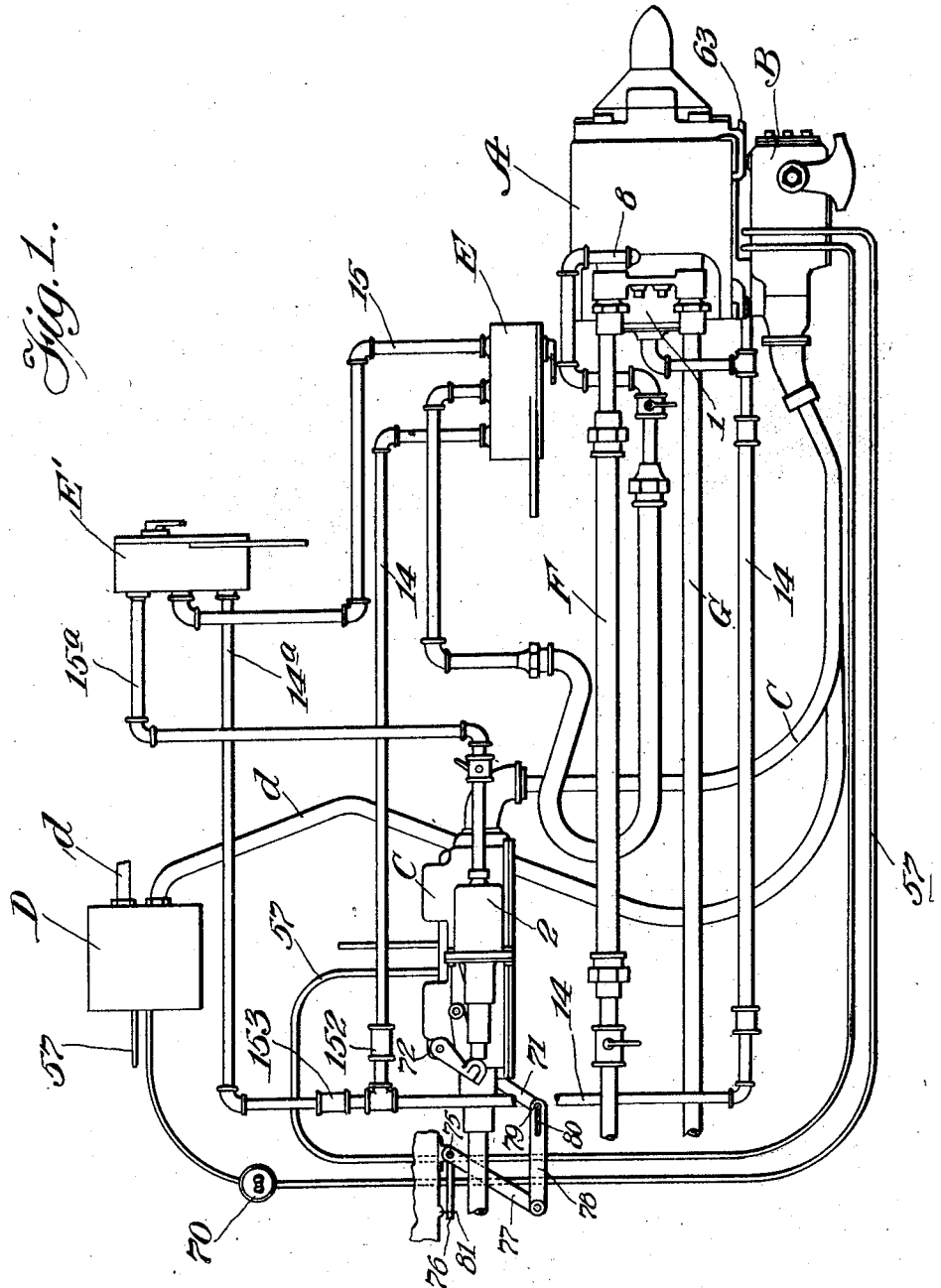
Aug. 27, 1929. H. E. VAN DORN 1,726,508

CONTROL SYSTEM FOR TRAIN CIRCUITS

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Fig. 1.



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CONTROL SYSTEM FOR TRAIN CIRCUITS

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Fig. 2.

