No. 839,366. PATENTED DEC. 25, 1906.

F. B. COREY.

AIR BRAKE SYSTEM.

APPLICATION FILED JUNE 5, 1905.

Fig. 1.

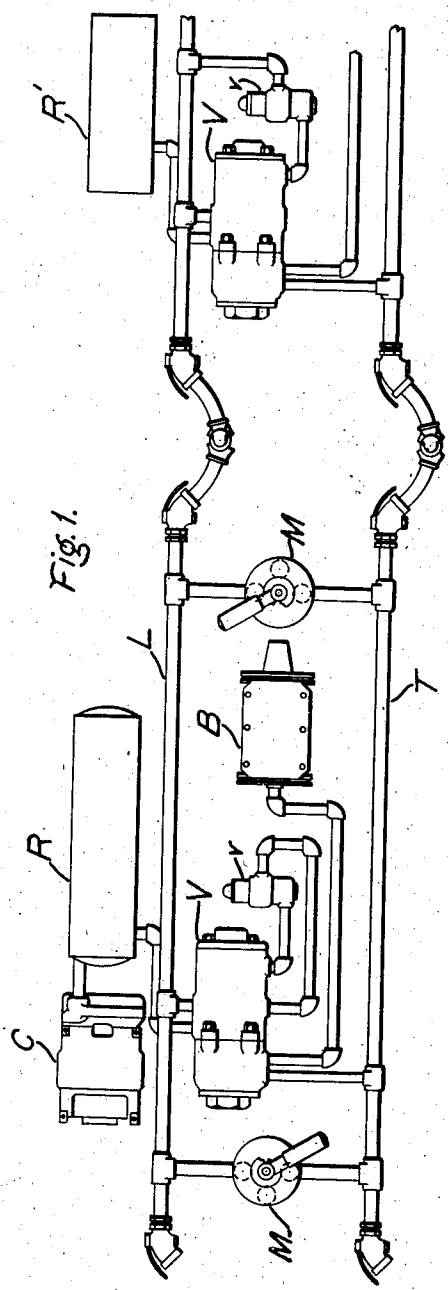
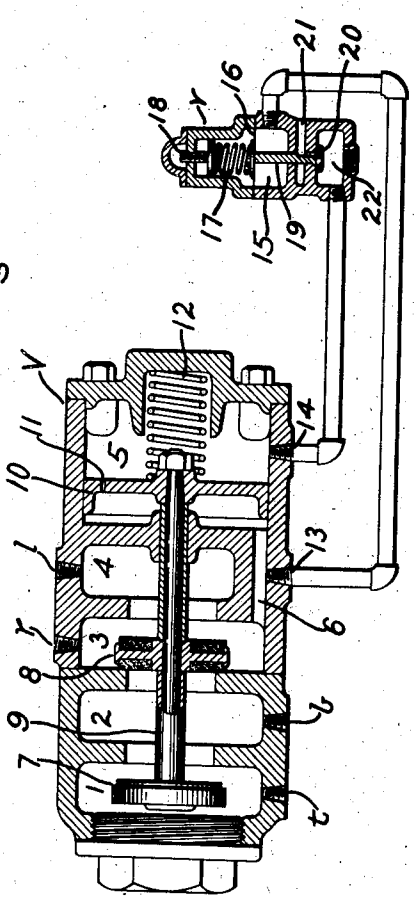


Fig. 2.



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UNITED STATES PATENT OFFICE.

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AIR-BRAKE SYSTEM.

No. 839,366. Specification of Letters Patent. Patented Dec. 25, 1906.

Application filed June 5, 1905. Serial No. 263,703.

To all whom it may concern:

Be it known that I, FRED B. COREY, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Air-Brake Systems, of which the following is a specification.

My invention relates to air-brake systems of the type known as "straight" air systems, in which the brake-cylinders are connected directly to the train-pipe and the brakes are applied and released by admitting air to and exhausting it from the train-pipe. Such a system possesses marked advantages over the so-called "automatic" system, especially on short trains, both because of the greater simplicity of apparatus and because it affords simple and efficient means for both gradually applying and releasing the brakes. On the other hand, the straight air system as ordinarily arranged possesses the disadvantage when applied to trains of not automatically applying the brakes when the train breaks apart.

