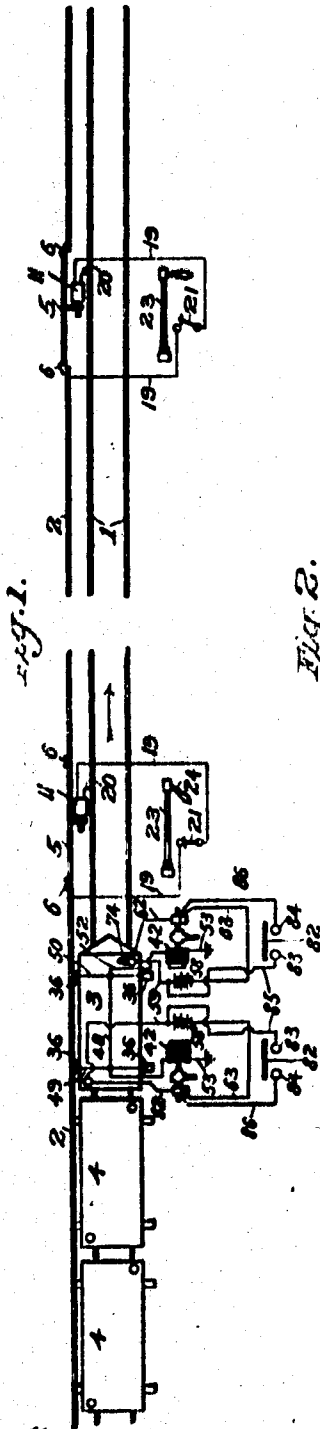


W. J. WILGUS.
 AUTOMATIC STOPPING MECHANISM FOR RAILWAY TRAINS.
 APPLICATION FILED MAR. 21, 1909.

946,298.

Patented Jan. 11, 1910.

4 SHEETS—SHEET 1.



Witnesses:
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Fig. 2.

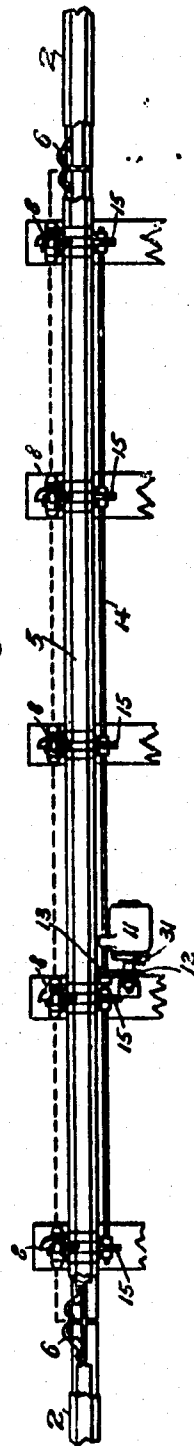


Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.



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 AUTOMATIC STOPPING MECHANISM FOR RAILWAY TRAINS.
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4 SHEETS—SHEET 2.

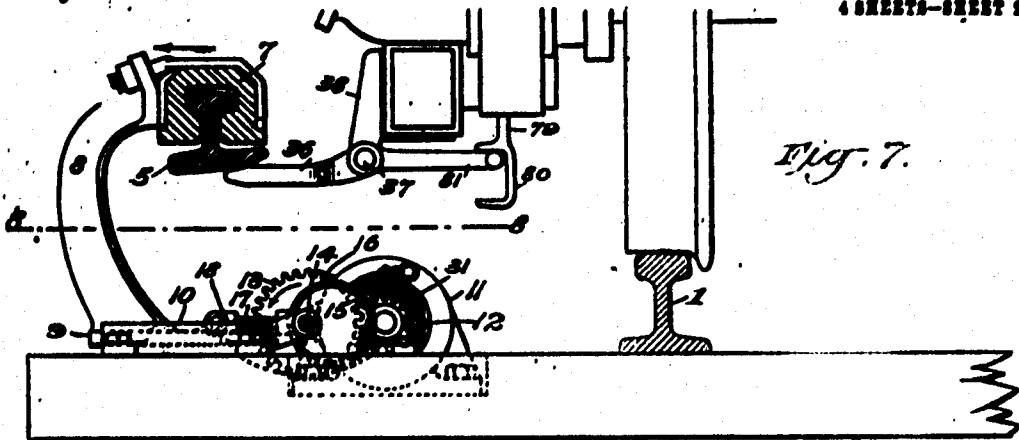


Fig. 7.

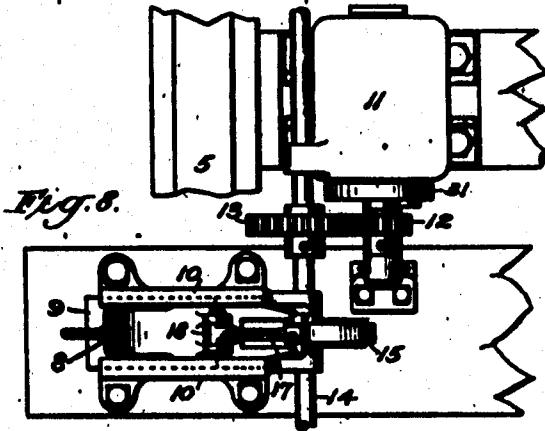


Fig. 8.

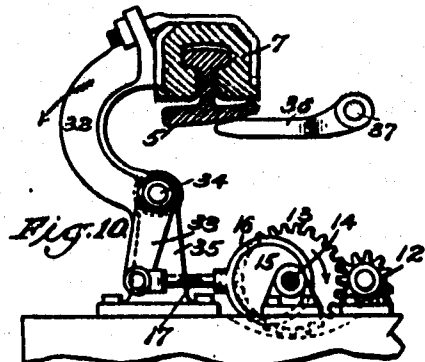


Fig. 10.

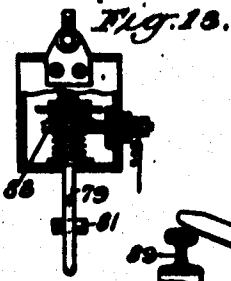


Fig. 13.

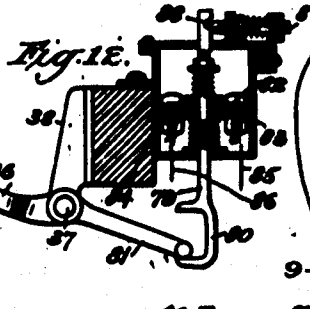


Fig. 15.

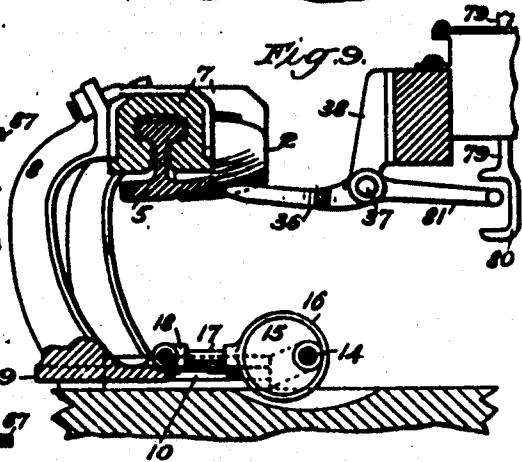


Fig. 9.

