A. C. EASTWOOD.

PROTECTIVE SYSTEM FOR ELECTRIC RAILWAYS.

APPLICATION FILED MAR. 6, 1907.

908,650.

Patented Jan. 5, 1909.

3 SHEETS—SHEET 1.

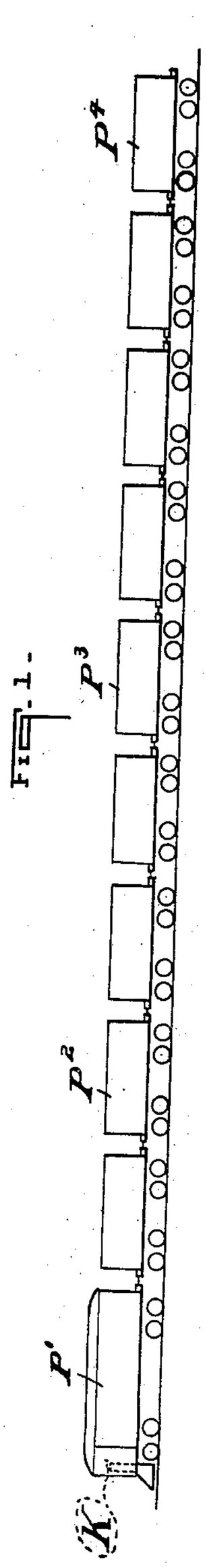

FIG. 1.

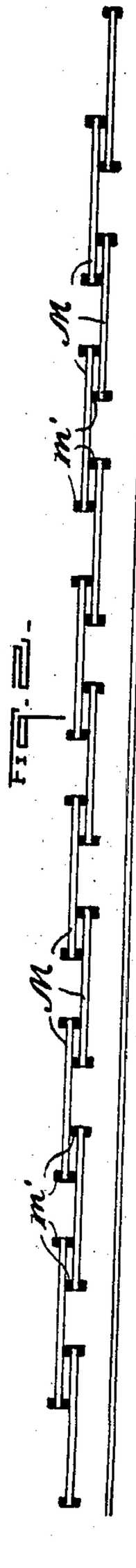

FIG. 2.

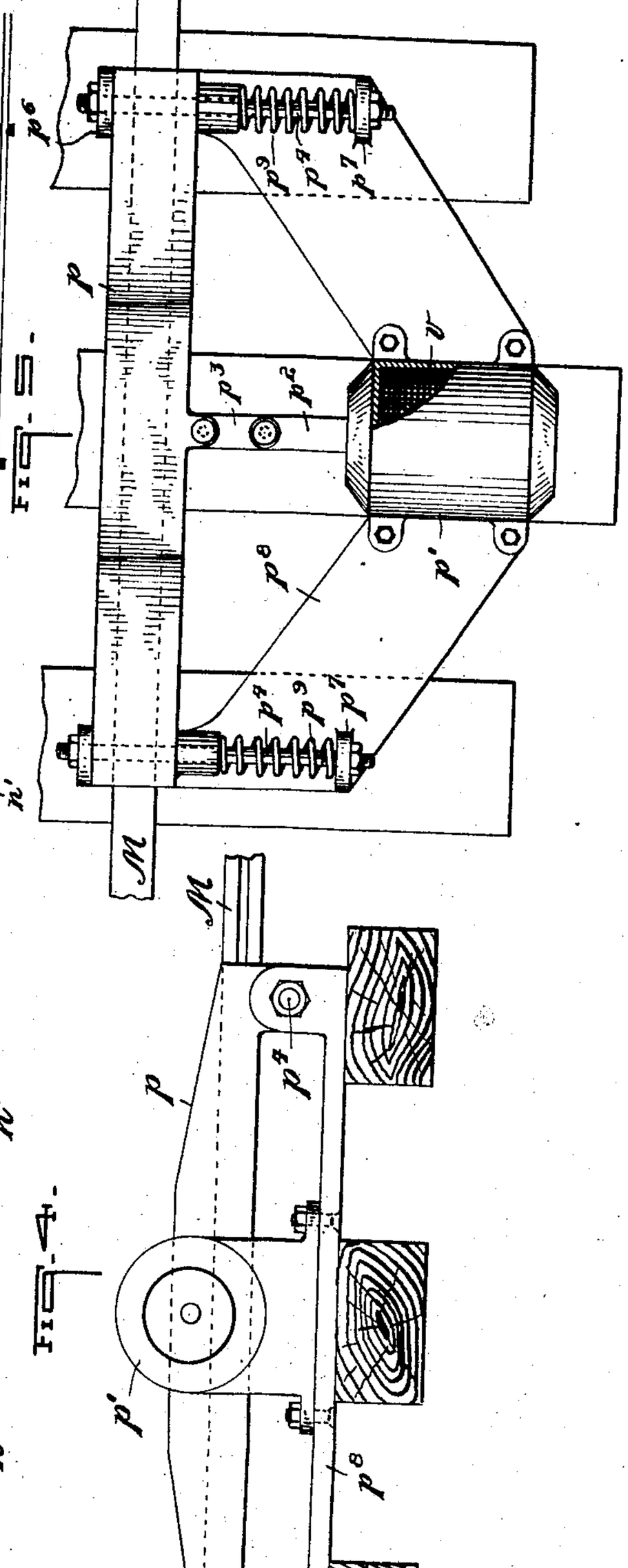

FIG. 3.

FIG. 4.

