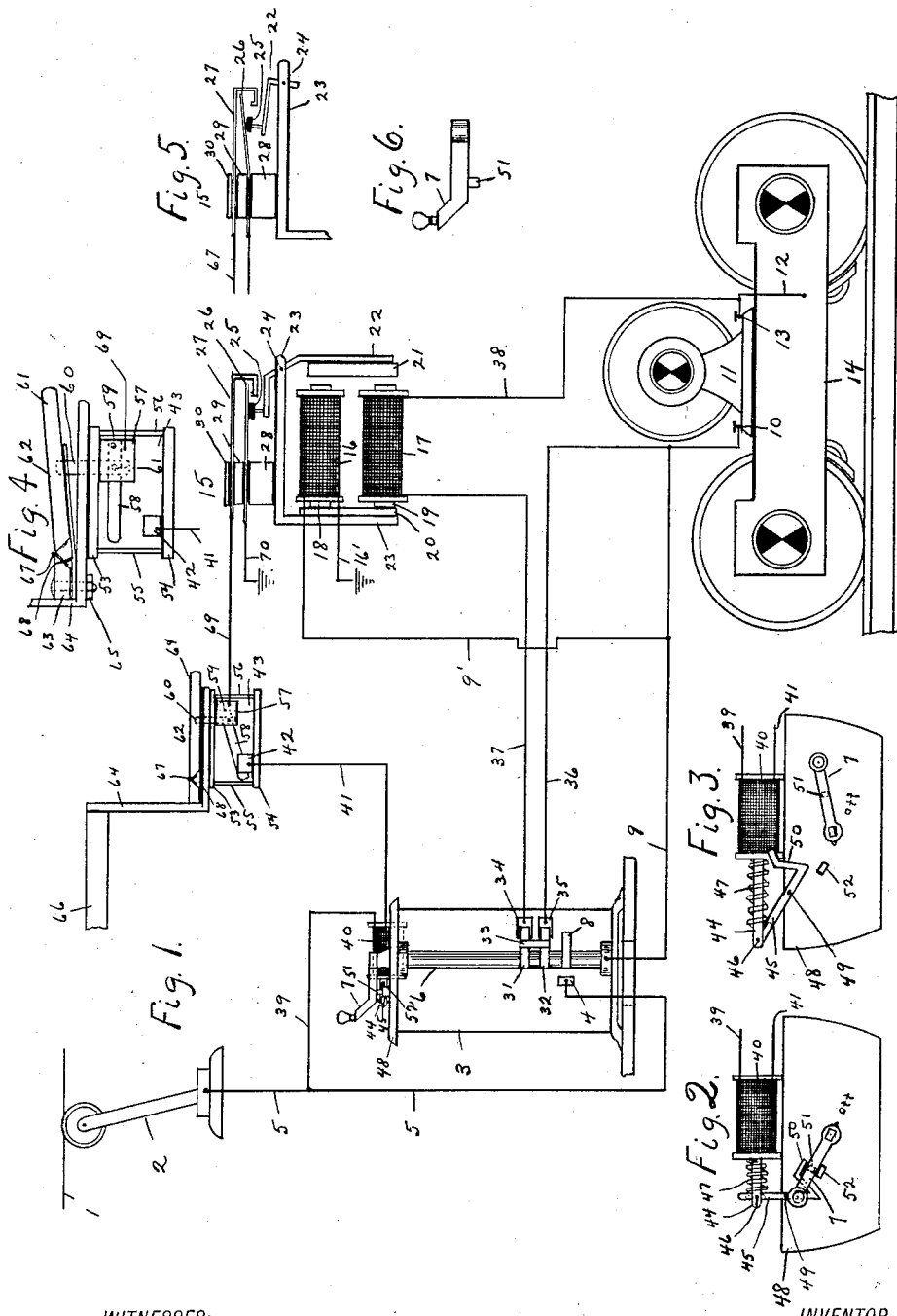


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SAFETY APPLIANCE FOR TRAMWAY CARS.
APPLICATION FILED FEB. 9, 1911.

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Patented Mar. 26, 1912.



WITNESSES:

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SAFETY APPLIANCE FOR TRAMWAY-CARS.

1,021,752.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JAMES E. SCHOOLFIELD, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented a new and useful Improvement in Safety Appliances for Tramway-Cars, of which the following is a specification.

