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CAR DOOR CONTROL EQUIPMENT

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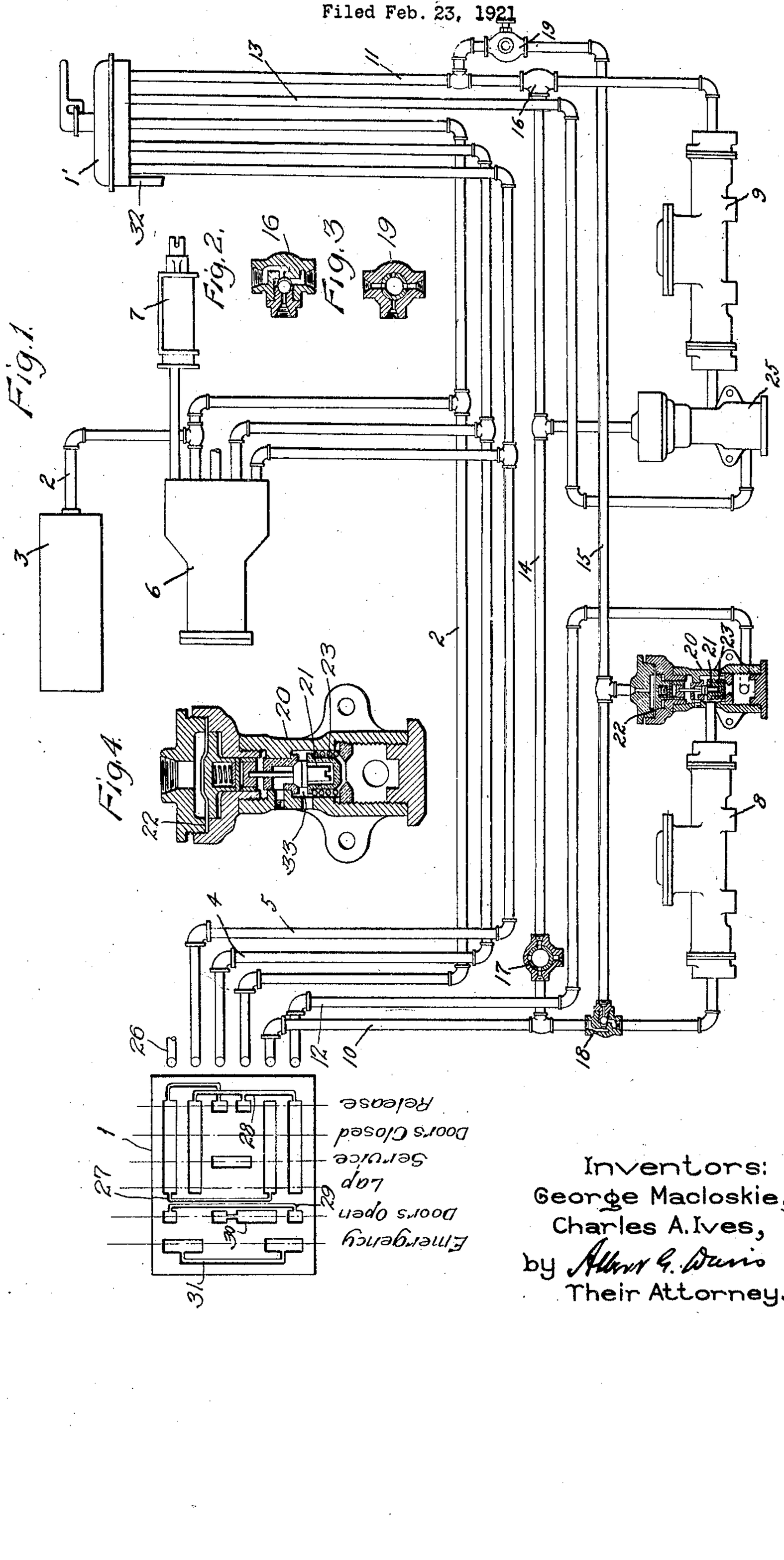


Fig. 1.



