No. 712,845. Patented Nov. 4, 1902.

J. Y. PORTER.

ELECTRIC SWITCH ACTUATOR.

(Application filed Aug. 14, 1901.)

(No Model.) 2 Sheets—Sheet 1.

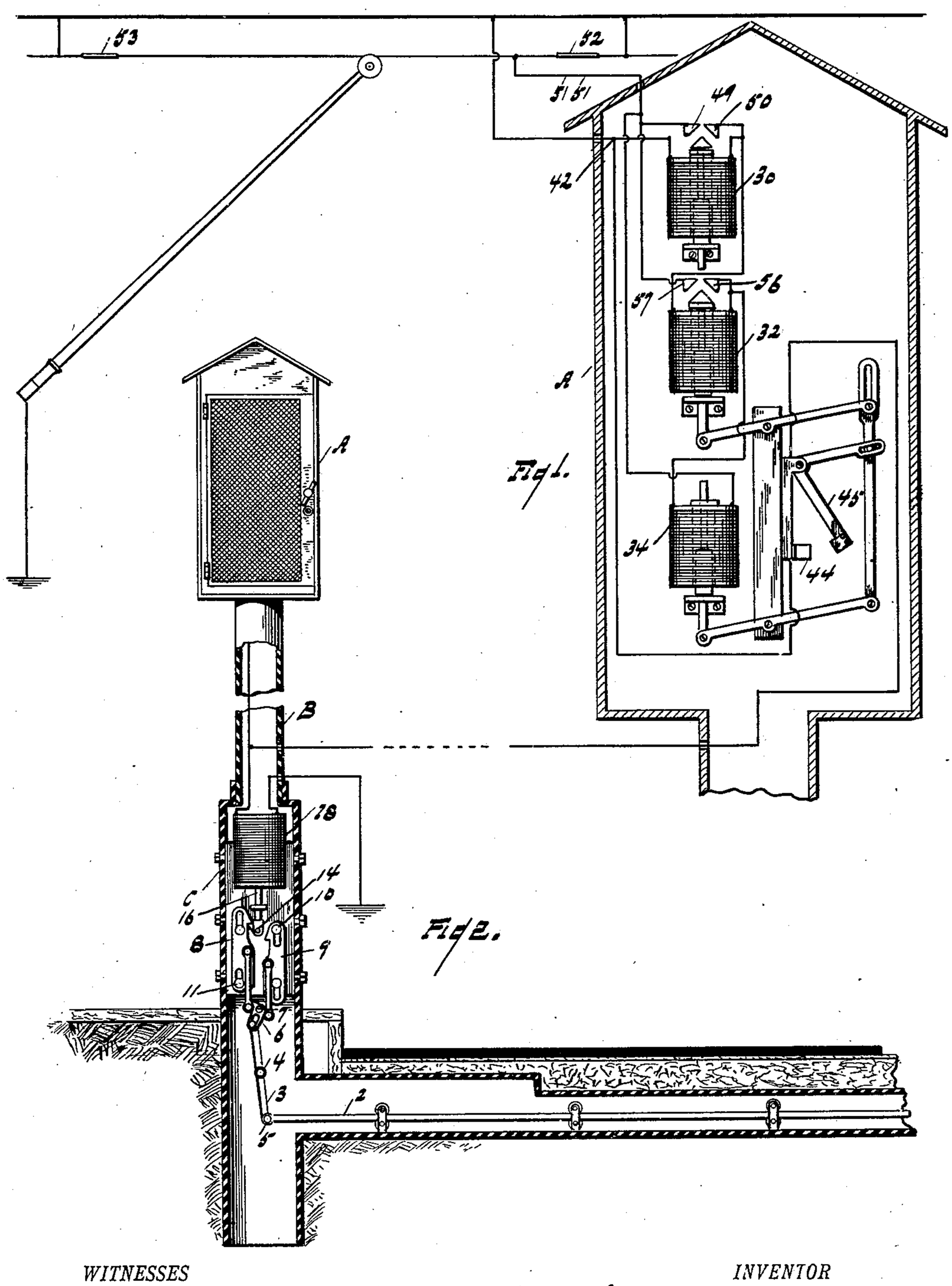

Fig 1.

Fig 2.