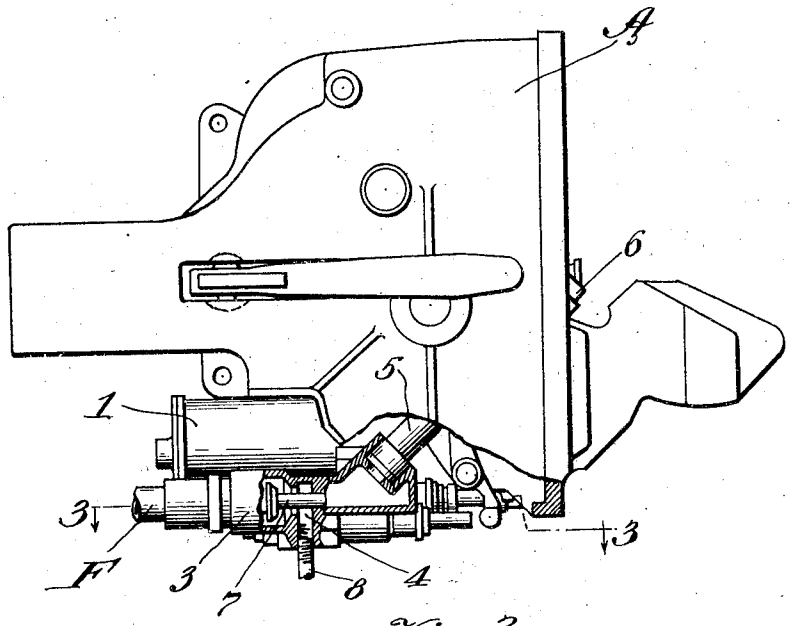
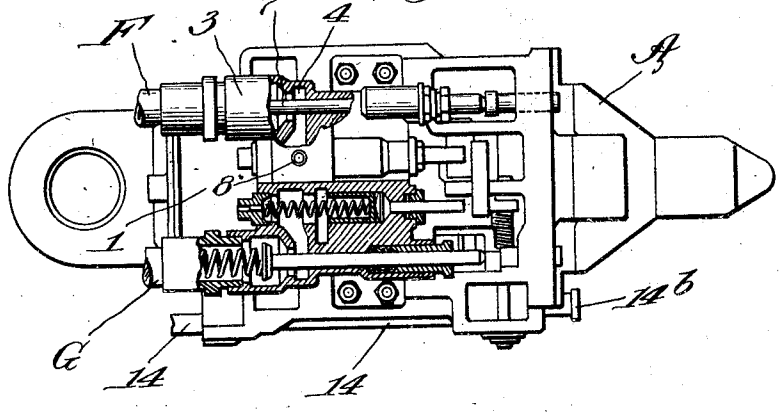


Fig. 3.



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CONTROL SYSTEM FOR TRAIN CIRCUITS

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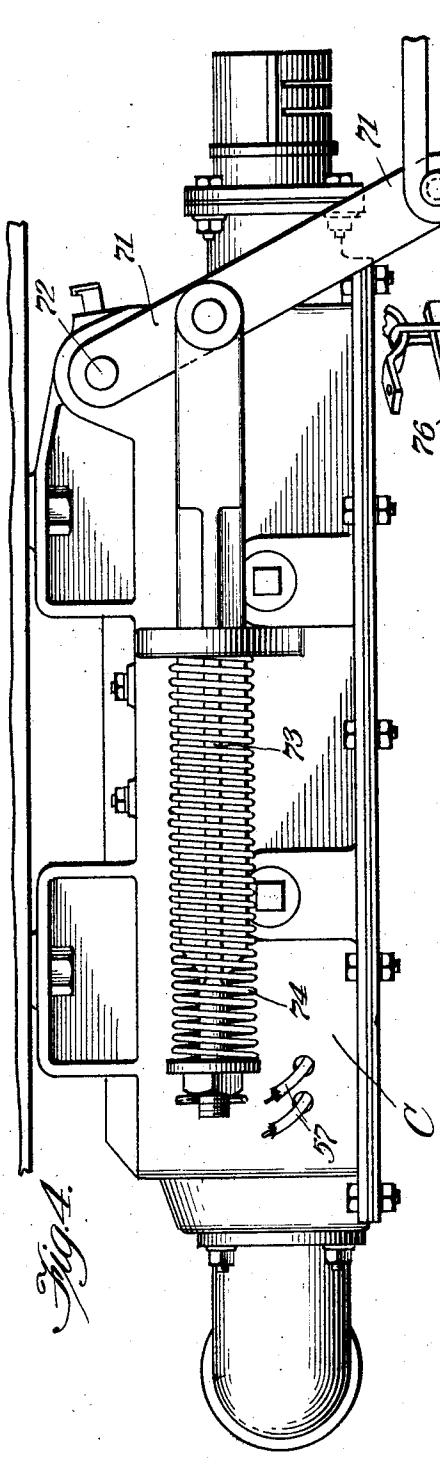


Fig. 4.

