No. 723,115. PATENTED MAR. 17, 1903.

M. M. WOOD.

CIRCUIT BREAKER FOR THIRD RAIL SHOES.

APPLICATION FILED AUG. 25, 1902.

NO MODEL.

Fig. 1.

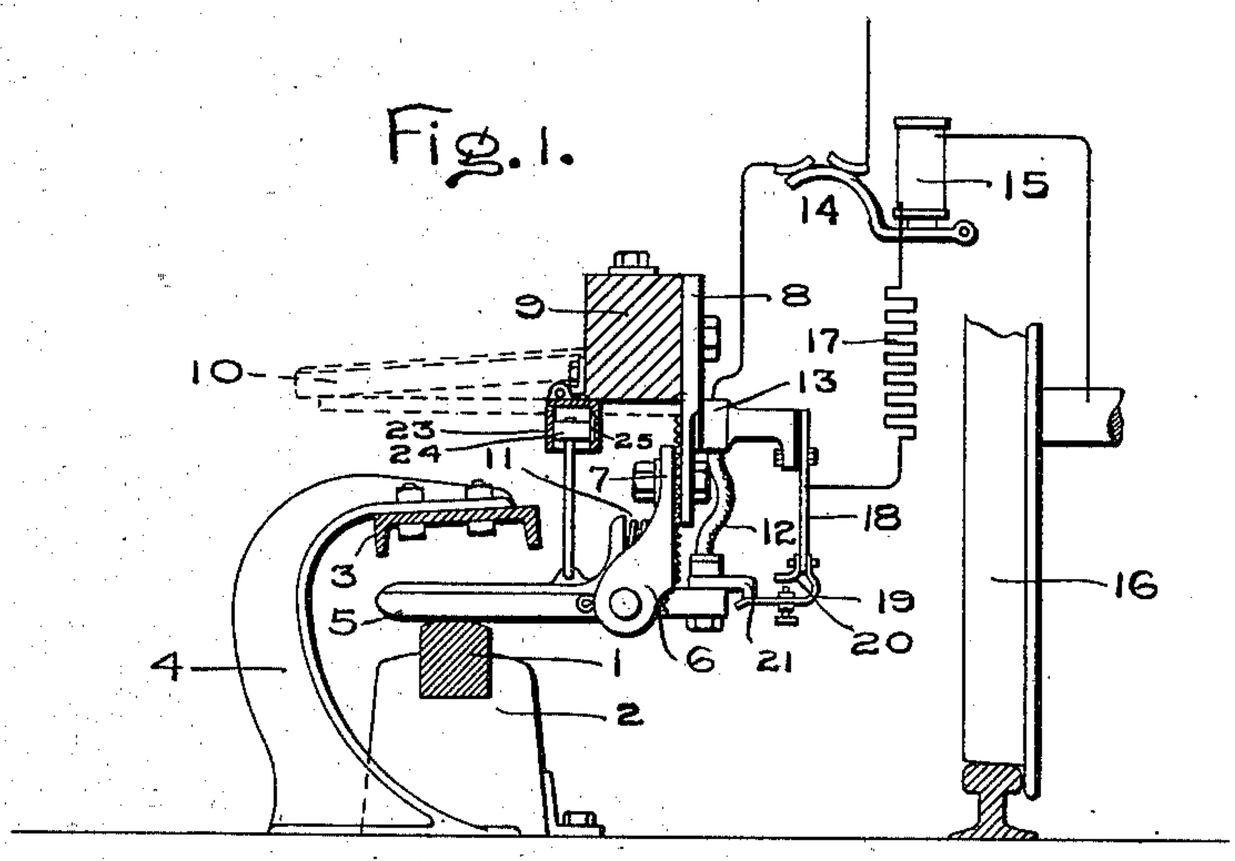


Fig. 2.

