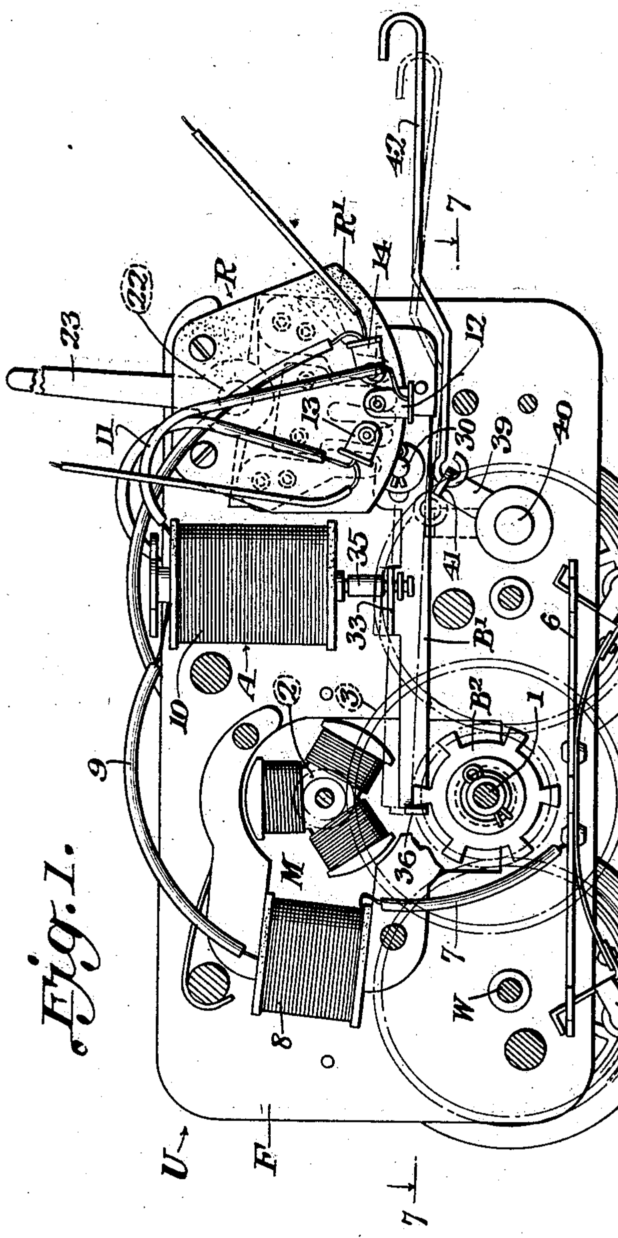
May 6, 1930. F. MIZE 1,757,676

MOTOR CONTROL FOR TOY ELECTRIC LOCOMOTIVES

Filed June 4, 1926 3 Sheets-Sheet 1



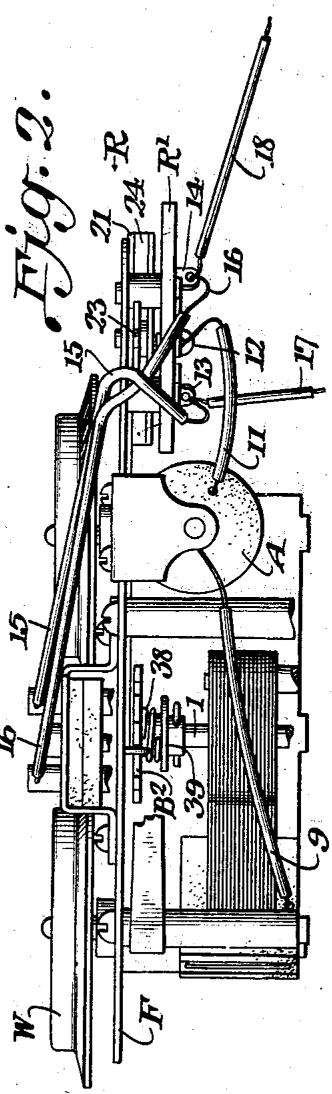


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Fig. 4.

