Aug. 29, 1933. H. E. VAN DORN 1,924,821

CONTROL SYSTEM FOR CAR COUPLERS AND ELECTRIC CIRCUITS

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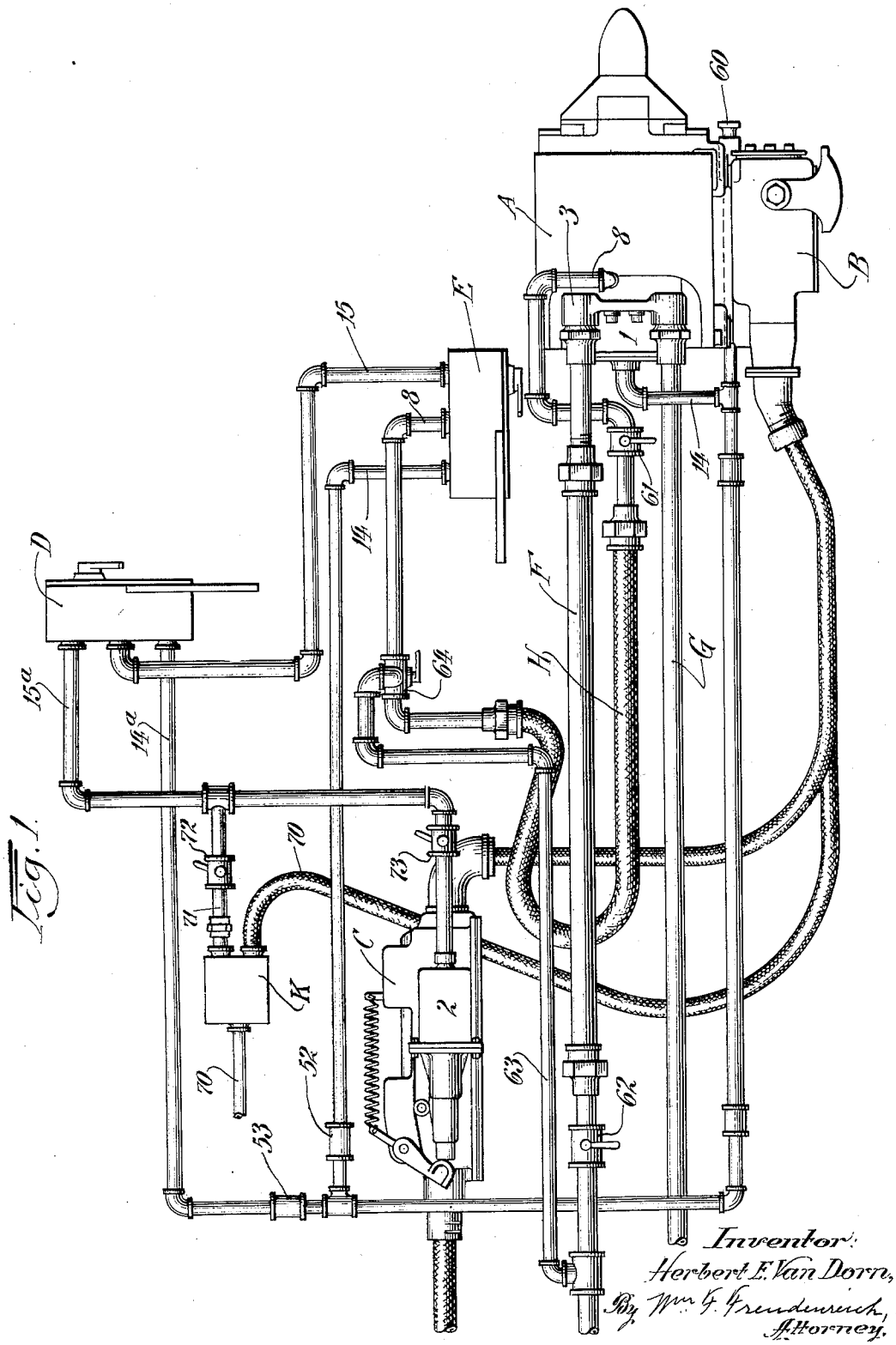


Fig. 1.

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Fig. 2.