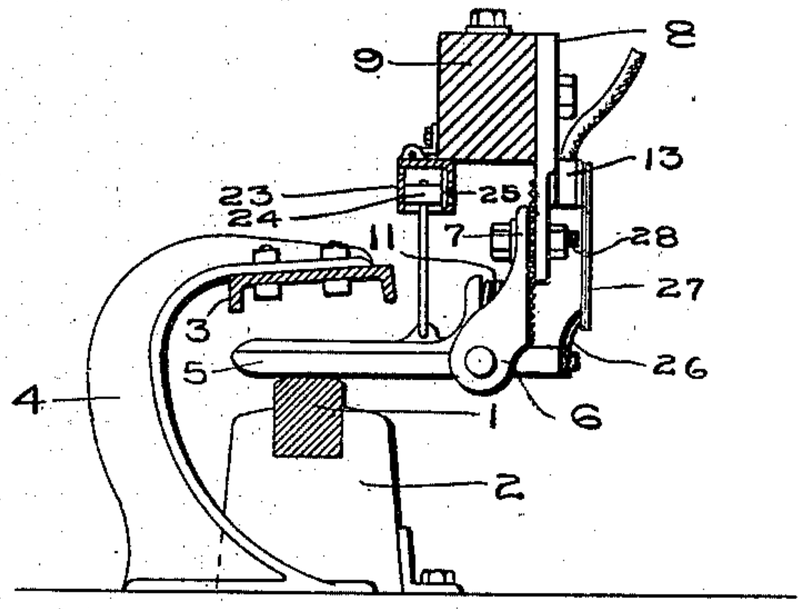


Fig. 4.

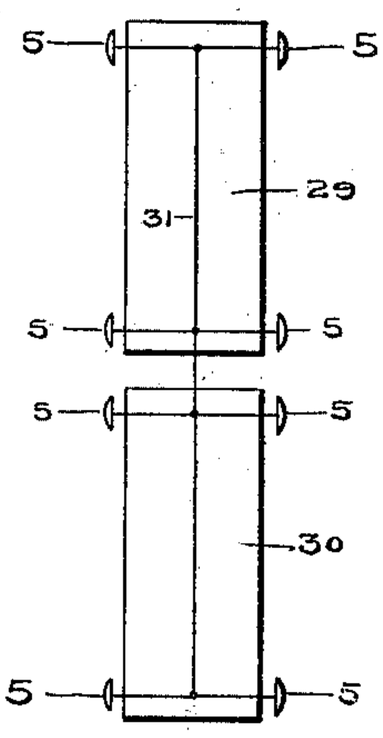
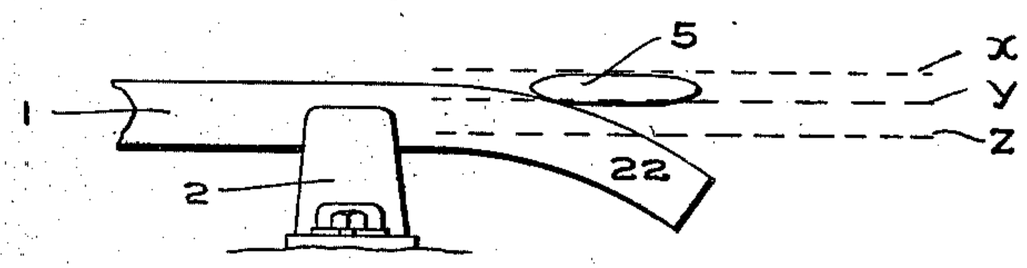


Fig. 3.



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UNITED STATES PATENT OFFICE.

MONTRAVILLE M. WOOD, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

CIRCUIT-BREAKER FOR THIRD-RAIL SHOES.

SPECIFICATION forming part of Letters Patent No. 723,115, dated March 17, 1903.

Application filed August 25, 1902. Serial No. 120,888. (No model.)

To all whom it may concern:

Be it known that I, MONTRAVILLE M. WOOD, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Circuit-Breakers for Third-Rail Shoes, of which the following is a specification.

This invention relates to electric railways, and especially those in which current is conveyed to the motor-cars by a third-rail paralleling the track-rails and a contact-shoe hinged to the car-truck and bearing on said rail. In such a system each motor-car usually has a shoe at each end of the car and on both sides of the car, so that whichever side of the car is adjacent to the third rail there will be one or two shoes in contact with it.