My invention relates to a safety appliance for the prevention of boarding and alighting accidents on tramway cars, and the objects of my improvement are, first, to prevent the car from being started when a person is on a step; second, to lock the controller in the "off" position when the car is at rest and a passenger is upon a step; third, to prevent the persons treading upon the steps when the car is in motion from interfering with the operating mechanism of the car, regardless of the position of the controller handle. I attain these objects by the mechanism and electric circuits illustrated in the accompanying drawings, in which—

Figure 1 shows the appliance and circuits when the car is at rest and pressure is being exerted upon a step thereof. Fig. 2 is a view of the controller and handle, locked in the "off" position, referred to in Fig. 1, and the electro-magnet and mechanism employed for locking said controller. Fig. 3 is a view of the controller locking device when the steps are clear regardless of the position of the controller handle. Fig. 4 is a side elevation of the circuit closer operated by the steps to close the controller locking circuit when a passenger is upon a step. Fig. 5 is a view of the circuit controller showing the controller locking circuit opened when the car is in motion. Fig. 6 is a side elevation of the controller handle.

Like characters and numerals of reference indicate the same or similar parts throughout the several views.

The numeral 1 represents the trolley wire having the trolley 2 bearing thereupon.

The numeral 3 represents the controller having the trolley terminal 4 therein which is connected with the trolley by means of

the wire 5. The controller 3 has a cylinder 6 adapted to be rotated when the handle 7 is turned to the first and each succeeding "point." The segment 8, attached to said cylinder, shall therefore be deemed to engage the trolley terminal 4 at all times when the controller handle 7 is turned to the "on" position. Connected to the cylinder 6, is the wire 9, in the motor circuit, which leads to the terminal 10 of the motor 11, and from the motor the wire 12 leads from the terminal 13 to ground on the truck 14. Thus it will be observed that the car can be started by turning the controller handle 7 to the "on" position and permitting the current from the trolley 1 to pass through the trolley 2, wire 5, terminal 4, segment 8, cylinder 6, wire 9, terminal 10, motor 11, pole 13, wire 12 to ground on the truck 14. The wire 9 also has a tap connection, wire 9', leading to the high resistance windings 16, of the circuit controller 15 and from which the wire 16' leads to ground. The circuit controller 15 has two windings 16 and 17, winding 16 being of high resistance and winding 17 of low resistance, the same having cores 18 and 19 connected by bar 20, and a movable armature 21, the latter being secured to the lever 22. The magnetic circuit being completed through armature 21, core 18, bar 20, and core 19. The lever 22 is hinged to the frame 23 at 24 and is fitted with an insulated cap near one end which is adapted to touch the spring contact finger 26 when the windings 16 and 17 are demagnetized, see Fig. 1, and raise contact finger 26, causing it to break contact with the rigid finger 27 when the armature 21 is attracted by either of the windings 16 or 17, see Fig. 5. The contact fingers 26 and 27 are held in place by insulated blocks 28, 29 and 30, secured to the frame 23 in any suitable manner.

The controller cylinder 6 is fitted with two insulated segments 31 and 32 which are connected by the bar 33. These segments are adapted to engage contacts 34 and 35 only when the controller handle 7 is turned to the "off" position, see Fig. 1, and to

break contact with the contacts 34 and 35 at the shortest interval possible before the segment 8 engages the trolley terminal 4, which occurs at the first "point." It should
 5 also be noted that this construction is intended to cause the segments 31 and 32 to engage contacts 34 and 35 as soon as segment 8 breaks contact with the terminal contact 4, which occurs between the first
 10 "point" and the "off" position. Connected to the contact 35 is a wire 36 which connects with wire 9 leading to the terminal 10 of the motor 11, while the contact 34 has a wire 37 leading to the low resistance winding 17, and from which winding a wire 38 connects with the wire 12 leading from the terminal 13 of the motor 11 to ground on the truck 14.

The wire 5 has a wire 39 leading to the
 20 electro-magnet coil 40 of the controller locking device, and from which coil a wire 41 leads to a blade contact 42 of the circuit closer 43.