WITNESSES

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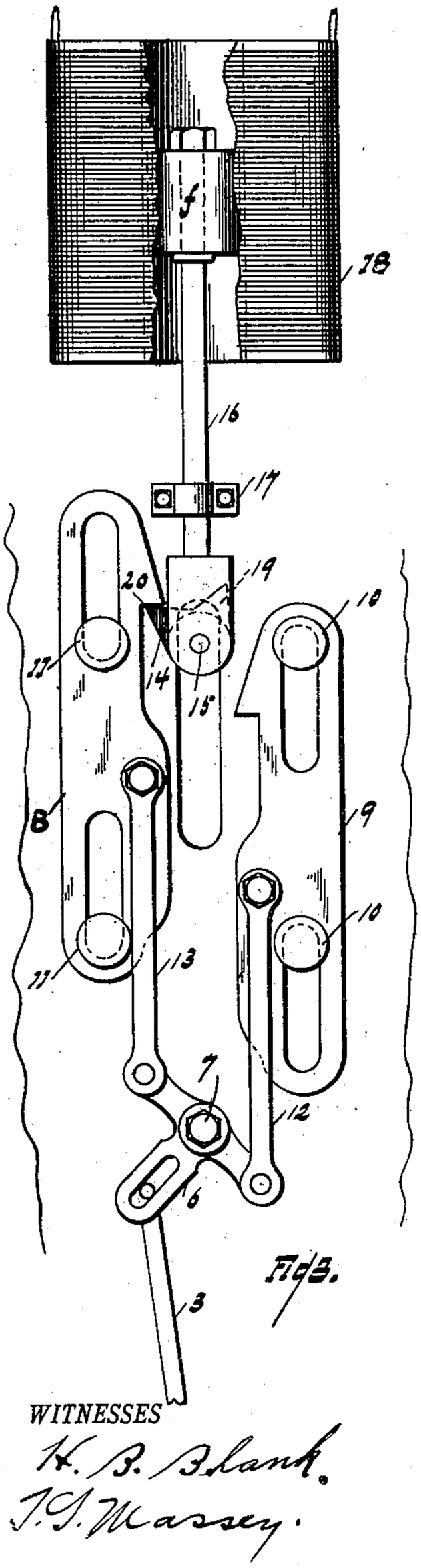

Fig 3.

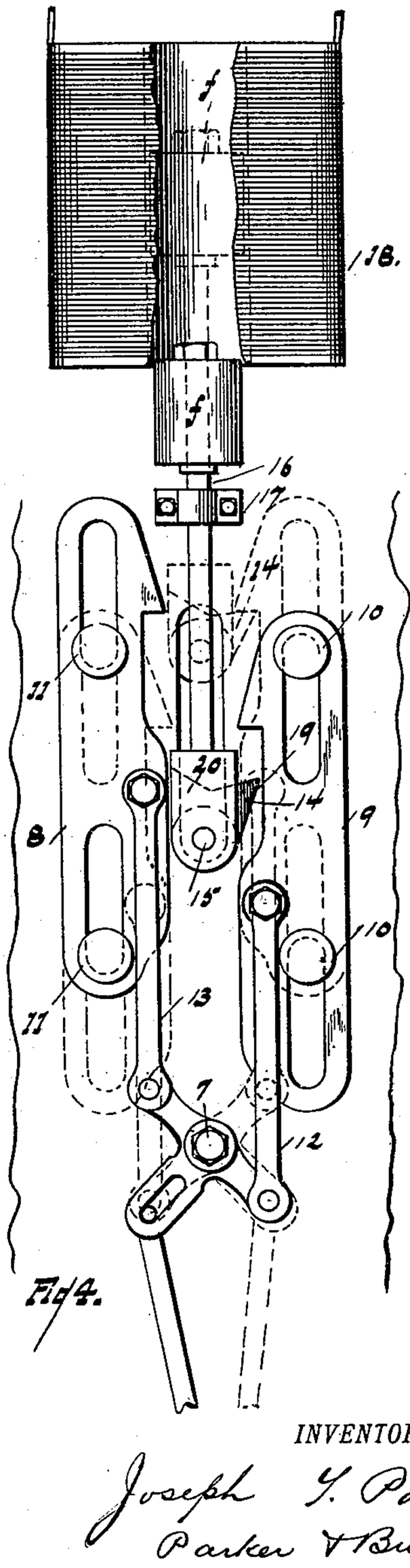

Fig 4.

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UNITED STATES PATENT OFFICE.

JOSEPH Y. PORTER, OF DETROIT, MICHIGAN.

ELECTRIC SWITCH-ACTUATOR.

SPECIFICATION forming part of Letters Patent No. 712,845, dated November 4, 1902.

Application filed August 14, 1901. Serial No. 71,984. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH Y. PORTER, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Electric Switch-Actuators; and I declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to switch-actuators for electrically-actuated railways, and has for its object an improvement in the means for actuating the shifting tongue of the track.