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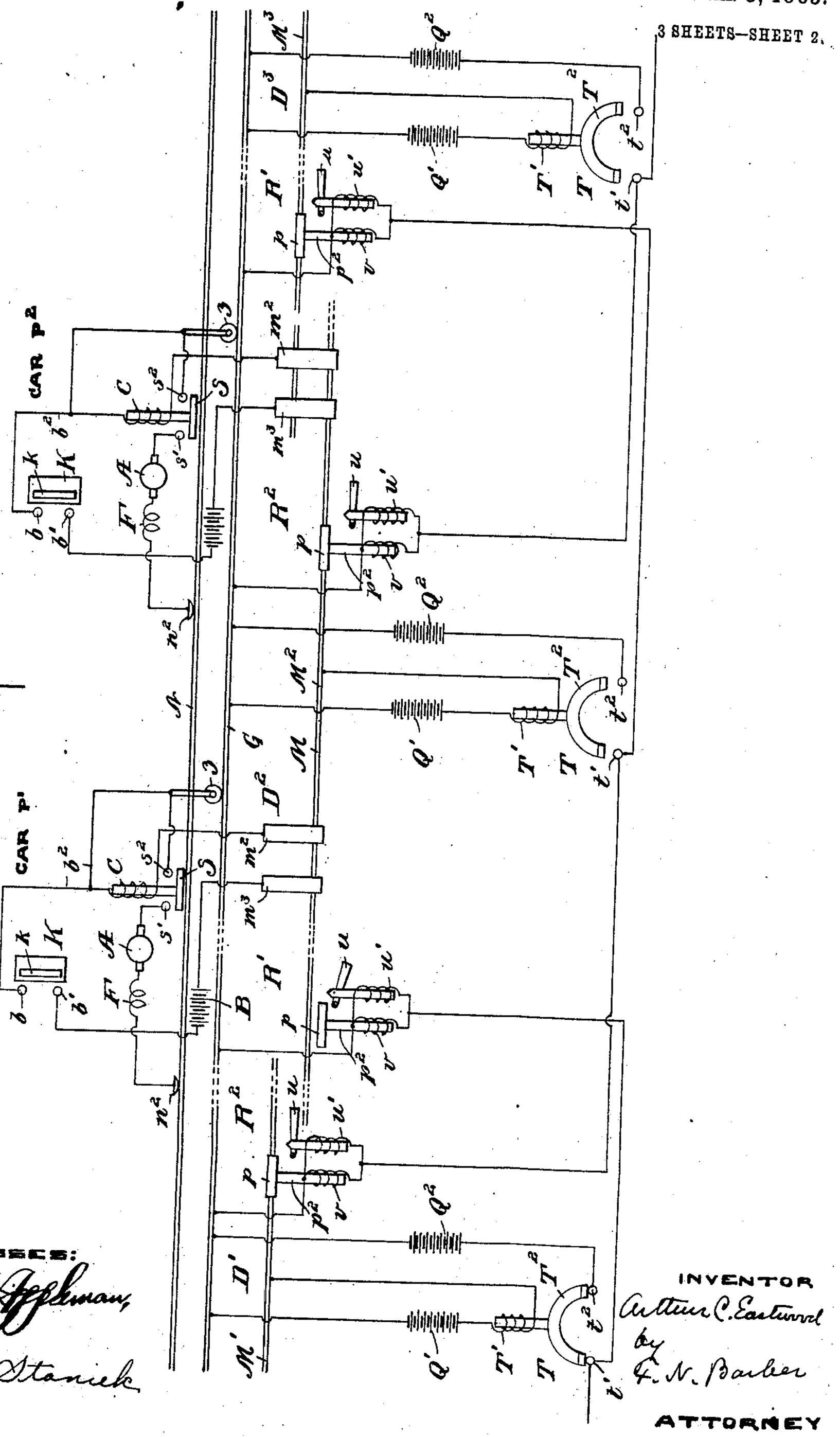
3 SHEETS—SHEET 2.

FIG. 3.



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3 SHEETS—SHEET 3.

FIG. 6.

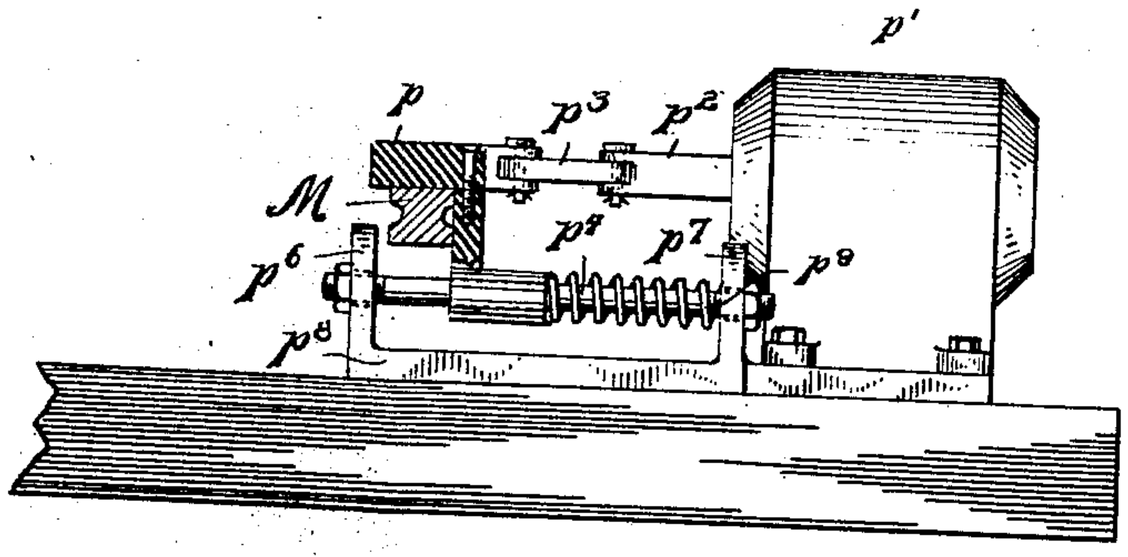


FIG. 10.