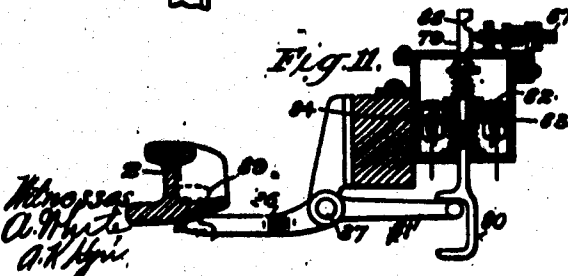


Fig. 11.

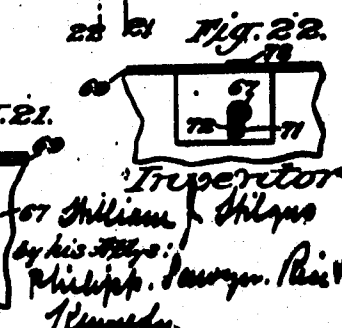
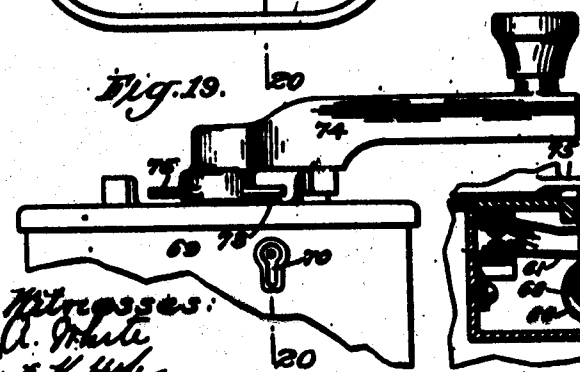
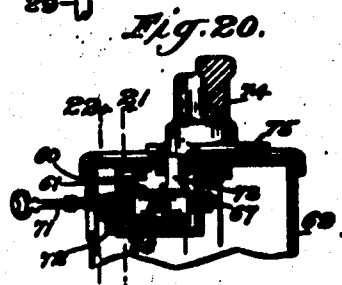
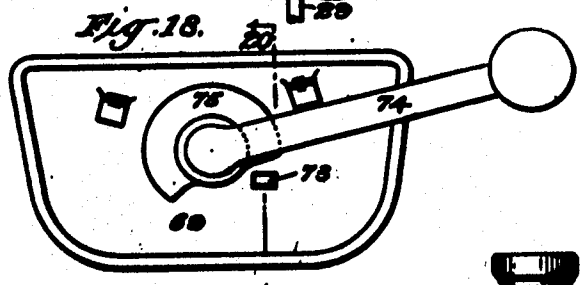
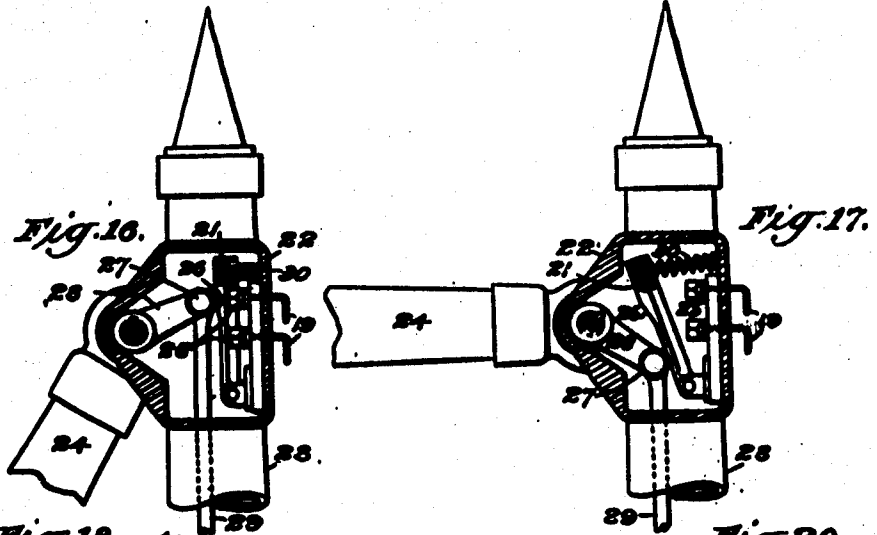
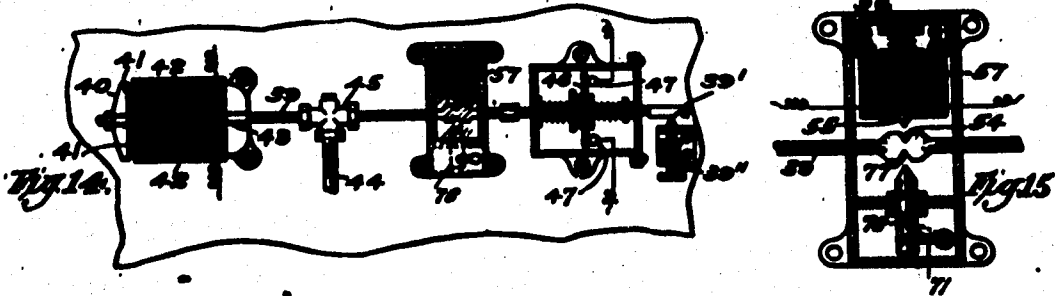
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 AUTOMATIC STOPPING MECHANISM FOR RAILWAY TRAINS.
 APPLICATION FILED MAR. 31, 1906.

946,298.

Patented Jan. 11, 1910.
 4 SHEETS-SHEET 2.