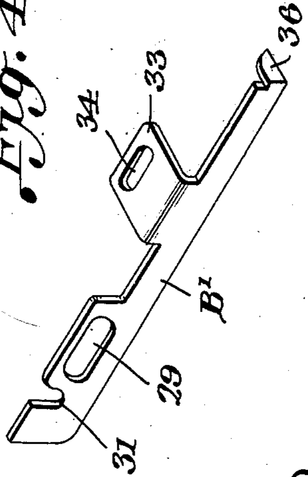


Fig. 6.

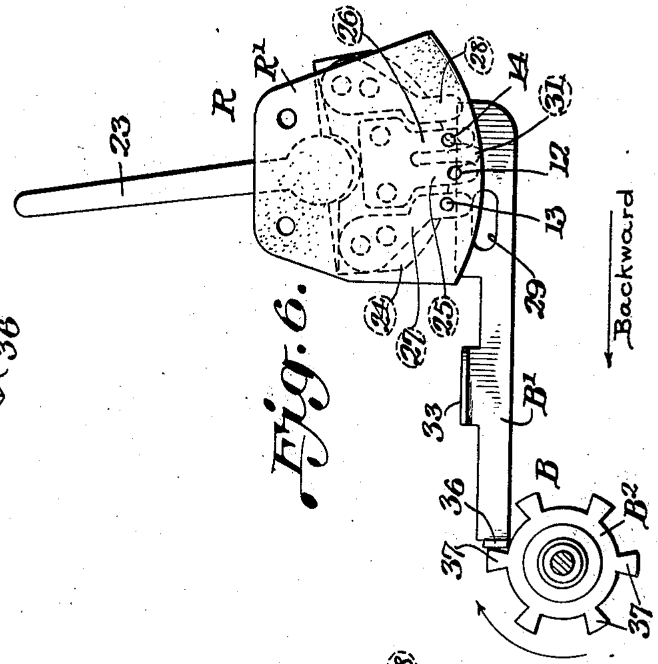


Fig. 3.

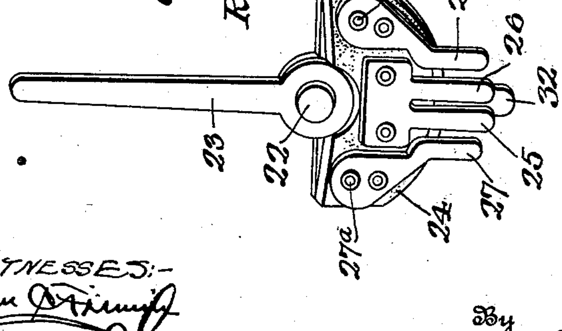
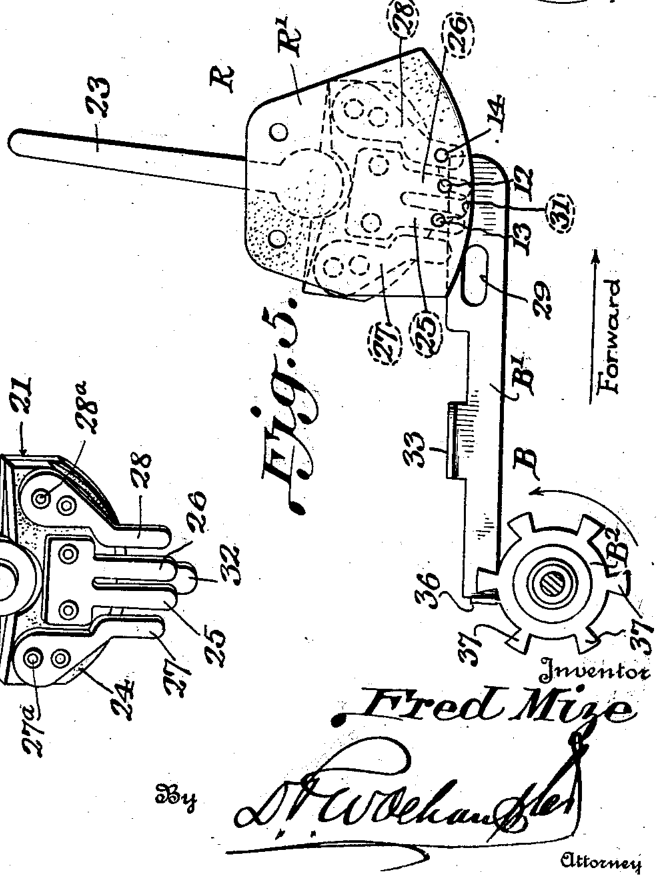


Fig. 5.



