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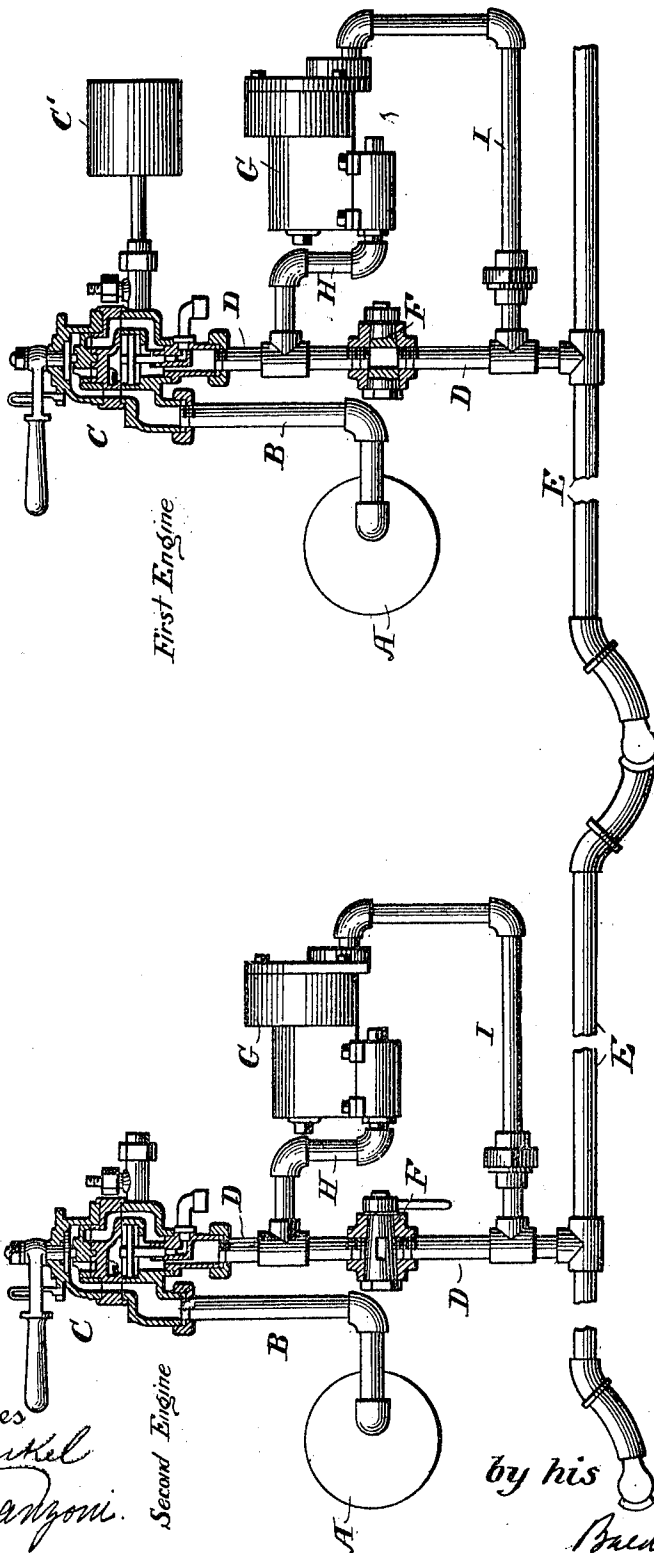
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2 SHEETS—SHEET 1.

Fig. 1.



Witnesses
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Second Engine

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UNITED STATES PATENT OFFICE.

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AIR-BRAKE.

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To all whom it may concern:

Be it known that I, CHARLES W. FRYE, a citizen of the United States, residing in Atlanta, in the county of Fulton and State of Georgia, have invented certain new and useful Improvements in Air-Brakes, of which the following is a specification.

My invention relates particularly to air brakes of the kind known as the Westinghouse system, in which the brakes are normally held in a released position by compressed air supplied by the engine; are applied by a diminution of pressure in the train pipe connecting the brake mechanism with the engine and are then released by increasing this pressure. The invention is however applicable to other brake systems.

It is quite common to connect two or more engines to a train when the train is long or the burden is great and in such cases it is advisable that the brake system should be under the exclusive control of the engineer of the first or leading engine, so that he alone can apply or release the brakes. Special valve mechanism, known as "double-header valves," have been employed for this purpose and such valves have been so constructed and arranged that the engineer of the first engine only can control the application and release of the brakes, and the arrangement has also been such that the brake equipment of the second or following engine can, under the control of the engineer of the first engine, assist in recharging the train pipe to release the brakes and bring the train pipe pressure to normal.

