

E. R. CUNNINGHAM.

COMBINED RELAY, TARGET SETTING, AND RETURN CALL CIRCUIT CLOSING DEVICE.

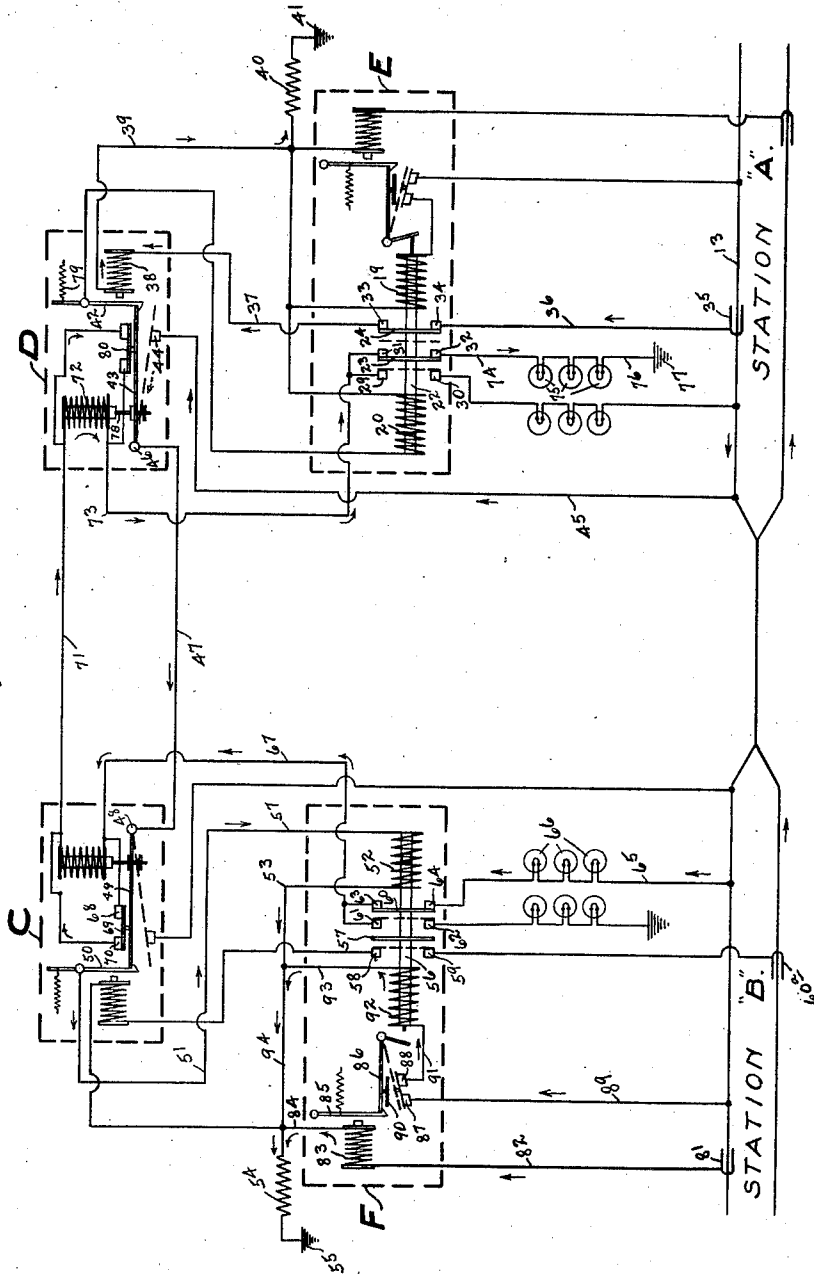
APPLICATION FILED SEPT. 7, 1909.

1,016,482.

Patented Feb. 6, 1912.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses.

