N. FALLEK.

CONTROLLER CHECKING DEVICE FOR STREET RAILWAY CARS.

APPLICATION FILED SEPT. 9, 1907.

907,763. Patented Dec. 29, 1908.

2 SHEETS—SHEET 1.

Fig. 1.

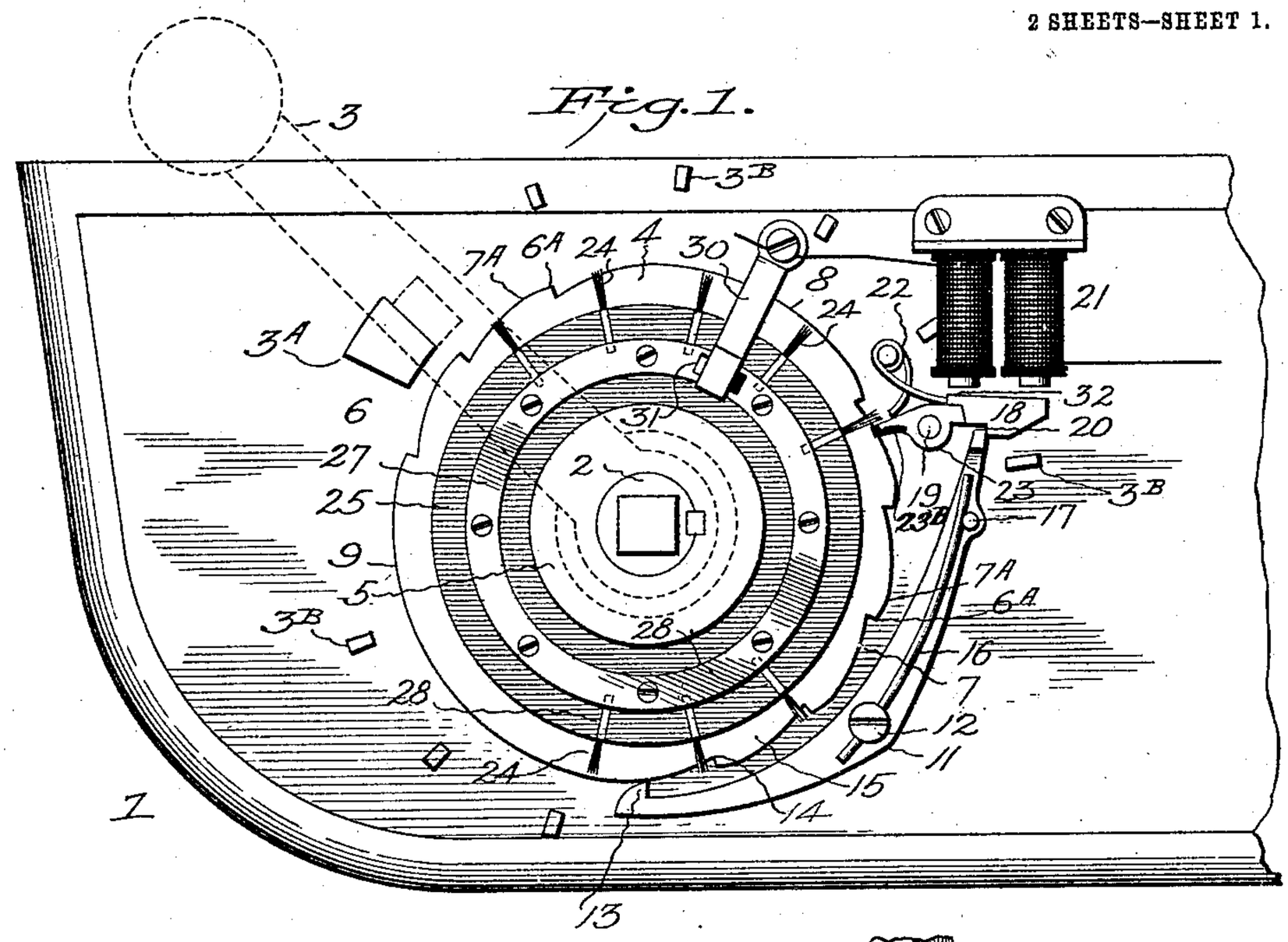


Fig. 3.