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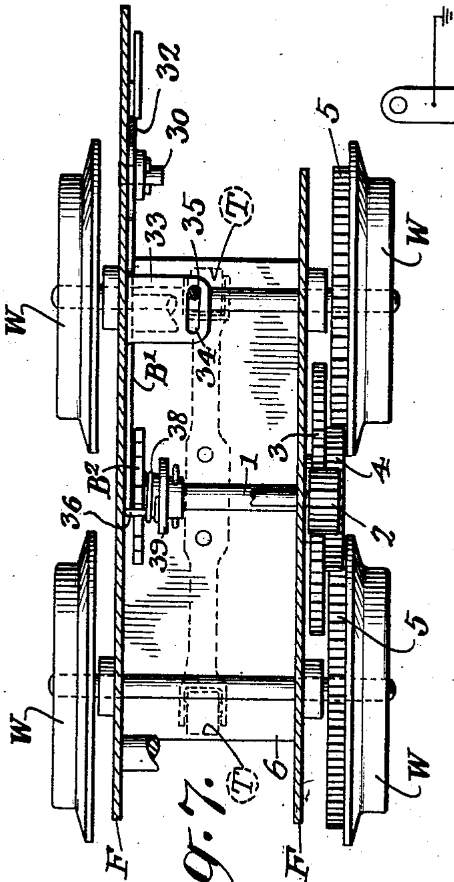

Fig. 7.

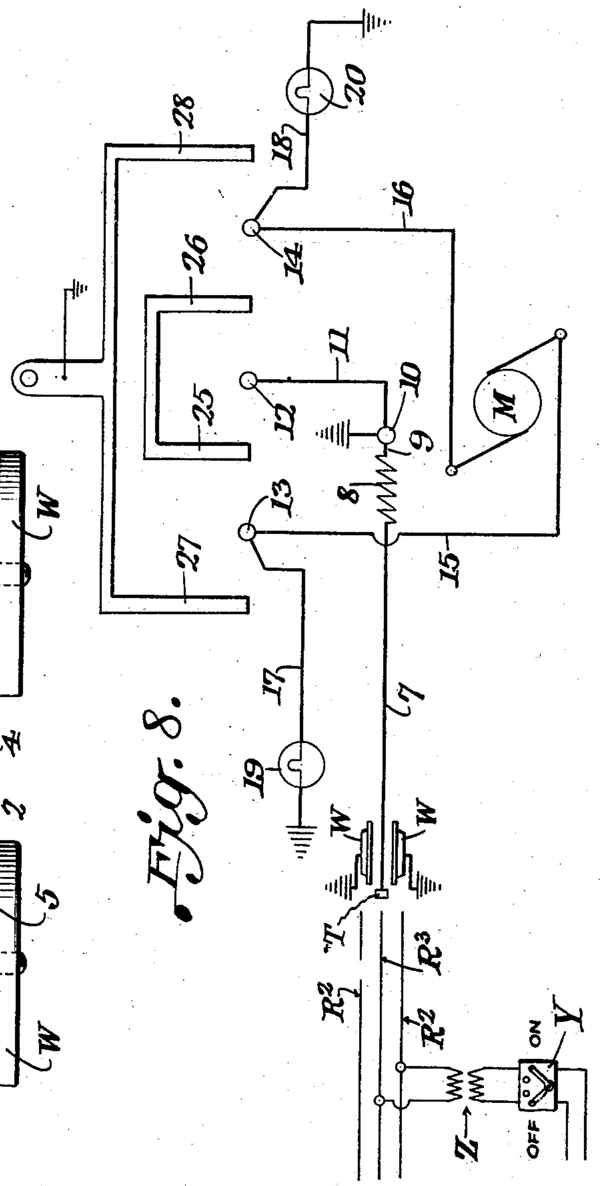

Fig. 8.

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UNITED STATES PATENT OFFICE

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MOTOR CONTROL FOR TOY ELECTRIC LOCOMOTIVES

Application filed June 4, 1926. Serial No. 113,796.

This invention relates to toy electric locomotives, and more particularly to novel means for controlling the current to the motor whereby the direction of movement of the locomotive may be reversed in a simple and practical manner.