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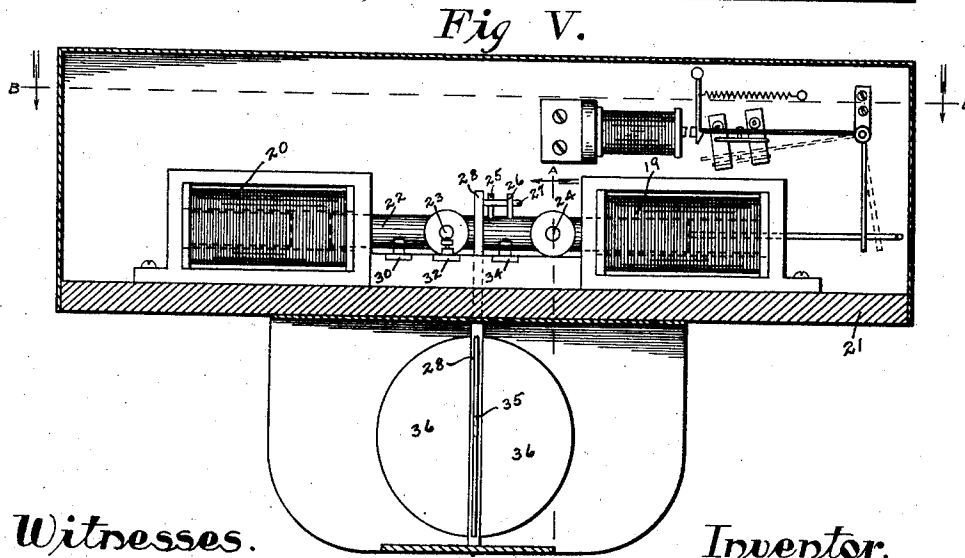
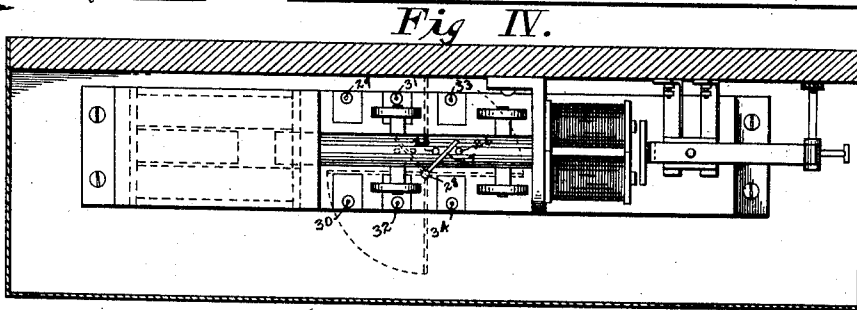
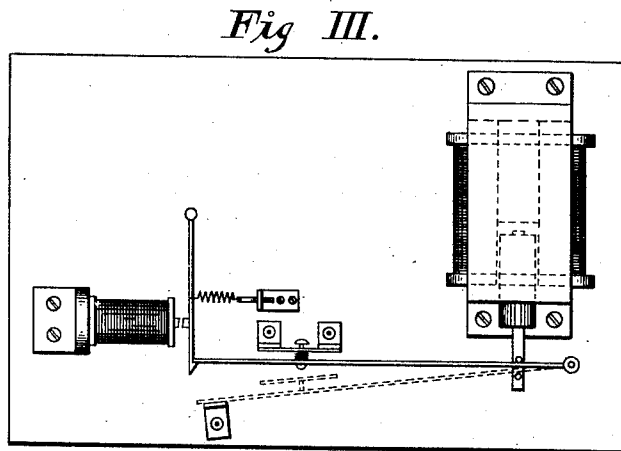
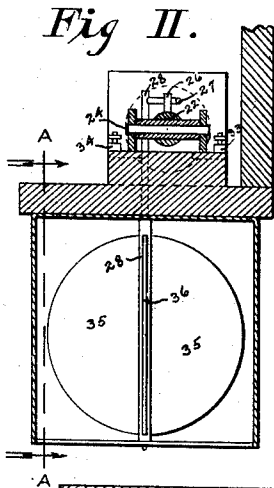
By Zell G. Roe Atty.

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2 SHEETS—SHEET 2.



Witnesses.

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UNITED STATES PATENT OFFICE.

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COMBINED RELAY, TARGET-SETTING, AND RETURN-CALL-CIRCUIT-CLOSING DEVICE.

1,016,482.

Specification of Letters Patent.

Patented Feb. 6, 1912.

Application filed September 7, 1909. Serial No. 516,611.

To all whom it may concern:

Be it known that I, EDWARD R. CUNNINGHAM, a citizen of the United States, residing in Des Moines, county of Polk, and State of Iowa, have invented a new and useful Improvement in Combined Relay, Target-Setting, and Return-Call-Circuit-Closing Devices, of which the following is a specification.

My invention relates to a new and improved method of automatically setting, operating and releasing, signals on an electrically operated railway, by means of a trolley wheel, or other current collecting device, of electrically operated cars.