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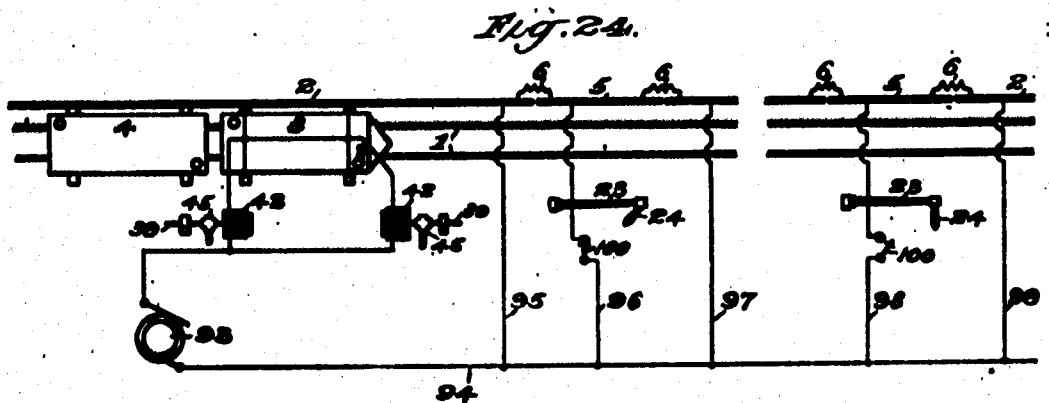
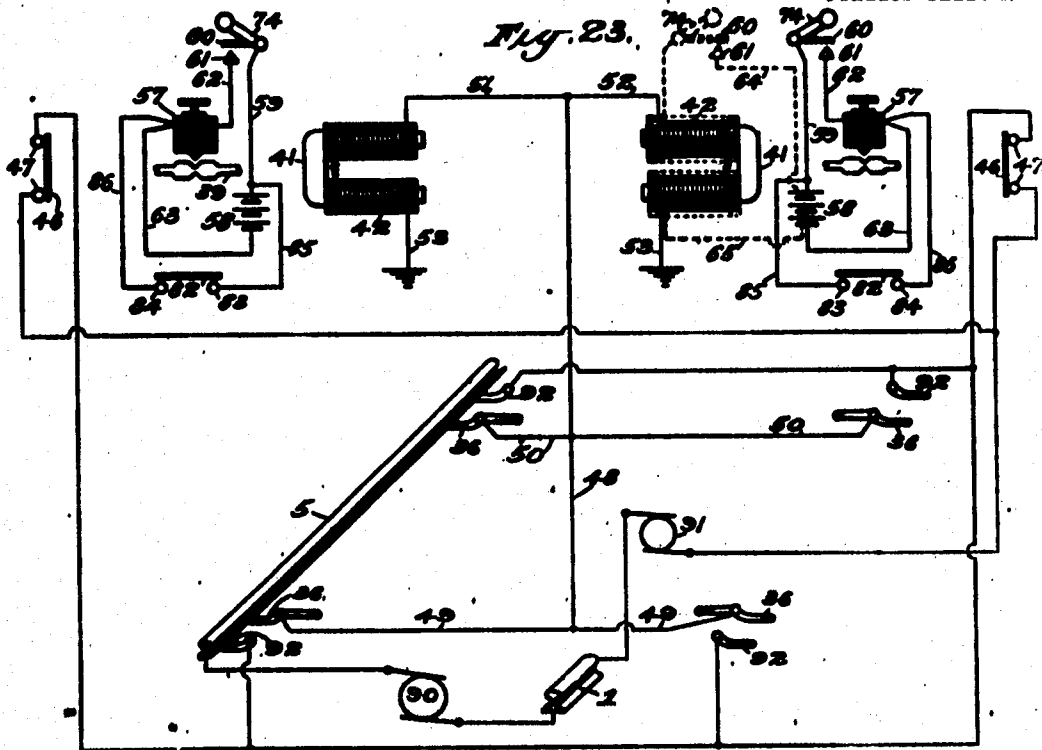
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 Kennedy.

W. J. WILGUS.
 AUTOMATIC STOPPING MECHANISM FOR RAILWAY TRAINS.
 APPLICATION FILED MAR. 31, 1909.

946,898.

Patented Jan. 11, 1910.

4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

WILLIAM J. WILGUS, OF NEW YORK, N. Y.

AUTOMATIC STOPPING MECHANISM FOR RAILWAY-TRAINS.

940,228.

Specification of Letters Patent. Patented Jan. 11, 1910.

Application filed March 21, 1903. Serial No. 422,430.

To all whom it may concern:

Be it known that I, WILLIAM J. WILGUS, a citizen of the United States, residing at New York, county of New York, and State of New York, have invented certain new and useful Improvements in Automatic Stopping Mechanism for Railway-Trains, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to certain improvements in automatic stopping mechanism for railway trains.

In the operation of railways, and particularly in the operation of electrically operated railways, on which high speed and frequent service are maintained, it is desirable that the trains be provided with stopping devices which shall operate to prevent a train from passing a signal which is in stop position. It will be understood, of course, that such roads are usually divided into blocks which are marked by suitable signals, such signals being also used in connection with switches, and the purpose of the automatic stopping mechanism is to prevent the driver of the train from running by a signal which is set against him in ignorance of the condition of the signal.

It is the object of this invention to produce an improved stopping mechanism which shall be of such a character as to prevent the driver of a train from running by a signal which is set against him without his being apprised of that fact.

A further object of the invention is to produce an improved automatic stopping mechanism for railroad trains which shall be of such a character that the driver of the train is prevented from running by a signal which is set against him without being apprised of that fact but which also enables him to pass such a signal if the conditions render it necessary.

The invention further extends to certain improvements in details of construction by which the objects referred to are carried into effect.

With these and other objects in view, the invention consists in certain constructions, and in certain parts, improvements and combinations as will be hereinafter fully described and then specifically pointed out in the claims.

In the accompanying drawings,—Figure

1 is a diagrammatic plan view of a section of a railroad equipped with one form of the improved automatic stopping mechanism, this view also illustrating the circuits employed. Fig. 2 is a plan view, on an enlarged scale, of one form of a stop mechanism controlling-section which may form a part of the working conductor. Figs. 3, 4, 5 and 6 are diagrammatic details illustrating the operation of a form of mechanism which may be employed to prevent the operation of a stopping mechanism when breaks occur in the working conductor. Fig. 7 is a detail sectional elevation, on a large scale, of one form of mechanism for effecting the operation of the controlling section of the working conductor. Fig. 8 is a plan view of the construction shown in Fig. 1, the view being taken on the line 8—8 of Fig. 7. Fig. 9 is a view similar to Fig. 7 showing the parts in a different position. Fig. 10 illustrates a modified form of the construction illustrated in Fig. 7. Fig. 11 is a view illustrating a construction of tripping mechanism which may be employed to prevent the operation of the stopping devices under certain conditions. Fig. 12 is a view similar to Fig. 11 but showing the parts in a different position. Fig. 13 is a detail of the construction illustrated in Figs. 11 and 12. Fig. 14 is a plan view of a certain construction of actuator mechanism for the stopping devices which may be employed in carrying the invention into effect. Fig. 15 is an enlarged detail view of a part of the construction shown in Fig. 14. Fig. 16 is a view, partly in section, illustrating a form of signal and circuit controller which may be employed. Fig. 17 is a view similar to Fig. 16, but showing the parts in different positions. Figs. 18, 19, 20, 21 and 22 are detail views illustrating certain features of construction by which the driver is enabled to pass a signal set against him if such action is necessary. Fig. 23 is a diagrammatic view illustrating the circuits which may be employed in connection with one form of the improved stopping mechanism. Fig. 24 is a diagrammatic view of the circuits which may be employed in connection with another form of the improved stopping mechanism.