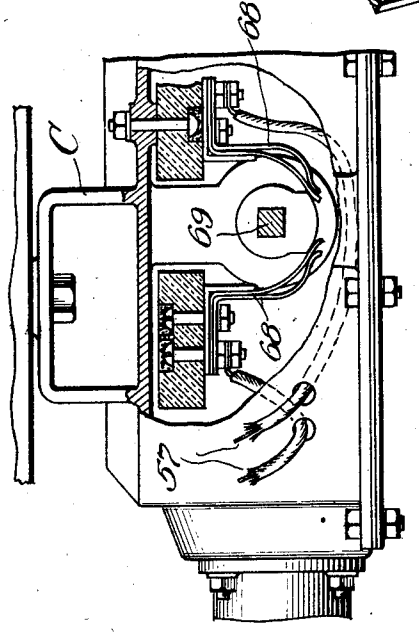


Fig. 5.

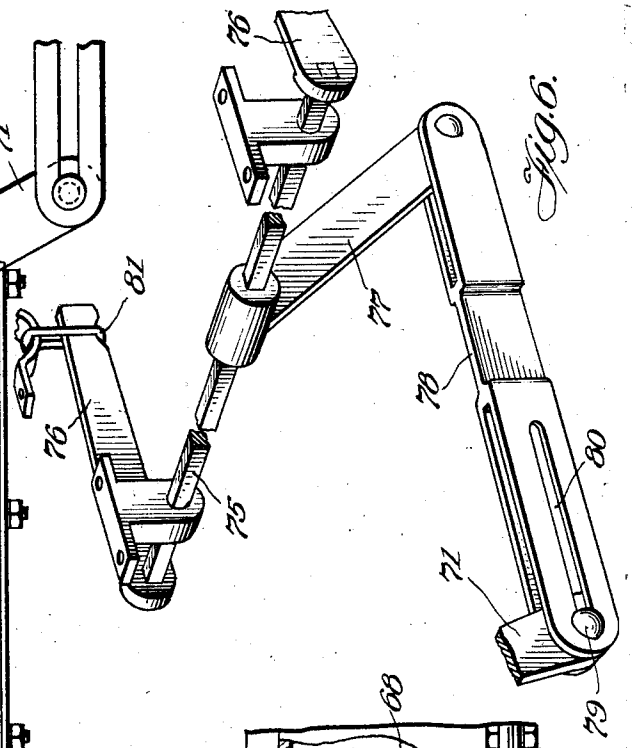


Fig. 6.

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CONTROL SYSTEM FOR TRAIN CIRCUITS

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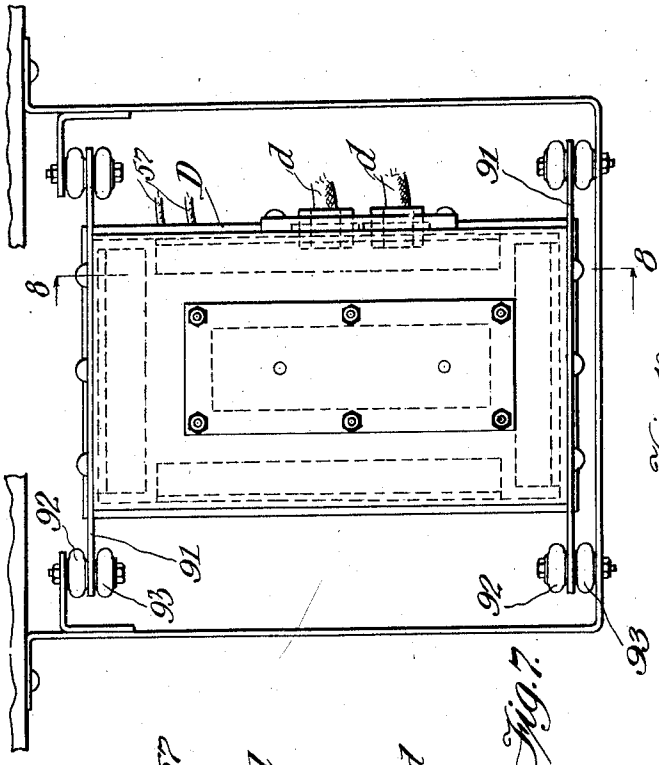


Fig. 7.

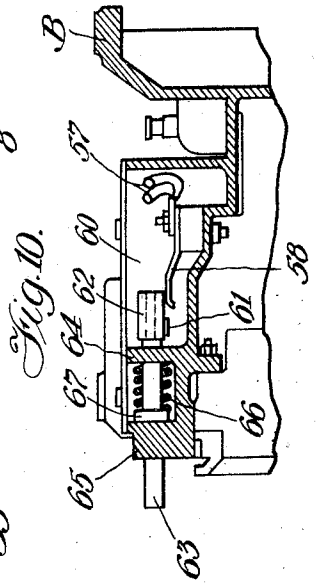


Fig. 10.