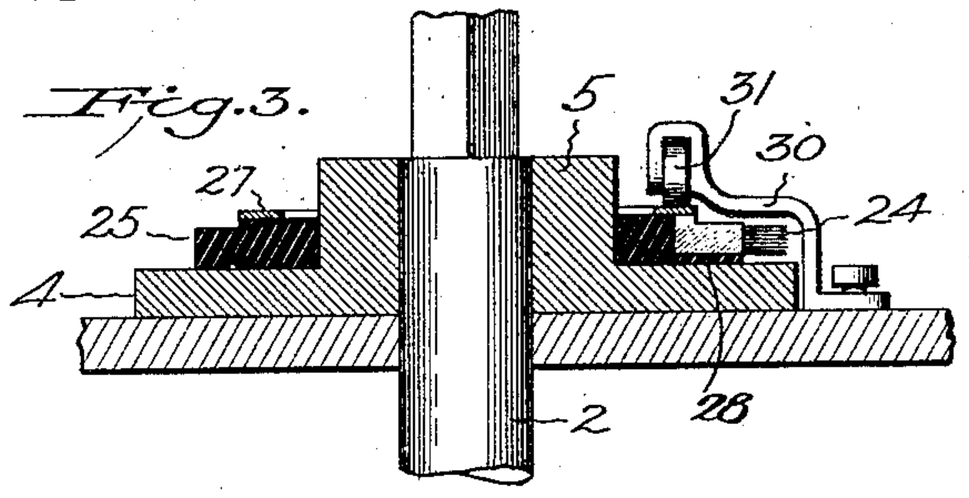


Fig. 4.

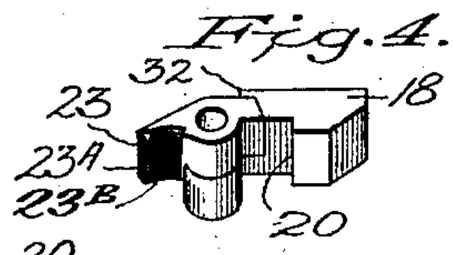


Fig. 2.

Witnesses:
G. Sargent Elliott.
Adella M. Towle

Inventor:
Nathan Fallek
By
H. S. Bailey. Attorney.

THE NORRIS PETERS CO., WASHINGTON, D. C.

N. FALLEK.

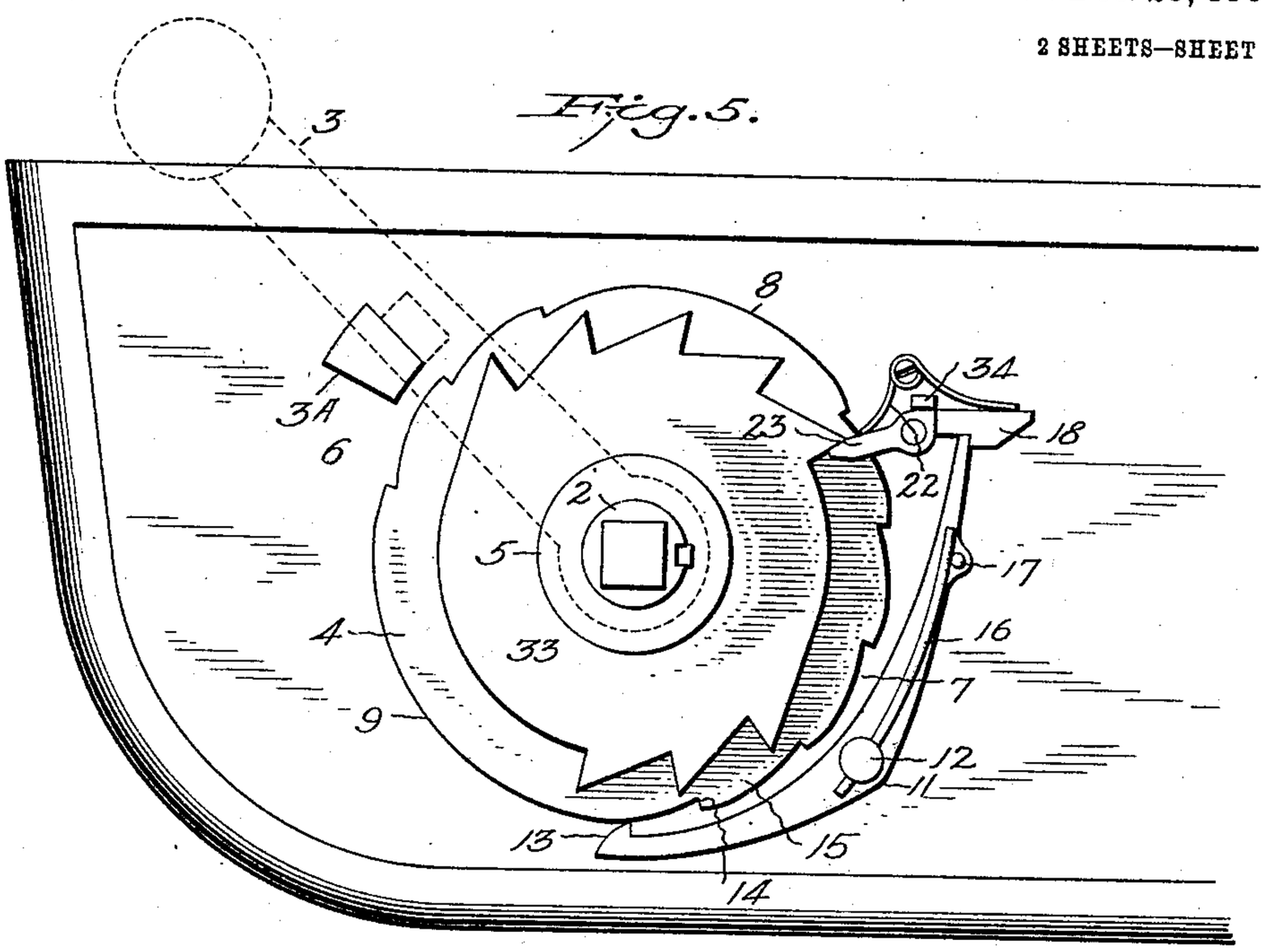
CONTROLLER CHECKING DEVICE FOR STREET RAILWAY CARS.

