipe is in direct communication with the upper chamber of the signal-valve the conductor can operate the signal-valve by means of the car discharge-valve in the usual way.

By turning the brake-valve to the emergency position the controlling-valve P will be moved to the position shown in Fig. 7, in which its passages 3, 4, and 5 connect the train-signal pipe D and pipe R with the exhaust-port 6 of the valve-casing and will permit the escape of air from said pipes D and R. The engineer can therefore by turning the brake-valve to emergency position reduce the pressure in the train-signal pipe for allowing the return of the automatic valve K to its normal position by the restoration of the train-brake-pipe pressure after the described automatic operation of said valve to set the brakes. In like manner when for any reason the engineer cannot set the brakes with train-brake-pipe pressure by the brake-valve in the usual way the movement of the brake-valve to the emergency position will place the controlling-valve P in position to discharge the air from the signal system, and when the pressure therein is sufficiently reduced the valve L at the rear end of the system will be moved by the predominating train-brake-pipe pressure to uncover the exhaust-port l^2, which will allow the escape of air from the train-brake-pipe, and thereby set the brakes. This valve L is returned to its normal position (shown in Fig. 2) when the normal pressure is again restored to the signal system. The controlling-valve P can also be moved by its handle to the position shown in Fig. 7 independently of the brake-valve when the latter is in running position to reduce the signal-pipe pressure and test the system by applying the brakes. As the brakes are then set by the escape of air at the valve L, if the engine-brakes set the engineer will know that both the signal and brake pipes are clear throughout and that the automatic device is also in operative condition.

The single controlling-valve P performs the functions of the several valves described in the patents mentioned and gives the engineer full control of the brake and signal systems. Obviously this valve could be differently constructed and connected to the brake-valve and operate in a similar manner. While a brake-valve of the New York type is shown in the drawings, the invention is equally applicable to the Westinghouse air-brake system.

The conductor's brake-valves G, Figs. 1 and 9, can be of the ordinary turn-plug type adapted to open and bleed the train-brake pipe when turned from the normal positions. The train-signal pipe is also provided with a valve S, arranged adjacent to each conductor's brake-valve and preferably having a turn-plug, which is connected by a lever s

and link s' or otherwise to the handle g of the conductor's brake-valve. This valve S has a passage which normally connects the parts of the train-signal pipe on opposite sides thereof, so as not to cut off the car discharge-valve H, but which opens the train-signal pipe to the atmosphere and bleeds the same through a discharge-port s^2 when the valve is turned by the operation of the conductor's brake-valve. Thus in an emergency the conductor can bleed the train brake and signal pipes by the operation of one of the usual brake-valves G, and thereby operate the valve L at the rear end of the system and set the brakes. In case of an obstruction in the train-brake pipe in rear of the valve G operated all of the brakes would nevertheless be set, those in front of the obstruction by the opening of the conductor's brake-valve G and those in rear of the obstruction by the action of the valve L.

The system described provides for automatic application of the brakes, as stated, and also enables either the engineer or the conductor to set the brakes in an emergency through the medium of the signal-system pressure.

I claim as my invention—

1. In an air-brake and signal system, the combination with the brake and signal pipes, of a device which is acted upon by the brake and signal pipe pressures and is operated to apply the brakes upon a variation of the normal relative pressures in said pipes and is returned to normal position by the restoration of the normal pressure in the brake-pipe, and a pressure-saving device which is operated in advance of said other device when the brake-pipe pressure is increased, substantially as set forth.

2. In an air-brake and signal system, the combination with the brake and signal pipes, of a device which is acted upon by the brake and signal pipe pressures and is automatically operated by the signal-pipe pressure to apply the brakes upon a reduction of pressure in the brake-pipe and is returned to normal position by increasing the brake-pipe pressure, and a pressure-saving device which is operated in advance of said automatic device when the brake-pipe pressure is increased, substantially as set forth.