The controller locking device is composed
 25 of an electro-magnet coil 40, of the solenoid type, which has an armature 44 slidable therein, see Figs. 2 and 3. The armature 44 is slotted to receive the locking lever 45 to which it is secured by any suitable means at
 30 46, and is normally forced outwardly from the coil 40 by means of the spring 47, see Fig. 3. The locking lever 45 is pivoted to the controller top 48 at 49 and has a semi L shaped projection (hook, latch or pin) 50,
 35 which is adapted to engage lug 51 of the controller handle 7 (although it is adapted to engage any segment of the cylinder 6, or any stop, lug or projection that may be fitted to any part of said controller which is moved
 40 to start the car, or to be inserted in any slot, hole or opening if a pin be used instead of a hook or latch), locking the handle 7 in the "off" position, when the coil 40 becomes energized and attracts the armature 44, see
 45 Fig. 2, against lug 52 which is fastened to the controller top 48.

The controller handle 7, see Fig. 6, comprises a metal casting suitably adapted to control the movement of the cylinder 6 and
 50 is provided with a lug 51 for engaging the lug 52 of the controller top 48 to stop the handle 7 in given positions. It is the lug 51 that is trapped between the lug 52 and the locking lever projection 50 when the coil 40
 55 is energized.

The circuit closer 43, see Fig. 4, comprises two insulating plates 53 and 54 fastened together by means of posts 55 and 56. Attached to the plate 53 is a metallic hinge
 60 block 57 to which the knife blade 58 is hinged near one end by means of a bolt 59. The other end of said knife is normally free but is adapted to engage blade contact 42 when pressure is applied to the tread of the
 65 step. Movable longitudinally in said hinge

block is an insulated plunger 60, pivoted at 61 to the knife 58. The other end of the plunger 60 is secured to the movable tread 61 of the step 62 in any suitable manner.
 70 The step 62 has a fixed portion 63, fastened to the hanger 64 by means of bolts 65, there being any suitable number of said bolts hangers etc. to properly support the step which is secured to the platform 66. The
 75 movable tread 61 of the step 62 is fastened to the fixed portion 63 by means of hinges 67 and is normally held in an elevated position by means of springs 68. Thus it will be observed that when pressure is applied
 80 to the tread 61, the plunger 62 is forced downwardly causing the knife 58 to engage blade contact 42.

The hinge block 57 has a wire 69 connected to it and leading to the rigid contact finger 27 of the circuit controller 15, while
 85 the spring contact finger 26 has a wire 70 leading to ground.

The operation of the appliance is as follows: When the car is at rest, the controller handle 7 in the "off" position and pressure
 90 is being exerted upon the tread 61 of the step 62, see Fig. 1, the knife blade 58 of the step switch 43 is forced downwardly and engages the blade contact 42, closing the controller locking circuit and permitting the
 95 current from the trolley wire 1 to pass through the trolley 2, wire 5, wire 39, controller locking coil 40, energizing the same, wire 41 blade contact 42, knife 58, hinge block 57, wire 69, contact finger 27, contact
 100 finger 26 and wire 70 to ground. Upon the coil 40 becoming energized the armature 44 is attracted causing the lever 45 which is pivoted to the controller top at 49 to bring the projection 50 into engagement with the
 105 lug 51 of the controller handle 7, trapping the latter between the lever projection 50 and the lug 52 of the controller top 48, thus preventing the handle 7 from being turned until the step is cleared. The instant, however, pressure is relieved from the tread 61,
 110 spring 68 causes it to rise, lifting the plunger 60 and disengaging the knife 58 from the blade contact 42, and opening the circuit, see Fig. 4. When the coil 40 is demagnetized, the spring 47 forces the armature 44
 115 outwardly and the lever projection 50 away from the handle lug 51, to the position shown in Fig. 3, permitting the handle 7 to be turned to start the car. Whenever the
 120 handle 7 is turned to the "on" position, see Fig. 3, the cylinder 6 is rotated connecting the segment with the trolley terminal 4, in which event the current passes from the trolley wire 1, through the trolley 2, wire 5,
 125 terminal 4, segment 8, cylinder 6, wire 9, terminal 10, motor 11, terminal 13 and wire 12 to ground on the truck 14, thereby starting the car. At the same instant the current passes through the wire 9, part of it
 130