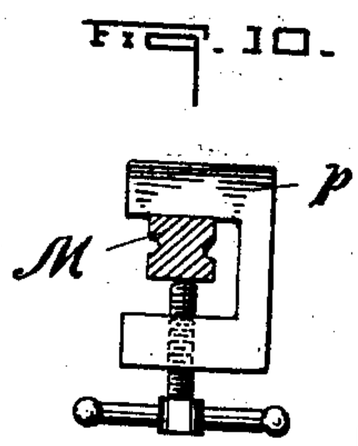


FIG. 9.

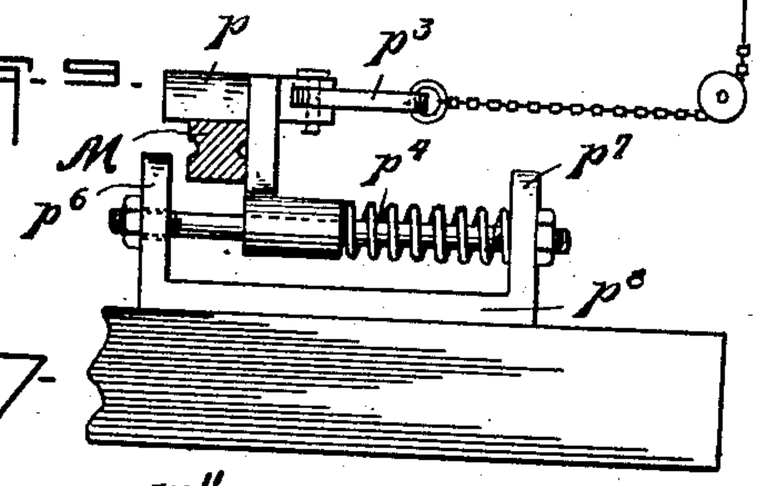


FIG. 7.

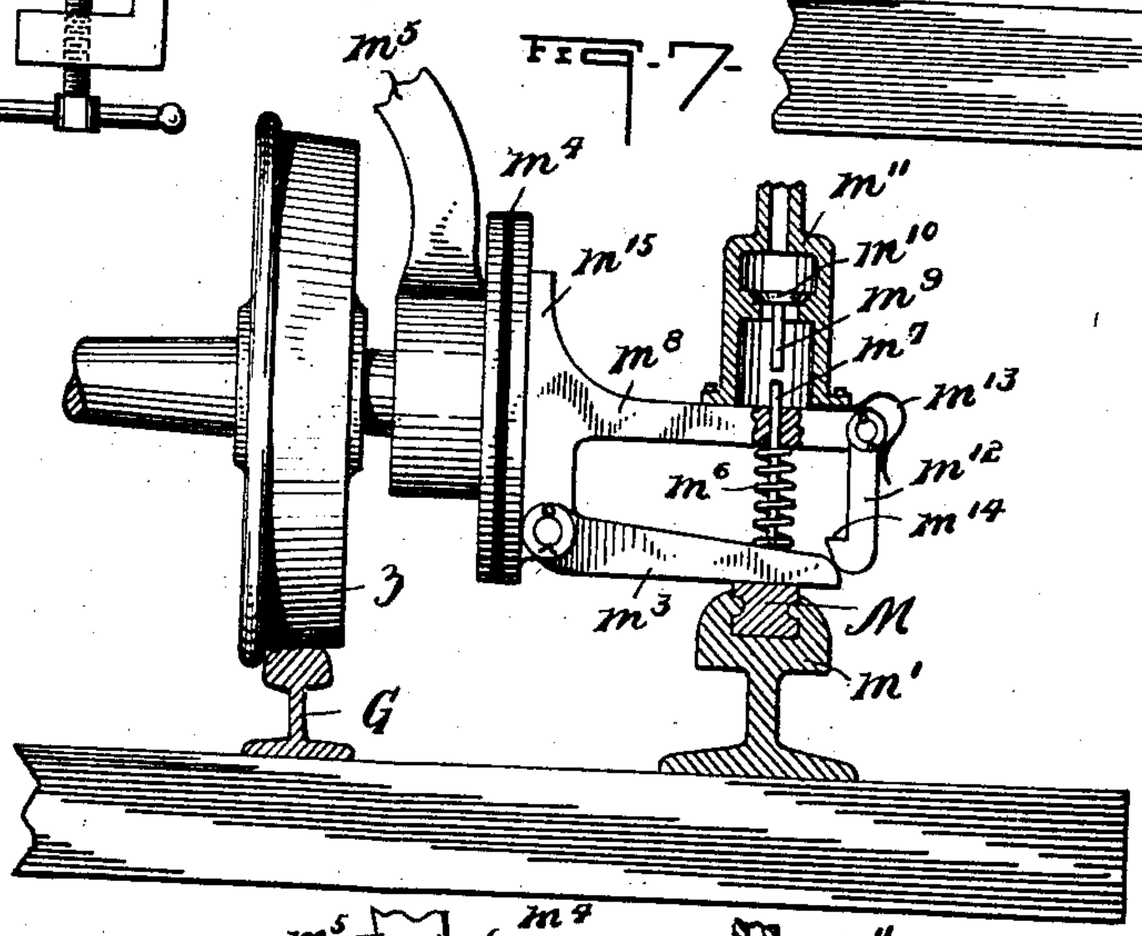
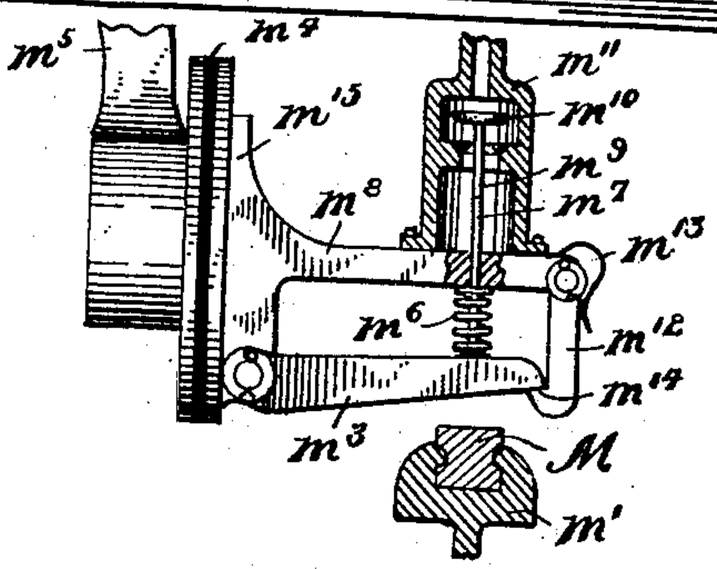