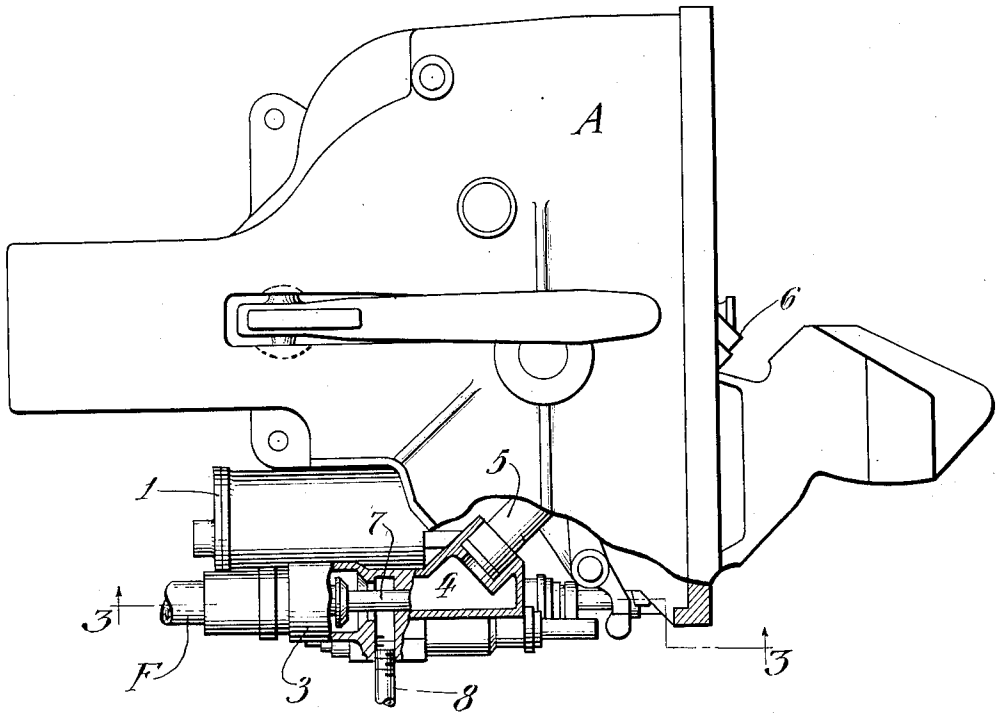
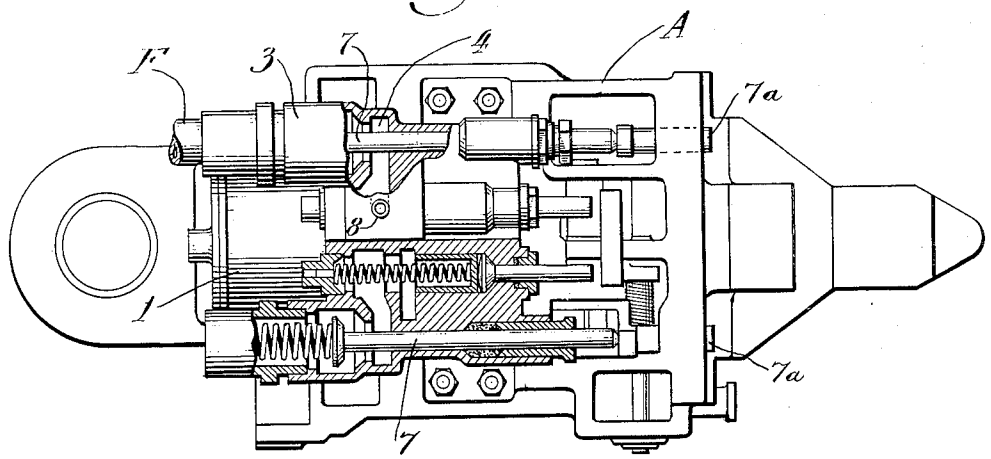


Fig. 3.



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Fig. 4.