is diverted through wire 9', winding 16, and wire 16', to ground, thereby energizing the winding 16, attracting the armature 21 and causing the lever 22 to raise the cap 25, breaking the connection between the circuit controller fingers 26 and 27, see Fig. 5, thus opening the controller locking circuit between the circuit closer 43 and ground and preventing the coil 40 from becoming energized when a person is riding upon a step. As soon, however, as the controller cylinder 6 is turned to the "off" position, see Figs. 1 and 2, the motor current will be interrupted between the terminal 4 and segment 8, the winding 16 will become demagnetized, release the armature 21, permit the finger 26 to drop and close the controller lock circuit, as shown in Fig. 1. Should a person be riding upon a step at that time, the controller locking circuit would be closed at blade contact 42 and knife 58, causing the coil 40 to become energized, attract the armature 44, lock the controller handle 7 and bring the car to a stop.

Since it becomes necessary for a motorman to turn the controller cylinder 6 to the "on" and "off" position frequently between regular stopping points, it is therefore desirable to prevent interference with the operation of the car by persons riding on a step, regardless of the position of the controller cylinder 6, or whether the car is running under power from the trolley or is coasting. It is a well known fact that a motor driven under power other than is supplied to it by an electric current, generates a current of its own, and it is this source of energy which I employ to energize the low resistance winding 17 of the circuit controller 15, to accomplish the same functions when the car is coasting and the controller cylinder in the "off" position, as is performed by the high resistance winding 16 when the motor is driven under power from the trolley and the controller cylinder 6 is in the "on" position. It is to be noted that while the term "dynamo-electric-machine" is used in the claims, it is intended to be generic to either a motor, magneto, generator or dynamo, since a magneto geared to the car axle, might be employed to energize a coil such as the low resistance winding 17, to perform the same functions as are performed by the high and low resistance windings 16 and 17, *i. e.* to energize a circuit controller magnet to interrupt the controller lock circuit when the car is in motion. It will therefore be observed that when the car is running under power from the trolley and the controller cylinder 6 is turned to the "on" position by the handle 7, see Fig. 3, the low resistance circuit, contact 35, wire 36, wire 9, terminal 10, motor 11, terminal 13, wire 12, wire 38, winding 17, wire 37, contact 34, will be opened since the segments 31, 32 and bar 33

have been rotated with the cylinder 6. However, when the cylinder 6 has been turned to the "off" position, the segments 31 and 32 engage contacts 34 and 35 the instant the segment 8 breaks contact with the terminal 4. And since the current generated by the motor travels through the low resistance circuit, motor 11, terminal 10, wire 9, wire 36, contact 35, bar 33, contact 34, wire 37, winding 17, wire 38, wire 12, terminal 13, the low resistance winding 17 becomes energized before the high resistance winding 16 loses its magnetism, consequently the armature 21 remains attracted and keeps the controller locking circuit interrupted, see Fig. 5, as long as the motor is running. When such a condition exists, a person riding upon a step cannot interfere with the operation of the car by actuating the controller locking device. But when the car is at rest and the controller locking circuit is closed by the circuit controller fingers 26 and 27, if pressure be exerted upon the tread 61, the circuit will be closed at the circuit closer and cause the locking coil 40 to become energized and lock the handle 7 and the cylinder 6 in the "off" position. Nor can the motorman start the car until the step is released and the coil 40 de-magnetized.

The particular form of the different parts of my invention as herein shown and described is not to be deemed material and I do not limit myself to them. Neither is the specific location in the car itself of the parts involved of any consequence. The locking device as shown in the drawings is applied to the handle 7, whereas it is adapted to engage any movable part of the controller that is used in starting the car, for instance, the cylinder 6 may be fitted with a stop or the segments 8, 31 or 32 may be employed instead of the lug 51 of the handle 7. All that is essential to the operation of the appliance as described is that of the relation of the several parts to each other and circuits be preserved.

Changes within the scope of my invention may be made without altering the principle involved.

My claims are:

1. In a safety appliance, a car, car controlling means, locking means for said car controlling means, and automatic means for rendering said locking means inoperative, substantially as described.
2. In a safety appliance, a car and controlling means therefor, electrically operated locking means for rendering said car controlling means inoperative, and automatic means for rendering said locking means inoperative, substantially as described.
3. In a safety appliance, a car, a movable member on said car, car controlling means, electrically operated locking means for rendering said car controlling means inopera-

tive, means operated by said movable member for actuating said locking means, and automatic means for rendering said locking means inoperative, substantially as described.

