W. V. TURNER & C. C. FARMER.

AIR BRAKE.

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931,237.

Patented Aug. 17, 1909.

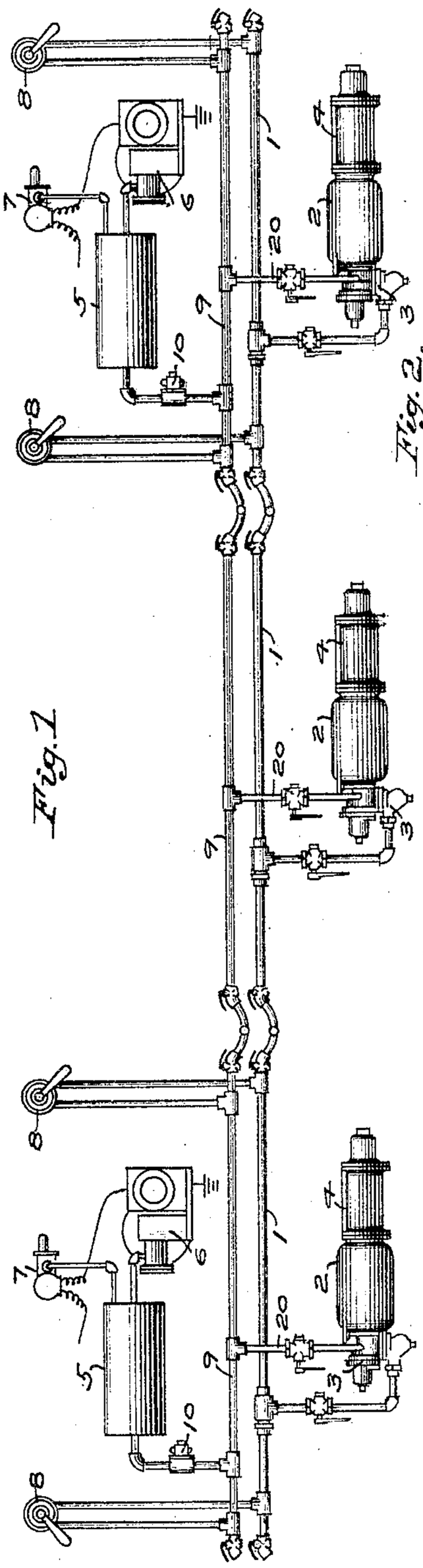

Fig. 1.