Fig. 2.



Fig. 3.




Fig. 4.




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## CAR-DOOR-CONTROL EQUIPMENT.

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Our invention relates to car door control equipments, and particularly to such equipments for use on one-man cars which are arranged to be controlled from either end.

One-man cars of the above type are usually provided with a door at each end and these doors are so arranged that the motorman can open and close the door only at the end from which he is operating the car. It is sometimes desirable, however, that both doors be controlled by the motorman from the operating end and it is an object of our invention to provide an arrangement whereby the motorman may control both doors simultaneously or the door at the operating end only.

Our invention will be better understood from the following description taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims.

In the accompanying drawing Fig. 1 is a diagrammatic view partially in section of a car door and brake control equipment embodying our invention. As shown in the drawing, the brake equipment comprises a motorman's valve 1 at one end of the car, a motorman's valve 1′ at the opposite end, a reservoir pipe 2 connected to the main reservoir 3, a straight air pipe 4, an emergency pipe 5, an emergency valve 6 and a brake cylinder 7. This brake equipment is standard apparatus and since it is well known in the art, it is believed that a further description thereof is unnecessary.

The motorman's valve 1 in addition to being arranged to control the brakes of the car also controls a fluid operated door engine 8 for operating the car door at that end of the car. The motorman's valve 1′ is also arranged to control a fluid operated door engine 9 for operating the car door at that end of the car.

The door engines 8 and 9 are provided with door opening pipes 10 and 11 and door closing pipes 12 and 13 respectively.

In the system shown in the drawing, the motorman's valves 1 and 1′, which may be of any suitable type, have six operating positions. In order to illustrate the various connections that are made by the motorman's valves when in their different operating positions, a diagrammatic development of the motorman's valve 1 is shown. Only an outline of the motorman's valve 1′ is shown in order to simplify the drawing. The connections which are made by the motorman's valve 1′ when in its different operating positions are the same as those shown in the diagrammatic development of the motorman's valve 1.

The motorman's valve 1 is arranged so that when it is in the release, door closed, service and lap positions the door opening pipe 10 is connected to the exhaust pipe 26 by a passage 27 and the door closing pipe 12 is connected to the emergency pipe 5 by a passage 28. When the motorman's valve 1 is in the door open position, the door closing pipe 12 is connected to the exhaust pipe 26 by a passage 29 and the door opening pipe 10 is connected to the reservoir pipe 2 by a passage 30. When the motorman's valve 1 is in the emergency position, the door opening pipe 10 and the door closing pipe 12 are connected to the exhaust pipe 26 by a passage 31.

The motorman's valve 1′ is arranged in a similar manner so that the door opening pipe 11 is connected to the exhaust pipe 32 and the door closing pipe 13 is connected to the emergency pipe 5 when the valve 1′ is in the release, door closed, service and lap positions; and the door closing pipe 13 is connected to the exhaust pipe 32 and the door opening pipe 11 is connected to the reservoir pipe when the valve 1′ is in the door open position; and the door opening pipe 11 and door closing pipe 13 are connected to the exhaust pipe 32 when the valve 1′ is in the emergency position.

The door engines are arranged in any suitable manner, examples of which are well known in the art, so that when fluid pressure is admitted to the door opening side thereof and the door closing side thereof is connected to atmosphere, the door engines open the car doors controlled thereby, and when fluid pressure is admitted to the door closing side thereof and the door opening side thereof is connected to atmosphere, the door engines close the doors controlled thereby. Therefore, when the motorman's valve 1 is in the release, door closed, service and lap positions the door engine 8 maintains the doors controlled thereby closed, and when the valve 1 is in the door open position the door engine 8 opens the doors controlled thereby. Similarly, the door engine 9 maintains the doors controlled there-

by closed when the motorman's valve 1′ is in the release doors close, service and lap positions and opens the doors when the valve 1′ is in the door open position.