My invention relates to double-header valve mechanisms and systems of this kind and my object is to simplify and improve such mechanism in such manner that when the brake equipments of two engines are connected and the direct connection between the engineer's valve and the train pipe is closed on the second engine, the connection between the train pipe and the double-header valve on the second engine will be automatically closed when the brakes are applied, will be automatically opened when the brakes are released to aid in charging the train pipe, and will then be again disconnected to allow the first engine to keep up the normal or proper pressure; the mechanism also being so arranged that in case of emergency the engineer of the second engine can apply the brakes.

In the accompanying drawings:—Figure 1 is a diagram, showing my double-header valve system applied to two engines, but it will be understood that it can be applied when more than two engines are coupled together. Fig. 2 shows a vertical central section through one of my double-header valves, the parts being in the position they occupy when the brakes are released and the pressure in the train pipe is normal. Fig. 3 is a similar view, with the parts in the position they assume when the brakes are applied.

It will be understood that each engine is provided with a double-header valve properly connected in the brake system and that when one engine only is used the double-header valve devices do not interfere in any way with the operation of the brakes. When two or more engines are coupled to the same train, the direct connection between the engineer's valve and the train pipe is left open on the first or leading engine while on the other engine or engines this connection is closed.

In Fig. 1 the main reservoir A on each engine is shown as being connected as usual by a pipe B with an engineer's valve C of the ordinary kind and provided with an equalizing reservoir C', as usual, and the engineer's valve is connected by a pipe D with the train pipe E. Each pipe D is provided with a cock F between the train pipe and the engineer's valve. When "running double-header" the cock F on the first or leading engine is left open, while the cock F on the following engine is closed.

In Fig. 1 my double-header valve is shown at G. It is connected by a pipe H with the pipe D between the cock F and the engineer's valve and by a pipe I with the pipe D between the cock F and the train pipe. The double-header valve G may be placed on any convenient part of the engine, the pipes H and I being made of suitable length to connect the valve with the pipe D, in the manner before described. Each double-header valve is preferably constructed in the manner shown in Figs. 2 and 3. The casing K of the main slide valve J is formed at its front end with a chamber k for the piston L and with a chamber k' for the slide valve J. These two chambers communicate and are closed at the rear end by the solid wall k'' of the casing and at the front end by a removable cap k^3 .

The piston L has a rod l , carrying at its rear end a yoke m in which is arranged a valve M. The rod l lies in a groove in the top of the slide valve J and can move endwise therein to a limited extent, the slide valve being held to its seat by a spring j . The chamber k is connected with the train pipe E by a passage e in the cap k^3 which connects with the pipe I, communicating with the pipe D in turn connected with the train pipe. The forward movement of the piston is limited by the cap k^3 and its rearward movement is limited by a flange l' against which the piston abuts. The piston is formed with a hub l^2 which is adapted to strike against the front end of the slide valve J, and thus limit the rearward movement of the piston relatively to the valve, while the forward movement of the piston relatively to the slide valve is limited by the valve M which then rests against its seat.

A plunger N is seated in a recess in the rear wall of the casing K and projects forward in the chamber k' . A cap N' on the outside of the casing closes this recess and contains a spring n , engaging a flange n' on the plunger and normally pressing it forward. When the piston L is by high pressure moved to its rearmost position, the yoke m abuts against the plunger N and presses it rearward, but when the pressure is released or the pressure on opposite sides of the piston is equalized the spring n presses the piston forward to a limited extent and thus seats the valve M, the parts then occupying the position shown in Fig. 2 which is the normal running position of the mechanism.

To the underside of the casing K is secured the casing O of the auxiliary valve P. This casing is formed with two chambers O' , O^2 , the rear casing O' being connected by a passage o with the rear end of the chamber k' , while the front chamber O^2 is connected by passages o' , o^2 with the chamber k' near its middle portion.

The valve P, which is in the form of a rod, carries a piston p' located in the chamber O^2 and the piston and rod are pressed rearward by a spring p^2 . The rear end of the rod is beveled to form a valve which fits a valve seat p^3 at the inner end of a passage h communicating with the pipe H leading to the pipe D, which is in turn connected with the engineer's valve or with the main reservoir. In the passage h there is a check valve Q that is pressed toward its seat by a spring q .

The casing K is formed with a passage R, leading from the passage e rearward and communicating with a lateral passage r communicating with the chamber k' at its rear portion, while a passage r' connects the front portion of this chamber with the passage R. An exhaust passage t between the

passages r and r' connects the chamber k' with the atmosphere.

The slide valve J is formed with a recess s , adapted to connect the passages r' and o^2 or the passage o^2 and the exhaust passage t and this valve is also formed with a recess s' , adapted to connect the passages r and o' or the passage o' and the exhaust passage t . The recess s' communicates with a passage u , which joins a port U, leading through the side of the slide valve and communicating with the chamber k' and this passage u contains the valve M which controls the port U.