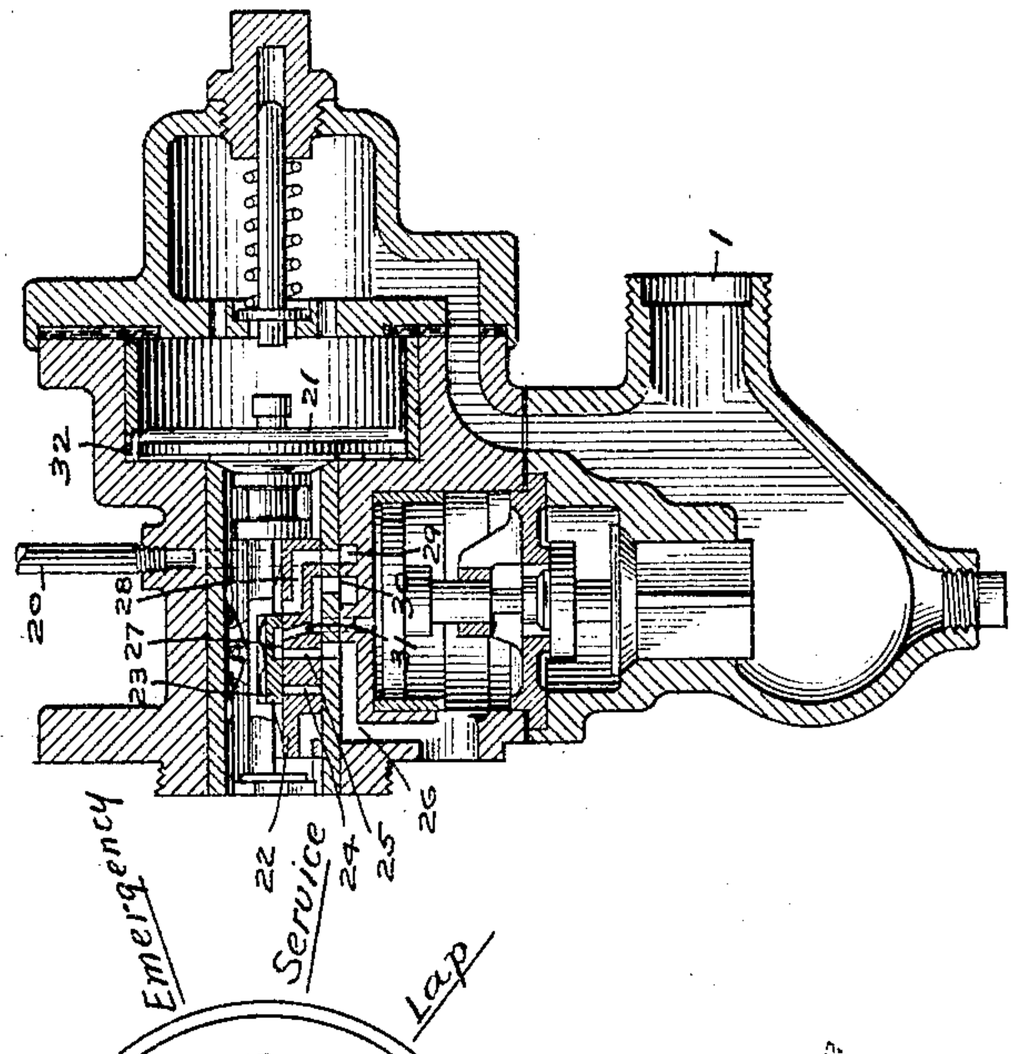

Fig. 2.

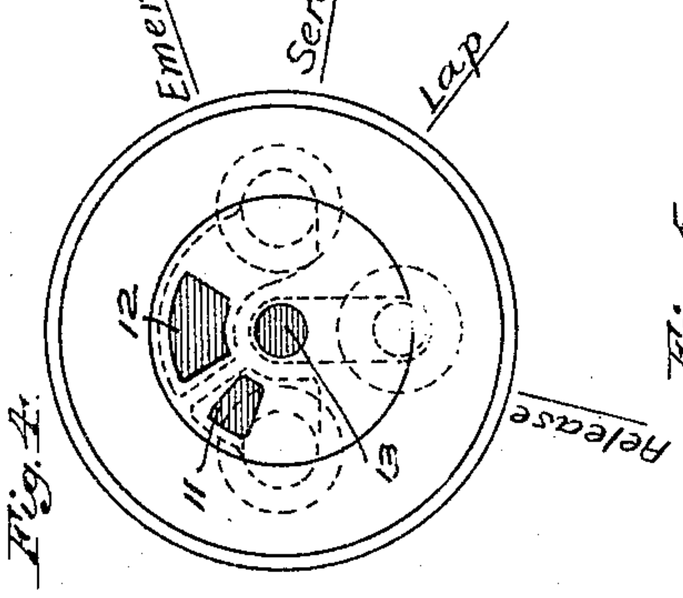

Fig. 4.

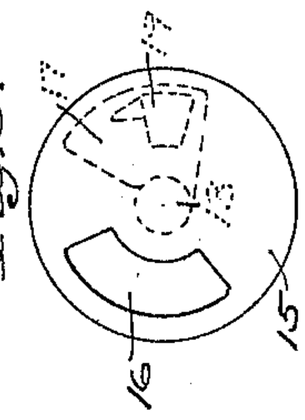

Fig. 5.