When either motorman's valve is in the emergency position the door opening and closing pipes connected thereto are connected to atmosphere so that the doors may be operated by hand.

With the arrangement heretofore described, it will be observed that each motorman's valve controls only one door engine. Sometimes it is desirable to operate both door engines simultaneously from one end and at other times it is desirable to operate only one door engine. In order that this desired result may be obtained, the following arrangement is shown in the drawing for accomplishing this result.

The door opening pipes 10 and 11 are connected together by the pipes 14 and 15. The pipe 14 is connected to the door opening pipe 11 by means of a double check valve 16 preferably of the well known ball type and sectionally illustrated on a relatively large scale in Fig. 2. This check valve is so arranged that, when the door opening pipe 11 is supplied with fluid under pressure through the motorman's valve 1′, communication between pipe 14 and the door opening side of the door engine 9 is cut off, and when fluid under pressure is admitted to the pipe 14 communication is cut off between the door opening pipe 11 and the door opening side of the door engine 9 and communication is established between pipe 14 and the door opening side of the door engine 9. A cut off cock 17 is placed in the pipe 14 at the opposite end of the car from where the motorman's valve 1′ is installed. This cut off cock which is similar in construction to the cut off cock 19 sectionally illustrated on a relatively large scale in Fig. 3 is so arranged that in one position it establishes communication between the door opening pipe 10 and pipe 14 and in another position cuts off this communication between the pipes 10 and 14 and connects the pipe 14 to atmosphere. The pipe 15 is connected to the door opening pipe 10 by means of a double check valve 18 of the same construction as the check valve 16. This check valve 18 is so arranged that when fluid under pressure is supplied to the door opening pipe 10 through the motorman's valve 1 communication is cut off between the door opening pipe 10 and the pipe 15, and when fluid under pressure is admitted to the pipe 15 communication is cut off between the door opening pipe 10 and the door opening side of the door engine 8, and communication is established between pipe 15 and the door opening side of the door engine 8. A cut out cock 19 is placed in the pipe 15 at the opposite end of the car from where the motorman's valve 1 is installed. This cut out cock is arranged so that in one position it establishes communication between the door opening pipe 11 and pipe 15 and in another position cuts off this communication between the pipes 11 and 15 and establishes communication between pipe 15 and atmosphere.

The communication between the door closing pipe 12 and the door closing side of the door engine 8 is controlled by a door operating valve 20 which is sectionally illustrated on a relatively large scale in Fig. 4. This door operating valve comprises a double beat valve 21 operated by a diaphragm 22, one side of which is subject to the pressure in the pipe 15 and the other side of which is subject to the pressure of a spring 23. When there is no pressure in the pipe 15 the valve 20 is held in the position shown in the drawing, in which position the double beat valve 21 establishes communication between the door closing pipe 12 and the door closing side of the door engine 8. When fluid under pressure is admitted to the pipe 15 the diaphragm 22 of the valve 20 is moved downwardly and the double beat valve 21 cuts off communication between the door closing pipe 12 and the door closing side of the door engine 8 and establishes communication between the door closing side of the door engine 8 and the passage 33 which is connected to atmosphere.

The communication between the door closing pipe 13 and the door closing side of the door engine 9 is controlled by a door operating valve 25 of the same construction as the valve 20. This valve 25 is so arranged that when there is no fluid under pressure in the pipe 14 communication is established between the door closing pipe 13 and the door closing side of the door engine 9, but when there is fluid under pressure in the pipe 14 communication between the door closing pipe 13 and the door closing side of the door engine 9 is cut off and communication established between the door closing side of the door engine 9 and atmosphere.