Referring to the drawings, and more particularly to Fig. 1, the track-rails are indicated at 1 and the working conductor at 2. This working conductor may be of any usual

description, such, for instance, as a third-rail or an over-head conductor, the third-rail type, however, being shown. It will be understood that the primary function of this conductor is to supply the current which furnishes the motive power for the motors of the trains, where the invention is employed in connection with electrically operated trains. An electric-locomotive or car is indicated at 3, said locomotive or car being represented as attached to other cars, indicated at 4.

In what are regarded as the best constructions for carrying the invention into effect, the working-conductor will embody what may be termed a controlling section of short length, this section being indicated at 5. The purpose of this section is to control, through proper agencies, the stopping devices on the car, locomotive or train, at the time a signal is set against the driver of the train, and while the length of the controlling section may be varied, it should not be longer than the length of a train, and, in the best forms of constructions, it will be less in length than an ordinary car; it being understood that the term "car", as used in the specification, is meant to include any form of car or locomotive. In the best constructions embodying the invention means will be employed for rendering this controlling-section operative or inoperative with respect to the stopping devices to be hereinafter described, and these means are, in the construction illustrated, of such a character as to be controlled from the signal employed. According to one form of construction illustrated (see Fig. 2) this controlling-section is made inoperative by changing or shifting its position. When the invention is carried into effect by a construction in which the controlling section is made inoperative by change of position, the continuity of the working conductor may be caused to remain undisturbed, notwithstanding this change in position by suitable connections. In the construction illustrated in Fig. 2, this is effected by connecting the ends of the section with the conductor by flexible bonds 6. The movement given the controlling section by which its position is changed or shifted, when the invention is carried into effect by the use of such a section, may be effected by means differing widely in character. The drawings illustrate two forms of construction for effecting this change in position.

Referring to the construction illustrated in Figs. 2 and 7, the controlling-section 5 of the third-rail is carried by insulators 7 of a usual form, these insulators being in turn carried by brackets 8. These brackets may be provided with feet 9 arranged to slide between ways 10 formed on a suitable base which supports the brackets, so that the

brackets may be moved to carry the movable section into and out of line with the working-conductor.

Where the invention is carried into effect by the employment of a movable section, a suitable positioning mechanism will be used for determining the position of the section. While this mechanism may be varied widely in its construction, as shown it includes a motor, indicated at 11, the shaft of this motor being provided with a gear 12 in mesh with a gear 13 on a shaft 14 extending along the movable-section, as illustrated in Fig. 2. This shaft may be provided with a plurality of eccentrics 15, one for each of the carrying brackets for the controlling section. 5, the strap 16 of each eccentric being connected by a rod 17 to a socket 18, these sockets being pivoted to the feet of the brackets. It will be apparent that when the motor shaft is turned, the brackets will be moved and the controlling section will be also moved.

Where a movable controlling section, the movement of which is determined by a positioning-device is employed, the positioning-device may be under the control of the signal. The means by which the signal controls the positioning device when the signal is employed for this purpose, may be varied widely. In the particular construction illustrated in Figs. 1, 2 and 7 to 10 inclusive, the motor is operated on a closed circuit which may, as shown (see Fig. 1) derive its current from the working conductor. In this figure, the wire leading into the motor is marked 19 and the ground wire leading from the motor is marked 20, it being shown as connected to one of the track rails.

A circuit controller is indicated at 21. This circuit controller (see Figs. 16 and 17) may be conveniently mounted in a box 22 carried on a post 23 which supports the signal, the signal chosen for the purpose of illustration being the ordinary semaphore, the arm of which is indicated at 24. This circuit-controller or switch 21 may consist of a pivoted arm, as shown, arranged to bridge a pair of terminals 25 in the branch 19 of the circuit referred to. This pivoted arm may be formed with a cam surface 26 arranged to be struck by a roller 27 on the crank arm 28 by which the semaphore arm is operated, the crank arm being in turn connected to the usual operating rod 29. A spring, as 30, may be employed to force the circuit controller away from the terminals when the semaphore arm is at the danger position, as indicated in Fig. 17.

The motor may be provided with suitable means, as, for instance, a spiral spring 31 on its shaft which tends to turn the motor shaft in a direction contrary to that in which it is moved by the current passing through the motor. With the construction

so far described, it will be understood that when the semaphore arm or other form of signal is set at danger, the circuit through the motor will be open, thus cutting off the current supplied to the motor. The spring 31 will, therefore, be free to operate and will turn the motor shaft. The rotation of the motor shaft by the spring will turn the shaft 14 which through the eccentrics and connections described will slide back the brackets carrying the movable controlling section from the position shown in Fig. 7 to the position shown in Fig. 9.

Instead of employing a sliding construction for the brackets, the brackets may be constructed as bell-cranks (see Fig. 10) one arm of the bell-cranks being marked 32 and the other marked 33. These bell-cranks may be pivoted at 34 to standards 35 and the connecting rods 17 of the eccentric straps may be connected to the arms 33. With this form of construction, the brackets, when the eccentric shaft is operated will be rocked to shift the position of the movable controlling section.

In constructions embodying the invention, the operation of the stopping devices to be hereinafter described will depend upon varying the electrical relation of the stopping devices with respect to the working-conductor, and suitable means will, therefore, be employed to place said stopping devices in electrical connection with the working-conductor. While these means may be varied, they may include a collector shoe of the usual type employed in third-rail construction, such a shoe being indicated at 36, in Fig. 7. This shoe is pivoted at 37 to a bracket 38 suitably supported on the car structure and being maintained in operative position by the usual torsion spring, not shown. The stopping devices employed may be made effective either through the braking mechanism of the car or by cutting off the power from the car, or through both these agencies. In the particular construction illustrated, the stopping devices are made effective through both these agencies.

While the particular construction of stopping devices employed may be varied, in the best constructions, they will include an actuator which may be electrically operated. In the particular construction illustrated, this actuator includes (see Fig. 14) a sliding rod 39, this rod being suitably connected to an armature 40, which armature is in turn connected to the cores 41 of a double solenoid, the windings of which are indicated at 42. This rod 39 may be provided with a suitable returning spring, such as indicated at 43, by which the rod may be moved in a direction opposite to the movement produced by the cores of the solenoid when it is energized. The main train pipe for the air brakes is indicated at 44 and the rod is shown as

passing through a valve 45, the construction being such that a movement of the rod in one direction will vent the train pipe, thus causing the brakes to be applied, in the manner well known in the construction of air brakes, and a movement of the rod in the opposite direction will close the vent. The details of construction by which this is effected are well understood in the art and, for that reason, are not illustrated or described.

When, as in the construction shown, it is desired to effect the stopping of the train not only by applying the brakes but also by cutting off the power, the rod 39 of the actuator may carry a circuit breaker, as 46, which may be arranged to bridge a pair of terminals 47 in the wiring of the motor.