APPLICATION FILED SEPT. 9, 1907.

907,763. Patented Dec. 29, 1908.

2 SHEETS—SHEET 2.

Fig. 5.



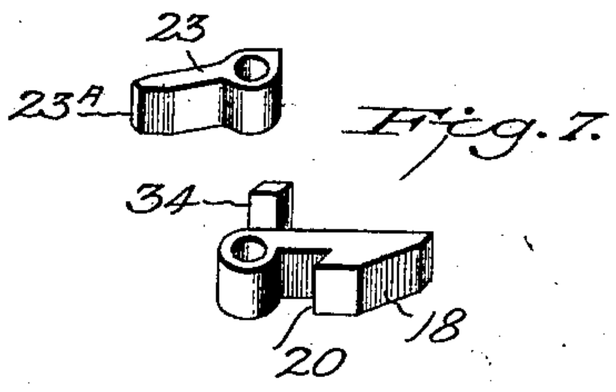


Fig. 7.

Fig. 6.

Witnesses:
L. Sargent Elliott.
Adella M. Fowle

Inventor:
Nathan Fallek.
By
H. S. Bailey. Attorney.

THE NORRIS PETERS CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

NATHAN FALLEK, OF DENVER, COLORADO.

CONTROLLER-CHECKING DEVICE FOR STREET-RAILWAY CARS.

No. 907,763. Specification of Letters Patent. Patented Dec. 29, 1908.

Application filed September 9, 1907. Serial No. 391,947.

To all whom it may concern:

Be it known that I, NATHAN FALLEK, a citizen of the United States of America, residing in the city and county of Denver and State of Colorado, have invented a new and useful Controller-Checking Device for Street-Railway Cars, of which the following is a specification.

My invention relates to an electrically operated controller checking device for cutting out the resistance of controllers of electric railway cars and other electric motors, in successive step by step order; and the objects of my invention are: First, to provide an automatically electrically operating controller check for railway car and other motors. Second, to provide an automatically operating electrical controller checking device that coöperates with the resistance cut-out current controllers at present in use on electric street railway cars. And third, to provide a new automatically operating resistance cut-out device adapted to be used in connection with the controllers at present in use for controlling the current of street railway car motors, that is very simple, inexpensive to make, durable, and reliable in its action. I attain these objects by the mechanism illustrated in the accompanying drawings, in which:

Figure 1, is a plan view of a portion of a controller used in connection with electric railway cars, showing my improved electrically operated controller checking device in connection therewith. Fig. 2, is a side elevation of the same. Fig. 3, is a vertical, longitudinal, sectional view through the parts constituting my invention. Fig. 4, is a perspective view of the combined pawl and latch armature. Fig. 5, is a plan view of a modification of the device, which dispenses with the electrical connection. Fig. 6, is a side view of the same. And Fig. 7, is a perspective view of a slight modification of the pawl and latch.