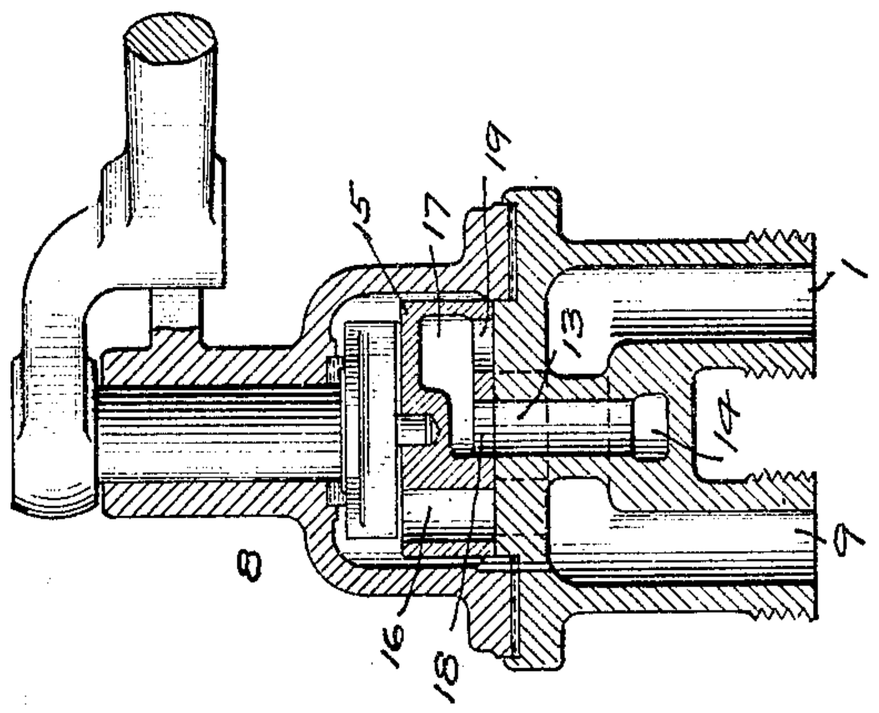

Fig. 3.

WITNESSES

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UNITED STATES PATENT OFFICE.

WALTER V. TURNER, OF WILKINSBURG, PENNSYLVANIA, AND CLYDE C. FARMER, OF CHICAGO, ILLINOIS, ASSIGNORS TO THE WESTINGHOUSE AIR BRAKE COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

AIR-BRAKE.

No. 931,237. Specification of Letters Patent. Patented Aug. 17, 1909.

Application filed November 19, 1904. Serial No. 233,410.

To all whom it may concern:

Be it known that we, WALTER V. TURNER and CLYDE C. FARMER, citizens of the United States, residing, respectively, at Wilkinsburg, county of Allegheny, State of Pennsylvania, and Chicago, county of Cook, and State of Illinois, have invented a certain new and useful Improvement in Air-Brakes, of which the following is a specification.

This invention relates to automatic air brake systems for railway cars, and is more especially adapted for use in connection with electrically propelled cars which are operated either singly or in trains. In this class of service, where two or more cars are coupled up in a train, each car, or at least a plurality of cars of the train, are usually motor cars, that is, they are provided with power motors and train control apparatus for controlling the motors of all the cars from any one of said cars. These cars are also usually provided with motor driven air compressors and reservoirs for storing the compressed air for operating the air brake system and one of the objects of this invention is to provide an improved equipment of this type, in which the compressed air from all the pumps and reservoirs throughout the train may be utilized in the operation of the brake system and that said system may be controlled from any one of the brake valves or any one of the motor cars throughout the train.