By my invention I add to the straight air-brake system as ordinarily arranged certain additional features which without interfering with the normal operation of the system give it the additional characteristic of automatic application of the brakes upon a separation of the train.

My invention consists in the combination with a straight air-brake system of a second train-line normally carrying air at reservoir-pressure, reservoirs on the several cars connected to this train-line, pilot-valves connected to and supplied with reservoir-pressure and arranged to operate when the reservoir-pressure falls below a predetermined amount, and a valve controlled by the pilot-valve and arranged to disconnect brake-cylinder from one train-line and reservoir from the other and to connect reservoir and brake-cylinder to each other. The pilot-valve is adjusted to act only when the pressure falls a certain amount below the minimum limit for which the air-compressor governor is set, so that during normal operation the pilot-valve is inoperative and the system is essentially a straight air-brake system in every respect. If, however, the train should break apart, lowering the pressure in the reservoir-line and reservoirs below normal limits, the pilot-valve would come into operation and produce an application of the brakes in the manner above stated.

My invention will best be understood by reference to the accompanying drawings, in which—

Figure 1 shows diagrammatically a straight air-brake system provided with additional features in accordance with my invention; and Fig. 2 shows a cross-sectional view of the pilot-valve and of the automatic valve controlled thereby.

In Fig. 1, R represents the main reservoir, and C the air-compressor. The reservoir R is connected through the automatic valve V, as will be hereinafter explained, to the reservoir-line L. B represents the brake-cylinder, which is normally connected through the automatic valve V to the usual train-line T. The train-line T is connected to the reservoir-line L through motorman's valve M. With this arrangement by the proper manipulation of the motorman's valve the reservoir may be connected to the train-line T to apply all the brakes on the train in the usual manner or the train-line T may be connected to atmosphere to release the brakes. *v* is the pilot-valve, controlling the automatic valve V. I have shown a second car arranged as a trailer, the motorman's valve and air-compressor being omitted and the auxiliary reservoir R′ being normally connected to and supplied from the reservoir-line L. It may be noted in passing that the pilot-valve *v* is connected to reservoir-line instead of to the automatic valve. Of course if the train is composed of motor-cars the equipment and connections on each car will be exactly the same as that already described for the first car.

The arrangement of the automatic valve V is shown in Fig. 2. This valve comprises a plurality of chambers 1 to 5. The chamber 1 is connected through the port *t* to the train-line T. The chamber 2 is connected, through port *b*, to the brake-cylinder B. These two chambers are normally in communication with each other, as shown, so that the brake-cylinder is normally con-

nected to the train-line. Chamber 3 is provided with a port *r*, through which it is connected to the main reservoir R, and chamber 4 is provided with a port *l*, through which it is connected to the reservoir-line L. Main reservoir and reservoir-line are thus normally connected to each other. Chamber 5 contains a piston 10, which carries a spindle 9, on which are placed two valves 7 and 8. The piston 10 is normally held in the position shown by a spiral compression-spring 12. In the position shown the valve 8 closes the connection between chambers 2 and 3. A passage 6 connects chamber 3 to the left-hand side of piston 10, and the restricted passage 11 connects opposite sides of the piston, so that the chamber 5 is connected through a restricted passage to reservoir-pressure and the pressures on opposite sides of piston 10 are normally equal. A port 13 opens out from passage 6 and is connected to a chamber 15 in the pilot-valve *v*. This chamber 15 is closed on one side by a diaphragm 16. It will be seen that this diaphragm is subjected on its lower side to reservoir-pressure and that a compression-spring 17, adjustable by means of the set-screw 18, presses on the upper side of diaphragm 16 and opposes the reservoir-pressure. The spring is so adjusted that reservoir-pressure through the normal operation of the system overpowers the spring and holds the diaphragm in the position shown. The diaphragm carries a spindle 19, on the lower end of which is the valve 20, which normally closes a connection between the port 21, open to atmosphere, and the chamber 22, which is connected through port 14 in the automatic valve V with the chamber 5.