The piston L may be provided with suitable packing, as indicated at w , and the chambers in which the pistons and valves operate may have suitable bushings, as shown. The bushing for the piston L is formed with a recess x whereby when the piston is in its foremost position, as shown in Fig. 3, the pressure on opposite sides thereof may be automatically equalized.

It will be understood that the engineer's valve of the second engine is always placed at running position, except in cases of emergency, as hereinafter explained.

When the brakes are released and the train pipe pressure is normal, as while running, the parts of the double-header valve are in the position shown in Fig. 2 where the piston L is pressed back by the high train pipe pressure and holds the slide valve in such position that the chamber O^2 in front of the piston p' of the auxiliary valve connects with the exhaust by way of the passage o^2 , recess s and passage t , while the chamber O' , in rear of the piston p' , connects with the train pipe by way of the passage o' , recess s' and passages r , R, e , etc. At this time the valve P is open, but the valve Q is closed as the pressure on the valve from the inside of the double-header valve and the spring pressure is sufficient to close it. Furthermore the communication between the main reservoir of the second engine and the train pipe is cut off by the valve M, which at this time closes the port U.

I would here remark that when the connection between the double-header valve and the main reservoir is made by the usual engineer's valve having the usual pressure-reducing device the valve Q may be omitted, but when a direct connection is made between the double-header valve and the main reservoir, or where the engineer's valve is not provided with pressure-reducing devices, I prefer to employ a reducing valve Q of the kind shown.

When the pressure in the train pipe is relieved by the engineman of the first engine to apply the brakes, the parts of the double-header valve on the second engine assume the position shown in Fig. 3; that is to say, the pressure in the chamber k in front of the piston L being reduced, the pressure behind

this piston will cause it to move forward to the position shown in Fig. 3, and when the parts are in this position the valve M remains closed, the passage r is covered by the slide valve J and communication of the rear portion of the chamber O^2 with the exhaust passage t is established by way of the passage o' and the recess s' . At the same time communication is established between the front portion of the chamber O^2 and the passage R by way of the passage o^2 , the recess s and the passage r' . When the parts are thus moved the spring p^2 and the reduced train pipe pressure causes the piston p' to move rearward and close the valve P on to its seat p^3 . Thus communication between the main reservoir of the second engine and the train pipe is cut off at three points, namely, by the valve P, the valve M and that part of the slide valve J which covers the passage r . Even should one of the valves leak the passage of air from the main reservoir of the second engine to the train pipe would be prevented by the other valves, and thus it is impossible for the engineman of the second engine to release the brakes while being applied at the first engine as long as the cock F on the second engine is closed. After the brakes have been thus applied the engineman of the first engine can release them by operating his engineer's valve to increase the pressure in the train pipe. This increased pressure, acting on the piston L (when in the position shown in Fig. 3) will first cause the piston L, its rod l and the yoke m with the valve M, to move rearward to a limited extent without moving the slide valve J. By this movement the valve M is opened but the passage r remains closed. Some of the air in the chamber h' can pass out through the port U, recess u and exhaust t , thus reducing the pressure on the valve Q and some of the air will pass through the passage o' into the front end of the chamber O^2 and tend to open the valve P. As the piston L moves farther rearward the valve J is also moved, and the passage r is uncovered and the valves Q and P then open and air under pressure from the main reservoir of the second engine can pass by way of the passage h , chamber O' , passage o , the port U and the passage r to the train pipe, and thus the second engine assists in charging the train pipe and in bringing the pressure therein up to normal, all this being done without any attention from the engineman of the second engine but it is done automatically whenever the engineman of the first engine operates his engineer's valve to charge the train pipes. After the pressure has been equalized on both sides of the piston L and the train pipe pressure is reduced at the leading engine the spring n causes the plunger N to be moved forward and to move the piston L forward

to a limited extent until it assumes the position shown in Fig. 2, at which time the valve M closes the port U, thus cutting off communication from the main reservoir of the second engine and the train pipe after the train pipe has been charged, and when the engines are running, or are in running condition. When the parts are in the position shown in Fig. 2, the valve Q is closed, inasmuch as the spring q , assisted by the pressure in the chamber O' , is sufficient to overcome the pressure from the main reservoir of the second engine, but when the pressure in the chamber O' is reduced, as when the valve M is open, then the spring q is not sufficient to hold the valve Q closed, and air can enter the chamber O' , in the manner before described.

This valve mechanism can be applied to brake systems already in use. Ordinary engineer's valves can be employed which may be set to running, service, release, lap, or any other usual position on the first engine and the engineman of the second engine cannot possibly interfere when the first engine is applying the brakes without turning the cock F to an open position. When he does this he can either apply or release the brakes, but as it is natural only for the engineman to grasp the handle of the engineer's valve C it is not at all probable that he would open this cock without taking time to realize the situation and to only open the cock in case of emergency.