It has heretofore been proposed to provide a main reservoir pipe line extending through the train for connecting up all of the main reservoirs, but with such an arrangement it has been found necessary to employ some means for securing simultaneous action of the governors for the air compressors on the several cars, as otherwise one pump would be required to do nearly all the work of compressing the air and be greatly overloaded while the other pumps were idle. Another objection to the high pressure main reservoir line is that the danger of burst hose and leaks is much greater than on the train pipe line where the degree of pressure carried is less. In order to overcome these objections and at the same time secure the benefit of all the air compressors and main reservoirs through the train, we employ what may be termed a control pipe line which is connected up to each main reservoir through a feed or reducing valve, by means of which the maximum degree of pressure supplied to the control pipe line is reduced to the normal degree of train pipe pressure carried in the system.

Another feature of our invention comprises a communication from the control pipe line to the auxiliary reservoir, whereby the auxiliary reservoirs may be quickly recharged upon release of the brakes.

Still another feature of our invention relates to the control of the supply of air from the control pipe line to the auxiliary reservoir side of the triple valve piston, whereby a graduated release of the brakes may be secured.

These and other features of our invention will now be more fully described in connection with the accompanying drawing, in which—

Figure 1 is a diagram of an air brake equipment embodying our improvements and applied to a train of three cars, two of which are indicated as motor cars having motor driven air compressors and main reservoirs, while the other car is indicated as a trailer car having no motors or reservoir; Fig. 2 is a vertical longitudinal section of our improved triple valve device; Fig. 3 is a vertical section of the motorman's brake valve; Fig. 4 is a plan view showing the brake valve seat; and Fig. 5 a plan of the rotary valve of the brake valve.

The usual automatic air brake equipment for this class of service comprises a train pipe 1, auxiliary reservoir 2, triple valve 3, brake cylinder 4, main reservoir 5, motor driven air pump 6, pressure governor 7, and a brake valve 8 at each end of the car, all of which may be of the usual standard construction, although according to one feature of our invention we prefer to employ an improved form of triple valve device having means for controlling the supply of air to the auxiliary reservoir, as more fully described hereinafter.

According to the first feature of our invention, we employ in addition to the train pipe line a control pipe line 9, extending through the train and provided with the usual hose and couplings between the cars. The brake valves may be connected by the usual branch pipes with the train pipe and control pipe, while the main reservoir or source of fluid under pressure is connected

to the control pipe line through the feed or reducing valve 10, which is set to limit the maximum degree of pressure in the control pipe line to the desired normal degree of train pipe pressure. In this way all of the pumps and reservoirs are utilized in supplying the compressed air for operating the system and the pressure in the control pipe line is constantly maintained at the desired maximum degree, while each air pump and governor operate independently of the others for maintaining the desired excess pressure in the main reservoir for each particular car.

Any desired construction of brake valve may be used, but we have shown in Figs. 3, 4, and 5 a preferred form of the rotary type having a valve seat containing port 11 communicating with the control pipe line, port 12 leading to the train pipe, and port 13 leading to the exhaust outlet passage 14. The rotary valve 15 contains a through port 16 and a large cavity 17 having an opening 18 communicating with the exhaust port 13, and an opening 19 adapted to register with the train pipe port 12 in application positions of the valve.

In order to rapidly restore the pressure in the auxiliary reservoir upon release of the brakes, a connection is made by a branch pipe 20 with the control pipe line 9, and any desired valve mechanism operated by variations in train pipe pressure may be used for controlling the flow through said connection. As a preferred means for this purpose, we employ an improved triple valve device, shown more particularly in Fig 2, having the usual piston 21, main slide valve 22, graduating slide valve 23, feed groove 32, service port 24, brake cylinder port 26, and exhaust port 30. According to our improvement the main slide valve seat is provided with an additional port 29 communicating with the branch pipe 20 of the control pipe line, and the main slide valve is provided with additional ports 25, 31 and 28 adapted to communicate respectively with the brake cylinder port 26, the exhaust port 30, and the control line port 29, when the valve is in release position. These ports 25, 31 and 28 in the main slide valve are controlled by the small graduating slide valve 23 having cavity 27.