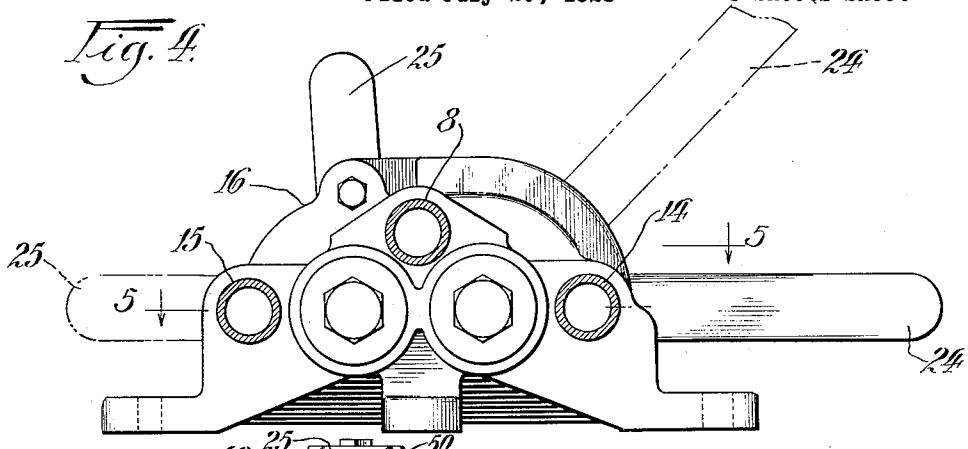


Fig. 5.

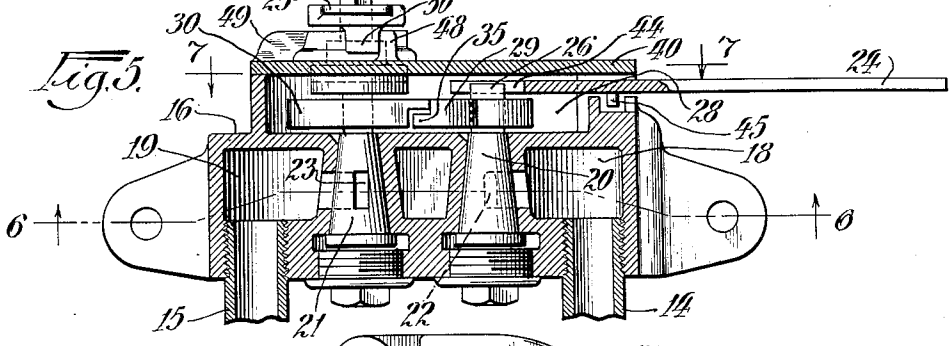


Fig. 6.

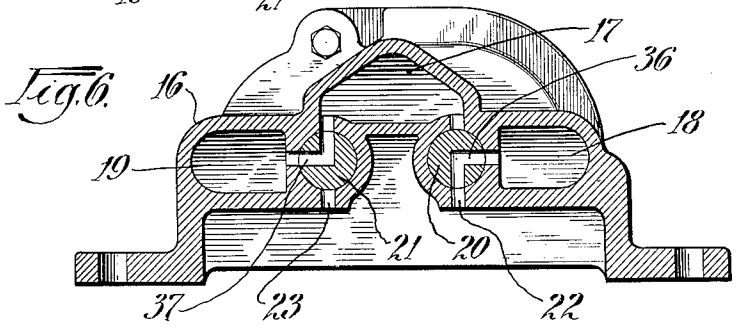


Fig. 7.

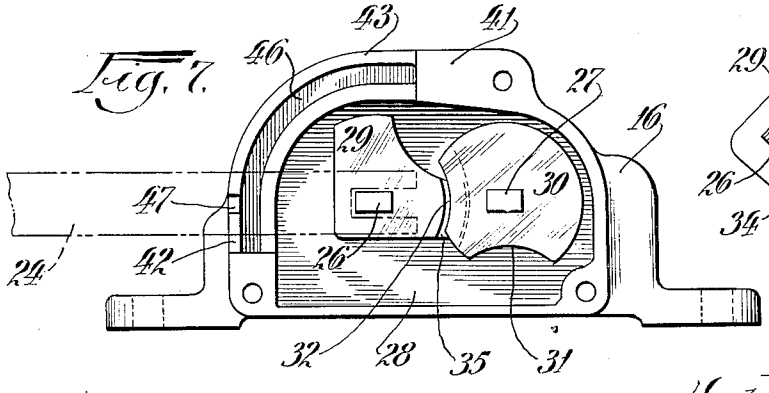
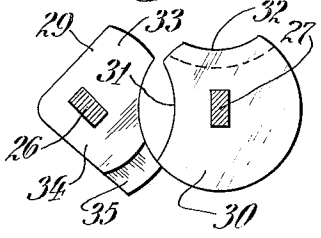


Fig. 8.



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UNITED STATES PATENT OFFICE

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CONTROL SYSTEM FOR CAR COUPLERS AND ELECTRIC CIRCUITS

Herbert E. Van Dorn, Chicago, Ill., assignor to William E. Van Dorn, Pasadena, Calif.