It will be understood that the brake mechanisms on both engines are to be equipped with proper pressure gages so that both enginemen can know the condition of the pressure in the train pipe and in his own main reservoir.

I claim as my invention:

1. In an automatic air brake system, the combination with a train pipe and an air reservoir of a double-header valve operated by a reduction in train pipe pressure when the brakes are applied, which, while the brakes are applied, cuts off communication between the main reservoir with which it is connected and the train pipe, which, when the brakes are released, first opens communication between the main reservoir with which it is connected and the train pipe, and then after the train pipe pressure is equalized and subsequently reduced by the leading engine automatically closes this connection.

2. A double-header valve, comprising a valve chamber, a piston operating therein, a connection between said chamber on one side of the piston and the train pipe, a slide valve controlling the connection between the valve chamber on the opposite side of the piston and the train pipe, a valve connected with the piston and having a limited movement independently of the slide valve for also

controlling the connection between the valve chamber on one side of the piston and the train pipe, and an auxiliary valve for closing the connection between the main reservoir and the valve chamber in rear of the piston and the opening and closing of which is controlled by the movement of said slide valve.

3. A double-header valve, comprising a valve casing, a piston chamber therein, a slide valve chamber in rear of said piston chamber, a piston, a slide valve connected to move therewith, a valve connected with the piston and having a limited movement independently of the slide valve, a connection between the front end of the piston chamber and the train pipe, a connection between the valve chamber in rear of the piston and the main reservoir, and a valve for opening and closing this last mentioned connection which is controlled by the movement of the slide valve.

4. A double-header valve, comprising a valve casing, having a piston chamber and a slide valve chamber, a piston operating in the piston chamber, a slide valve operating in the slide valve chamber, a valve connected with the piston and having a limited movement independently of the slide valve and which controls a port therein, a connection between the front end of the piston chamber and the train pipe, a connection between the rear end of the slide valve chamber and the main reservoir, a spring-pressed valve for opening and closing this connection, and another valve for opening and closing this connection controlled by the movement of the slide valve.

5. A double-header valve, comprising a valve casing having a piston chamber and a slide valve chamber, a piston operating in the piston chamber, a slide valve operating in the slide valve chamber, a connection between the front end of the piston chamber and the train pipe, a connection between the rear end of the slide valve chamber and the main reservoir, a chambered auxiliary valve casing, a valve carrying a piston operating in a chamber of this casing and which is adapted to close communication between the reservoir and the slide valve chamber, passages connecting said chamber on opposite sides of the piston with the slide valve chamber, connections between the train pipe and the slide valve chamber, and an exhaust passage controlled by the slide valve and which may be brought into communication with the chamber of the auxiliary valve either in front of its piston or in rear thereof, said slide valve being also adapted to open communication between the train pipe and the

front end of the chamber of the auxiliary valve and to open communication between the train pipe and the slide valve chamber.

6. A double-header valve, comprising a valve casing having a piston chamber and a slide valve chamber, a piston operating in the piston chamber, a slide valve operating in the slide valve chamber, a connection between the piston chamber and the train pipe, a connection between the slide valve chamber and the reservoir, a valve controlled by the movements of the slide valve for opening and closing the communication between the slide valve chamber and the reservoir, and a spring-controlled valve interposed between the last-mentioned valve and the reservoir.

7. In an air brake system, double-header valve mechanism operated by a reduction in train pipe pressure when the brakes are applied and which normally while in running position cuts off communication between the main reservoir and the train pipe, which, when the pressure is reduced in the train pipe cuts off communication between the main reservoir and the train pipe by a plurality of valves, and which, when the pressure in the train pipe is raised at first admits air from the main reservoir to the train pipe to assist in charging the train pipe but which subsequently, when the train pipe pressure is equalized and afterward reduced at the leading engine, cuts off communication between the main reservoir and the train pipe.

8. A double-header valve, comprising a valve chamber, a piston operating therein, a groove or recess to permit air in the piston chamber to equalize in front and rear of the piston, a connection between the air chamber on one side of the piston and the train pipe, a slide valve controlling the connection between the valve chamber on the opposite side of the piston and the train pipe, a valve connected with the piston and having a limited movement independently of the slide valve for also controlling the connection between the valve chamber on one side of the piston and the train pipe, a spring-pressed plunger in rear of the slide valve and operating to close said independently moving valve, and an auxiliary valve for closing the connection between the main reservoir and the valve chamber in rear of the piston, and the opening and closing of which is controlled by the movement of said slide valve.

In testimony whereof, I have hereunto subscribed my name.

CHARLES W. FRYE.

Witnesses:

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