FIG. 8.



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ARTHUR C. EASTWOOD, OF CLEVELAND, OHIO.

PROTECTIVE SYSTEM FOR ELECTRIC RAILWAYS.

No. 908,650. Specification of Letters Patent. Patented Jan. 5, 1909.

Application filed March 6, 1907. Serial No. 360,924.

To all whom it may concern:

Be it known that I, ARTHUR C. EASTWOOD, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented or discovered new and useful Improvements in Protective Systems for Electric Railways, of which the following is a specification.

My invention relates to block system for electric railways.

The object of my invention is to produce a block system which will operate in such a manner that a car or train cannot enter a block while there is another car or train either standing or running in the block, this being accomplished by automatically cutting off the power from the train as it approaches the occupied block and at the same time automatically applying the brakes. The means which I employ for cutting off the power and applying the brakes also form a part of my invention.

In carrying out my invention I preferably make use of the system described in my pending application for patent, Serial No. 340,469. In the drawings of the present application, I have omitted the speed controlling and reversing apparatus shown in said pending application, and have shown the controllers with only one stop and only one magnetically controlled switch in the motor circuit, as thereby the present application will be greatly simplified and abbreviated without in the least sacrificing any principles of my invention.

In a train comprising a number of motor-equipped and motorless units, I provide suitable controlling devices on the motor-equipped cars, these controlling devices being actuated by electric power which is controlled by a suitable master switch, preferably mounted on the leading car of the train. I provide a stationary control-conductor along the track, together with suitable contact shoes or their equivalent carried by the motor-equipped cars, in order to connect the operating switch with the controlling mechanism on the various cars.

I divide the control-conductor into sections of a length depending upon the length of block desired and I provide automatic means, actuated by the presence of a train on a given block, for placing a cam-path or its equivalent in the path of the contact shoes in the control circuit of any train which may approach the occupied block in either direction. In case a train approaches the occupied block, the contact shoes coöperating with the control-conductor will be raised from engagement therewith and will be locked in the raised position. This opens the control circuit which causes all of the controlling devices on the several motor cars of the train to cut off the supply of power to the motors, the action being similar to that which occurs when the motorman brings his operating switch to the off position. I also provide means, put into action by the raising of the contact shoe, for automatically applying the brakes. In addition to these automatic arrangements for cutting off the power and applying the brakes on a train approaching an occupied block, I provide a visual signal, such as a light or semaphore, which is actuated by the presence of a train on a given block to warn the motorman of an approaching train that the said block is occupied.

Referring to the drawings which accompany this specification, Figure 1 is a side elevation of a train equipped in accordance with the principles of my invention; Fig. 2, a plan of the track and the adjacent stationary conductors; Fig. 3, a diagrammatic view of a railway equipped with my invention; Figs. 4 and 5, are respectively a side elevation and a plan of the preferred form of cam-path with its operating mechanism and the control-conductor; Fig. 6, an end view of Figs. 4 and 5 partly in section; Fig. 7, a side elevation of a contact shoe and parts associated therewith, carried by the truck of a motor-equipped car; Fig. 8, a view similar to Fig. 7 but with the shoe m^3 shown locked out of contact with the conductor M; Fig. 9, a modification showing an elevation of a cam-path with manually actuating means; and Fig. 10, a portable cam-path.

Referring to Fig. 1, P', P^2, P^3, P^4 are cars equipped with electric motors, the remaining cars being motorless. This view merely shows one arrangement of the two kinds of cars, the scale being too small to indicate the motor mechanisms and their controllers.