Application July 25, 1928. Serial No. 295,333

11 Claims. (Cl. 173—332)

The present invention relates to the equipment for electric railway cars, whereby the cars are coupled together mechanically while at the same time the electric train lines and the air lines are automatically connected together; and has for its object a simplified and improved control system for such equipment.

Before cars are uncoupled it is desirable that the electric train circuits be interrupted to avoid arcing at the contacts in the electric couplers during the uncoupling operation, particularly where power current is passed through the couplers, and to insure that the contacts thereafter will be dead. Viewed in one of its aspects, the present invention may be said to have for its object to produce a simple and novel controlling system whereby the train line circuits will be automatically completed and interrupted in proper time relation to the coupling and uncoupling of the cars.

In carrying out my invention, I employ in the electric train line a switch that tends constantly to open, and provide pneumatic operating means for closing the switch. The pneumatic operating means for the switch and the unlocking cylinder for the car coupler are provided with a common controller to insure proper sequence of operation. A further object of the present invention may therefore be said to be the control of the electric train lines through the controlling mechanism for mechanically uncoupling the cars.

Since the switch should be opened before the cars are uncoupled, my invention may be said to have for a further object a provision of means to prevent the operation of the pneumatic unlocking means for a coupler until the switch has been opened.

The various features of novelty whereby my invention is characterized will hereinafter be pointed out with particularity in the claims; but, for a full understanding of my invention and of its objects and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is a diagram illustrating the equipment for one end of one car arranged in accordance with my invention; Fig. 2 is a top plan view, partly in section, showing the car and air coupler; Fig. 3 is a section taken approximately on line 3—3 of Fig. 2; Fig. 4 is a rear view of the master controlling valve; Fig. 5 is a section taken approximately on line 5—5 of Fig. 4; Fig. 6 is a section taken approximately on line 6—6 of Fig. 5; Fig. 7 is a section taken approximately on line 7—7 of Fig. 5; and Fig. 8 is a view of the interlocking cams illustrating them in different positions than those which they occupy in Fig. 7.

Referring to Fig. 1 of the drawings, A represents a combined car and air coupler, and B is an electric coupler mounted underneath the latter. C is the main switch. The car coupler has an unlocking cylinder 1. The switch is of the type that is normally open, as shown in my Patent No. 1,752,763, dated April 1, 1930; there being an actuating cylinder 2 for closing the switch. The admission of air to and the discharge of air from the cylinders 1 and 2 is controlled by a suitable master valve D. In the arrangement shown, there are two of these valves, the valve D being adapted to be positioned in the motorman's cab while a second valve, E, is placed in such position that it may be operated by a person standing on the ground beside the car.

F and G represent respectively the main reservoir line and the brake line of the air brake system. Both of the train air lines are adapted to be automatically connected to the corresponding members on an opposing car through the car coupler.

The car coupler is set forth and claimed in my Patent Number 1,878,031 issued Sept. 20, 1932.

In Figs. 2 and 3 there is shown sufficient of the detail of the coupler to illustrate its functions so far as the present invention is concerned. Referring to these figures, it will be seen that the main reservoir pipe F is connected to a casing 3 on the side of the coupler head, this casing containing a chamber 4 with which communicates an inclined pipe 5 whose outer end 6 is adapted to be engaged by a corresponding pipe on an opposing coupler to connect the two reservoir lines together. A suitable automatic valve 7 shuts off communication between the pipe F and the chamber 4 when the cars are uncoupled and is forced open when a coupling is made; conveniently by means of a plunger 7*a* adapted to strike a forward face on an opposing coupler.

The master valve device is shown in detail in Figs. 4 to 8. This valve is the same as that disclosed and claimed in my Patent Number 1,790,291 issued Jan. 27, 1931. It will be seen in Figs. 1, 2 and 3 that there is a pipe 8 connected to the chamber 4 in the coupler head and leading to about the center of the valve device E. The pipe 14 leads from the valve device E to the unlocking cylinder 1 of the coupler. A third pipe 15 leads from the valve device E to the center of

the valve device D. A pipe 15*a*, corresponding in location to the pipe 15 with respect to the valve E leads from the valve D to the switch cylinder 2. There is also a pipe 14*a* corresponding to the pipe 14, leading from the valve device D and connected to the pipe 14.