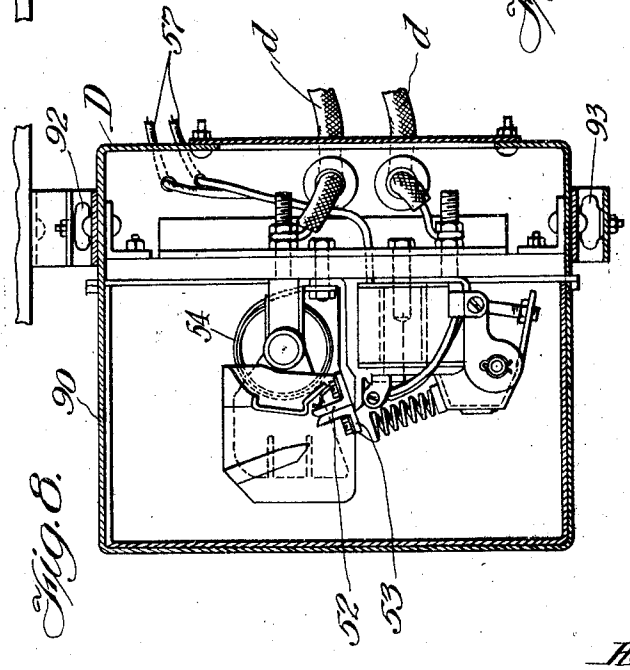


Fig. 8.

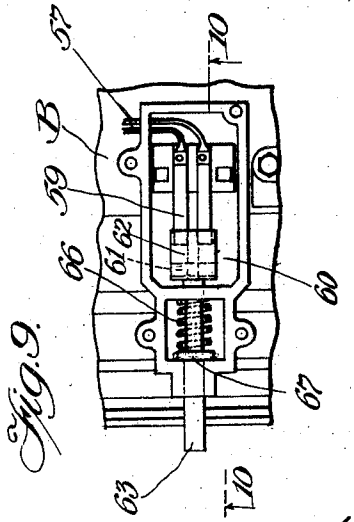


Fig. 9.

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CONTROL SYSTEM FOR TRAIN CIRCUITS

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Fig. 11.

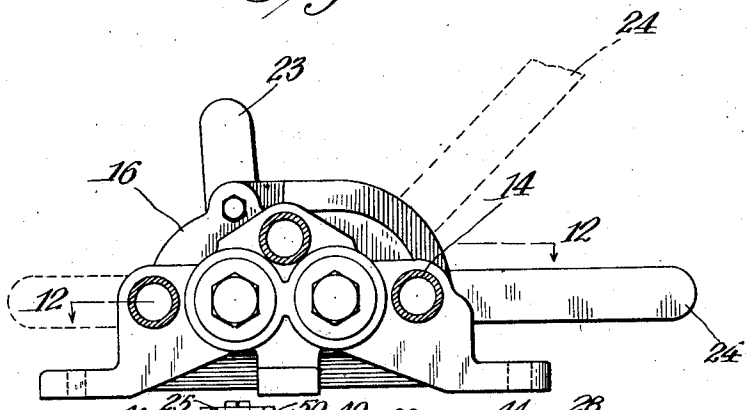


Fig. 12.

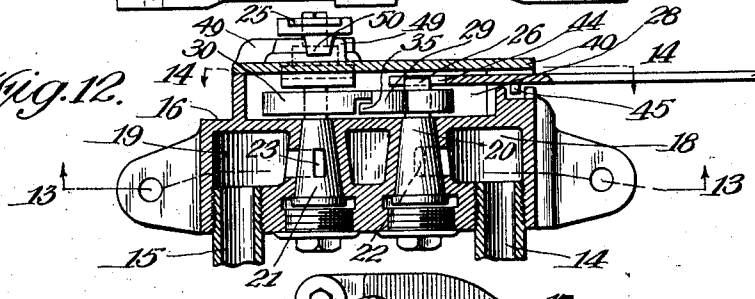


Fig. 13.

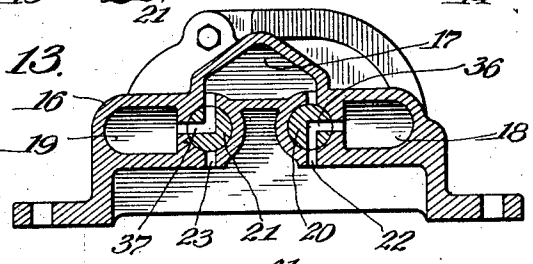


Fig. 14.