Referring to the drawings, the numeral 1, designates the casing of a street car controller box; 2, designates the controller shaft; and 3, the controller and full current crank. 3^A is the stop pin for defining the starting points of the controller crank. The casing is also provided with the usual circular row of radiating projecting lugs 3^B, spaced at short distances apart concentrically around the axial center of the controller shaft and arranged in two groups, preferably five lugs being illustrated in one group and three in the other group. These lugs represent points in the rotative movement of the controller crank at which the resistance is cut-out. Upon the shaft 2 I mount a ratchet disk 4, which rests on top plate of the controller. This ratchet disk is provided with a hub portion 5, which is secured to the controller shaft. The peripheral edge of this ratchet disk is provided with two independent groups of ratchet teeth 6 and 7, arranged on opposite sides of it and separated from each other by smooth plain peripheral edge portions 8 and 9. These ratchet teeth are positioned in line with the circularly arranged radial lugs 3^B, that are placed on the top plate of the controller. These ratchet teeth are formed with that portion 6^A of their face surfaces that lies adjacent to their shoulders, slightly less in diameter than their full height 7^A from the bottom of their shouldered portions, so that the pawl that engages them when it moves over their highest portion 7^A and is locked to stand fixed in that relation to these ratchet teeth, will not engage the outer edges of the shoulders, but will ride over and past them, as will be fully described hereinafter.

Upon the top plate portion of the controller, I pivotally secure adjacent to the ratchet disk 4, a pawl 11, intermediate of its ends, by a pin 12. This pawl comprises a rocking lever, one end of which is provided with a pawl tooth 13, that is formed to engage the shoulders 14 of the ratchet teeth 15 of the ratchet toothed disk, and is held in resilient engagement therewith by a spring 16, which is preferably secured to the pivot pin 12, or to the top plate of the casing, and is arranged to bear with resilient tension against a pin 17 in the end of the pawl, in a manner to cause its tooth to engage the teeth of the ratchet disk 4. The opposite end of the pawl extends to a lever 18, which I term the armature lever. This armature lever is pivoted at one end by a pin 19 to the top plate of the casing, and is provided on one side of it with a shoulder 20, which is arranged to engage the free end of the pawl and hold the pawl tooth at the opposite end of the pawl lever out of engagement with the ratchet teeth of the disk 4. This make and break lever is made of any suitable electro-magnetic material.

An electro magnet 21 is secured to the top plate of the controller in operative make and

break relation to the armature lever, the magnet being arranged to engage the armature portion of the lever 18, which is placed on the opposite side of the lever 18, from the shoulder that engages the free end of the pawl 11. A spring 22 is secured to the top plate of the casing at one end, and bears with resilient tension against the armature lever in such a manner as to hold it under a resilient pressure towards the free end of the pawl lever, which enables the armature lever to hold the pawl out of engagement with the ratchet teeth when it is in engagement with the free end of the pawl lever. The pivotal pin 19 of the armature lever extends above the body of that lever, and upon it I pivotally mount a pawl 23, which I term the armature pawl. The free end of this armature pawl is formed into a pawl tooth 23^{A}. This armature pawl tooth engages a plurality of contact terminal brushes 24, that form a part of a commutator ring, which is mounted on and is secured to the hub 5 of the ratchet disk 4, and rests against the ratchet disk. This commutator ring comprises a ring 25 of non-conductive material, and a ring 27 of conductive material, which is secured to the top surface of the non-conductive ring, and two groups of contact terminal brushes 24, which are arranged on opposite side portions of the peripheral edge of the ring in slots 28, which extend radially into the peripheral edge of the non-conductive ring far enough to allow the contact terminal brushes to bear against and consequently be in circuit with the conductive ring portion of the commutator. These terminal brushes are fitted tightly into the slot 28 which extend partially through the ring 25, so as to be preferably held there by frictional pressure, but if desired they may be removably secured in them by any suitable means; consequently any desired number may be used and they can be readily replaced by new ones in case of breakage. I preferably illustrate three of these contact terminal brushes on one side of the commutator ring and five on the opposite side, although more or less may be used, as desired. The ring is preferably secured to the hub of the wheel 4, in a position to bring its three contact terminal brushes over or adjacent to the five ratchet teeth of the ratchet disk below it, and its five contact terminal brushes over the three ratchet teeth of the ratchet disk. A binding post 30 is secured to the top plate of the controller's casing adjacent to the ratchet disk, the free end of which extends over the commutator ring, and a roller 31 is pivotally mounted on it and is arranged in engagement with the conductive ring of the commutator.