The operation of our improved apparatus is as follows: The control pipe line being supplied with air from the main reservoir through the feed valves at the desired normal maximum degree of train pipe pressure all the brake valves except the one at the head end of the train are cut out or set in lap position, and the head brake valve is set in release or running position, in which the port 16 of valve 15 registers with ports 11 and 12 in the valve seat thereby opening communication from the control pipe line to the train pipe line and charging the same and the auxiliary reservoirs to the same normal degree of pressure. An application of the brakes is made by turning the brake valve to service application position, in which the small extension of port 19 registers with train pipe port 12 thereby causing the desired reduction in train pipe pressure, after which the brake valve is turned to lap position. This reduction in train pipe pressure causes the triple valve device to act in the usual way to supply air from the auxiliary reservoir to the brake cylinder. The port 29 in the triple valve is closed by the first movement of the slide valve toward service position, and so cuts off communication from the control pipe line to the auxiliary reservoir. If then it be desired to release the brakes completely, the brake valve is thrown back to release position and air from the control pipe line at the maximum degree of train pipe pressure is turned into the train pipe, which is then at a reduced pressure, and moves all triple valves to release position. This opens up the port 29, whereby the auxiliary reservoirs are then recharged rapidly, since the air may flow from the control pipe line directly into the triple valve chamber and auxiliary reservoir through ports 29 and 28, and also from the train pipe through the usual feed groove 32. If, after the brakes are applied, it should be desired to grade down the brake cylinder pressure a certain amount, this may be done by bringing the brake valve to release position for an instant and then turning to lap position. As the increased wave of air pressure enters the train pipe the triple valve moves to release position and the air from the brake cylinder begins to discharge to the atmosphere through ports 26, 25, 27, 31 and 30, but at the same time the ports 29 and 28 are opened and air flows from the control pipe line into the valve chamber upon the auxiliary reservoir side of the triple piston. This pressure immediately accumulates to a higher degree than that on the train pipe side of said piston, since the communication through the brake valve has been closed and moves the piston with the graduating slide valve back sufficiently to cut off communication between ports 25 and 31, thereby preventing further exhaust from the brake cylinder, and also closes inlet port 28, thus preventing further movement of the triple piston. Further reductions in the brake cylinder pressure may be made in a similar manner and a graduated release of the brakes thereby secured.

It will be noted that all of the main reservoirs assist in supplying air to the control pipe line through the respective feed valves and maintain the pressure therein constant and substantially equal to the normal maximum degree of train pipe pressure.

By means of our improved apparatus the braking power is always under the perfect control of the engineer or motorman, since he may grade the brake cylinder pressure up or down, as desired, and owing to the means for rapidly restoring the pressure in the auxiliary reservoir this pressure never diminishes below a safe working degree even when many applications of the brakes are made in rapid succession.

This apparatus is designed so that each motor car has a complete equipment for operating on the multiple unit principle, so that it will be apparent that the action of the brake apparatus will be as complete and effective when the cars are operated singly or when two or more motor cars are coupled up in trains either with or without trailer cars.

The invention is also adapted for use on steam railway cars as well, and it is not to be restricted to any particular class of service.

Having now described our invention, what we claim as new and desire to secure by Letters Patent is:—

1. In an air brake, the combination with a train pipe line and a control pipe line normally carrying air at a pressure different from that of the reservoir, of a brake valve connected to both pipe lines for controlling the train pipe pressure and a reservoir or source of air under pressure for supplying the control pipe line.

2. In an air brake, the combination on a plurality of cars of a plurality of reservoirs, a pipe line connecting said reservoirs and normally carrying air at a pressure different from that in said reservoirs, a train pipe line, and a brake valve for controlling the train pipe pressure.