On Figs. 2 and 3, the traction rails (only one shown on Fig. 3) are shown at G and the stationary power conductor or conductor-rail for supplying electric current to the car-propulsion motors is shown at N. This rail is supported by the insulators n' and coöper-

ates with the contact shoes n^2 carried by the motor cars. A second stationary conductor M, called the control-conductor is also provided along the roadway and is supported by the insulators m' coöperating with the shoes or contacts m^2 carried by the said motor cars. The conductors M and N may be bars, rails, or trolley wires. The return circuit of both of these conductors is preferably through the rails G. The control-conductor M is divided into sections (Fig. 3) of such length that two trains will not be operated upon the same section at the same time, the ends of the sections overlapping a distance equal to the maximum length of the train, so that in passing frome one section to the next the contacts m^2, m^3 will span the overlapping conductors without opening the control circuit.

On Fig. 3, I show diagrammatically the wiring of two motor cars P′ and P², which may be supposed to be parts of a train. The traction rails are shown by the single rail G, which with the power conductor N and the conductor rail M, is broken away at various places to indicate indefinite lengths of the same.

On Fig. 3, D′, D², and D³ show three consecutive block sections, the sections D′ and D³ showing only the portions adjacent to the ends of the section D². M′, M², and M³ are the sections of the control-conductor M corresponding to each of the respective block sections. B is the control battery or other source of electric energy for controlling the several motors on the train. One pole of the battery B is connected to the contact finger b' of the master-switch K, while the other pole leads to the shoe m^3, hereinafter to be described, which has sliding contact with the sections of the control-conductor M and is sufficiently long to bridge the overlapping ends of the control-conductor sections. The contact-finger b is arranged so as to be connected to the contact-finger b' by the contact strip k on the drum of the controller K, the contact-finger b being connected by the wire b^2 to the rail G through the car-truck, represented diagrammatically by the wheel z. A is the armature, and F the field of the motor, which is connected to the power conductor N by the shoe n^2 and to the truck z through the fixed contacts s' and s^2, adapted to be connected by the switch S, which is secured to the plunger or core of the winding C. The latter is in a connection between the wire b^2 and the shoe m^2 carried by the car and slidingly contacting with the control-conductor M. It is thus seen that the motor driving circuits on the cars are in parallel between the power-conductor N and the traction rails G, and their circuits are controlled by the motor control circuits which are in parallel between the control-conductors M and the rails G, the battery of the leading or master-controller car being, when the contact-fingers b, b' are bridged by the strip k, between the wire b^2 and the control-conductor M.

The parts so far described being as shown on Fig. 3, let it be supposed that the controller K on the car P′ has been actuated so that the strip k connects the contact-fingers b and b'. The control circuit on this car will be from the battery B through the finger b', the strip k, the finger b, the wire b^2, the winding C, the shoe m^2, the section M² of the control-conductor M and the shoe m^3 back to the battery B. At the same time a portion of the battery current passes from the wire b^2 through the truck z to the traction rails G and thence through the truck z of the car P² through the wire b^2, the winding C, and the shoe m^2 of the car P² to the section M³ of the control-conductor M and thence along the section M² to the shoe m^3 and the battery B of the car P′. If there were other motor cars to the right of the car P² they would each receive current from the battery B of the car P′ in the same manner. The windings C of all the motor cars being simultaneously energized by the control-circuits just traced will all lift their plungers and cause all the switches S to bridge their contacts s' and s^2, thus closing the motor circuits and causing the rotation of all the motors on all the motor cars. When the strip is moved off from the contact-fingers b, b', all the windings C will be deënergized, whereupon the switches S will all fall and open all the motor circuits.

I have not shown any means for controlling the speed and direction of rotation of the motors as they form no part of the matter to be claimed in the present application. The construction shown in my application, Serial No. 340,469 discloses a satisfactory system of motor control which embodies the regulation of both the speed and direction of rotation of the motors. The system shown on Fig. 3 is the same as shown in my said application with all the controller points and speed controlling switches after the first omitted.

Each section is provided with two block switches R′ and R², one being located near each end of the section and at such a distance therefrom that, after the action of the automatic safety apparatus, presently to be described, a train will be brought to rest before reaching the beginning of the next block or section.

Each block has a master battery Q′ and a winding T′ of a master relay T bridged across the control conductor M and the rail G. The core of the winding T′ is secured to the movable switch member or contact T², which, when the winding is not energized, connects the stationary contacts t' and t^2, the latter being connected to the rail G, the oper-

ating battery Q^2 being included between said contact t^2 and the rail G. The contact t' is connected to the rail G through a pair of parallel windings v and u' at the block stations of the blocks adjacent to each end of the blocks, to which the master relay T belongs. To illustrate, the contact t' of the block D^2 is connected to the rail G through a pair of parallel windings v and u' of the block station R′ in the block D^3 and also to the rail G through another pair of parallel windings v and u' of the block station R^2 in the block D′. The contact t' of the block D′ is connected to the windings v and u' of the block station R′ in the block D^2 and to similar windings in the nearest end of the next block to the left.

Each winding v contains a core p^2 which is connected to the middle point of a cam-path p by a link p^3. The cam path is supported on the guide rods p^4 in brackets p^6 and p^7 on the base casting p^8. Helical springs p^9 surround the rods p^4 between the brackets p^6 and the side of the cam-path p and push the latter, when the winding v is not energized, so as to make it lie over the control-conductor M, as shown in Figs. 5 and 6. The cam-path is tapered at each end toward the conductor M so that the shoes m^2 and m^3 will ride over the same. The winding v is contained in the casing p' supported on the said base casting p^8.