It will thus be seen that when the valve devices D and E are properly set, in the event that two cars are coupled together, so that there is air under pressure in the chamber 4 in the coupler, air may flow from the reservoir line into the pipe 8 through the valve device E and pipe 14 to the unlocking cylinder of the coupler, so as to cause the coupler to be unlocked; or, the air, after entering the valve casing E through the pipe 8, may leave through the pipe 15, the valve D, the pipe 15*a* to enter the switch operating cylinder 2, so as to close the switch. If the valve device D were not present, the pipe 15 would lead directly to the switch cylinder, and therefore the operation system may be explained in a preliminary way without reference to the valve device D.

One of the master valves, to be regarded as the master valve D, is shown in detail in Figs. 4 to 8. The valve casing contains three chambers, 17, 18 and 19; the chamber 17 being at the top and in the middle, while the chambers 18 and 19 are arranged slightly below and at opposite sides of the chamber 17. The pipe 8 is connected with the chamber 17, and the pipes 14 and 15 are connected respectively to the chambers 18 and 19. Between the chamber 17 and each of the other chambers is a plug valve, these being indicated at 20 and 21. Suitable ports and passages are provided so that each of the chambers 18 and 19 may be placed in communication with the chamber 17 or shut off therefrom. The parts are so proportioned and arranged that when the valves are turned ninety degrees from the positions in which they connect the chamber 17 with the chambers 18 and 19 they vent the chambers 18 and 19 through suitable ports 22 and 23 respectively, leading to atmosphere.

It will thus be seen that air may be admitted from the pipe 8 to the uncoupling cylinder and to the switch cylinder. However, the pipe 8 is not supplied with air, that is compressed air, except when two cars are coupled together. Therefore, when the car coupler is not coupled to a companion coupler, the spring in the switch cylinder is free to operate the switch so as to open the same, or to hold it open if it is already open. When a plurality of cars are coupled together, all of the pipes corresponding to the pipes 8, except those associated with a coupler at each end of the train, will receive air, so that the switches and the uncoupling mechanism corresponding to those couplers that are in coupled relation to each other may be operated.

The two valve elements in the master valve should be interlocked to insure that the system will always function in the manner desired. As heretofore explained, each plug valve in one position vents the cylinder controlled by it to atmosphere while, in another position, ninety degrees removed, it connects that cylinder to the supply pipe 8. Each valve is provided with an operating handle, as indicated at 24 and 25, respectively, adapted to swing through an angle of ninety degrees, corresponding to the necessary movements of the plug valves. The air pipes enter the valve casing from the rear and the valve stems 26 and 27 project out through the front wall of the main portion of the casing. This front wall is hollowed out on the outer side to provide a chamber 28. Within this chamber are located two interlocking plates 29 and 30 mounted on the valve stems 26 and 27, respectively, so as to be rotatable with the latter. The plate 29 is L-shaped, being mounted on the valve stem at the juncture of the two arms. The plate 30 is in the form of a disc having two peripheral notches 31 and 32, forming arcs struck about the center of the stem 26 when these notches lie directly opposite the stem. The radius of the notch 31 is greater than that of the notch 32 and is approximately equal to or slightly greater than the radius of the curved end of the arm 33 of the plate 29. The arm 34 of the member 29 is longer than the arm 33. Consequently the arm 33 will be free to swing in the notch 31 when the parts are in the position shown in Fig. 8; but the arm 34 is too long to swing through either notch. However, the marginal portion of the member 30, on the underside and along the notch 32, is cut away, and the outer end of the arm 34 is also cut away along the top to form a lip 35 that will ride underneath the lip on the member 30 when the parts are positioned as shown in Fig. 7; the main portion of the arm 34 being short enough to pass through the notch 32.

Figs. 5, 6 and 7 show the parts in their normal positions. Namely, the port 36 in the valve 20 places the chamber 18 and therefore the pipe 14 in communication with atmosphere through the port 22, so that the unlocking cylinder on the car coupler is free from pressure. At the same time the port 37 in the valve 21 places the chambers 19 and 17, and therefore the pipes 15 and 8 in communication with each other. Assuming that the car coupler is not coupled to another coupler, there will be no pressure in the pipe 8, as this pipe is venting through the open end of the pipe or conduit 5 of the air coupling device. As a result, there will be no pressure in the switch cylinder and the switch will be held open by the spring. When two cars are coupled together, air is automatically supplied to the pipe 8, as heretofore explained, and therefore air will pass from this pipe through the master valve and to the switch cylinder so as to close the switch; pressure being maintained in the switch cylinder as long as the cars are coupled.