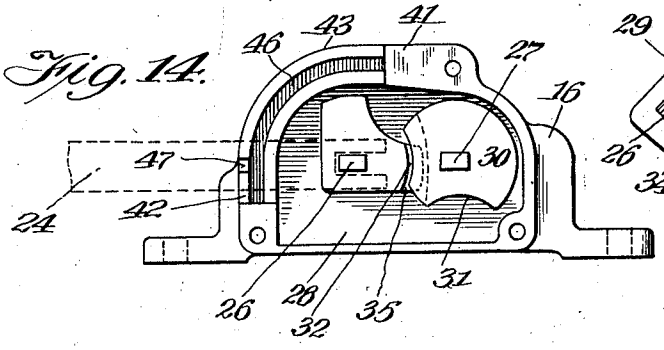
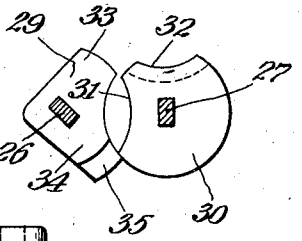


Fig. 15.



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UNITED STATES PATENT OFFICE.

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CONTROL SYSTEM FOR TRAIN CIRCUITS.

Application filed December 22, 1928. Serial No. 327,857.

The present invention relates to the coupling up and the control of electric train lines and train air lines in trains made up of electric railway cars, and has for its object to simplify and improve systems of this kind.

Coupling mechanism for mechanically coupling together two cars and at the same time connecting together the electric train lines and the various air pipes are in common use. In most cases only comparatively light currents are carried through the couplers but, at other times, it is desirable to have a train bus line carrying heavy currents. While it is desirable that the contacts in a coupler be dead at the time cars are uncoupled, this is particularly desirable in the case of the bus contacts; and, viewed in one of its aspects, the present invention may be said to have for its object to provide a simple and novel control system for a train bus line, to insure that the bus contacts in the couplers will be deenergized, except when they should be energized.

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 diagrammatic illustration of the equipment for one end of a car arranged in accordance with my invention; Fig. 2 is a top plan view, partly in section, of a combined car and air coupler; Fig. 3 is a view partly in side elevation and partly in section, illustrating the car and air coupler; Fig. 4 is a side elevation of the switch for the train lines carrying comparatively small currents; Fig. 5 is a view similar to Fig. 4, showing only a fragment of the switch, and parts being broken away to disclose the interior; Fig. 6 is a perspective view of the manually operated levers by means of which the switch shown in Fig. 4 may be actuated; Fig. 7 is an elevation of the bus switch enclosed within its housing; Fig. 8 is a section taken approximately on line 8—8 of Fig. 7; Fig. 9 is a top plan view of the front end of the electric coupler showing the automatic controller for the bus switch, the cover for the controller being omitted; Fig. 10 is a section taken approximately on line 10—10 of Fig. 9; Fig. 11 is a rear view of one of the master controlling valves; Fig. 12 is a section taken approximately on line 12—12 of Fig. 11; Fig. 13 is a section taken approximately on line 13—13 of Fig. 12; Fig. 14 is a section taken approximately on line 14—14 of Fig. 12; and Fig. 15 is a view of the interlocking cams, illustrating them in different positions than those which they occupy in Fig. 14.

Referring to Fig. 1 of the drawings, A represents a combined car and air coupler, and B represents an electric coupler underlying and fixed to the car and air coupler. C is the main switch in the train lines carrying the comparatively small currents; these lines being carried from the switch to the electric coupler through a cable C. D is the switch in the bus line, that is the train line adapted to carry heavy currents; the bus line being represented by a cable *d* extending between the switch D and the electric coupler. The car coupler has an unlocking cylinder 1. The switches C and D are of the normally open type; the switch C being conveniently of the type illustrated in my prior application Serial Number 292,465 filed on the 13th day of July, 1928; 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 E. In the arrangement shown, there are two of these valves one of which, the valve E, being adapted to be positioned in the motorman's cab while the 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 pipe and the brake pipe of the air brake system. These pipes are adapted to be automatically connected to the corresponding pipes on an adjacent car by a suitable car and air coupler such, for example, as is illustrated in my application Serial Number 244,826, filed January 6, 1928.

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 cham-

ber 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.

The master valve device is shown in detail in Figs. 11 to 15. This valve is the same as that disclosed and claimed in my application Serial Number 234,733 filed November 21, 1927. 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. A 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 E′. A pipe 15ª, corresponding in location to the pipe 15 with respect to the valve E leads from the valve E′ to the switch cylinder 2. There is also a pipe 14ª corresponding to the pipe 14, leading from the valve device E′ and connected to the pipe 14.