Referring to Fig. 7, the shoe m^3 is shown in contact with the control conductor M and pivoted to the frame m^{15} carried by the insulating support m^4 secured to the truck frame m^5 of the car, represented by the wheel z. The shoe m^3 is pressed down and held in engagement with the control-conductor M by the spring m^6, surrounding the pin m^7 resting on the top of the shoe m^3 and sliding loosely up and down in the arm m^8 on the frame m^{15}. The upper end of this pin is arranged in line with and slightly below the lower end of the stem m^9 of the valve m^{10} in the air brake system of the train. The arrangement is such that when the shoe m^3 is raised by the cam-path p, the pin m^7 will lift the valve m^{10} from its seat in the train pipe connection m^{11}, causing a reduction of pressure in the train pipe and the consequent application of the brakes in a well-known manner. m^{12} is a latch pivoted to the arm m^8 and pressed toward the shoe m^3 by the spring m^{13}. Normally the shoe m^3 is below the seat m^{14} of the latch, but when the shoe rides up in the cam-path p, the shoe is caught and held in its raised position by the said seat m^{14}.

Each winding u' contains a movable core which controls the semaphore or other visual signal u in a manner well understood.

Fig. 3 shows the car P′ of a train wholly on the block D^3 and the car P^2 of the train about to leave the block D^3 and enter the block D^2, the shoes m^2 and m^3 contacting with both of the control conductors M^2 and M^3. The circuits of the windings T′ for the blocks D^2 and D^3, which are open when there is no train in these blocks, are now completed through the trucks z, the wires b^2, the windings C, the shoes m^2, and the conductor M, which causes these windings to become energized and lift the switches T^2 away from the contacts t' and t^2 for the blocks D^2 and D^3, thus opening the circuits which include the batteries Q^2 for the sections D^2 and D^3 and also the pairs of windings v and u' in the nearest block stations R′ and R^2 in adjacent blocks D′ and D^3. Inasmuch as the shoe m^3 is on the control-conductor section M^3, it will be seen that the battery Q′ for the block D^3 will energize the winding T for that block and open the circuit of the windings v and u' at the right hand end of the block D^2 and also at the left hand end of the block to the right of the block D^3. Consequently, the cam-paths of the station R^2 in the block D′, the station R′ in the block D^3, and the station R^2 in the block D^2 will be pushed by their springs so as to lie on the control-conductor M, as shown, and the semaphores of these stations will all be set at danger. The section D′ being supposed to be clear, the switch T is closed, and the cam-path of the station R′ in the block D^2 is withdrawn and the corresponding semaphore is set at safety. As soon as the shoe m^2 of the car P^2, or the last motor car in the train, passes from the section M^3 of the control-conductor, the battery Q′ of the block D^3 will have its cireuit opened, whereupon the corresponding switch T^2 will fall and close the circuit of the battery Q^2 for said block. The cam-paths in the stations R^2 in the block D^2, and R′ in the block at the rear of the block D^3 will be withdrawn and the corresponding semaphores will be set at safety. As soon as the shoes m^2 and m^3 of the leading car P′ leave the section M^2 of the control-conductor, the cam-path of the station R^2 in the block D′ will be retired and the corresponding semaphore will be lowered owing to the deënergizing of the battery Q′, and the consequent energizing of the battery Q^2 of the block D^2.

It will be readily understood that when a train approaches an occupied block the safety switches guarding that block will be in the positions shown in Figs. 5, 6, and 7, and should the operator fail to observe the visual signal and cut off his power and apply the brakes, the contact shoe m^3 of the leading car of the train will ride up on the cam-path p, which is made of insulating material, thereby interrupting the control circuit and cutting off the power from all the motors on the train. At the same time the valve m^{10} will be opened, thereby applying the brakes and bringing the train to rest. The shoe m^3 will be held in the elevated position and out of contact with the control-conductor by the latch m^{12}. As soon as the semaphore or

other visual signal shows clear, the operator may release the latch and proceed into the following block.

It will be understood from the foregoing description that my invention affords means for automatically warning the motorman of a train approaching an occupied block from either direction and is retroactive in the case of trains approaching each other in opposite directions. Thus, if there were a train on the block D^2 moving toward the right and a train on the block D^3 moving toward the left, the motorman on the first train would be warned by the signal *u* in the station R^2 in his block, and if he did not cut off his power in time it would be cut off and the brakes automatically applied by the action of the cam-path *p* on the switch or shoe m^3, which would be automatically lifted from the control-conductor and held in such lifted position by said latch. Similarly the motorman of the second train would be warned by the signal *u* in the station R′ in the block D^3, and if he did not cut off his power in time, it would be automatically cut off and the brakes applied. So that, even if the two trains should reach the respective safety switches or stations R′ and R^2 at the same instant and running at full speed, and the two motormen should each fail to see the signal and cut off power and apply the brakes, this would be automatically accomplished and the trains brought to rest before they could come together. It will be understood, therefore, that my invention doubly safeguards against trains approaching each other, as is commonly the case in a single track road and is a fruitful source of accidents on roads having a plurality of tracks in cases where a train for some reason is compelled to "back". It is obvious also that when a train is to be signaled to stop at a station (as for orders) the same manual mechanism that is used to operate the usual semaphore or other visual signal may be made to operate a cam-path such as shown in Figs. 5, 6, and 7, the manual operating means shown in Fig. 9, taking the place of the solenoid p^1, thus absolutely preventing the motorman running past a point where a stop is required. Further when it becomes necessary to flag a train between blocks (as on account of the destruction of a bridge or other derangement of the roadway) a portable cam-path may be applied to the control conductor, thus compelling the train to stop whether or not the motorman sees such danger signal as may be displayed.