At crossings, switches, drawbridges, and the like the continuity of the third rail is necessarily interrupted, and in order to prevent breaking the power-circuit when one of the shoes leaves the third rail at such a point it is customary to connect all the shoes in multiple, so that current will always be supplied through the shoe or shoes remaining on the rail. If two or more motor-cars are coupled into a train, all of the shoes are connected for the same reason; but it often happens that at the places where the third rail is interrupted there are metal structures, such as switch-stands or bridge-girders or other grounded metal-work, which may come into close proximity to the shoe as it passes, so that there is danger that the shoe which is out of contact with the third rail may establish a short circuit from the other shoes to ground, which short circuit would injure whatever lay in the path of the heavy current which would instantly flow through the short circuit, besides interfering with the service. Moreover, the shoes on the opposite side of the car from the third rail are alive, and as they are protected only by a short wooden guard, which stands some little distance above them, there is great danger that some one may accidentally come in contact with one of them and receive a serious or even fatal shock. My invention aims to prevent this dangerous possibility by so constructing each shoe and its connections that unless it is resting in contact with the third rail it will be dead. I accomplish this, in brief, by utilizing the play of the shoe in a vertical direction in excess of that required to allow for irregularities in the track or the swaying of the car-truck, so that when the shoe runs off the third rail and drops below the normal limit of oscillation it opens a switch which may be either in the power-lead itself or in an auxiliary circuit containing an electromagnetic switch controlling the power-lead. In either case the dropping of any shoe below the lowest normal position it occupies while in contact with the rail breaks the connection between that shoe and the others after the circuit is broken between the shoe and the rail, so that the shoe is deënergized so long as it remains in this abnormally-low position and out of contact with the third rail. By breaking the power-circuit at the shoe and then opening the power-lead I avoid all danger of an arc at the switch in the power-lead.

In the accompanying drawings, Figure 1 is a sectional end elevation of a third rail and contact-shoe, the latter being provided with a switch controlling an electromagnetic switch in the power-circuit. Fig. 2 is a similar view showing the switch for opening the power-lead mounted directly on the shoe. Fig. 3 is a diagrammatic view illustrating the normal and abnormal positions of the shoe. Fig. 4 is a diagram of two cars, showing the shoes connected in multiple.

The third rail 1, mounted on its insulating-chairs 2, and its overhanging channel-iron guard 3, carried by the curved standards 4, are of the customary construction. So, also, is the contact-shoe 5, hinged to ears 6 on the base 7, which is bolted to the hanger 8, fastened to the beam 9, secured to the truck-frame. In ordinary practice a wooden guard 10, as shown in dotted lines in Fig. 1, projects from the beam over the shoe to prevent persons from accidentally brushing against it; but my invention enables this guard to be dispensed with. The shoe is pressed down against the rail 1 by a spring 11, and a short flexible lead 12 connects the heel of the shoe

with a binding-post 13 on the hanger. In addition to these parts I provide a switch 14 for opening and closing the power-lead between the shoe and the controller. This switch is operated by an electromagnet 15, one terminal of which is grounded through the car-wheels 16. The other terminal is connected, through a current-reducing rheostat 17, with an arm 18, insulated from the hanger 8 and carrying a spring-contact 19, capable of movement in a vertical direction. Its range of upward motion is limited by a fixed stop 20. A finger 21 on the heel of the shoe bears on the spring-contact and holds it normally far enough from the stop to keep in contact with it during all normal up-and-down oscillations of the shoe while it rests on the third rail—say between the horizontal lines x and y in Fig. 3; but when the shoe drops down to the level of the line z in Fig. 3, as it will when it runs off the inclined end 22 of the rail, the spring-contact is prevented by the stop from following the finger as it rises, so that the circuit of the magnet 15 is broken and the switch 14 opens and breaks the lead from the shoe. In this condition the shoe cannot be energized by current from the other shoes, and thus all danger of a short circuit from it is avoided.