It will thus be seen that when the valve devices E 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 E′, the pipe 15ª to enter the switch operating cylinder 2, so as to close the switch. If the valve device E′ 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 E′.

Referring to Figs. 11 to 15, it will be seen that the valve casing 16 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, 36 and 37, respectively, 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 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 associated with the switch C 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 C and the uncoupling mechanisms 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. 15; 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. 12, 13 and 14 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 2 and the switch C 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 C so as to close the switch C; 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. 14, 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. 14. When it is desired to uncouple, the handle 24 is swung up as far as is will go, namely forty-five degrees, to the position shown in dotted lines in Fig. 11. This brings the locking plate 29 into the position shown in Fig. 15. The switch valve 21 has now been swung through an angle of ninety degrees in the counter-clockwise direction as viewed in Fig. 13, and therefore the chamber 19 and consequently the pipe 15 in the switch cylinder 2, are vented to atmosphere through the port 23. Therefore, because of the venting of the switch cylinder 2, the switch C 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 degrees, 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 36 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. 13 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 E′, 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 2, so as to close the switch C. 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 E′, the pipe 15^a must fist 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 152 and 153, respectively, so that the pipe 14^a will not vent through the valve E, nor the pipe 14 vent through the valve E′, when air under pressure is being delivered to either of these pipes to energize the unlocking cylinder.

Although the switch C on one care is not opened by reason of the manipulation of a master valve on the second car, yet it 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. 12, 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. 11 and in dotted lines in Fig. 14, 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. 11 and 12 and in dotted lines in Fig. 14. However, in returning the handle to this position he must also return the other handle from the dotted line position in Fig. 11 to the full line position in that figure. That this follows will be clear from the inspection of Fig. 15. The uncoupling handle 24 cannot be swung in the counterclockwise direction from the position shown in Fig. 15 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. 13, 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 certain of the 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. 15; 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 bus line switch D is not operated pneumatically as is the switch C, but is an electro-magnetic switch, conveniently of the character shown in Fig. 8. Referring to Fig. 8, 52 represents a stationary switch contact and 53 a movable contact. The bus line is made and interrupted at the contacts 52 and 53; the current flowing through a suitable coil 54, to blow out the arc that is formed when the switch is opened. An electromagnet 55, when energized, draws the switch contacts into engagement with each other, whereas the contact 53 drops away and breaks the power circuit when the electromagnet is deenergized. The details of this switch are of no importance and, of themselves, form no part of the present invention, since the switch that I have illustrated is old and well known. The energizing circuit for the electromagnet 55 is indicated at 57. The continuity of this circuit is interrupted at two points, once at the switch C and again at the coupler, so that the bus switch is controlled by the coupler and also by the switch C. The controlling means in the circuit 57 at the coupler may conveniently be a small switch that is normally open but is automatically closed when the cars are coupled together, as illustrated in Figs. 9 and 10. The switch, as illustrated, comprises two stationary spring fingers 58 and 59 mounted in a chamber 60 on top and at the front of the electric coupler, and a movable contact piece 61. The movable contact piece is fixed to the underside of a block 62 of insulating material mounted on the rear end of a plunger 63 extending lengthwise of the coupler and projecting beyond the front end of the latter. The plunger is slidably supported by two transverse ledges 64 and 65 on the coupler. Surrounding the plunger, between these ledges, is a spring 66 whose rear end bears against the rear ledge 64 while its front end engages with a collar 67 on the plunger. The parts are so proportioned that normally the spring holds the plunger forward, with the contact piece 61 positioned beyond the front end of the fingers 58 and 59. However, when two cars

are coupled, the plunger on each coupler abuts against a surface of the opposing coupler and is pressed back until the contacts 61 engage with the corresponding contact fingers.

The second interruption in the circuit 57 occurs at the switch C. As shown in Fig. 5, it will be seen that there is a gap in the circuit between two stationary contact fingers 68 in the switch C. When this switch is closed, the fingers 68 are electrically connected together by a contact 69 on one of the drums of the switch, whereas at other times, when the switch is open, the continuity of the circuit is interrupted at the fingers.

In other words, the bus switch can not be closed or remain closed unless and until the cars are coupled and the switch for the train control circuits and other circuits carrying light currents is closed, and the bus switch must open, in normal operation before an uncoupling of the cars because the switch C is opened when air is admitted to the unlocking cylinder of the car coupler. Also, if for any reason the switch C remains closed during uncoupling, the actuating magnet for the bus switch will promptly be deenergized through the opening of the switch on the coupler; and therefore no destructive arc can at any time be produced between the bus contacts.

The energizing circuit for the bus switch actuator may contain also a manual switch that may conveniently be of the push button type as indicated at 70, whereby the bus swich may be opened at will.