A primary object of the invention is to provide means adapted to be automatically actuated by the control of the circuit from the transformer usually used in connection with toy electric train outfits, whereby the opening and closing of the circuit by manipulating the rheostat handle of the transformer will cause the operation of an electrical device which in turn renders mechanical means operable for throwing a switch carried by the locomotive to reverse the current to the terminals of the motor. That is to say, it is proposed, broadly, to provide means whereby the control of the current to the tracks on which the locomotive travels will operate switch means carried by the locomotive itself to cause the reversal of the motor.

The patent to Culver No. 1,561,411 dated Nov. 10, 1925 is directed to a combined motor and headlight control mechanism for toy electric locomotives, the same including a reversing switch carried by the locomotive and actuated by contact with an abutment in the trackway. The present invention represents a carrying forward of the invention of the Culver patent in the respect that the reversing of the switch on the locomotive controls both the motor and the headlights, but instead of the switch on the locomotive being actuated by an abutment in the trackway it is operated by means carried on the locomotive and controlled by the manipulation of the transformer which feeds the current to the track system. Also, in the foregoing connection the present invention contemplates a carrying forward of the invention shown and described in the Becker Patent No. 1,589,096 dated June 15, 1926 wherein a special form of reversing switch is used to reverse the current to the motor and headlights, the said switch being operated through the intermediary of an actuator which is engaged by an abutment in the trackway.

Accordingly, the present invention contemplates track circuit controlled means for in turn controlling the actuating means for the switch, thereby rendering it unnecessary to provide special track abutments and rendering the control of the locomotive entirely automatic through the means for controlling the track circuit, usually a transformer. The transformer in this case acts as a switch to open and close the circuit or if not actually opening and closing the circuit to reduce the voltage to such an extent that the resistance in the track system will serve to cut down the current to the electro-magnetic control means so that it will automatically release the switch actuating means for operation.

A further object of the invention is to provide a novel series of instrumentalities for actuating the reversing switch which are so arranged and located that they may be manually rendered inoperative when it is desired to run the locomotive in one direction only, or on the other hand make possible the manual control of the reversing switch if desired.

With the above and other objects in view which will more readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination and arrangement of parts hereinafter more fully described, illustrated and claimed.

A preferred and practical embodiment of the invention is shown in the accompanying drawings in which

Fig. 1 is a vertical sectional view of the motor unit of a toy locomotive, illustrating the present invention.

Fig. 2 is a top plan view of the construction shown in Fig. 1.

Fig. 3 is a detail perspective view of the reversing switch.

Fig. 4 is a detail perspective view of the lever element of the reversing switch actuator.

Fig. 5 is a diagrammatic view illustrating the manner in which the reversing switch is thrown to one position by the momentum of the locomotive after the current has been shut off.

Fig. 6 is a view similar to Fig. 5 illustrat-

ing the manner in which the switch is thrown to the opposite position.

Fig. 7 is a horizontal sectional view taken on the line 7—7 of Fig. 1.

Fig. 8 is a diagrammatic view illustrating the circuits involved.

Similar reference characters designate corresponding parts throughout the several figures of the drawings.

In carrying the invention into effect it is proposed to provide control means for the reversing switch contained entirely within the motor unit designated generally as U. This unit includes the side frame plates F, one of which carries the reversing switch designated generally as R and the electro-magnet device A for controlling the operation of the actuator B for the reversing switch designated generally as R. The actuator includes a lever and ratchet element respectively designated as B^1 and B^2, the former being preferably carried by one of the frame plates and the latter being carried by the shaft 1 which is a part of the motion transmitting means from the motor M to the track wheels W.

The electro-magnet device A is in circuit with the field coils of the motor M, as will presently more fully appear in detail, and when current is being supplied to the motor the said device A will hold the lever B^1 of the actuator B elevated in the dotted line position so that its forward end is held out of contact with the ratchet B^2.

When the circuit to the motor is cut off, the device A will be deenergized and will permit the lever B^1 to drop and be actuated by the ratchet B^2 so that the said lever B^1 will throw the switch R and thus reverse the terminals of the switch so that when the current is again turned on the motor will rotate in the opposite direction. It will of course be understood that when the current is again turned on the device A will lift the lever B^1 to the dotted line position (Fig. 1) so that the forward end thereof will be out of the path of operation of the ratchet B^2. Thus, it will be apparent that the reversing switch R is controlled by the actuator B each time the device A is deenergized, the movement of the lever B^1 of the actuator being effected through the movement of the locomotive due to its momentum, the ratchet B^2 being a friction ratchet, as will presently appear.