The operation of the equipment shown is as follows: Let it be assumed that the motorman's valve 1 is at the operating end of the car. If it is desired to control the door at the operating end only, the cut out cock 17 is turned so that it cuts off communication between door opening pipe 10 and the pipe 14 and establishes communication between the pipe 14 and atmosphere. The cut out cock 19 is also turned so that it cuts off communication between the door opening pipe 11 and pipe 15 and establishes communication between the pipe 15 and atmosphere. The motorman's valve at the non-operating end is placed in lap position, which is a door closing position, and therefore the door closing pipe 13 at the non-operating end is supplied with fluid under pressure from the

emergency pipe 5 and the door opening pipe 11 at the same end is connected to atmosphere. It will be apparent therefore that the door at the non-operating end is held closed independently of the motorman's valve at the operating end.

The brake equipment on the car may be controlled in the usual manner from the operating end by moving the motorman's valve 1 to the various brake positions. The door at the operating end may be controlled also by moving the motorman's valve 1 to the various door positions. For example, if it is desired to open the door at the operating end the brake valve 1 is moved to its door opening position in which fluid under pressure is supplied from the reservoir pipe 2 to the door opening pipe 10 and the door closing pipe 12 is connected to atmosphere. No fluid under pressure flows from the pipe 10 to the pipe 15 because the fluid pressure in the pipe 10 moves the check valve 18 so that it cuts off communication between pipes 10 and 15. In order to prevent the pressure from building up in the pipe 15 due to the check valve 18 leaking, the valve 19, which is at the non-operating end, is arranged to connect the pipe 15 to atmosphere when it is operated to cut off communication between pipes 15 and 11. Since there is no fluid under pressure in the pipe 15 at this time, the double beat valve 21 of the door opening valve 20 remains in its normal position so that the communication between the door closing pipe 12 and the door closing side of the door engine 8 is maintained. Since the door opening side of the door engine 8 is supplied with fluid under pressure and the door closing side is connected to atmosphere it operates to open the door controlled thereby. When it is desired to close the door at the operating end of the car, the motorman's valve 1 is moved to a door closing position in which fluid under pressure is supplied to the door closing pipe 12 and the door opening pipe 10 is connected to atmosphere. Fluid under pressure is thereby supplied to the door closing side of the door engine 8 whereupon it operates to close the door at the operating end.

Let it now be assumed that both doors of the car are to be controlled from the operating end, which we assumed to be the end where the motorman's valve 1 is situated. The cut out cock 17 which is at the operating end is now turned so that it establishes communication between the door opening pipe 10 and the pipe 14 so that pipe 14 is supplied with fluid under pressure each time the motorman's valve 1 is moved to the door opening position. The admission of fluid under pressure to the pipe 14 causes the check valve 16 which is at the non-operating end, to move so that it cuts off communication between the door opening pipe 11 and the door opening side of the door engine 9 and establishes communication between the pipe 14 and the door opening side of the door engine 9 so that fluid under pressure is supplied thereto. The admission of fluid under pressure to the pipe 14 also operates the door valve 25 at the non-operating end to cut off communication between the door closing pipe 13 and the door closing side of the door engine 9 and to establish communication between the door closing side of the door engine 9 and atmosphere. Therefore, it will be apparent that each time the motorman's valve 1 at the operating end is moved to the door opening position both of the door engines 8 and 9 are operated to open the doors controlled thereby. When the motorman's valve 1 is moved to a door closing position the pipe 14 is connected to atmosphere through the pipe 10. This exhausts the door opening side of the door engine 9 and reduces the pressure on the top of the diaphragm 22 of the door operating valve 25. When the pressure in the pipe 14 drops to a predetermined value the valve 25 is restored to its normal position by the spring 23 in which position communication is again established between the door closing pipe 13 and the door closing side of the door engine 9 whereupon the door engine 9 is operated to close the door at the non-operating end of the car. From the above description it will be apparent that when the car is operated from the end where the motorman's valve 1 is situated, the door engine 8 only is controlled by the motorman when the cut out cock 17 is in one position, and the door engines 8 and 9 are simultaneously controlled by the motorman when the cut out cock 17 is in the other position. Furthermore, it will be evident from the above description that when the car is operated from the other end, the motorman will be able to control the door engine 9 only when the cut out cock 19 is in the position in which it establishes connection between the pipe 15 and atmosphere and will be able to control the door engines 8 and 9 simultaneously when the cut out cock 19 is in the position in which it establishes communication between the door opening pipe 11 and the pipe 15.