It may sometimes be desirable to close the switch C while the cars are uncoupled. To this end one of the radial arms 71 on the rock shaft 72 through which the switch C is operated, is extended for the purpose of receiving a connection with a manual operating mechanism. As shown in Fig. 4, the arm 71 is the one to which is connected a rod 73 surrounded by a compression spring 74 that acts in opposition to the pneumatic operating means for the switch. The manual operating means consists of a rock shaft 75 extending transversely across the car and having operating handles 76 at the ends. The shaft 75 has a radial arm 77 to which is pivoted one end of a connecting rod 78. The free end of the extended arm 71 has a pin 79 that extends into an elongated slot 80 in the connecting rod. The parts are so proportioned that when one of the handles 76 is swung up it causes the switch C to be closed; and it may be locked in this position by means of a suitable catch 81. Normally, however, when the handle is free from the catch, the pin and slot connection, just described, permits the switch to open and close without affecting the manual operating means.

The bus switch may be enclosed in a suitable casing 90 having, both at the top and at the bottom, lateral projections 91. Each of these projections extends between and is supported by insulators 92 and 93 which are in turn supported from the car in any suitable way.

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. Where I employ the expression control line or control circuit I mean any line or circuit that does not carry the heavy currents of the bus circuit or line.

I claim:—

1. In a car, air and electric coupling system, a coupler, electric control lines and an electric power line leading to the coupler, a switch in said control lines, a second switch in the power line, and means controlled jointly by the coupler and the first switch for operating said second switch.

2. In a car, air and electric coupling system, a coupler, electric control lines and an electric power line leading to the coupler, a switch in said control lines, a second switch in the power line, pneumatic actuating means for the first switch, electro-magnetic actuating means for the second switch, a control valve for said pneumatic actuating means, and means associated with the first switch for controlling said electro-magnetic actuating means.

3. In a car, air and electric coupling system, a coupler, electric control lines and an electric power line leading to the coupler, a switch in said control lines, a second switch in the power line, pneumatic actuating means for the first switch, electro-magnetic actuating means for the second switch, a control valve for said pneumatic actuating means, and means controlled jointly by said first switch and said coupler for energizing said electro-magnetic actuating means.

4. In a car, air and electric coupling system, a coupler, electric control lines and an electric power line leading to the coupler, a switch in said control lines, a second switch in the power line, electro-magnetic actuating means for the switch in the power lines, and means controlled by said coupler for energizing said electro-magnetic actuating means.

5. In a car, air and electric coupling system, a coupler, electric control lines and an electric power line leading to the coupler, a switch in said control lines, a second switch in the power line, means controlled by the coupler for actuating the first of said switches, an electro-magnetic actuating means for the second of said switches, a con-

trol circuit for said electro-magnetic actuating means, and a normally open switch in said control circuit at the coupler adapted and in position to be closed by an opposing coupler in the act of coupling.

6. In a car, air and electric coupling system, a coupler, electric control lines and an electric power line leading to the coupler, a switch in said control lines, a second switch in the power line, means controlled by the coupler for actuating the first of said switches, an electro-magnetic actuating means for the second of said switches, a control circuit for said electro-magnetic actuating means, a normally open switch in said control circuit at the coupler adapted and in position to be closed by an opposing coupler in the act of coupling, and means associated with the first-mentioned switch to open said control circuit when the first-mentioned switch is open.

7. In a car, air, and electric coupling systems, a coupler, electric control lines and a bus line leading to the coupler, a switch in the control lines, a bus switch, means controlled by the coupler for closing the first switch, and means controlled by the first switch for closing the bus switch.

8. In a car, air and electric coupling system, a coupler, an unlocking means for the coupler, electric control lines and a bus line leading to the coupler, a normally open switch in the control lines, a normally open bus switch, closing means for the bus switch controlled by the first switch, whereby the bus switch is caused to open when the other switch opens, power means for closing the first switch, and means compelling the de-energization of said power means before said unlocking means for the coupler can be operated.

9. In a car, air and electric coupler system, a coupler, electric control lines and a bus line, means for automatically connecting the control lines to the coupler after a coupling is made, and means for automatically connecting the bus line to the coupler after the control lines have been connected as aforesaid.

10. In a car, air and electric coupling system, a car and air coupler, an electric coupler, electric control lines and an electric power line leading to the electric coupler, a switch in said control lines, a second switch in the power line, a third normally-open switch in the electric coupler which will be closed on the coupling of the car, air and electric couplers, a pneumatic actuating means for the first switch, means associated with the first switch to cause the second switch to open when the first switch opens, a control valve for said pneumatic actuating means, a means associated with the third switch to cause the second switch to open in case the first switch does not open in the act of uncoupling.