During this time the switch controlling valve and the uncoupling valve are interlocked as shown in Fig. 7, so that the former cannot be operated, whereas the uncoupling valve may be turned through an angle of forty-five degrees, in the clockwise direction as viewed in Fig. 7. When it is desired to uncouple, the handle 24 is swung up as far as it will go, namely forty-five degrees, to the position shown in dotted lines in Fig. 4. This brings the locking plate 29 into the position shown in Fig. 8, but does not permit air to pass into the uncoupling cylinder. Thereupon the handle 25 may be swung down from the full line position as shown in Fig. 4, to the dotted line position bringing the plate 30 into the position shown in Fig. 8. The switch valve 21 has now been swung through an angle of ninety degrees in the counterclockwise direction as viewed in Fig. 6, and therefore the chamber 19 and consequently the pipe 15 in the switch cylinder, are vented to atmosphere through the port 23. Therefore, because of the venting of the switch cylinder, the switch is permitted to open before air can be admitted to the uncoupling cylinder. After the condition just explained has been brought about, the uncoupling valve may be turned through a further angle of forty-five de-

grees, the arm 33 of the interlocking plate 29 swinging through the slot 31 in the plate 30 during this movement of the valve. When the uncoupling valve is turned forty-five degrees the second time it causes the passage 37 to place the chamber 18 and therefore the pipe 14 in communication with the chamber 17, so that air flows from the pipe 8, through the master valve, and into the uncoupling cylinder. When the cars are drawn apart, after being uncoupled, the valve 7 in the train line closes, so that the pipe 8 vents to atmosphere through the open end of the pipe or conduit 5 on the coupler, and the air is therefore exhausted from the uncoupling cylinder.

Since the master valves are left in the condition shown in Fig. 6 after the cars have been uncoupled and remain so while automatic coupling is taking place and until it is again desired to uncouple, it will be seen that by connecting the pipe 15 of the valve E to the chamber 17 of the valve D, the pipe 15*a* forms a continuation of the pipe 15, so that when two cars are brought together and the valves 7 in the coupler are opened, air will flow through both of the master valves on each car to the corresponding switch cylinder, so as to close the switch. Then, when it is desired to uncouple by operating the valve device E, the pipe 15, and therefore the pipe 15*a*, must first be connected to atmosphere to permit the switch to close before air under pressure can be admitted to the pipe 14 and from there into the uncoupling cylinder. If, on the other hand, the uncoupling is to be effected by means of the valve D, the pipe 15*a* must first be opened to atmosphere before the air from pipe 15 can be admitted to pipe 14*a* and from there to the pipe 14 and uncoupling cylinder.

In the pipes 14 and 14*a* there are check valves 52 and 53, respectively, so that the pipe 14*a* will not vent through the valve E, nor the pipe 14 vent through the valve D, when air under pressure is being delivered to either of these pipes to energize the unlocking cylinder.

Although the switch on one car is not opened by reason of the manipulation of a master valve on the second car, yet the switch will open automatically when the cars are drawn apart and the switch cylinder is vented out through the reservoir line connection in the coupler head.

As a protective measure, each master valve should be locked against tampering by an unauthorized person. The common method of protecting controlling devices is to make their handles removable. On account of the interlocking elements between the two valves in the master valve, it is sufficient that one of the handles be removable. To this end, while the handle 25 is made a permanent part of the master valve, the handle 24 is detachable. In the arrangement shown, the chamber 28 on the front side of the valve casing is closed by a cover plate 40. The wall 41 bounding the upper side of the chamber 28, and one of the end walls 42 are made comparatively thick and are so shaped as to provide between them and the cover plate a narrow slot 43 through which the handle 24 may be inserted. In one end of this handle is a notch 44 to receive the projecting square or rectangular end of the valve stem 26. The handle is provided with a laterally-projecting pin 45, as best shown in Fig. 5, adapted to ride in a curved groove 46 in the front face of the walls 41 and 42, to prevent accidental withdrawal of the handle. Near the lower end of the groove is a lateral branch 47 leading to the outside. When the handle 24 is in the position shown in full lines in Fig. 4 and in dotted lines in Fig. 7, the pin is opposite the notch or branch groove 47, and the handle may be withdrawn lengthwise. The interlocking of the handle 24 with the casing has the further function of preventing the removal of the handle except when the uncoupling valve is in a position to vent the uncoupling cylinder to atmosphere, thus preventing air from being admitted to the uncoupling cylinder when the cars are coupled and air automatically supplied to the chamber 17 in the master valve casing.