My invention consists of specially constructed and electrically operated setting switches, combined non-interfering relay and indicating targets or semaphores, and electrically operated releasing switches, so arranged and connected as to set, operate and release, signal lights, indicating targets, or semaphores, at each end of the block, or within the block, by the passage of the car in or out of the block, indicating at both ends of the block, or at intervals along the block, when a car is in the block and the direction it is running.

The object of my invention is to so thoroughly equip an electrically operated railway with danger and safety signals of various kinds, combined with return proofs showing that all signals in advance and in the rear have been set, as to make it practically impossible for opposing cars not to be notified and warned as to the positions, locations, etc., of the other cars.

A further object is to provide my signal setting apparatus with means responsive to failure of energy in the system for insuring said signals giving the same indication upon return of energy in the system and also to provide means whereby the block or danger targets will remain set when a car is within the block, giving the same indication without energy on the line as with it.

Another object is to provide a contact for setting and releasing the signals on the system which will be operated in such a manner as not to diminish the efficiency of the electricity in the operation of the car.

A further object is to provide a return

call circuit closing device so constructed that the setting of the signals thereon is absolute and conclusive proof that all other signals on the system, controlled by the particular setting switch of the car entering the block, have been set.

My invention consists of certain details of construction, hereinafter set forth, pointed out in my claim and illustrated in the accompanying drawings, in which—

Figure I shows a diagram of the system of wiring I employ and the location of the various electrical and mechanical parts; Fig. II shows a transverse sectional view of the non-interfering relay and semaphore target which I employ; Fig. III shows a side view of the quick acting automatic or self restoring setting switch which I employ to set the signals; Fig. IV shows a plan view, on the line B—B in Fig. V, of the non-interfering relay and semaphore target I employ; Fig. V shows a longitudinal sectional view of the same, taken on the line A—A, in Fig. II.

Referring to the accompanying drawings the reference letters A and B are used to indicate two stations on an electric railway line, and each station is provided with a switch to permit the cars to pass one another. The right track at each station is provided with a setting switch which is operated by a contact secured to the trolley wire and itself operated by the trolley wheel of the car in passing through.

The contact is so constructed and the parts so wired as to transmit the energy from the current collecting device to the setting switch which is illustrated in Fig. III.

The setting switch is a specially constructed three point, two way, lever switch designed to be moved or operated in one direction by gravity, when released by the quick acting trolley contact relay, and to be automatically restored and operated in the other direction by a solenoid magnet which is cut in the return call circuit, as hereinafter described. For convenience I have surrounded all the parts contained in the setting switches with dotted lines and I have indicated the parts, as inclosed, generally by the letters D and C, respectively, which refer to the setting switches at the stations A and B respectively.

I have provided, at each station, a non-

interfering relay and semaphore target, illustrated in Figs. II, IV and V, which is designed and constructed not only to open the signal setting switch at the other end of the block when a car has entered and taken possession of the block from one end, thus preventing an opposing car from setting the opposite direction signals, but for the further purpose of setting a red danger target in front of an opposing car. The operation of setting the target closes the secondary circuit, sending back a return signal to the car entering the block that the setting switch at the other end has been opened and the semaphore or danger target set against all opposing cars and this signal will remain set until the entering car has passed through the block and released the signals. This combined non-interfering relay and target is located between the setting switch and the contact for operating the same, and consists of two solenoids 19 and 20 mounted horizontally, on opposite sides of a frame 21, and an armature shaft 22, designed to operate between them, and to open and close circuits, as will be hereinafter described. The armature shaft 22, of this combined non-interfering relay target and return call circuit closing device, is mounted upon two insulating axles, 23 and 24, which have suitable wheels at either end. The object of these wheels and axles is to carry the weight of the armature, to balance it, and to allow it to move freely back and forth by decreasing the friction. Centrally located upon, and extending upwardly from, the armature shaft 22 are two pins 25 and 26 and resting between them is an arm 27 rigidly connected, at its outer extremity, with a semaphore crank 28 which is mounted, for rotary movement, in the frame 12. The numerals 29 and 30, 31 and 32, and 33 and 34, indicate three sets or pairs of contacts, the members of each set being disposed on opposite sides of the frame 21, in line with their respective wheels. A further object of the axles and wheels, which support the armature shaft, is to keep the pins 25 and 26, which throw the semaphore crank, in a vertical position. Another object of the axles and wheels is to electrically connect, or open the contacts 29 and 30, or 31 and 32, or 33 and 34, depending upon the position of the armature shaft 22, as hereinafter described.