The pawl 23 is locked to the arm 18, when moved in the direction in which the commutator ring is moved to cut the resistance out from the controller, while in the opposite direction its swinging movement is independent of the armature. The pawl is locked to the armature 18, by engaging a stop 32, which is formed on the armature and is arranged to be engaged by the pawl and thus lock the armature and pawl when the pawl is pressed down by spring 22 to engage lever 11. The spring 22, which bears at one end upon the armature, is arranged to bear at its opposite end against the pawl in such a manner as to normally hold it against its stop pin; consequently this pawl is spring controlled to move independently of the armature when the brushes are rotated backward or in a direction to turn the resistance into the controller, and far enough to cause the upper end of lever 11, to engage the armature 18, by the engagement of lever tooth 13, with the highest point of one of the disk teeth 15, as will now be explained hereinafter in the operation of the controller checking device. The lower side and front end of pawl 23, are faced with a suitable non-conducting element 23^{B}, which will prevent the magnet from being energized by contact of the brushes 24 with the metal portion of the said pawl on their reverse movement.

The source of current supply is wired from the trolley of the car to the magnet, and from the magnet to the binding post 30, from which the current is transmitted to the conductive ring and brushes of the commutator ring. The ratchet disk and its pawl and the armature lever are connected to the ground circuit of the controller and car.

In Figs. 5, 6, and 7, I illustrate a modification of a portion of the pawl locking mechanism of my device. This modification consists of substituting for the commutator ring a second ratchet ring 33, which is also mounted on the hub of the ratchet disk in the same relative position to the teeth of the ratchet disk and the resistance cut-out lugs as the commutator ring was. This disk is also provided with the same number of ratchet teeth as the commutator ring was with brushes 24, and the pawl 23, is engaged by the ratchet teeth of this new ratchet ring as it is rotated with and by the controller crank, and releases the check pawl and allows it to engage the teeth of the ratchet disk 4, thus acting in the same manner as the brushes of the commutator except that in this arrangement the magnet is dispensed with and is removed as is also binding post 30 and the current wires connecting them with the trolley current, the action of the pawl 23 being now purely mechanical, the lever being provided with a stop pin 34, which the pawl engages when it is moved by a tooth of the ratchet disk 33.

The operation is as follows: The controller crank is placed on the controller shaft in a position to stand against the right hand side of the starting post of the casing, and then when the motorman desires to start