3. In an air brake, the combination with a train pipe and brake valve, of a control pipe line, a reservoir for supplying air to the control pipe line and means for limiting the maximum pressure in said control pipe to substantially equal the normal train pipe pressure.

4. In an air brake, the combination with a train pipe and brake valve, of a control pipe line, a reservoir for supplying air to the control pipe line and a feed or reducing valve located between the reservoir and the control pipe line.

5. In an air brake, the combination with a train pipe and brake valve, of a control pipe line connected to the brake valve, and means for limiting the maximum pressure admitted to the control pipe line to the normal train pipe pressure.

6. In an air brake, the combination with a train pipe and brake valve, of a control pipe line connected to the brake valve, a reservoir for supplying air to the control pipe line and a reducing or feed valve located between the reservoir and the control pipe line.

7. In an air brake, the combination with a train pipe, brake valve and auxiliary reservoir, of a control pipe line having a source of pressure, and means for supplying air from the control pipe line to the auxiliary reservoir.

8. In an air brake, the combination with a train pipe, brake valve and auxiliary reservoir, of a control pipe line having a source of pressure, and a valve device operated by variations in train pipe pressure for controlling the supply of air from the control pipe to the auxiliary reservoir.

9. In an air brake, the combination with a train pipe, brake valve and auxiliary reservoir, of a control pipe line having a source of pressure, and a valve device operated by variations in train pipe pressure for controlling the supply of air from the control pipe and from the train pipe to the auxiliary reservoir.

10. In an air brake, the combination with a train pipe, brake valve, and auxiliary reservoir, of a control pipe line connected to the brake valve and having a source of pressure, and a valve device operated by variations in train pipe pressure for supplying air from the control pipe to the auxiliary reservoir.

11. In an air brake, the combination with a train pipe, brake valve and auxiliary reservoir, of a control pipe line, means for supplying air at the maximum degree of train pipe pressure to the control pipe line and a valve device operated by variations in train pipe pressure for supplying air from the control pipe to the auxiliary reservoir.

12. In an air brake, the combination with a main reservoir, train pipe, brake valve and auxiliary reservoir, of a control pipe line, a reducing valve located between the main reservoir and the control pipe line, and a valve device operated by variations in train pipe pressure for supplying air from the control pipe to the auxiliary reservoir.

13. In an air brake, the combination with a train pipe, brake valve, auxiliary reservoir, triple valve and brake cylinder, of a control pipe line, and means governed by the triple valve for controlling the supply of air from the control pipe to the auxiliary reservoir.

14. In an air brake, the combination with a train pipe, brake valve, auxiliary reservoir, triple valve and brake cylinder, of a control pipe line, and means governed by the triple valve for controlling the supply of air from the control pipe to the auxiliary reservoir, and from the train pipe to the auxiliary reservoir.

15. In an air brake, the combination with a train pipe, brake valve and auxiliary reservoir, of a control pipe line and a valve mechanism operated by an increase in train pipe pressure for opening communication from the control pipe to the auxiliary reservoir.

16. In an air brake, the combination with a train pipe, brake valve, auxiliary reservoir, triple valve and brake cylinder, of a control pipe line, the triple valve having a port adapted to be open in release position for establishing communication from the control pipe to the auxiliary reservoir.

17. In an air brake, the combination with a train pipe and a source of fluid pressure, of a control pipe line supplied with air from said source of pressure, a brake valve for controlling communication from said control pipe line to the train pipe, and means for supplying air from the control pipe line to the auxiliary reservoir.

18. In a fluid pressure brake, the combination with a train pipe, triple valve and auxiliary reservoir, of a source of fluid pressure from which the triple valve supplies air to the auxiliary reservoir in the release position of the triple valve.

In testimony whereof we have hereunto set our hands.

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CLYDE C. FARMER.

Witnesses as to Turner:
R. F. EMERY,
JAMES B. MACDONALD.
Witnesses as to Farmer:
A. L. HUMPHREY,
M. H. BURCHARD.