The operation is, then, as follows: Under inoperative and all parts of both pilot- normal conditions the pilot-valve *v* remains valve and automatic valve remain in the positions shown in Fig. 2, in which the proper connections are established for operation of the system as an ordinary straight air system. If, however, the train should break apart, opening the reservoir-line L to atmosphere, the pressure in reservoir-line and in the reservoirs would be lowered beyond the lowest limit for which the air-compressor governor is set. When this lowest limit has been passed by a predetermined amount, the spring 17 of the pilot-valve forces the diaphragm 16 downward against the lowered pressure in chamber 15, so as to open the connection between chamber 22 and port 21. The pressure in chamber 5 is consequently lowered, since the port 11 is too restricted to permit a quick equalization of pressures on opposite sides of the piston 10. The resulting difference of pressure on opposite sides of the piston forces it toward the right, opening the connection between chambers 2 and 3 and closing the connections between chambers 1 and 2 and 3 and 4, respectively. The brake-cylinder is thus disconnected from the train-pipe T, the reservoir is disconnected from the reservoir-line L, and the brake-cylinder is connected to the reservoir, thereby applying the brakes. Meanwhile the air-compressor will have started to raise the reservoir-pressure, and since the connection between the reservoir and reservoir-line L is broken the pressure in the reservoir will rise until the pilot-valve is again returned to the position shown, breaking the connection between chamber 5 and atmosphere. The pressure in chamber 5 will then quickly be raised to reservoir-pressure by leakage through the port 11, and the automatic valve will then return to the position shown in Fig. 2. This again connects brake-cylinder to train-line and reservoir to reservoir-line, so that the pressure in the brake-cylinder will be somewhat lowered. Before the brakes are entirely released, however, the reservoir-pressure will again have been lowered a sufficient amount by exhausting through the broken reservoir-line L to cause the pilot-valve *v* to operate again in the manner that has been heretofore explained. Thus as long as the reservoir-line remains broken the pilot-valve and automatic valve controlled thereby will move periodically from one position to the other, raising and lowering the brake-cylinder pressure, but without releasing the brakes. As soon as the reservoir-line L is closed, the rise in reservoir-pressure due to the operation of the compressor will return the valves to the position shown in Fig. 2 permanently, so that the brakes will be automatically released.

The cycle of operation which has been described occurs on each motor-car of the train—that is, if the train is composed entirely of motor-cars each arranged like the motor-car in Fig. 1 the description above applies to all the cars. If, however, a portion of the cars are trailers—that is, not provided with air-compressors, but instead with auxiliary reservoirs charged from the reservoir-line—the arrangement and the operation are slightly different. As shown in Fig. 1, the pilot-valve *v* on the trailer is connected to reservoir-line instead of to reservoir through the automatic valve, as on the motor-car. The reason for this change will appear from the following considerations: If the pilot-valve on the trailer were connected to the reservoir, it would be necessary to provide special means, such as a by-pass valve, for releasing the brakes after the reservoir-line had broken and again been connected, for since the automatic valve disconnects reservoir-line from auxiliary reservoir on the trailer a rise of pressure in the reservoir-line after it has been connected could

not pass to the auxiliary reservoir, and consequently the pilot-valve would not be affected by this rise in pressure, but would remain in position to maintain the brakes applied. By connecting the pilot-valve, on the other hand, to reservoir-line, as shown in Fig. 1, it will be returned automatically to normal position when the pressure in reservoir-line rises to normal, and thus the brakes on the trailers would be automatically released. With the pilot-valve connected to reservoir-line instead of to reservoir the brakes are applied when the reservoir-line is broken by connecting auxiliary reservoir to brake-cylinder, and this connection is not disturbed until reservoir-line is again connected and pressure therein restored to normal.