In the best constructions employing the invention, the actuator will operate on a closed circuit so that any defect in or disarrangement of the apparatus will be at once noticed. In the particular construction illustrated, the actuator mechanism is directly in circuit with the working-conductor. The circuits will be readily understood from the diagram, Fig. 23, in which the circuits shown are those which may be employed in an ordinary double-ended car. Referring to this figure, four collectors 36 are shown, inasmuch as four collectors would ordinarily be used on the car. The main-line wire is indicated at 48 and from this wire branches 49 lead to two of the collectors 36 and branches 50 to the other two collectors 36. The wire 48 divides into two branches, 51, 52, one of these branches leading to the solenoid 42 at one end of the car and the other to the solenoid 42 at the other end of the car. The ground wires for the solenoids are indicated at 53.

It will be observed that when the parts are in the position shown in Fig. 23, that is to say, when the collectors 36 are in contact with the controlling section, the circuit will be made through one or the other of the solenoids 42, according to whether the car is running in one direction or the other. When, however, the movable controlling section 5 is shifted so as to be out of contact with the collectors 36, as will be the case in the apparatus so far described when the semaphore arm is set at danger, the circuit through the solenoid will be broken. When the circuit is thus broken (referring to Fig. 14) the spring 43 will operate to move the rod 39, thus venting the train pipe and at the same time breaking the control wiring circuit, so as to cut off the power from the motor. With the apparatus so far described, therefore, it will be understood that it will not be possible for the driver to run by a signal set at danger, for the reason that when the signal is set at danger, the circuit through the actuating mechanism for the stopping

devices is necessarily broken, so that the brakes will be set and the power cut off. Should the train be under such headway as to coast, after the power has been cut off and the brakes applied, beyond the break in the working conductor formed by shifting the controlling-section, it is apparent that the collectors 36 would be again in condition to pick up current from the working-conductor, so that immediately the break was passed, the solenoid 42 would be energized. As soon as this happened, the rod 39 would be pulled over and the switch 46 caused to bridge the terminals 47, thus restoring the current to the motor circuit. A careless driver, therefore, might find himself in the condition where the brakes of his train were applied and the motor endeavoring to drive the train against the pressure of the brakes. Means which may be varied widely in construction may be employed for the purpose of preventing such a condition as this. In the particular construction shown, the end of the rod 39 is provided with a notch 39' which, when the current is shut off from the solenoid 42 and the rod 39 shifted, is engaged by a spring latch 39". This latch will be sufficiently strong to hold the rod against movement even after the solenoid has been energized, and will, therefore, prevent such a movement of the rod as will close the motor circuit. This latch will be provided with a suitable handle which may be seized by the driver to release the latch.

In practical railroading, it is frequently desirable and sometimes necessary for the driver of a train to pass a signal set at danger and to proceed to the next signal cautiously. While with the short controlling-section it might be possible to cause the train to coast the gap by getting up sufficient speed even though the brakes were set and the power cut off, yet this would be undesirable on account of the strain on the equipment, and, further, because it would result in annoyance to the passengers. In the best constructions involving the invention, therefore, means will be provided whereby the driver may prevent the action of the stopping devices under certain circumstances, so that it may be possible for him to pass a signal set against him. The means employed by which the driver is enabled to prevent the action of the stopping devices in the manner referred to may be widely varied. They may, however, conveniently include a locking mechanism for the actuator. In the particular construction illustrated, the actuator rod 39 is provided with a notch 54 which may be engaged by a locking bolt 55. The operating means for the locking mechanism may be widely varied and will be varied according to the character of the locking mechanism employed. It may, however, conveniently include a local circuit un-

der the control of the driver. In the particular construction illustrated, the locking bolt 55 is carried on the armature 56 of an electro-magnet 57. The circuit for this magnet 57 is shown in the diagram Fig. 23, the current for the magnet being supplied from a battery, indicated at 58. From the battery the current goes by a wire 59 to a switch 60. When the circuit is closed this switch 60 is in contact with the terminal 61 from which the current is led into the magnet 57 by a wire 62. The return from the magnet to the battery is by the wire 63. It is apparent that when this local circuit is closed and the magnet 57 energized, the locking bolt will engage the notch in the actuator rod and prevent the movement of the rod, even though the circuit through the solenoid 42 be interrupted.

A modification of the locking mechanism is also illustrated in Fig. 23 which presents some advantages. In this construction, the current from the battery is carried by independent wiring around the spools of the solenoid, the circuit being indicated by the dotted lines 64, 65. In the construction indicated in dotted lines, the lock will be effected by the battery current operating through the solenoid even though the circuit from the working conductor through the solenoid is interrupted.

While it is desirable, as has been pointed out, to permit the driver, under certain circumstances, to prevent the operation of the stopping devices, the construction should not be such as to permit an indefinite suspension of the operation of these devices, or such that a careless driver might overlook the fact that he has prevented the action of the stopping devices and so fail to restore them to operative condition. For these reasons, therefore, in the best constructions, the mechanism for preventing the operation of the stopping devices, under the circumstances referred to, will be of such a character that the stopping devices will be automatically restored to action as soon as the driver removes his hand from the interrupting or preventing mechanism. While the means employed for this purpose may be varied, in the construction illustrated the switch 60 (see Fig. 21) is arranged to be operated by a cam 66 on a shaft 67, this shaft being provided with a spring 68 which normally holds the shaft in the position shown in Fig. 21 in which the circuit is normally open, the switch 60 being away from the terminal 61. This switch may be conveniently located in a box in a controller case 69, which case may be provided with a key-hole, as 70, through which a key 71 for operating the shaft may be inserted. The shaft 67, see Fig. 22, may be provided with a projection 72 which is engaged by the key in the usual manner. The construction is such,

however, that the spring 68 will return the shaft as soon as the pressure is removed from the key, so that the circuit controlled by the switch 60 will be normally open. In other words, the mechanism for locking the actuator will be inoperative except during the period of positive operation by the driver.

When the driver sees a signal set against him but conditions are such that he is nevertheless required to pass the signal, he should be compelled to do so at reduced speed, the usual rule being that the train shall come to a full stop and then proceed with caution past the signal.

In the best construction involving the invention, means will be provided to prevent the operation of the mechanism for suspending the action of the stopping devices except when the train is moving at a predetermined speed. The mechanism for carrying this into effect may be widely varied. In the particular construction illustrated, there is provided (see Figs. 18 to 21) a locking bolt 73 which bears on the cam 68 before referred to. The controller handle 74 of the motor is provided with suitable means for controlling this bolt, such, for instance, as a flange 75 fast thereon. The controller handle is shown in stop position in Fig. 18, and it will be seen that it must be approached very nearly to this position before the bolt 73 will be free to operate, so that the speed of the car must be reduced almost to a minimum before the bolt 73 can pass the flange 75, that is, before the key 71 can turn the shaft 67.