After the cars have been uncoupled and the trainman desires to remove the detachable handle, it is first necessary for him to return the handle 24 to the position shown in full lines in Figs. 4 and 5 and in dotted lines in Fig. 7. However, in returning the handle to this position he must also return the other handle from the dotted line position in Fig. 4 to the full line position in that figure. That this follows will be clear from the inspection of Fig. 8. The uncoupling handle 24 cannot be swung in the counterclockwise direction from the position shown in Fig. 8 without first turning the handle 25 and the locking disc 30 in the counterclockwise direction through an angle of ninety degrees, since the lip 35 strikes against the edge of the plate 30, in the position shown. After the valves have been brought into the position shown in Fig. 6, with the handle 25 projecting up and the handle 24 removed, the handle 25 is locked against movement until the handle 24 is again inserted and swung up through an angle of forty-five degrees.

In order to insure that neither of the two controlling handles will be swung through an angle of more than ninety degrees, I prefer to make the slot 43 approximately ninety degrees long, thus limiting the swinging movements of the handle 24; and to provide the cover plate of the casing with stationary lugs 48 and 49 lying in the path of travel of a finger or projection 50 on the inner side of the handle 25, thereby definitely limiting the swinging movement of the handle 25.

It will thus be seen that I have produced a simple and novel means for controlling the switch associated with conductors leading to the electric coupler, as well as the uncoupling of cars; whereby the switch is caused to open before uncoupling is possible; and whereby the master controller may be left in a safe condition by the removal of a single handle. It will also be seen that while I guard against uncoupling while the contacts in the electric coupler are alive, means are provided for permitting the electric switch to be operated at will. For this purpose it is only necessary to swing the uncoupling handle up forty-five degrees to its intermediate position, bringing the interlocking plates or cams into the positions shown in Fig. 8; whereupon the controlling valve for the switch is left free to move from either limit to the other. This is important because it may at times be necessary to inspect an electric coupler while cars are coupled, and it is not desirable that the contacts in the electric coupler be energized at such times.

The pipe 14 is connected to a fitting or conduit 60 on the coupler head that is adapted to cooperate with a corresponding member on a cooperating head so as to place the coupler unlocking pipes on the two cars in communication with each other. Therefore, when one of the master valves is manipulated to unlock its coupler, air under pressure is carried to the unlocking or uncoupling cylinder on the opposite car, so that both couplers are unlocked.

In case the hose section H of the pipe or con-

duit 8 should burst, there would be no means for operating the switch-closing and coupler-unlocking means. I have therefore placed a valve 61 in the pipe 8, close to the coupler and, in rear of the hose section in the reservoir line, I have placed another valve 62. A by-pass pipe 63 is connected to the reservoir line inwardly from the valve 62 and to the pipe 8 inwardly from the hose section H in the latter. A three-way valve 64 is placed at the juncture of the pipe 63 and the pipe 8, so as to permit the master valve to be supplied with air either from the chamber 4 in the coupler head or directly from the train pipe. Not only does the by-pass connection permit air to be supplied to the switch cylinder and the unlocking cylinder when the hose section of the pipe 8 is out of order, but it will also permit emergency operation of the system in case the hose section of the reservoir line bursts.

In some installations the power circuits, as well as the control circuits are carried through the automatic couplers. In such cases there should be bus line switches in addition to the switches for the control circuits, so that the power will be shut off except while the cars are in coupled relation. I have therefore conventionally illustrated a pneumatically actuated bus switch K as part of the system. The power current is carried in a cable leading to the switch K and from there to the electric coupler. A branch pipe 71 leads from the pipe 15*a* to the bus switch so that this switch will be opened and closed simultaneously with the switch C. In the pipe 71 is placed a manual valve 72 having a side outlet; a similar valve 73 being located in the pipe 15*a* near the switch C. In the event of trouble, the valve 72 may be operated to cause the bus switch to open without affecting the control switch or the remainder of the system. So, also, by operating the valve 73, the control switch may be opened, in an emergency, without disturbing the bus switch.