Referring now more specifically to the arrangement and details of construction whereby the foregoing novel results are obtained, reference may be made to Figs. 1, 2 and 8 from which it will be observed that the shaft 1 which carries the friction ratchet wheel B^2 is driven by the motor operated pinion 2 (see Fig. 7) through the medium of the relatively large gear 3 mounted on the shaft 1. The pinion 2 is mounted on the armature shaft of the motor M and by reason of its small diameter has a relatively high speed as compared with the gear 3 to give the desired power advantage for driving the wheels W. The gear 3 carries on the face thereof a gear 4 which in turn meshes with the gears 5 on the track engaging wheels W. This is standard construction but is described here so that it will be understood how the ratchet B^2 is driven after the current to the motor M is cut off.

The frame plates F have mounted at their lower side an insulation member 6 carrying the trolley T adapted to engage within the third rail R^3 of the track system in the usual manner while the wheels W engage with the track rails R^2, as shown diagrammatically in Fig. 8. The third rail R^3 is electrically continuous and insulated in the usual manner from the metallic ties while the wheel bearing rails R^2 form the ground of the circuit. Therefore, the trolley T is directly connected by means of the wire 7 with the field coil 8 of the motor M, and the field coil 8 is in turn connected by the wire 9 with the magnet coil 10 of the electro-magnet device A. The coil 10 is grounded as shown in Fig. 8 to complete the circuit through the frame of the unit U and wheels W to the rails R^2. Also the coil 10 is connected by wire 11 to the middle terminal 12 mounted on the insulation piece R′ of the reversing switch R.

The reversing switch R may be of the same general construction and type shown in the Becker patent previously referred to and therefore the same will not be described in detail here except in so far as is necessary to follow out the circuits. Therefore, it may be pointed out that in addition to the main or middle terminal 12 the switch includes the motor terminals 13 and 14 the same being connected to the commutator of the motor through the medium of the wires 15 and 16 respectively. Also as will be observed from Figs. 1, 2 and 8 the terminals 13 and 14 may be connected by the wires 17 and 18 with the front and rear headlights 19 and 20.

The shiftable metal member 21 of the reversing switch is pivotally supported in the frame as indicated at 22 and may have the finger operating extension 23 as shown. The body of the member 21 is provided with suitable insulation 24 carrying on its face a centrally located pair of electrically connected contact fingers 25 and 26, and the separate ground contact fingers 27 and 28 which are secured to the metal member 21 by fastenings 27^a and 28^a and are therefore grounded.

The contact fingers 25 and 26 always cooperate with the main terminal 12, that is, they serve to alternately connect the main terminal 12 with the motor terminals 13 and 14. As will be observed from Fig. 5 the member 21 is so arranged that the locomotive moves forward. In this position of the switch the contact finger 26 will rest upon terminal

12 and the contact finger 25 will rest upon motor terminal 13 while ground contact 28 engages with terminal 14. When the locomotive is to be reversed to move backward the switch part 21 is thrown to the position shown in Fig. 6 whereupon the contact 25 will engage the main terminal 12 and contact 26 and engage motor terminal 14 and ground contact 27 will engage terminal 13.

Referring now to the actuator B for the reversing switch R, it will be observed that the lever B^1 of the said actuator is provided with an elongated slot 29 whereby it may be loosely mounted on the pin 30 carried by one of the side plates of the frame F, (Fig. 1). Adjacent the slot 29 the lever B^1 is provided with a notch 31 for receiving the arm 32 of the reversing switch member 21 so that when the lever B^1 slides in the direction of its length on the pin 30 it will effect the shifting of the member 21. The intermediate portion of the lever B^1 is provided with the laterally offset and horizontally disposed ear 33 which has a slot 34 for loosely and slidably receiving the end 35 of the solenoid of the electro-magnet A. Also as will be observed from Fig. 4 the said lever B^1 is provided at one end with the laterally offset ratchet engaging lug 36 which is adapted to be lifted out of or dropped into engagement with the teeth 37 of the ratchet wheel B^2.