5 4. In a safety appliance, a car, a movable member on said car, a circuit closer, car controlling means, locking means for rendering said car controlling means inoperative, of which said circuit closer forms a part, means
10 for actuating said circuit closer to energize said locking means when said movable member is out of its normal position and means to automatically interrupt said locking means, substantially as described.

15 5. In a safety appliance, a car, a movable member on said car, means for holding said movable member in a normal position, car controlling means, locking means for rendering said car controlling means inoperative,
20 a circuit closer forming a part of said locking means and operated by said movable member in an abnormal position for exciting said locking means, and means for rendering said locking means inoperative, substantially as described.

25 6. In a safety appliance, a car, a movable member on said car, car propelling means, a controller for controlling said car propelling means, means for locking said controlling means in the "off" position for rendering said car propelling means inoperative
30 when said movable member is in an abnormal position, and automatic means for rendering said locking means inoperative, substantially as described.

35 7. In a safety appliance, a car and propelling means therefor, including a controller having a rotatable shaft, an electro-magnetic lock for said shaft, a movable step
40 for said car, means operated by said step for exciting said lock, and automatic means controlled by said car propelling means for rendering said lock inoperative, substantially as described.

45 8. In a safety appliance, a car, a movable step on said car, a circuit closer operated by said step, a motor, a motor circuit, a controller for the motor, a controller lock, a circuit including said lock and circuit closer
50 for preventing the operation of the car when pressure is present upon said step, and means to prevent the operation of said lock, regardless of pressure upon said step, substantially as described.

55 9. In a safety appliance, a car, a movable member on said car, a motor, a controller for the motor, a lock for the controller, means for exciting said lock, a circuit closer operated by said movable member and forming
30 a part of said locking means, a circuit-controller controlled by said motor and controller comprising windings and means for interrupting said locking means to energize said windings from said motor and controller,
65 and means to keep said locking

means interrupted at predetermined intervals, substantially as described.

10. In a safety appliance, a car, a movable member on said car, a motor, a motor circuit, a circuit-closer operated by said
70 movable member, a controller for the motor, a controller lock, a controller lock circuit, of which said circuit-closer forms a part, a circuit-controller having windings of high and low resistance circuits for said wind-
75 ings, means to bridge the low resistance winding across the terminals of the motor and energize the same, means to energize the high resistance winding from the motor circuit, and means comprised in said cir-
80 cuit-controller and controlled by said windings to interrupt said controller lock circuit, as set forth.

11. In a safety appliance, a car, a movable member on said car, a motor, a motor circuit, a controller for the motor, a circuit-
85 closer operated by said movable member, an electro-magnetic controller lock, a circuit for actuating said lock including said circuit-closer, a circuit controller having
90 windings of high and low resistance, circuits for said windings, means comprised in said circuit-controller and operated by said windings to interrupt said locking circuit,
95 means to bridge the low resistance windings across the motor terminals and energize the same, and means to energize the high resistance winding from the motor circuit, substantially as described.

12. In a safety appliance, a car, a movable
100 member, on said car, a motor, a motor circuit, a controller for the motor, a circuit-closer operated by said movable member, an electro-magnetic controller lock, a circuit
105 for exciting said lock including said circuit-closer, an electro-magnetic-circuit-controller having windings of high and low resistance, and comprising means controlled by said windings to interrupt said lock circuit,
110 circuits for said windings, means governed by said controller to bridge the low resistance winding across the motor terminals to energize said windings to interrupt said lock circuit, and means to connect the
115 high resistance winding in multiple with said motor to energize said windings to interrupt said lock circuit, substantially as described.

13. In a safety appliance, a car, a movable member on said car, a motor, a motor circuit,
120 a controller in said motor circuit having a rotatable shaft and handle, an electrically operated lock for said handle and shaft, a circuit for exciting said lock, a circuit-closer operated by said movable member
125 and forming a part of said lock circuit step, an electro-magnetically-operated-circuit-controller having windings of high and low resistance, and comprising means controlled by said windings to interrupt said lock cir-
130

cuit, circuits for conducting current to said windings, means governed by said controller handle and shaft to close the circuit to energize said low resistance winding when said controller handle and shaft occupy the "off" position, and means to energize said high resistance winding from said motor circuit, substantially as described.