While I have illustrated and described with particularity only a single preferred form of my invention, I do not desire to be limited to the exact structural details thus illustrated and described; but intend to cover all forms and arrangements which come within the definitions of my invention constituting the appended claims.

I claim:—

1. The combination with an uncoupling member for a car and electric coupler and the operating member of a switch associated with a conductor leading to the coupler, of an individual manual controller for each of said members, and an interlock between said controllers to prevent the operation of the said uncoupling member except when the controller for the switch-operating member is in the position to render the latter member ineffective.

2. The combination with the uncoupling cylinder and the switch-closing cylinder of an automatic car and electric system including a pipe adapted automatically to be supplied with air upon a coupling being made and to be vented to atmosphere upon uncoupling, of separate valves each adapted to connect one of the cylinders alternately to said pipe and to atmosphere, and an interlock between said valves to insure their operation in a predetermined sequence.

3. The combination with the uncoupling cylinder and the switch-closing cyplinder of an automatic car and electric system including a pipe adapted automatically to be supplied with air upon a coupling being made and to be vented to atmosphere upon uncoupling, of separate valves each adapted to connect one of the cylinders alternately to said pipe and to atmosphere, and an interlock between said valves arranged to prevent the coupling cylinder from being connected to said pipe except when the switch cylinder is open to atmosphere.

4. The combination with the uncoupling cylinder of a combined car and electric coupler and a cylinder for closing a switch in a conductor leading to the coupler, of separate valves for controlling the flow of air to and from said cylinders, a removable handle for one of said valves, and means for preventing the removal of said handle except when both valves are in a single predetermined position.

5. The combination with the uncoupling cylinder and the switch-closing cylinder of an automatic car and electric system including a pipe adapted automatically to be supplied with air upon a coupling being made and to be vented to atmosphere upon uncoupling, of separate valves each adapted to connect one of the cylinders alternately to said pipe and to atmosphere, a removable handle for one of said valves, and an interlock between said valves to prevent the removal of said handle except when the valves are in the positions in which the uncoupling cylinder is connected to atmosphere and the switch cylinder is connected to said pipe.

6. The combination with the uncoupling cylinder and the switch-closing cylinder of an automatic car and electric system including a pipe adapted automatically to be supplied with air upon a coupling being made and to be vented to atmosphere upon uncoupling, of separate valves each adapted to connect one of the cylinders alternately to said pipe and to atmosphere, the valve for the uncoupling cylinder having an intermediate position in which it interrupts communication of the uncoupling cylinder both with said pipe and with the outside air, and an interlock between said valves to prevent the uncoupling cylinder from being connected to said pipe except when the switch cylinder is open to atmosphere and to permit the free operation of the valve for the switch cylinder while the other valve is in said intermediate position.

7. The combination with an uncoupling member for a car air and electric coupler and the closing member for a switch associated with a conductor leading to the coupler and which tends constantly to open, of controlling valves, means for delivering air under pressure to said valves from the train line at a point on the coupler, a by-pass from the train line to said valves, and valve means for permitting air to be delivered to the control valves either through the by-pass or from said point on the coupler.

8. The combination with an automatic car, air and electric coupler, of a switch controlling the electrical circuits leading to the coupler, a switch actuator for closing the switch and means mounted on said coupler to open communication between the air lines on two cars in the act of coupling the latter together and then cause the actuator for corresponding switches on the two cars to be operated to close the switches.

9. The combination with an automatic car, air and electric coupler which will couple the cars and connect the air and electric lines automatically together when coupled to a corresponding coupler, of a switch controlling the electric circuits leading to the coupler, a switch actuator,

means on the coupler for automatically opening the air connections through the coupler, and means on the coupler to cause said switch actuator to operate to close the switch after said air connections have been opened.

10. The combination with an automatic car, air and electric coupler which will automatically couple the cars and the air and electric lines when two cars are run together, of a switch controlling the electric circuits leading to the coupler, a pneumatic switch actuator, means on the coupler for automatically opening the air connections through the coupled couplers, and means on the coupler to cause air to be supplied to said pneumatic actuator after said air connections have been opened.

11. The combination of an automatic car, air and electric coupler adapted automatically to connect cars and the air and electric lines on the cars when two cars are run together, a switch controlling the electrical circuits leading to the coupler, and means including an automatic controller on the coupler to cause said switch to close upon the completion of the coupling.

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