Under certain circumstances, it may be desirable to prevent the operation of the stopping devices altogether, as, for instance, when a car is provided with stopping devices at each end, one set or the other should be out of commission, according to the direction in which the car is running. Again, if the train being operated is of the multiple unit type it will be unnecessary, and, indeed, undesirable, to have any stopping devices in operation except those on the front end of the leading car. For these and other reasons, therefore, means should be provided for preventing the operation of the stopping devices for a greater or less time, according to the operating conditions. While this may be done in various ways, it may be conveniently effected by providing the actuator rod 89 with a notch 77, this notch being engaged by a lock bolt 78 operated by the key 71. Various safeguards may be provided for preventing the unauthorized operation of this lock bolt 78. In the best constructions, however, it will be made so as to be operated by the same key which operates the mechanism for closing the local circuit, and the construction should be such that the key cannot be drawn from the lock except

when the bolt is in inoperative condition, that is, when it is not in engagement with the actuator rod. In order, therefore, for the driver to be provided with the key for temporarily preventing the operation of the stopping devices, he must be sure that the bolt 78 is in inoperative position.

Where the invention is carried into effect by the use of collectors operating in connection with a working-conductor, means should be provided for automatically preventing the operation of the stopping devices at breaks in the conductor where track conditions require such breaks and where no stop is intended. The automatic mechanism employed for thus preventing the operation of the stopping devices may be widely varied. In the construction illustrated, there is provided a tripping mechanism which is automatically actuated and which, through proper agencies, prevents the operation of the actuator. Referring to Figs. 11 to 13, the tripping mechanism includes a tripping rod 79, the lower end of which is formed with an open-hook 80 which hook is engaged by an operating arm 81 which may be conveniently formed in one piece with the collector 36, this arm extending rearwardly from the pivotal point of the collector. This tripping rod 79 may be provided with a circuit closer 82 arranged to bridge the terminals 83, 84 of a circuit which may be caused to control the actuator locking devices before described. Referring to Fig. 23, the circuit-closer or switch 82 is located in a circuit leading from the battery 58 before described. This circuit may comprise a wire 85 leading to the terminal 83, a wire 86 leading from the terminal to the magnet, the return to the battery being by the wire 60 before referred to. A suitable locking mechanism may be employed in connection with this tripping rod 79, such, for instance, as a spring bolt 87 (see Fig. 12) engaging with a notch 88 in the shank of the tripping rod.

Means should be provided for operating the tripping mechanism when such mechanism is employed for the purposes referred to, and these means should be located in such a way as to automatically operate the tripping mechanism when a break occurs in the working-conductor. In the particular construction shown (see Figs. 3 to 6 inclusive) there is provided an inclined block 89, this block being located at a break in the conductor, the purpose of which is to rock the collector 36 upward so that the arm 81 will actuate the tripping rod and draw it down to such a point that the locking bolt 87 will engage. When (see Figs. 3 to 6 and Fig. 12) the collector runs out of contact with the working conductor 2 by reason of break therein, it runs up on the incline block 89 before referred to, which block throws the collector from the position show

in Fig. 11 to the position shown in Fig. 12. At this time, as will be readily understood, the circuit before described is closed through the magnet 37 which is the actuator locking bolt magnet. Even, though, therefore, the circuit through the actuator solenoid is broken, the actuator rod will be automatically prevented from acting.

The operation of the mechanism so far described will be apparent from the description, especially when taken in connection with the circuits illustrated in Fig. 23. In this figure, in addition to the circuits already described, the generator is indicated at 90, and the car motor at 91. The current is taken from the working-conductor for propulsion purposes by the shoes 92, the circuits from these shoes into the motor being readily traced.

In the apparatus so far described, the stopping devices are operated by changing the electrical relation between a controlling-section of the working-conductor and the means for operating the stopping devices, this change in the electrical relation being effected by moving the section so that it will be out of physical contact with the electrical stopping mechanism of the car. The invention may, however, be embodied in constructions in which the controlling section is not made movable but is made inoperative with respect to the electrical stopping devices on a car in other ways. One such embodiment is illustrated in Fig. 24. In this figure, 93 represents a generator which through a line 94, branches 95, 96, 97, 98 and 99 will supply current to the working conductor 2 which is different in its characteristics from the propulsion current which is passing through the conductor. In this form of construction, the bonds 6 will be reactance bonds which will permit the passage of the propulsion current but which will not permit the passage of the current from the generator 93.

The branches 96, 98 which supply current to the short sections 3 having switches 100 in them which may be controlled from the semaphore posts 23 in the manner hereinbefore described and illustrated in Fig. 16.

The circuits through the cars may be the same as those hereinbefore described, the actuator rod 39 and the solenoids for controlling it being illustrated in the diagram. It will be understood, however, that the wiring and circuit connections of these solenoids will be such as to be immune to the propulsion current. With the construction described in Fig. 24, the current will pass from the working-conductor into the stopping devices on the car, through the actuator solenoid and back to the generator, in the same manner as that heretofore described. This condition will continue as long as the working-conductor is supplied with current from the generator 93. When, however, any

semaphore arm is set at danger, the switch 100 is open and the controlling-section 3 of the working-conductor while it is supplied with propulsion current, is not supplied with the current which is necessary to operate the solenoids of the actuator mechanism of the stopping devices. When, therefore, a train reaches a section of conductor which is not provided with the particular kind of current necessary to operate the actuator mechanism solenoid, the brakes will be applied and the power shut off, in the manner hereinbefore described.

It will be observed that the various agencies hereinbefore described in connection with the first form of the apparatus may be employed in connection with the apparatus diagrammatically illustrated in Fig. 24.

Other modifications of the apparatus by which the invention is carried into effect may be made. It is to be understood, therefore, that the invention is not to be limited to the forms of apparatus herein illustrated and described.

Certain novel features shown but not claimed herein are claimed in a companion application No. 448,320, filed August 13, 1908.

What is claimed is:--

1. In an automatic stopping mechanism for railroads, the combination with a car provided with braking devices, of a working conductor, said conductor including a short controlling section for coöperating with the stopping devices, a signal, and means controlled by the signal for rendering said section inoperative with respect to said stopping devices.

2. In an automatic stopping mechanism for railroads, the combination with a car provided with stopping devices and a current collector, of a working conductor, said conductor including a short controlling section, connections whereby the controlling section may effect the operation of the stopping devices, a signal, means controlled by the signal for placing the section in operative or inoperative condition with respect to the collector, and means under the control of the driver for rendering the connections between the controlling section and the stopping devices operative or inoperative.

3. In an automatic stopping mechanism for railroads, the combination with a car provided with stopping devices, of a working conductor including a controlling section, connections whereby the controlling section may effect the operation of the stopping devices, a signal, means whereby the signal places the controlling section in operative or inoperative condition, and means for preventing the operation of the stopping devices at breaks in the working conductor.

4. In an automatic stopping mechanism for railroads, the combination with a car

having braking devices and a current collector, of a signal, a working conductor including a short controlling section, and means controlled by the signal for preventing said controlling section from supplying current to the collector.