The complete system as applied to a block signal on a single track between the two turnouts, or stations, A and B is illustrated diagrammatically in Fig. I, and operates as follows: The trolley wheel, or other current collecting device, of a car entering the block by way of station A, passes under, or through, the contact (which I will number 35 in the diagram) raising, or outwardly de-

flecting, the contact plates and closing the contact (*i. e.* connects it to the trolley wire). While the current collecting device is within, or under, the contact a current will flow from the trolley wire through the connection 36 to contact 34, of the non-interfering relay (which in the diagram I have inclosed with dotted lines and indicated by the letter E) at station A, through the wheels and shaft 24 (providing opposing signals are not set, in which event the setting circuit will be open at this point) to contact 33, through a connection 37 to a relay magnet 38, thence through a connection 39 and a non-inductive resistance 40 to the ground 41. Current flowing, momentarily, in this circuit energizes the relay magnet 38 which draws the spring actuated latch lever contact 42, of the setting switch D at station A, out of engagement with a pivotally mounted setting switch lever 43, letting it fall, by gravity, onto a contact 44. Current will then flow from the trolley wire, at station A, through a permanent trolley connection 45 to the contact 44, of the setting switch D at station A, through the switch lever 43 to the contact hinge, pivotal connection, 46, thence through the line wire connection 47 to the hinged contact, or pivotal connection, 48, of the setting switch C at station B, thence through the switch lever 49 to the spring actuated latch lever contact 50, thence through the connection 51 to the setting solenoid magnet 52, of the non-interfering relay and target setting device F, at station B, thence through the connection 53 and the non-inductive resistance 54 to the ground 55 at station B. Current flowing in the above described circuit energizing the setting solenoid magnet 52, of the non-interfering relay F and draws the armature, or core, toward the setting solenoid. The movement of the armature in the direction of the setting solenoid sets the red target, which is mechanically connected to the armature by turning it through an angle of 90 degrees, so that the white target is concealed from view while the red target is exposed.

It will be remembered that the non-interfering relay F at station B, is exactly similar in every respect to the non-interfering relay E at station A, and the setting switches C and D, at their respective stations are also exactly similar to each other. The same movement of the armature 56, which sets the red target, moves the contact plate from the contacts 58 and 59, thus opening the circuit between the trolley contact 60^a and the setting switch C, at station B, and this will prevent an opposing car, should it disregard the danger signals, from operating the opposite direction signals or from interfering with them in any manner. The movement of the armature 56 also re-

moves the contact plate 60 from its connection with the contacts 61 and 62 and causes it to close the circuit between the contacts 63 and 64. The closing of contacts 63 and 64 permits a current to flow from the trolley wire through the permanent connection 65 through the red lights 66 to contact 64, through the contact plates 60 to the contact 63, through the connection 67 to the contact 68 through the short circuiting switch lever 69 to the contact 70 thence through the line connection 71 to restoring solenoid magnet 72, of the setting switch D at station A, through this magnet to the connection 73 and to the contact 31, of the non-interfering relay and target setting device E, at station A, through the wheels and axles, which I sometimes refer to as contact plate, 23, to contact 32, thence through a connection 74 to the white, or return call, lights 75, thence through a connection 76 to the ground 77. The lighting of the return call lights is a positive indication, to the car entering the block by way of station A, that the red, or danger, target at station B has been set, for the reason that the setting of the red target closes the return call circuit. Current flowing in the return call circuit momentarily flows through the restoring solenoid 72, of the setting switch D at station A, which raises the pivotally mounted switch lever 43 by means of the armature 78. When the switch lever has been raised it is engaged by the latch lever 42, which is actuated by the spring 79, and this causes the solenoid 72 to be shunted out by the contact plate 80 which is attached to the switch lever 43 with hinged and insulated connection, as clearly shown in Fig. III. The raising of the switch lever 43 cuts the power off the setting circuit and the line 47, by restoring the end of said line, at station A, to the ground, which is its home position. After the car has entered the block and set the distant danger target at station B, current will continue to flow through the return call circuit, lighting the red lights 66 at the distant station, and the white, or return call, lights 75 at the home station, while the car is within the block. Should the power fail while the car is within the block the danger target will remain set, showing that a car is within the block, giving the same indication without power as with it, the only difference being that the return call lights will be extinguished during the interval the power is down.