While we have shown one embodiment of our invention various modifications and changes may be made without departing from the spirit and scope of our invention and we aim to cover in the appended claims all such modifications and changes.

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

1. In a car door control equipment, the combination of a fluid operated door engine at each operating end of the car for operating a door thereat, a source of fluid pressure, a manually controlled door valve at each operating end of the car arranged to

establish suitable communication between said source and the engine at the corresponding end of the car to effect the opening and closing of the door thereat, valve means associated with each engine and adapted to be controlled by the door valve at the other end of the car to effect the operation of the engine with which it is associated, and a manually controlled device at each end of the car arranged to prevent the door valve at the corresponding end from controlling the valve means associated with the engine at the other end.

2. In a car door control equipment, the combination of a fluid operated door engine at each operating end of the car for operating a door thereat, a source of fluid pressure, a manually controlled door valve at each operating end of the car arranged to establish suitable communication between said source and the engine at the corresponding end of the car to effect the opening and closing of the door thereat, a valve means associated with each engine and adapted to be controlled by the door valve at the other end of the car so that both engines are simultaneously operated, and a manually controlled device at each end of the car arranged to prevent the door valve at the corresponding end from controlling the valve means associated with the engine at the other end.

3. In a car door control equipment, the combination of a fluid operated door engine at each end of the car for operating a door thereat, each engine having a door opening pipe and a door closing pipe, a source of fluid pressure, a manually controlled door valve at each end arranged when in the door closing position to establish communication to the door closing pipe of the engine at the corresponding end so that fluid under pressure is supplied thereto and to establish communication between the door opening pipe of said engine and atmosphere and arranged when in the door opening position to establish communication between said source and the door opening pipe of the engine at the corresponding end and to establish communication between the door closing pipe of said engine and atmosphere, and valve means associated with each engine and adapted to be operated by the fluid pressure in the door opening pipe of the other engine to effect the operation of the engine with which it is associated when the door valve at the corresponding end is in the door closing position and the door valve at the other end is in the door opening position.

4. In a car door control equipment, the combination of a fluid operated door engine at each end of the car for operating a door thereat, each engine having a door opening pipe and a door closing pipe, a source of fluid pressure, a manually controlled door valve at each end arranged when in the door closing position to establish communication to the door closing pipe of the engine at the corresponding end so that fluid under pressure is suplied thereto and to establish communication between the door opening pipe of said engine and atmosphere and arranged when in the door opening position to establish communication between said source and the door opening pipe of the engine at the corresponding end and to establish communication between the door closing pipe of said engine and atmosphere, valve means associated with each engine and adapted to be operated by the fluid pressure in the door opening pipe of the other engine to effect the operation of the engine with which it is associated when the door valve at the corresponding end is in the door closing position and the door valve at the other end is in the door opening position, and a manually controlled valve at each end of the car for controlling the communication between the door opening pipe at the corresponding end and the valve means associated with the door engine at the other end.