5. In an automatic stopping mechanism for railroads, the combination with a signal, of a working conductor, and means controlled by the signal for shifting the position of a part of the working conductor.

6. In an automatic stopping mechanism for railways, the combination with a signal, of a working conductor including a short controlling section, a car having stopping devices including a current collector, and means controlled by the signal for preventing contact between the collector and the section.

7. In an automatic stopping mechanism for railroads, the combination with a working conductor including a movable short controlling section, of a positioning mechanism for said section, a signal and operating connections between the positioning mechanism and the signal whereby the signal controls the operation of the positioning mechanism.

8. In an automatic stopping mechanism for railroads, the combination with a working conductor having a short controlling section, of an electrically operated positioning mechanism including a normally closed circuit, a circuit breaker in the circuit, a signal, and means whereby the signal controls the circuit breaker.

9. In an automatic stopping mechanism for railroads, the combination with a working conductor having a short controlling section, of a motor for determining the position of the section, a signal, and connections whereby the signal controls the operation of the motor.

10. In an automatic stopping mechanism for railroads, the combination with a working conductor having a short controlling section, of a motor operating on a normally closed circuit, connections whereby the motor determines the position of the controlling section, a circuit breaker in the circuit, a signal, and connections whereby the signal controls the circuit breaker.

11. In an automatic stopping mechanism for railways, the combination with a working conductor, of a plurality of short controlling sections in line with the conductor, each of said sections being in circuit with a source of electrical energy, means for changing the condition of said sections so as to render them operative or inoperative with respect to stopping devices mounted on a car, and means controlled by the driver for rendering said change ineffective.

12. In an automatic stopping mechanism for railways, the combination with short

movable controlling sections, of means for producing a movement thereof whereby a section may be rendered operative or inoperative with respect to stopping devices mounted on the car, and means controlled by the driver for rendering said movement ineffective.

13. In an automatic stopping mechanism for railways, the combination with a working conductor, of a plurality of short controlling sections in line with the conductor, electrical devices for producing a change in condition of said sections whereby a section may be rendered operative or inoperative with respect to stopping devices mounted on the car, normally closed circuits for operating said electrical devices, means whereby said normally closed circuits may be opened to produce the change in condition, and means controlled by the driver whereby the change in condition of a section is rendered ineffective.

14. In an automatic stopping mechanism for railways, the combination with a working conductor, of a plurality of short controlling sections in line with the conductor, electrical devices for producing a change in condition of said sections whereby a section may be rendered operative or inoperative with respect to stopping devices mounted on the car, normally closed circuits for operating said electrical devices, means whereby said normally closed circuits may be opened to produce the change in condition, means controlled by the driver whereby the change in condition of a section is rendered ineffective, signals, and means whereby the indications of said signals are changed in accordance with the change in condition of the controlling sections.

15. In an automatic stopping mechanism for railways, the combination with a plurality of short movable controlling sections, of electrical devices for producing a movement of said sections whereby a section may be rendered operative or inoperative with respect to stopping devices mounted on the car, normally closed circuits for operating said electrical devices, means whereby said normally closed circuits may be opened to produce a movement of a section, and means controlled by the driver whereby the movement of the section is rendered ineffective.

16. In an automatic stopping mechanism for railways, the combination with a plurality of short movable controlling sections, of electrical devices for producing a movement of said sections whereby a section may be rendered operative or inoperative with respect to stopping devices mounted on the car, normally closed circuits for operating said electrical devices, means whereby said normally closed circuits may be opened to produce a movement of the sections, means controlled by the driver whereby the move-

ment of the sections is rendered ineffective, signals, and means whereby the indications of said signals are changed in accordance with the movement of the sections.

17. In an automatic stopping mechanism for railways, the combination with a working conductor, of a plurality of short controlling sections arranged along the conductor, said sections being in circuit with a source of electrical energy, a car having stopping devices thereon, means for changing the condition of said sections so as to render them operative or inoperative with respect to the stopping devices, means mounted on the car and under the control of the driver for preventing the operation of the stopping devices notwithstanding the change in condition of the controlling sections, signals, and means whereby the indications of said signals are changed in accordance with the change in condition of the controlling sections.

18. In an automatic stopping mechanism for railways, the combination of a plurality of short movable controlling sections, a car having stopping devices, means for producing a movement of said sections whereby a section may be rendered operative or inoperative with respect to the stopping devices, and means mounted on the car and under the control of the driver for preventing the operation of the stopping devices notwithstanding the movement of a controlling section.

19. In an automatic stopping mechanism for railways, the combination of a plurality of short movable controlling sections, each of said sections being in circuit with a source of electrical energy, a car having stopping devices, means for producing a movement of said sections whereby a section may be rendered operative or inoperative with respect to the stopping devices, and means mounted on the car and under the control of the driver for preventing the operation of the stopping devices notwithstanding the movement of a controlling section.

20. In an automatic stopping mechanism for railroads, the combination with a car having a current collector and stopping devices, of a working conductor with which the collector cooperates, an electrically operated actuator for said stopping devices, a normally closed circuit including the collector and the actuator, and means under the control of the driver for preventing the operation of the actuator when the electrical connection between the conductor and the collector is interrupted.

21. In an automatic stopping mechanism for railroads, the combination with a working conductor including a short controlling section, of a car having a current collector and stopping devices, an electrically operated actuator for the stopping devices, a normally closed circuit including the conductor, the collector and the actuator the breaking

of which circuit effects the operation of the actuator, a signal, and means under the control of the signal for regulating the electrical connection between the collector and the controlling section.

22. In an automatic stopping mechanism for railroads, the combination with a working conductor including a short controlling section, of a car having a current collector and stopping devices, an electrically operated actuator for the stopping devices, a normally closed circuit including the conductor, the collector and the actuator the breaking of which circuit effects the operation of the actuator, a signal, means under the control of the signal for regulating the electrical connection between the collector and the controlling section, and means under the control of the driver for preventing the operation of the actuator when the electrical connection between the collector and the conductor is interrupted.

23. In an automatic stopping mechanism for railroads, the combination with a working conductor including a short controlling section, of a car having a current collector and stopping devices, an electrically operated actuator for the stopping devices; a normally closed circuit including the conductor, the collector and the actuator the breaking of which circuit effects the operation of the actuator, a signal, means under the control of the signal for regulating the electrical connection between the collector and the controlling section, and electrically operated means under the control of the driver for preventing the operation of the actuator when the electrical connection between the collector and the conductor is interrupted.

24. In an automatic stopping mechanism for railroads, the combination with a working conductor, of a signal, means whereby the signal renders a part of the conductor operative or inoperative, a car having a current collector, and stopping devices, an actuator for said devices, means whereby the actuator may be operated when the electrical connection between the collector and the working conductor is interrupted, means including a manually operated device for preventing the operation of the actuator, and means for rendering said device inoperative except during the period of positive operation by the driver.