A semaphore may be used in place of the return call light, or in conjunction with the return call lights, which will remain set in the event of failure of power on the line while a car is within the block, and I do not wish to limit myself to the use of return call lights alone but am free to use sema-

phores, or the like, in place of, or in conjunction with, the return call lights. The semaphore for this purpose is one that is held in the "set" position during the passage of a current, this being accomplished by any of the well known devices adapted for this purpose.

In leaving the block the trolley wheel engages the contact 81, at station B, said contact being similar to the contact 35 at station A, and momentarily connects the trolley wire to the contact plates and current flows momentarily, through the connection 82 to the relay magnet 83, thence through the connection 84 and the non-inductive resistance 54 to the ground 55. The energizing of the relay magnet 83 draws a spring actuated latch lever 85 out of its engagement with an L shaped, pivotally mounted, switch lever 86, of the releasing switch and said switch lever falls, by gravity, and closes the contacts 87 and 88. Current then flows from the trolley wire through the permanent connection 89 to the contact 87, through a plate 90, on the switch lever 86, to the contact 88, through the connection 91 to the solenoid 92, of the non-interfering relay and target operating device F at station B, thence through the connection 93 and the connection 94 and the non-inductive resistance 54 to the ground 55. Current flowing in this circuit draws the armature shaft 56 toward the releasing solenoid 92, turning the target through an angle of 90 degrees and thus concealing the red target and restoring it to its home position. The movement of the armature shaft 56 opens the return call circuit between the contacts 63 and 64 by drawing the contact plate 60 away from them. This movement of the armature shaft also closes the circuit between the contact plates 61 and 62 by causing the contact plate 60 to connect them, thus restoring the return call circuit to the ground at station B, which is its normal, or home position. This movement of the armature shaft 56 also closes the contacts 58 and 59 by moving the plate 57 until it connects them, thus restoring the circuit from the trolley contact 60^a to the setting switch C at station B, which was opened to prevent an opposing car from operating the setting switch at station B while a car was within the block. This movement of the armature shaft 56 causes it to strike the downwardly projecting member of the L shaped, pivotally mounted, switch lever 86, thus forcing the main body of the said lever upwardly until it is again engaged and held in its home position by the latch lever 85.

Each station of each block is equipped with exactly similar construction and their parts are connected by the line wires 47 and 71. As I have hereinbefore described the construction and operation of the parts which

are operated by a car passing from one block to the other; it is obvious that it is unnecessary to describe the operation of a car coming in the opposite direction, for it will operate in exactly the same manner. It is also obvious that when any car leaves any station it leaves my system in readiness to be operated by a car subsequently entering the same block.

10 It will be noted that in perfecting my system I have so constructed it that no magnets are in circuit, except momentarily, and all trolley connections are cut off except when a car is within the block, and then only the return call circuit is connected with the trolley. Probably the most important feature of my invention and the one to which I desire to call particular attention, is that the return call lights, or signals, cannot light or operate until after the distant danger signals have been set. I also desire to call attention to the quick acting, relay operated, setting switch which I employ and which causes the setting switch to remain closed until the danger target at the distant station has operated and it is then automatically restored by the return call circuit. It will also be noted that my quick acting, relay operated, restoring mechanism leaves the power on the restoring solenoid 92 until the signals are restored and then it is automatically cut off.

Having thus described my invention what I claim and desire to secure by Letters Patent of the United States is:

The combination with a trolley line, of a normally open ground connection leading from said trolley line and including a magnet, a circuit controlling switch controlled by said magnet, a normally open grounded connection from said wire controlled by said switch and including a solenoid, spaced signals, a third ground connection from the trolley wire including said spaced signals and a circuit closer, a core for said solenoid controlling said last mentioned circuit closer, a second solenoid included in the signal circuit and connected with said circuit controlling switch to open the same when energized, a shunt around said solenoid closed by the opening of said circuit controlling switch and restoring means comprising a normally open grounded connection including a magnet closed by the passage of a car, a circuit closer controlled by said magnet, a normally open grounded connection from the wire including a solenoid and adapted for closure by said circuit closer, the core of said solenoid being connected in alinement with the core of the first mentioned solenoid.

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Witnesses:

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