the car he moves the crank to the right but when he reaches the first resistance cut-out stop lug 3^B, in the rotative path of the crank. The brush 24, adjacent to the armature pawl 23, has engaged the said pawl, thereby forming a circuit through the magnet, which attracts the armature, and releases the end of the pawl 11, which is then under tension due to the outward pressure of the spring 16, which causes the tooth 13, at its opposite end to contact with the edge of the ratchet disk 4, as the said disk moves, and to engage the shoulder of the first tooth 15, of the group 7. When the first brush 24, passes the pawl 23, the circuit is broken, and the armature 18, resumes the position shown in Fig. 1, but does not engage the end of the pawl 11. Now, in order to free the first ratchet tooth 15, from engagement with the tooth 13 of the pawl 11, the crank must be reversed a short distance, and this backward movement of the crank and consequently of the disk 4, causes the highest point of the periphery of the disk or of a tooth, according to the position of the disk, to engage the tooth 13, of the pawl 11, which throws the opposite end of the pawl in toward the disk, and this end rides over the edge of the armature, until it is engaged by the shoulder 20, of said armature, and is thus held. The tooth 13, now engages a portion of the disk, or of one of the teeth, as the case may be, which is farther from the axial center of the disk, than the extremity of the shoulder 14 of a tooth 15, so when the crank is moved forward again, the first ratchet 15, will pass beneath the tooth 13, of pawl 11, without being engaged thereby, but before it will have passed the shoulder 14, of a second ratchet 15, the second brush 24, will have contacted with the pawl 23, making a circuit through the magnet which attracts the armature, releasing one end of the pawl 11, while the other end having tooth 13, will engage the second ratchet 15. It will thus be seen that as the tooth 13 of lever 11, is engaged by the highest portion of the face of the ratchet teeth 15, the opposite end of the lever will be moved in and held by the shoulder 20, of the armature 18, and the outer extremity of the engaging shoulder 14 of the next ratchet tooth 15, being inside the radius of the highest point of the teeth, will pass under the pawl tooth 13, without being engaged thereby. This backward movement of the crank may of course exceed the length of a ratchet disk tooth, but any backward movement in excess of the length of a tooth is not necessary and is a waste of time, although it does not change the mechanism any, and the motorman soon learns the amount of backward movement necessary to release the check pawl, and having made this backward movement at the first resistance cut-out lug he again moves the controller crank forward on its current turning on rotative stroke, and as the commutator armature rotates one of its brushes engages the armature pawl and closes the electric current circuit to the armature lever, which is instantly attracted by and moves to the magnet, thus releasing the free end of the check pawl lever, the pawl tooth of which is instantly thrown into engagement with the shoulder of the next tooth, of the ratchet disk, and stops the crank, and it is necessary for the motorman to again move the crank and ratchet disk back far enough to release the check pawl, when he again goes forward to the third resistance cut-out lug, and in so doing closes the circuit by moving another brush against the armature pawl and thus again closes the electric circuit and releases the check pawl so it will stop the controller crank at the fourth resistance cut-out lug. Having reached the limit of the rotative current turning on movement of the controller crank both for the parallel and series arrangement of the motors, as indicated by the two groups of resistance lugs on the casing, which is the opposite side of the starting lug at which point the car is at full speed, and he wishes to slow down or stop the car, or if at any point in the progressive intermittent movement of turning on the current and cutting out its resistances, the motorman desires to slow down or stop, he immediately turns the crank backward, which action locks the check pawl to the armature lever and the armature pawl will run over the brushes.

My invention provides a simple, durable, reliable, and thoroughly practical electrically operated resistance cut-off controller checking device, and while I have illustrated the preferred construction and arrangement of it, my invention contemplates broadly an electrically controlled and operated controller checking device for the motors of electrical street cars and for other purposes.

Having described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. An electrically operated controller check, comprising an operatively arranged controller and crank, a ratchet wheel movable with said crank, a pawl in engagement with said ratchet wheel, an armature arranged to lock said pawl out of engagement with said ratchet wheel, and an electro magnet arranged to attract said armature and release said ratchet pawl at predetermined points of said crank's operative movement.

2. An electrically operated controller check, comprising the controller casing, provided with resistance cut-out indicating point and a controller crank, and a pawl and ratchet device for checking the resistance cutting out movement of the controller, a spring controlled armature arranged to lock said

pawl out of engagement with said ratchet, a magnet arranged in operative circuit relation to said armature, and a commutator in circuit with said magnet and armature and arranged to cause said magnet to release said pawl and lock said ratchet at the resistance cut-out points of said controller's operative movement.

3. In an electrically operated controller, the combination of the controller, provided with resistance cut-out indicating marks, and the controller crank, and an electrically operated mechanism for momentarily stopping the controller crank at said resistance cut-out marks, consisting of a ratchet wheel having teeth corresponding in number and arrangement to the cut-out marks on the controller, a spring-controlled pawl pivoted to said controller intermediate of its ends and provided at one end with a pawl tooth in engagement with the teeth of said ratchet wheel, a reciprocating armature pivotally mounted on said controller and spring controlled in one direction of its movement and arranged to lock to the free end of said pawl and hold it out of engagement with the teeth of said ratchet, a magnet mounted on said controller in operative circuit relation to said armature, a commutator mounted on said controller crank to move with it and said ratchet wheel, and in circuit with said magnet, terminal contact brushes on said commutator, and a spring-controlled pawl on said armature arranged to be engaged by said brushes, whereby the circuit is closed between said magnet and commutator and armature and said magnet moves said armature to release the free end of said pawl, thus permitting it to engage said ratchet wheel and stop said controller crank.