I claim—

1. In an electric railway, a stationary control conductor along said railway, a car on said railway, a motor or motors, electrically actuated controlling mechanism, and a master switch all on said car, a traveling contact carried by said car for normally connecting said master switch with said stationary control conductor, a second traveling contact carried by said car for connecting said electrically actuated controlling mechanism with said stationary control conductor and stationary means for opening the traveling connection between said master switch and said stationary control conductor.

2. In an electrically operated railway, a stationary control conductor along said railway, a train of cars on said railway, propelling motors and electrically actuated controlling means therefor on certain of the cars of said train, a master switch on one of the cars of said train, a traveling contact carried by said car for connecting said master switch to said stationary control conductor, traveling contacts carried by the other electrically equipped cars of said train for connecting their respective electrically actuated controlling means with said stationary control conductor, and automatic means for interrupting the traveling contact between said master switch and said stationary control conductor.

3. In an electric railway, the combination of a train of cars on said railway, driving motors and electrically actuated controlling mechanism on certain of the cars of said train, a master switch on one of said cars, a source of control current on the car with said master switch, one side of the electrically actuated controlling mechanism on each of the electrically equipped cars being connected to said source of control current and said master switch by means of traveling contacts engaging with said stationary control conductor, the other side of each of the electrically actuated controlling mechanisms being connected to said source of control current through the rails of said railway, and stationary means along said railway for interrupting the connection between said source of control current and said stationary control conductor.

4. In an electric railway, the combination of a train of cars on said railway, driving motors and electrically actuated controlling mechanism on certain of the cars of said train, a master switch on one of said cars, a source of control current on the car with said master switch, one side of the electrically actuated controlling mechanism on each of the electrically equipped cars being connected to said source of control current and said master switch by means of traveling contacts engaging with said stationary control conductor, the other side of each of the electrically actuated controlling mechanisms being connected to said source of control current through the rails of said railway, and means brought into action by the proximity of another train for opening the connection between said source of control current and said stationary control conductor.

5. In an electrically operated railway, a

stationary control conductor divided into sections, a train of cars on said railway, driving motors and electrically operated controlling mechanism on certain of said cars, a master switch on one of said cars, one side of the control circuits on each of the cars equipped with motors being connected to said master switch by means of traveling contacts engaging said stationary control conductor, the other side of each of the controlling circuits being connected to the master switch through the rails of said railway, and automatic means governed by the electrical connection between a section of said control conductor and the rails of said railway for opening the connection between said master switch and said stationary control conductor as the train approaches said section.

6. In an electrically operated railway, a stationary control conductor divided into sections, a train of cars on said railway, driving motors and electrically operated controlling mechanism on certain of said cars, one side of the control circuit on each of the electrically equipped cars being connected through a traveling contact with said control conductor, the other side of the control circuit on each of said cars being connected to the rails of said railway, and automatic means governed by the presence of a train on a given section and connecting the control conductor with the rails through the control circuits on the train for preventing a train from entering that section.

7. In an electrically operated railway, a stationary control conductor divided into sections, a master switch by means of which the motors of the train are normally controlled by governing the flow of current through said control conductor and the rails of said railway, and automatic means governed by the presence of a train on a given section which connects the control conductor with the rails through the controlling circuits on the train for warning a train approaching said section from either direction that said section is occupied.

8. In an electric railway system, a train of cars containing a plurality of motor cars, a stationary control-conductor divided into sections, a second stationary conductor, a master switch on one of the cars, a control circuit, in which the control current travels on one conductor from the master car to the control apparatus on the other cars and on the other conductor from the said control apparatus to the master switch, and automatic means governed by electrical connection between a section on said control conductor and the rails of said railway for preventing a train from entering said section.

9. In an electrically operated railway, a stationary control conductor divided into sections, a train of cars on said railway, driving motors and electrically operated controlling mechanism on certain of said cars, the electrical controlling devices on said cars being connected in parallel between said stationary control conductor and the rails of said railway, and automatic means governed by a train either running or standing on a given section which thus connects the control conductor with the rails through the control circuits for cutting off the power from a train approaching said occupied section.

10. In an electrically operated railway, the combination of a control conductor, divided into sections, a motor car, a motor or motors thereon for driving the same, a controller for said motor or motors, and electrically operated means energized from said control conductor and actuated independently of the said controller for automatically cutting off the power from a train about to enter the section occupied by said car.

11. In an electrically operated railway, the combination of a control conductor, divided into sections, a motor car, a motor or motors thereon for driving the same, a controller for said motor or motors, and electrically operated means energized from said control conductor and actuated independently of the said controller for automatically warning a train about to enter said section that said section is occupied.

12. In an electrically operated railway, the combination of a control conductor, divided into sections, a motor car, a motor or motors thereon for driving the same, a controller for said motor or motors, and electrically operated means energized from said control conductor and actuated independently of the said controller for automatically cutting off the power and applying the brakes on a train about to enter the section occupied by said car.