It will be seen that although the connections of the pilot-valves on the motor-car and trailer differ somewhat, nevertheless the connections in both cases are essentially the same—that is, the pilot-valve is connected to the source of pressure. This source on the motor-car is the main reservoir, and on the trailer it is the reservoir-line. It is this connection to the source in each case which produces automatic release of the brakes in both cases. If the pilot-valve were connected to reservoir-line on the motor-car or to reservoir on the trailer, the operation as far as application of the brakes is concerned would be precisely the same as the arrangement shown in the drawings, but special means, such as by-pass valves, would be required for releasing the brakes.

I do not desire to limit myself to the particular construction and arrangement of parts here shown, but aim in the appended claims to cover all modifications which are within the scope of my invention.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an air-brake system, reservoirs on the several cars of the train, a train-line normally connected to the brake-cylinders, a second train-line normally connected to the reservoirs, a pilot-valve on each car responsive to a fall in reservoir-pressure below normal limits, and means controlled by said pilot-valve for disconnecting brake-cylinder from the first train-line and reservoir from the second train-line and for connecting brake-cylinder to reservoir.

2. In an air-brake system, reservoirs on the several cars of the train, a train-line normally connected to the brake-cylinders, a second train-line normally connected to the reservoirs, a pilot-valve on each car comprising a movable member subjected to reservoir-pressure on one side and to a constant pressure in the other, and means controlled by said pilot-valve for disconnecting brake-cylinder and reservoir from the train-lines and for connecting them to each other.

3. In an air-brake system, reservoirs on the several cars of the train, a train-line normally connected to the brake-cylinders, a second train-line normally connected to the reservoirs, a pilot-valve on each car comprising a diaphragm subjected to reservoir-pressure on one side and to spring-pressure on the other, and means controlled by said pilot-valve for disconnecting brake-cylinder and reservoir from the train-lines and for connecting them to each other.

4. In an air-brake system, reservoirs on the several cars of the train, a train-line normally connected to the brake-cylinders, a second train-line normally connected to the reservoirs, a pilot-valve on each car normally in connection with reservoir and reservoir-line, and means controlled by said pilot-valve for disconnecting brake-cylinder and reservoir from the train-lines and connecting them to each other.

5. In an air-brake system, reservoirs on the several cars of the train, a train-line normally connected to the brake-cylinders, a second train-line normally connected to the reservoirs, a pilot-valve on each car comprising a movable member subjected to reservoir-pressure on one side and to spring-pressure on the other, and an automatic valve controlled by said pilot-valve and comprising a chamber connected to said pilot-valve, a piston in said chamber, and valves operatively connected to said piston and adapted to disconnect brake-cylinder and reservoir from the train-lines and to connect them to each other.

6. In an air-brake system, reservoirs on the several cars of the train, one or more of said reservoirs being provided with air-compressors, a train-line normally connected to the brake-cylinders, a second train-line normally connected to said reservoirs, a pilot-valve on each car responsive to a fall in reservoir-pressure below normal limits, and means controlled by said pilot-valve for disconnecting brake-cylinder and reservoir from the train-lines and for connecting them to each other.

7. In an air-brake system, reservoirs on the several cars of the train, a train-line normally connected to the brake-cylinders, a second train-line normally connected to reservoirs, a connection between the two train-lines, a motorman's valve in said connection, a pilot-valve on each car responsive to a fall in reservoir-pressure below normal limits, and means controlled by said pilot-valve for disconnecting brake-cylinder and reservoir from the train-lines and for connecting them to each other.

8. In an air-brake system, reservoirs on

the several cars of the train, a train-line normally connected to the brake-cylinders, a second train-line normally connected to the reservoirs, a pilot-valve on each car normally in connection with reservoir and reservoir-line, and means controlled by said pilot-valve for disconnecting brake-cylinder and reservoir from the train-lines and connecting them to each other, said pilot-valve being connected to said reservoir and reservoir-line on the reservoir side of said disconnecting means.

In witness whereof I have hereunto set my hand this 3d day of June, 1905.

FRED B. COREY.

Witnesses:

BENJAMIN B. HULL,

HELEN ORFORD.