It is desirable to allow the shoe the utmost freedom of oscillation between the limits x and y and yet cause it to drop slowly below the level y in order that the shoe may remain energized until after it actually leaves the rail, so that the arcing which occurs when the power-circuit is broken will take place at the shoe instead of at the switch 14. This effect is accomplished by a suitable retarding device, such as a dash-pot 23, preferably hinged to the beam 9 with its plunger 24 pivotally connected with the shoe. A by-pass 25 permits the plunger to move freely during a part of its travel, so that it does not interfere with the easy motion of the shoe; but when the shoe drops to the level y the by-pass is closed by the plunger and the shoe is retarded in its fall to the level z. This retardation begins before the spring-contact 19 strikes the stop 20 and parts company with the contact-finger 21, so that the breaking of the magnet-circuit does not take place until after the shoe has left the rail and passed beyond the arcing distance therefrom.

In Fig. 2 is shown a modification in which the connection between the shoe and the power-lead is through a switch comprising a pair of contacts 26 27, one on the shoe and the other on the hanger. During the ordinary movements of the shoe there is a rubbing contact between the two contacts; but when the shoe leaves the rail and breaks the power-circuit the two contacts separate and open the power-lead, an insulated stop 28 limiting the movement of the resilient contact 27.

In Fig. 4 is shown in a simple diagrammatic way two motor-cars 29 30, each equipped with four contact-shoes and all the shoes connected in multiple to a common power-lead 31.

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

1. The combination with the contact-shoe of a third-rail electric-railway car, of a switch in the power-lead therefrom arranged to open automatically when the shoe leaves the third rail.

2. The combination with the contact-shoe of an electric-railway car, of a switch in the power-lead therefrom arranged to open automatically when the shoe drops below a predetermined level.

3. The combination with the contact-shoe of an electric-railway car, of a switch-contact on said shoe adapted to open the power-lead when the shoe drops below a predetermined level.

4. The combination with the contact-shoe of an electric-railway car, of a switch in the power-lead therefrom, an electromagnet for operating said switch, and a switch operated by the shoe and controlling said magnet.

5. The combination with the contact-shoe of an electric-railway car, of a switch controlling the power-circuit therefrom, an electromagnet for operating said switch, a spring-finger in circuit with said magnet and arranged adjacent to said shoe, and a finger on said shoe bearing on said spring-contact.

6. The combination with the contact-shoe of an electric-railway car, of a switch controlling the power-circuit therefrom, an electromagnet for operating said switch, a spring-finger in circuit with said magnet and arranged adjacent to said shoe, a finger on said shoe bearing on said spring-contact, and a stop limiting the movement of said spring-contact in one direction.

7. The combination with the contact-shoe of a third-rail electric-railway car, of a switch controlling the power-circuit thereof and operated by said shoe, and means for preventing said switch from opening until after the shoe has passed beyond arcing distance from the third rail.

8. The combination with the contact-shoe of a third-rail electric-railway car, of a switch in the power-lead therefrom arranged to open automatically when the shoe drops below a predetermined level, and means for retarding the downward movement of the shoe as it approaches said level.

9. The combination with the contact-shoe of a third-rail electric-railway car, of a switch in the power-lead therefrom arranged to open automatically when the shoe drops below a predetermined level, and a retarding device permitting free movement of the shoe at its normal level but retarding its movement as it approaches the level at which the switch is arranged to open.

10. The combination with a third-rail electric-railway car or train provided with two or more contact-shoes connected in multiple, of

means for deënergizing each of said shoes when it leaves the third rail.

11. The combination with a third-rail electric-railway car or train provided with a plurality of contact-shoes connected in multiple, of a switch in the power-lead of each shoe arranged to open automatically when said shoe leaves the third rail.

12. The combination with a third-rail electric-railway car or train provided with a plurality of contact-shoes connected in multiple, of means for deënergizing any one of said shoes when it drops below a predetermined level.

In witness whereof I have hereunto set my hand this 23d day of August, 1902.

MONTRAVILLE M. WOOD.

Witnesses:

BENJAMIN B. HULL,

JOS. A. L. ENDRES.