4. In an electrically operated controller check, the combination of an operative pawl and ratchet wheel, a swinging armature arranged to be moved by the rotative movement of said ratchet wheel, to lock said check pawl out of engagement with said ratchet wheel, and means including a magnet arranged in make and break relation with said armature for releasing said check pawl.

5. In an electrically operated controller check, the combination with the controller casing provided with resistance cut-out indicating marks, and the controller crank, of a ratchet wheel provided with as many teeth as said casing has resistance cut-out marks, a spring controlled pawl in engagement with said ratchet wheel, means connected with said ratchet wheel for moving said pawl out of engagement with the teeth of said ratchet wheel, means including a reciprocating armature for locking said pawl out of engagement with said ratchet wheel, and means including a magnet arranged in operative relation to said armature, for releasing said pawl.

6. In an electrically operated controller check, the combination of the controller casing provided with the resistance marks, the controller shaft and the controller crank, with the ratchet wheel, the spring controlled pawl and the swinging armature, with the magnet and the commutator ring operatively arranged in make and break circuit with said armature.

7. In an electrically operated controller checking device, the combination of the controller and casing provided with a plurality of resistance cut-out points, the controller, the controller shaft and the controller crank, of a ratchet wheel mounted on said controller shaft, provided with teeth corresponding in number to the number of resistance cut-out points on said casing, said ratchet wheel having teeth provided with a stopping portion of greater diameter from the center of said wheel than the shoulder portions of said teeth, a rocking pawl spring-controlled to normally engage the teeth of said ratchet wheel, a swinging armature lever pivoted at one end to said casing and provided with a shouldered portion adapted to engage the free end of said rocking pawl, means including a spring controlled conductive pawl connected to said armature, a commutator movable with said controller crank, provided with brushes corresponding in number to the number of resistance cut-out points on said controller's casing, and arranged to register therewith to engage in circuit said armature's conductive pawl when said controller crank registers with the resistance cut-out points of said casing, and a magnet in circuit with the trolley current and in circuit with said commutator and arranged in make and break relation to said armature lever and adapted when one of said commutator's brushes engages said armature's pawl to electrically energize said magnet to cause said armature to move to said magnet and release said rocking pawl, thereby causing it to again engage the tooth of said ratchet wheel and check and stop the operative movement of said controller crank at one of said casing's resistance cut-out points.

8. In an automatically electrically operating controller checking device, the combination of the controller, provided with a spring actuated pawl-controlled toothed wheel, an electric means connected with the movement of said controller and including a device connected with the movement of said controller for locking said pawl out of engagement with said toothed wheel, and means including an operative make and break magnet and armature operatively arranged to be controlled by the movements of said controller for releasing said pawl at predetermined points of the controller's current turning on and resistance cutting out movement.

9. In a controller checking device as speci-

fied, the combination with a controller and its shaft, of a toothed disk mounted rigidly upon the shaft; a spring actuated lever pivoted to the controller, having a tooth at one end, which engages the teeth of the said disk; a pivoted catch for engaging the opposite end of the lever and thereby disengaging the lever tooth from a disk tooth; and means for withdrawing the catch to release the lever, at a predetermined point in the rotation of the disk.

10. In a controller checking device as specified, the combination with a controller and its shaft, of a toothed disk rigidly mounted on the shaft, a portion of the faces of said teeth being a greater distance from the axial center of the disk than the extremity of the shoulders of said teeth; a lever pivoted to the controller having a stop tooth at one end adapted to engage the teeth of the disk; a spring for throwing the toothed end of the lever against the said disk teeth; a pivoted catch in the path of the opposite end of the lever for engaging the same and means for releasing the lever from the said catch on the forward movement of the disk, whereby the toothed end of the lever is automatically moved to engage a tooth of the disk, a partial reverse movement of the disk causing the lever to be moved outward so that its opposite end is again engaged by the pivoted catch.

In testimony whereof I affix my signature in presence of two witnesses.

NATHAN FALLEK.

Witnesses:
G. SARGENT ELLIOTT,
BESSIE THOMPSON.