11. In a car, air and electric coupling system, a car and air coupler, an electric coupler secured to the car and air coupler, electric control lines and an electric power line leading to the electric coupler, a switch in said control lines, a second switch in the power line, means for manually closing the switch in the control lines and keeping it closed in operation, an electro-magnetic means for closing the switch in the power line, a switch in the electric coupler for controlling the said electro-magnetic means, a means in the first switch for controlling the said electro-magnetic means, said switch in the electric coupler being constructed and arranged to open on the uncoupling of the car couplers and cause the power switch in the power line to open even though the switch in the control line remains closed.

12. In a car, air and electric coupler attached to each end of a car whereby two similar car couplers will be coupled on the impact of the cars to hold cars together, the coupling of the car couplers operating to automatically couple the air lines between the cars, the coupling of the electric couplers operating to couple the electric circuits in the electric couplers automatically on the coupling of the cars, control lines and an electric power line leading to the electric coupler, a switch in the coupler which will be automatically closed on the coupling of the car, air and electric couplers, a control switch in the control lines for controlling the control circuits of the car, a bus switch for controlling the power circuit of the car, electro-magnetic actuating means for the power switch, a control circuit for the electro-magnetic actuating means, the control circuit passing through the control switch and through the switch located in the car coupler, whereby the switch in the coupler will cause the power circuit to open in case of an accidental uncoupling of the car, air and electric couplers and blow out any arc between the power contacts in the electric coupler before the control circuit for the power switch would be opened in the control switch.

13. In a car, air and electric coupling system, a coupler, air lines passing through the coupler, air control lines passing through the coupler, electric control lines and a power line leading to the coupler, the coupler designed for automatically coupling the car, air and electric connections between cars, a switch for controlling the control lines, a switch for controlling the power line, a normally-open switch in the coupler to be closed in the coupling of the car, air and electric couplers, a means for controlling the control switch, a valve means in the car coupler for

controlling the switch control means and thereby the control switch, an electromagnetic actuating means for the power switch, and means associated with the switch in the coupler and with the control switch for controlling the electro-magnetic actuating means.

14. In a car, air and electric coupling system, a coupler, electric control lines and an electric power line leading to the coupler, a switch in said control lines, a second switch in the power line, a switch in the electric coupler to be closed on the coupling of the car couplers, pneumatic actuating means for the control switch, electro-magnetic actuating means for the power switch, a valve in the car coupler for controlling the pneumatic actuating means for the control switch, a control circuit passing through the switch in the coupler and the control switch for controlling the electro-magnetic actuating means, and a means whereby the control switch may be opened and open the power switch without the switch in the electric coupler being opened.

15. In a car, air and electric coupling system, a coupler, electric control lines and an electric power line leading to the coupler, a switch in the control lines, a switch in the power line, a switch in the coupler to be closed on the coupling of the car coupler, and electro-magnetic actuating means for the power switch, a control circuit for controlling the electro-magnetic actuating means passing through the switch in the coupler, pneumatic actuating means for the control switch, a valve in the coupler for controlling the said actuating means, a pneumatic uncoupling means for the car coupler, a manually operated means for operating the control switch whereby when the car couplers are pneumatically uncoupled the manually operated means will not be operated and the coupler will open the power switch before the control switch is opened in the act of uncoupling.

16. In a car, air and electric coupler system, a coupler, electric control lines and an electric power line leading to the electric coupler, a switch in the control lines and a second switch in the power line, a pneumatic actuating means for the first switch, an electro-magnetic actuating means for the power switch, a controlling valve for said pneumatic actuating means, a control circuit passing through the control switch for controlling the electro-magnetic actuating means, a manually operated switch in the control line for controlling the electro-magnetic actuating means whereby the power switch can be opened and closed when the car, air and electric couplers are coupled without the opening and closing of the control switch, and a means whereby the control switch can be opened and closed and thereby open and close the power switch without operating the manually operated switch.

17. In an electric coupling and control system, a coupling device, electric control lines leading to the coupling device, an electric power line, a control switch in the electric control lines, a power switch in the power line, means for manually closing the control switch, an electro-magnetic actuating means for the power switch, and a control circuit passing through the control switch for controlling the electro-magnetic actuating means so that the power switch will be closed automatically upon the manual closing of the control switch.

18. In an electric coupling and control system, control lines and a power line leading to the end of a car, a means for connecting said lines to another car coupled thereto, a control switch in the control lines, a power switch in the power line, a means for opening and closing the control switch, and a means whereby the power switch will be opened and closed simultaneously with the opening and closing of the control switch.

In testimony whereof, I sign this specification.

HERBERT E. VAN DORN.