5. In a car door control equipment, the combination of a fluid operated door engine at each end of the car for operating a door thereat, each engine having a door opening pipe and a door closing pipe, a source of fluid pressure, a manually controlled door valve at each end of the car arranged when in the door closing position to establish communication to the door closing pipe of the engine at the corresponding end so that fluid under pressure is supplied thereto and to establish communication between the door opening pipe of said engine and atmosphere and arranged when in the door opening position to establish communication between said source and the door opening pipe of the engine at the corresponding end and to establish communication between the door closing pipe of said engine and atmosphere, a valve device in each door opening pipe adapted to be operated by the fluid pressure in the door opening pipe at the other end of the car to cut off communication between the door opening pipe in which said valve device is connected and the door opening side of the engine at the end of the car at which the respective valve device is located and to establish communication between the door opening side of said engine and the door opening pipe at the other end of the car, and a valve device in each door closing pipe adapted to be operated by the fluid pressure in the door opening pipe associated with the engine at the other end of the car to cut off communication between the door closing pipe in which said valve device is connected and the door closing side of the engine at the end of the car at which the respective valve device is located and to

establish communication between said door closing side of the engine and atmosphere.

6. In a car door control equipment, the combination of a fluid operated door engine at each end of the car for operating a door thereat, each engine having a door opening pipe and a door closing pipe, a source of fluid pressure, a manually controlled door valve at each end of the car arranged when in the door closing position to establish communication to the door closing pipe of the engine at the corresponding end so that fluid under pressure is supplied thereto and to establish communication between the door opening pipe of said engine and atmosphere and arranged when in the door opening position to establish communication between said source and the door opening pipe of the engine at the corresponding end and to establish communication between the door closing pipe of said engine and atmosphere, a valve device in each door opening pipe adapted to be operated by the fluid pressure in the door opening pipe at the other end of the car to cut off communication between the door opening pipe in which said valve device is connected and the door opening side of the engine at the end of the car at which the respective valve device is located and to establish communication between the door opening side of said engine and the door opening pipe at the other end, a valve device in each door closing pipe adapted to be operated by the fluid pressure in the door opening pipe associated with the engine at the other end of the car to cut off communication between the door closing pipe in which said valve device is connected and the door closing side of the engine at the end of the car at which the respective valve device is located and to establish communication between said door closing side of the engine and atmosphere, and a manually controlled valve at each end of the car for controlling the communication between the door opening pipe at the corresponding end and the valve devices at the other end of the car.

7. In a car door control equipment, the combination of a fluid operated door engine at each end of the car for operating a door thereat, each engine having a door opening pipe and a door closing pipe, a source of fluid pressure, a motorman's valve at each end of the car arranged when in the lap position to establish communication to the door closing pipe of the engine at the corresponding end so that fluid under pressure is supplied thereto and to establish communication between the door opening pipe of said engine and atmosphere, and arranged when in the door opening position to establish communication between said source and the door opening pipe of the engine at the corresponding end and to establish communication between the door closing pipe of said engine and atmosphere, a valve device in each door opening pipe adapted to be operated by the fluid pressure in the door opening pipe at the other end of the car to cut off communication between the door opening pipe in which the valve device is connected and the door opening side of the engine at the end of the car at which the respective valve device is located and to establish communication between said door opening side of said engine and the door opening pipe at the other end, and a valve device in each door closing pipe adapted to be operated by the fluid pressure in the door opening pipe associated with the engine at the other end of the car to cut off communication between the door closing pipe in which the valve device is connected and the door closing side of the engine at the end of the car at which the respective valve device is located and to establish communication between said door closing side of said engine and atmosphere.

8. In a car door control equipment, the combination of a fluid operated door engine at each end of the car for operating a door thereat, each engine having a door opening pipe and a door closing pipe, a source of fluid pressure, a motorman's valve at each end of the car arranged when in the lap position to establish communication to the door closing pipe of the engine at the corresponding end so that fluid under pressure is supplied thereto and to establish communication between the door opening pipe of said engine and atmosphere, and arranged when in the door opening position to establish communication between said source and the door opening pipe of the engine at the corresponding end and to establish communication between the door closing pipe of said engine and atmosphere, a valve device in each door opening pipe adapted to be operated by the fluid pressure in the door opening pipe at the other end of the car to cut off communication between the door opening pipe in which the valve device is connected and the door opening side of the engine at the end of the car at which the respective valve device is located and to establish communication between said door opening side of said engine and the door opening pipe at the other end, a valve device in each door closing pipe adapted to be operated by the fluid pressure in the door opening pipe associated with the engine at the other end of the car to cut off communication between the door closing pipe in which the valve device is connected and the door closing side of the engine at the end of the car at which the respective valve device is located and to establish communication between said door closing side of said engine and atmosphere, and a manually controlled valve at each end

of the car for controlling the communication between the door opening pipe at the corresponding end and said valve devices at the other end of the car.