3. In an air-brake and signal system, the combination with the brake and signal pipes, of a device which is acted upon by the brake and signal pipe pressures and is automatically operated by the signal-pipe pressure to connect the brake-pipe with an exhaust-opening and apply the brakes upon a reduction of pressure in the brake-pipe and is returned to normal position by increasing the brake-pipe pressure, and a pressure-saving device which is operated in advance of said automatic device to cut off said exhaust-opening from the brake-pipe when the brake-pipe pressure is increased, substantially as set forth.

4. In an air-brake and signal system, the combination with the brake and signal pipes, of a valve which is acted upon by the brake and signal pipe pressures and is automatically operated by the signal-pipe pressure to open the brake-pipe to the atmosphere and apply the brakes upon a reduction of pressure in the brake-pipe and is returned to the normal position by increasing the brake-pipe pressure, and a pressure-saving valve which is exposed to the brake-pipe pressure only and is operated in advance of said automatic valve to close the brake-pipe to the atmosphere when the brake-pipe pressure is increased, substantially as set forth.

5. In an air-brake and signal system, the combination with the brake and signal pipes, of a valve which has differential faces exposed to the brake and signal pipe pressures and which is automatically operated by the signal-pipe pressure to connect the brake-pipe with an exhaust-opening between said valve-faces and apply the brakes upon a reduction of pressure in the brake-pipe, substantially as set forth.

6. In an air-brake and signal system, the combination with the brake and signal pipes, of a valve which has differential faces exposed to the brake and signal pipe pressures and which is operated by the brake-pipe pressure to connect the brake-pipe with an exhaust-opening between said valve-faces and apply the brakes upon a reduction of pressure in the signal-pipe, substantially as set forth.

7. In an air-brake and signal system, the combination with the brake and signal pipes, and the car discharge-valves connected with the train-signal pipe, of a device which is acted upon by the brake and signal pipe pressures and is operated to apply the brakes upon a reduction of pressure in the signal-pipe, and conductor's valves in the cars in addition to the car discharge-valves for bleeding said signal-pipe, substantially as set forth.

8. In an air-brake and signal system, the combination with the brake and signal pipes, of a device which is acted upon by the brake and signal pipe pressures and is operated to apply the brakes upon a reduction of pressure in the signal-pipe, a conductor's brake-valve, and a valve connected to said conductor's brake-valve for bleeding the signal-pipe, substantially as set forth.

9. In an air-brake and signal system, the combination with the brake and signal pipes, of devices connecting the brake and signal pipes at different points in the system for automatically applying the brakes by the signal-pipe pressure upon a reduction of pressure in the brake-pipe and by the brake-pipe pressure upon a reduction of pressure in the

signal-pipe, and means for rendering inoperative all of said devices except that at the rear end of the system, substantially as set forth.

10. In an air-brake and signal system, the combination with the brake and signal pipes, of an automatic device in connection with the brake and signal pipes for applying the brakes by the signal-pipe pressure upon a reduction of pressure in the brake-pipe, and by the brake-pipe pressure upon a predetermined reduction of the pressure in the signal-pipe, and a controlling-valve connected to the engineer's brake-valve and which reduces the pressure in the signal-pipe to prevent the action of said automatic device when the engineer's brake-valve is moved to apply the brakes, and which further reduces the signal-pipe pressure to apply the brakes when moved to another position, substantially as set forth.

11. In an air-brake and signal system, the combination with the brake and signal pipes, of an automatic device in connection with the brake and signal pipes for applying the brakes by the signal-pipe pressure upon a reduction of pressure in the signal-pipe, branch pipes for supplying air at different pressures to the signal-pipe, a pressure-retaining valve, and a controlling-valve connected to the engineer's brake-valve and which in one position connects the signal-pipe to the branch supply-pipe of greater pressure, and in a second position cuts off said last-mentioned branch supply-pipe and connects the signal-pipe to said pressure-retaining valve, and in a third position discharges the signal-pipe to apply the brakes, substantially as set forth.

Witness my hand this 13th day of June, 1906.

THOMAS J. QUIRK.

Witnesses:
C. W. PARKER,
A. L. McGEE.