In the drawings, Figure 1 shows diagrammatically the arrangement of current-controllers by means of which the current taken to the switch-actuator is regulated. Fig. 2 shows the tongue-actuating apparatus. Fig. 3 is a detail of a part of the tongue-actuating apparatus. Fig. 4 is a detail of the same part shown in a different position.

The apparatus is one which is intended to shift the tongue of a railway-switch by a current of electricity that passes through a coil arranged as a solenoid, the core of which reciprocates under the influence of the current and is connected to mechanism which alternately pushes and pulls the linkage which is connected with a tongue and which actuates the tongue. The current which passes through the solenoid 18 is removed from the main feeder of the trolley system, and that part of it which actuates the solenoid passes to the ground directly; but the same current which actuates the solenoid divides from that which actuates the trolley-car, and that part of it which actuates the trolley-car passes to the ground through the trolley and the car in the ordinary way, and because it is necessary to provide for the conduction of currents of different power through the different cars that run or may run on a trolley system it is necessary to provide some appliances which will conduct a quantity of current from the feeder sufficient to actuate both the car and switch-tongue, and this quantity shall be determined by the car itself, and this apparatus for regulating the current taken from the feeder and dividing it to send one part of approximately regular power through the switch-actuating mechanism and another part of variable power through the trolley is contained in the mechanism located in the housing A on the post B and which is diagrammatically represented in Fig. 1.

The mechanism for shifting the switch-tongue will first be described and afterward the mechanism for controlling the current which actuates it.

C indicates a station, generally a hollow post, which is located near the railway-switch and from which there is a connecting-link 2, that actuates the switch-tongue. The link 2 is itself actuated by a lever 6, fulcrumed on a pin 4 and connected to the link 2 by a pivot 5. The lever 3 is pivoted at its upper end to a double bell-crank lever 6, secured by a pivot 7 to the main framework or housing in which the apparatus is contained. On the frame above the bell-crank lever 6 are two sliding hooks 8 and 9, secured by pins 10 and 11 to the main frame of the structure. The pins 10 pass through slots in the body of the hook 9, and the hook is capable of vertical movement on the pins. The slide 8 is secured by pins 11, which pass through corresponding slots in the slide 8 and hold it to the main frame of the structure. Each hook is connected by a link to the double bell-crank lever 6. Each link is secured to both the lever and its own hook by pivot-pins. The link 12 is secured to the hook 9, and the link 13 is secured to the hook 8. The opposing faces of the hooks 8 and 9 are each provided with a bill or point, and these bills or points are adapted to engage an oscillating catch 14. The oscillating catch 14 is held by a pivot 15 to a bar 16, held in a guide 17, and to the upper end of the bar 16 is attached the core of a solenoid 18. The oscillating catch 14 has two wings 19 and 20, the points of which are spread to such an extent that the bill of neither hook can pass the wing without swinging the catch on its pin 15, and, on the contrary, if the catch be pushed below the bill under it engaging with the widened body of the hook it will be swung in the opposite direction. Each hook has a body part that extends toward its companion hook to a line in which the extreme point or bill of the hook terminates, and this line is parallel to

the long axis of the plunger of the solenoid-core. Both the solenoid and the hook reciprocate. The actuation is primarily due, however, to the movement of the solenoid, which drops when there is no current in the coil to its lowermost position, as indicated in Fig. 4. When in this position, the catch 14 is below the bills of both hooks; but the hooks themselves are at different elevations. One of the hooks—as, for example, the hook 8, as shown in Fig. 4—is lifted to the position which it has when the switch-point is over the one side of its throw. In this position the hook 8 is so far lifted with respect to the catch that the wide body part of it has engaged against the point of the wing 20 and thrown the catch over with the point of the wing 19 in position to engage with a bill of the hook 9. When now the current is turned through the solenoid, the core is lifted to the position shown in dotted lines in Fig. 4 and in raising the point of the wing 19 engages under the bill of the hook 9, and the hook 9 is drawn upward, rocking the lever 6 on its pin and shifting the switch-point. As soon as the electric current is turned off the solenoid-core *f* falls, and the point of the wing 19 engaging against the body part of the hook 9 causes the catch 14 to swing on its pivot to bring the point of the wing 20 in position to engage the bill of the hook 8, when the solenoid-core is again lifted, and the complete lifting of the solenoid-core throws the switch-point to the opposite position. A subsequent dropping followed by a lifting of the core again actuates the switch-point, and with each repetition of the dropping and lifting of the solenoid-core the switch-point is actuated, and it is thrown alternately from one position to another.