9. In a car door control apparatus, the combination with a door engine, of a door controlling valve device at each end of the car, a door control pipe leading from each door controlling valve device to the door engine, and a double check valve for controlling communication from said control pipes to the door engine.

10. In a car door control apparatus, the combination with a door engine, of a door controlling valve device at each end of the car, a door control pipe leading from each door controlling valve device to the door engine, and a double check valve operated by the pressure of fluid supplied from one controlling valve device through its control pipe for opening communication from said control pipe to the door engine and for closing communication from said control pipe and the door engine to the other control pipe.

11. In a car door control apparatus, the combination with two door engines, of a door controlling valve device at each end of the car, a door control pipe leading from each controlling valve to each door engine, and a double check valve for controlling communication from each control pipe to one of said door engines.

12. In a car door control equipment, the combination with a door engine, of two door controlling valve devices, a door control pipe leading from each door controlling valve device to the door engine, and a double check valve for controlling communication from said control pipes to the door engine.

13. In a car door control equipment, the combination with a door engine, of two door controlling valve devices, a door control pipe leading from each door controlling valve device to the door engine, and a valve device operated by fluid pressure in one of said control pipes for establishing communication from said control pipe to the door engine and for closing communication from said control pipe and door engine to the other control pipe.

14. In a car door control equipment, the combination with a door engine, two door controlling valves, two door control pipes leading from one of said door controlling valves to said engine, another door control pipe leading from the other door controlling valve to said door engine, and means responsive to fluid pressure in one of said door control pipes for cutting off communication between said door engine and another of said door control pipes.

15. In a car door control equipment, the combination with a door engine, two door controlling valves, two door control pipes leading from one of said door controlling valves to said engine, another door control pipe leading from the other door controlling valve to said door engine, and valve devices responsive to fluid pressure in said last mentioned door control pipe for cutting off communication between said door engine and both of the other door control pipes and for establishing communication between said door engine and the door control pipe leading from said other door controlling valve to said door engine.

16. In a car door control equipment, the combination with a door engine, two door controlling valves, two door control pipes leading from one of said door controlling valves to said engine, another door control pipe leading from the other door controlling valve, valve devices responsive to fluid pressure in said last mentioned door control pipe for cutting off communication between both of the other door control pipes and said door engine and for establishing communication between said door engine and the door control pipes leading to said other door controlling valve, and a manually controlled valve for controlling communication between said valve devices and the door control pipe leading from said other door controlling valve.

17. In a car door control equipment, the combination with a door engine, two door controlling valves, a door opening pipe and a door closing pipe leading from one of said door controlling valves to said door engine, a door opening pipe leading from the other door controlling valve to said door engine, and valve means responsive to fluid pressure in said last mentioned door opening pipe for cutting off communication between said door engine and the door opening and closing pipes leading from said one of said door controlling valves.

18. In a car door control equipment, the combination with a door engine, two door controlling valves, a door opening pipe and a door closing pipe leading from one of said door controlling valves to said door engine, a door opening pipe leading from the other door controlling valve, valve means responsive to fluid pressure in said last mentioned door opening pipe for cutting off communication between said door engine and the door opening and closing pipes leading from said one of said door controlling valves, and a manually controlled valve for controlling communication between said valve means and the door opening pipe leading from said other door controlling valve.

In witness whereof, we have hereunto set our hands this 19th day of February, 1921.

GEORGE MACLOSKIE.
CHARLES A. IVES.