14. In a safety appliance, a car, a movable member on said car, a motor, a motor circuit, a controller, a lock for said controller, a circuit for exciting said lock, a circuit closer in said lock circuit operated by said movable member for locking said controller in the "off" position, a circuit controller having windings of high and low resistance, and comprising means to interrupt said lock circuit, circuits for said windings, means governed by said controller to bridge the low resistance winding across the motor terminals to energize the same, and means to energize the high resistance winding from said motor circuit, substantially as described.

15. In a safety appliance, a car, a step provided with a movable tread, means for holding said tread in an elevated position, a motor, a motor circuit, a controller for the motor having a movable handle and shaft, an electro-magnet lock for locking said handle and shaft in the "off" position, a circuit for actuating said lock, a circuit closer operated by said tread and forming a part of said lock circuit, a circuit controller having windings of high and low resistance, circuits for energizing said windings, means comprised in said circuit-controller and operated by said windings to interrupt said lock circuit, means governed by said controller to bridge the low resistance winding across the motor terminals and energize the same, and means to connect the high resistance winding "in multiple" with the motor and energize the same, substantially as described.

16. In a safety appliance, a car, a movable member on said car, a motor, a motor circuit, a controller having a rotatable handle and cylinder, a lock adapted to trap said handle and cylinder in the "off" position and prevent their release, a circuit for exciting said lock, a circuit closer in said circuit operated by said movable member, a circuit-controller having windings of high and low resistance and contacts forming parts of said lock circuit, circuits for said windings mechanism operating said contacts and comprised in said circuit-controller to interrupt said lock circuit, said mechanism being actuated by said windings, means to bridge said low resistance winding across the terminals of the motor and energize the same when the handle and cylinder of the controller are in the "off" position, and means to energize the high resistance winding from the motor circuit

when the motor is receiving current, substantially as described.

17. In a safety appliance, a car, a movable member on said car, a dynamo-electric-machine, a circuit for said dynamo-electric-machine, a controller in said circuit, a lock for said controller, a circuit for exciting said lock of which circuit a circuit-closer operated by said movable member forms a part, a circuit controller having windings of high and low resistance, a circuit for energizing the high resistance windings from said dynamo-electric-machine circuit, a circuit to energize the low resistance winding by the current from said dynamo-electric-machine, and means comprised in said circuit-controller and controlled by said windings to interrupt the lock circuit when either of said windings is energized, substantially as described.

18. In a safety appliance, a car, a movable member associated therewith, a dynamo-electric-machine for propelling the car, a dynamo-electric-machine-circuit, a controller in said circuit, an electro-magnetic lock for said controller, a circuit for exciting said lock, a circuit closer in said lock circuit operated by said movable member in its abnormal position, a circuit controller having windings of high and low resistance, circuits for said windings, means comprising in said circuit-controller and controlled by either of said windings to interrupt said lock circuit, and to close the lock circuit upon the de-energization of said windings, means governed by said controller to energize the low resistance windings from the current from the dynamo-electric-machine, means to energize the high resistance winding from the dynamo-electric-machine circuit, substantially as described.

19. In a safety appliance, a car, car controlling means, a dynamo-electric-machine, locking means for rendering inoperative said car controlling means, and means controlled by said dynamo-electric-machine for rendering said locking means inoperative, substantially as described.

20. In a safety appliance, a car, a movable member on said car, car controlling means, locking means and circuits for rendering said car controlling means inoperative, a circuit for said locking means a circuit closer in said circuit operated by said movable member for exciting said locking means, an electro-magnetically operated circuit-controller having contacts forming parts of said locking circuit, and a dynamo-electric-machine for supplying current to the windings of said circuit controller to interrupt said locking circuit, substantially as described.

21. In a safety appliance, a car and controlling means therefor, a movable member on said car, a lock to prevent the operation of the car, circuits for exciting said lock, a

circuit-closer controlled by said movable member and forming a part of said lock circuit, an electro-magnetically operated circuit-controller having contacts forming
5 parts of said lock circuit, a dynamo-electric-machine operatively connected with the car wheels for supplying current to said circuit controller windings to interrupt said lock circuit and circuits for energizing said windings, substantially as described.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."