The ratchet wheel B^2 is frictionally mounted on the shaft 1 by means of the coil spring 38 and washer 39 which holds the spring 38 compressed against the side of the disk 32. It will thus be apparent that the ratchet wheel B^2 will frictionally move with the shaft 1 but when the ratchet is held by the lug 36 engaging with the teeth 37 thereof, the continued movement of the locomotive due to its momentum will be permitted without damaging the moving parts of the locomotive.

If it is desired to render the actuator B inoperative it is only necessary to maintain the lever B^1 elevated by means of the cut-out device pivotally carried by one of the frames F and clearly shown in Fig. 1. This cut-out device consists of an arm 39 pivotally supported as at 40 and having the offset portion 41 for receiving the manipulating lever 42. When the device is in the full line position shown in Fig. 1 the automatic control of the actuator is permitted, but when the arm 42 is pushed to the dotted line position shown in Fig. 1 the automatic means is cut-out by automatically maintaining the lever B^1 elevated so that it cannot fall into the ratchet B^2 when the magnet is deenergized. The train will always run in one direction when the cut-out device is thrown to the dotted line position, regardless of when the current is turned on or off. The operation of the device may be briefly described as follows:

Assuming that the wheels W of the unit U are resting on the track rails R^2—R^2 (Fig. 8) and the trolley T of the unit is resting upon the third rail R^3, if the rheostat Y of the transformer Z is turned to the "on" position, the third rail R^3 and the track rails will be charged with electrical current and the electro-magnet A will be energized simultaneously with the furnishing of the current to the motor M. When the electro-magnet A is energized its solenoid lifts the lever B^1 of the actuator B, and the motor will run either forward or backward according to the position of the reversing switch as shown either in Fig. 5 or Fig. 6.

Upon desiring to change the direction of travel of the locomotive, the rheostat handle is moved back to the "off" position whereby the current to the motor is cut off and likewise electro-magnet A is deenergized thus causing the lever B′ to drop so that the lug 36 thereof will drop into the ratchet B^2. As previously explained the ratchet is frictionally held to the shaft 1 and although the current to the motor M is cut off the locomotive will move a short distance due to its momentum and readily shift the lever B′ longitudinally so as to shift the reversing switch R.

Each time the current is cut on and off at the transformer-rheostat the magnet A will be energized and deenergized to control the arm B^1 and the ratchet B^2 will move the arm forward or backward as will be readily apparent from Figs. 5 and 6.

From the foregoing, it will be apparent that the present invention provides means for automatically controlling the reversal of the direction of movement of a toy locomotive by the control of the current from the transformer which usually includes a rheostat, or, an equivalent device acting as a switch. As is well known transformers are used merely for the purpose of stepping down alternating current house service lines to the low voltage necessary to operate the toy motor, but if a battery of proper voltage should be used, or current from any source of suitable voltage used, a mere switch of simple form would serve to control the current in such a way that the object and intent of the present invention would be carried out. Therefore, it will now be apparent that the "control" of the device herein claimed is from some remote point, as for example, at or adjacent the transformer, but the actual operating means for causing a reversing of the electrical switch is entirely mechanical, the same being momentum-operated from the running gear of the locomotive by the over-running thereof when the current is switched off and the mechanical reversing device therefore is placed in operative condition.

Without further description it is thought that the features and advantages of the invention will be readily apparent to those skilled in the art, and it will of course be

understood that changes in the form, proportion and minor details of construction may be resorted to, without departing from the spirit of the invention and scope of the appended claims.

I claim:—

1. An electric locomotive including a driving motor, a reversing switch for the motor, an actuator including a rotatable and a slidable part for the switch, electro-magnet means for raising and lowering said slidable part when the current to the motor is turned on and off.

2. An electric locomotive including a driving motor, an oscillating reversing switch connected with the motor, an actuator including a rotatable part and a slidable part for the switch, and an electric device in circuit with the driving motor and adapted to cause the engagement of said slidable and rotatable parts when the current is cut off from the driving motor.

3. An electric locomotive including a driving motor, a reversing switch for the motor, an actuator for the switch including a member adapted to be driven by the over-running movement of the locomotive after the current has been cut off from the driving motor, a lever for throwing said switch, and an electrical device in circuit with the motor and adapted to hold said lever in an inoperative position until the current is cut off from the motor.