25. In an automatic stopping mechanism for railways, the combination with a working conductor, of a plurality of short controlling sections, said sections being in circuit with a source of electrical energy, a car having a current collector and stopping devices, means for rendering the sections inoperative with respect to the collector, an actuator for the stopping devices, means whereby the actuator may be operated when

the sections are rendered inoperative with respect to the collector, means including a manually operated device for preventing the operation of the actuator, and means for rendering said device inoperative except during the period of positive operation by the driver.

26. In an automatic stopping mechanism for railroads, the combination with a working conductor, of a signal, means whereby the signal renders a part of said conductor operative or inoperative, a car having a current collector cooperating with the conductor, an electric motor on the car, a motor controller, stopping devices on the car, an actuator for the stopping devices, means whereby the actuator may be operated when the electrical connection between the collector and the working-conductor is interrupted, devices under the control of the driver for preventing the operation of the actuator, and means whereby said devices are rendered inoperative except when the motor controller is in a predetermined position.

27. In an automatic stopping mechanism for railways, the combination with a working conductor, of a plurality of short controlling sections in circuit with a source of electrical energy, a car having a current collector, means for rendering the controlling sections inoperative with respect to the collector, an electric motor on the car, a motor controller, stopping devices on the car, an actuator for the stopping devices, means whereby the actuator may be operated when a section is inoperative with respect to the collector, devices under the control of the driver for preventing the operation of the actuator, and means whereby said devices are rendered inoperative except when the motor controller is in a predetermined position.

28. In an automatic stopping mechanism for railroads, the combination with a working conductor including a short length controlling section, of a car having a current collector thereon, a signal, means controlled by the signal for rendering the controlling section operative or inoperative with respect to the collector, stopping devices on the car, an actuator therefor, a normally closed circuit including the collector and the actuator, the interruption of which effects the operation of the actuator, and means under the control of the driver for preventing the operation of the actuator when the electrical connection between the collector and the section is interrupted.

29. In an automatic stopping mechanism for railways, the combination with a working conductor including a plurality of short controlling sections, said sections being in circuit with a source of electrical energy, a car having a current collector thereon, means

for rendering the controlling sections operative or inoperative with respect to the collector, stopping devices on the car, a normally closed circuit including the collector and the actuator, the interruption of which effects the operation of the actuator, and means under the control of the driver for preventing the operation of the actuator when the electrical connection between the collector and a section is interrupted.

30. In an automatic stopping mechanism for railways, the combination with a working conductor, of a plurality of short controlling sections said sections being in circuit with a source of electrical energy, a car having a collector thereon, means for rendering the sections operative or inoperative with respect to the collector, stopping devices on the car, an actuator therefor, a normally closed circuit including the collector and the actuator, manually operated means for preventing the operation of the actuator when the electrical connection between the collector and a section is interrupted, and means for holding said manually operated means in inoperative position except during the period of manual operation.

31. In an automatic stopping mechanism for railways, the combination with a working conductor, of a plurality of short controlling sections said sections being in circuit with a source of electrical energy, a car having a collector thereon, means for rendering the sections operative or inoperative with respect to the collector, stopping devices on the car, an actuator therefor, a normally closed circuit including the collector and the actuator, manually operated means for preventing the operation of the actuator when the electrical connection between the collector and a section is interrupted, and means for preventing the operation of the manually operated means except when the car is moving at a predetermined speed.

32. In an automatic stopping mechanism for railways, the combination with a working conductor, of a plurality of short controlling sections said sections being in circuit with a source of electrical energy, a car having a collector thereon, means for rendering the sections operative or inoperative with respect to the collector, stopping devices on the car, an actuator therefor, a normally closed circuit including the collector and the actuator, manually operated means for preventing the operation of the actuator when the electrical connection between the collector and a section is interrupted, means for holding said manually operated means in inoperative position except during the period of manual operation, and means for preventing the operation of said manually operated means except when the car is moving at a predetermined speed.

33. In an automatic stopping mechanism

for railroads, the combination with a car having stopping devices, of an electrically operated actuator therefor, a key controlled electrically operated locking mechanism for the actuator, and an independent key-controlled mechanically operated locking mechanism for the actuator, said locking mechanisms being constructed to be operated by the same key.

- 10 34. In an automatic stopping mechanism for railroads, the combination with a car having stopping devices, of an electrically operated actuator therefor, a key-controlled electrically operated locking mechanism for the actuator, an independent key-controlled mechanically operated locking mechanism for the actuator, said locking mechanisms being constructed to be operated by the same key, and means whereby said locking mechanisms are rendered inoperative except when the key is in working position.

35. In an automatic stopping mechanism for railroads, the combination with a working conductor, of a car having stopping devices, means including a current collector co-operating with the conductor for operating the stopping devices, and means for automatically preventing the operation of the stopping devices at breaks in the working conductor.

36. In an automatic stopping mechanism for railroads, the combination with a working-conductor, of a car having stopping devices, an actuator in circuit with the conductor and constructed to be operated when the current from the conductor is interrupted, and means for automatically preventing the operation of the actuator at breaks in the conductor.

37. In an automatic stopping mechanism for railroads, the combination with a working conductor, of a car having stopping devices, an actuator in circuit with the conductor and constructed to be operated when the current from the conductor is interrupted, mechanism for preventing the operation of the actuator at breaks in the conductor, and means near the path of travel of the car for operating said mechanism.

38. In an automatic stopping mechanism

for railroads, the combination with a working conductor, of a car having stopping devices, an actuator for said devices in circuit with the conductor and constructed to be operated when the current from the conductor is interrupted, mechanism including a tripping device for preventing the operation of the actuator at breaks in the conductor, and means for causing said tripping device to be operated at each end of a break in the conductor.

39. In an automatic stopping mechanism for railroads, the combination with a working conductor, of a car having stopping devices, an actuator for said stopping devices in circuit with the conductor and constructed to be operated when the current through the conductor is interrupted, a local circuit, a switch in said circuit under the control of the driver, and connections whereby said local circuit prevents the operation of the actuator when the current from the conductor to the actuator is interrupted.

40. In an automatic stopping mechanism for railroads, the combination with a working-conductor, of a car having stopping devices, an actuator for said devices in circuit with the conductor and constructed to be operated when the circuit from the conductor is interrupted, a local circuit, a switch in said circuit, and an actuator locking mechanism controlled from said local circuit.

41. In an automatic stopping mechanism for railroads, the combination with a working conductor, of a car having stopping devices, an actuator for said devices in circuit with the conductor and constructed to be operated when the circuit from the conductor is interrupted, a local circuit, an actuator locking mechanism in said circuit, a circuit closer, and means near the path of travel of the car for automatically operating said circuit closer.

In testimony whereof, I have hereunto set my hand, in the presence of two subscribing witnesses.

WILLIAM J. WILGUS.

Witnesses:

A. WILGUS,
JAMES Q. RICE.