13. In an electrically operated railway, a visual danger signal, a stationary control conductor divided into sections, a master switch by means of which the motors of the train are normally controlled by governing the flow of current through said control conductor and the rails of said railway, and automatic means governed by the presence of a train on a given section which connects the control conductor with the rails through the controlling circuits on the train for displaying said danger signal to a train approaching said occupied section.

14. In an electrically operated railway, a stationary control conductor divided into sections, a master switch by means of which the motors of the train are normally controlled by governing the flow of current through said control conductor and the rails of said railway, and automatic means governed by the presence of a train on a given section which connects the control conductor with the rails through the controlling cir-

cuits on the train for cutting off the power from a train approaching said occupied section from either direction.

15. In an electrically operated railway, a stationary control conductor divided into sections, a master switch by means of which the motors of the train are normally controlled by governing the flow of current through said control conductor and the rails of said railway, and automatic means governed by the presence of a train on a given section which connects the control conductor with the rails through the controlling circuits on the train for automatically cutting off the power and applying the brakes on a train approaching said occupied section from either direction.

16. In an electrically operated railway, a visual danger signal, a stationary control conductor divided into sections, a master switch by means of which the motors of the train are normally controlled by governing the flow of current through said control conductor and the rails of said railway, and automatic means governed by the presence of a train on a given section which connects the control conductor with the rails through the controlling circuits on the train for displaying said danger signal to a train approaching said occupied section from either direction.

17. In an electrically operated railway, a visual danger signal, a stationary control conductor divided into sections, a master switch by means of which the motors of the train are normally controlled by governing the flow of current through said control conductor and the rails of said railway, and automatic means governed by the presence of a train on a given section which connects the control conductor with the rails through the controlling circuits on the train for displaying said danger signal to a train approaching said occupied section and, in case said signal is not heeded, for cutting off the supply of power from said train.

18. In an electrically operated railway having thereon a train with a plurality of motor operated cars, a stationary control-conductor along said railway, a train on said railway having a plurality of motor cars therein, a master-switch and a contact-shoe carried by the leading car of said train and coöperating with said control-conductor to connect said master-switch with the motor controlling mechanism on the various motor cars of said train, and stationary means along said railway for automatically raising said contact shoe from engagement with said stationary control-conductor.

19. In an electrically operated railway, a stationary control-conductor along said railway, a train on said railway, having a plurality of motor cars therein, a master-switch and a contact shoe carried by the leading car of said train and coöperating with said control-conductor to connect the master-switch with the motor controlling mechanism on the various motor cars of said train, stationary means along said railway for automatically raising said contact shoe from engagement with said stationary control-conductor, and means for holding said shoe in said raised position.

20. In an electrically operated railway, a stationary control-conductor along said railway, a train on said railway having a plurality of motor cars therein, a master-switch and a contact shoe carried by the leading car of said train and coöperating with said control-conductor to connect the master-switch with the motor controlling mechanism on the various motor cars of said train, stationary means along said railway for automatically raising said contact-shoe from engagement with said stationary control-conductor, means for holding said shoe in said raised position, and means for causing said contact shoe when raised to apply the brakes on said train.

21. In an electric railway, a sectional control-conductor along said railway, a train on said railway having a plurality of motor cars therein, a master-switch and a contact-shoe carried by one of the cars of said train and adapted to coöperate with said control-conductor in such manner as to connect the master-switch on said car with the motor-controlling devices on another motor car, and means actuated by the presence of a train on an adjacent section for automatically disengaging said contact-shoe from said control-conductor when said train approaches said occupied section.

22. In an electric railway, a sectional control-conductor along said railway, a train on said railway having a plurality of motor cars therein, a master-switch and a contact-shoe carried by one of the cars of said train and adapted to coöperate with said control-conductor in such manner as to connect the master switch on said car with the motor controlling devices on another motor car, and means actuated by the presence of a train on an adjacent section for automatically disengaging said contact-shoe from said control-conductor and automatically applying the brakes when said train approaches said occupied section.

23. In an electrically operated railway, a sectional control conductor along said railway, a battery for each section, a master-relay for each section having its winding connected through said battery to the control-conductor and to one of the rails of said railway, and signal apparatus near either end of each section of said control-conductor controlled by the relay.

24. In a protective system for railways, the combination of a stationary control conductor along said railway, said control

conductor being divided into blocks or sections, and a separate automatic signaling apparatus placed within minimum train stopping distance of each end of each section of the control conductor.

25. In a protective system for railways, the combination of a stationary control conductor along said railway, said control conductor being divided into blocks or sections, and a separate automatic signaling and automatic train stopping apparatus placed within minimum train stopping distance of each end of each section of the control conductor.

26. In an electric railway, the combination of a stationary control conductor divided into insulated sections along said railway, motor driven cars on said railway, magnetically actuated control mechanism on said motor driven cars, the windings of said magnetically actuated control mechanism being connected between the rails of said railway and said control conductor, and a separate automatically operated electric signaling apparatus near each end of each section of said control conductor, said signaling apparatus having an actuating circuit which is normally open between the rails of said railway and said control conductor, said circuit being closed through the windings of the control mechanism when there is a motor driven car on a given block or section.

Signed at Cleveland Ohio this 2nd day of March 1907.

ARTHUR C. EASTWOOD.

Witnesses:
C. PIRTLE,
J. H. HALL.