4. An electric locomotive including a reversible driving motor, a reversing switch for the motor, an actuator for the reversing switch including a slidable member adapted to be shifted by the over-running movement of the locomotive after the current has been cut off from the driving motor, a rotatable member, and means controlled simultaneously with the motor for maintaining said slidable member out of engagement with the rotatable member until current is cut off from the motor.

5. An electric locomotive including a reversible driving motor, a mechanical reversing switch for the motor, an actuator for the switch comprising a slidable member and a rotatable member operated by the travelling over-running movement of the locomotive, after the current has been cut off to the driving motor, and an electro-magnet device included in circuit with the motor and energized simultaneously therewith to maintain said slidable member out of engagement with the rotary member of the actuator until the current is cut off from the motor.

6. An electric locomotive including a reversible driving member, a reversing switch for the motor, an actuator for the switch including a slidable member interlocked with the movable part of the switch and a rotatable ratchet member having a frictional mounting on a wheel driven part of the locomotive and an electro-magnet included in circuit with the motor and connected with said slidable member whereby when current is supplied to the motor the said electro-magnet maintains the arm inoperative but releases the same into engagement with the ratchet when the current to the motor is cut off.

7. An electric locomotive including a motor frame, a reversible motor and a switch carried by the frame, and an actuator for the switch also mounted on the frame and including a pivoted and slidably mounted lever having one end operatively engaged with the switch and provided with a laterally projecting lug at its other end, and a ratchet member frictionally mounted on a wheel driven part of the locomotive for engaging said laterally off-set lug on the end of the arm, and an electro-magnet included in circuit with the motor and having the solenoid thereof connected with said arm whereby when the motor is energized the magnet will lift the arm out of the ratchet.

8. An electric locomotive including a reversible driving motor, a mechanical reversing switch for the motor, automatic actuating means for the said switch, including a lever adapted to be shifted by the over-running movement of the locomotive after the current has been cut off from the driving motor, and means for manually rendering said lever inoperative.

9. An electric locomotive including a reversible driving motor, a reversing switch for the motor, automatic actuating means for the switch including a lever, a magnet and a member for moving the lever, and a manually operated member for engaging said lever for rendering said automatic means inoperative.

10. An electric locomotive including a reversing driving motor, a reversing switch for the motor, automatic actuating means for the switch including a pivoted sliding lever, means for rendering said lever inoperative, and a handle for manually operating the switch when the lever is rendered inoperative.

11. An electric locomotive including a driving motor, a mechanical reversing switch for the motor, an actuator for the switch including a lever connected with the switch and a lever engaging member movable by the wheels of the locomotive, and electro-mechanical means controlled simultaneously with the motor for rendering said lever operative or inoperative with respect to the part driven by the wheels of the locomotive.

12. An electric locomotive including a driving motor, a mechanical reversing switch for the motor, an actuating device for the switch operated from the over-running movement of the locomotive, and an electro-mechanical device in circuit with the motor and adapted to render the actuating device inoperative until the current is cut off from the motor.

13. In a toy railway system, the combination with the tracks and the source of electrical energy therefor, of a locomotive having a reversible motor, and means carried by the locomotive for effecting the reversal of the motor, said means including a switch and momentum operated electro-mechanical means operated from the source of energy which feeds the motor but independent of the motor and also by the over-running movement of the locomotive.

14. In a toy electric railway system, the combination with the tracks and the source of electrical energy, of a locomotive having a reversible driving motor, a shiftable mechanical switch for the motor, and means for actuating said switch when the source of electrical energy is interrupted, said means comprising an electro-mechanical device having a part operated from said source of energy but independent of the motor and another part by the over-running movement of the locomotive.

15. A train control for toy electric railway systems including in combination with the tracks and the source of electrical energy, of a wheeled vehicle having a driving motor, a reversing switch for the motor, an electro-mechanically controlled device for actuating said switch when the source of energy is interrupted and the vehicle continues to run when the energy is cut off, the electric control means being independent of but in parallel with the motor, and a primary control device arranged between the source of energy and the tracks to provide a remote control for the motor and the said electro-mechanical means.

In testimony whereof I hereunto affix my signature.

FRED MIZE.