In order that the current which actuates the solenoid may be of proper power irrespective of the amount that is drawn from the feed-wire, there is placed in the line which feeds the solenoid 18 a controller. This may consist of two or more coils placed in the line, and the result produced depends somewhat on the winding of the coils and on the selection of proper and suitably-wound coils for the desired purpose.

The current which passes through the solenoid 18 is derived from the main feeder or source of supply of electric current. This current divides at the point marked 42, one part passing through the solenoids 30, 32, and 34 in series, thence over conductor 51 to the insulated portion of the trolley-wire, (designated in the drawings between insulators 52 and 53,) thence through the trolley to controller and motors. The action of this current passing through the solenoids 32 and 34 operates a system of levers to control switch 44 and 45. This switch completes a circuit between the feeder and solenoid 18, so that the current divides at point 42, part of this current passing through solenoid 30, 32, and 34, while a relatively uniform quantity passing through the switch 44 and 45, and thus through solenoid 18 to the return-conductor. The variable part passing through the solenoids is occasioned by the variable quantity of current required to furnish the necessary power to the cars of different types and speeds which may take variable amounts of power to operate them. When this variable current is small in quantity, the solenoid 32 does not leave the core of its solenoid to close the electric switch-points 44 and 45, for the reason that the solenoid 32 is so constructed that the ampere-turns are less with a give current than the ampere-turns in solenoid 34. The result of this is that for small currents solenoid 34 closes the electric switch-points 44 and 45 by means of the intervening link mechanism. This is due to the fact that when the current first flows through these three solenoids the same amount of current measured in amperes flows through each of the solenoids, and the solenoid 34, having more turns than solenoid 32, the ampere-turns will therefore be greater, and hence the lifting power will be greater. Should the amperes flowing through the solenoids 30, 32, and 34 increase toward the maximum safe-carrying capacity of solenoid 34, the core of solenoid 32 will be lifted, throwing into action the links controlled by this solenoid and operating or holding closed the electric switch-points 44 and 45, at the same time short-circuiting or shunting solenoid 34 by connecting points 56 and 57, which are connected together electrically by the upper end of the plunger or core of solenoid 32 making contact between these points 56 and 57. The action of solenoids 34 and 32 as described completes and maintains the electrical circuit through solenoid 18 and operates the rail-switch. The purpose for which the circuit was closed by means of the electrical switch-points 44 and 45 has now been accomplished, and if the current is entirely shut off the plungers or cores of solenoids 32 and 34 drop to their original positions, opening the electric switch-points 44 and 45, thus shutting off the current from solenoid 18. Now should the current required to operate the car approach the maximum safe-carrying capacity of solenoid 32, the solenoids 34 and 32 having accomplished their purpose, this excessive current will operate the plunger or core of solenoid 30, leaving it so that the upper end makes an electrical contact between points 49 and 50, short-circuiting or shunting solenoids 32 and 34, thus preventing an excessive current from flowing through solenoids 32 and 34, they having already performed their service before the current reached an excessive amount. With the core of solenoid 30 lifted the car may take the maximum amount of current required to operate same without damage to the other solenoids. The amount of current taken from the wire is regulated on the trolley-car in the ordinary way, the car taking under the appliances with which it is equipped the proper amount of current

to actuate it and the solenoid 18 taking the amount of current in addition thereto proper to actuate it.

The general principle of action of the means employed for controlling the flow of the electric current may be embodied in any one of several different electrically-actuated devices or motors, the essential feature being that there shall be several of the motors in series and that the electrical current shall flow normally through all the series so long as the strength of the current is not sufficient to injure or destroy that one of the series which is wound for or prepared to come into action with the current of least power that will be used and so arranged that they shall be successively cut out of use as the current increases in power. Of course in actual use the motor actuated by the low power would be properly cut out some time before the current rose to so high a power as to actually endanger it.

What I claim is—

1. In an apparatus for the purpose described, the combination of a line-wire, an insulated section thereof, a connecting-wire between said section and the line-wire, an electrically-actuated mechanism for operating the track-switch, an electrical switch for making and breaking the circuit through the track-switch-actuating mechanism, and means for actuating said electrical switch located in said connecting-wire and adapted to be actuated by either the maximum or minimum current used by a car.

2. The combination of a rod arranged to be reciprocated, a pawl upon said rod adapted to protrude beyond the side of said rod upon one side or the other, two pieces adapted to reciprocate in paths parallel to said rod and upon opposite sides thereof, each of said pieces being provided with a hook arranged to be engaged by said pawl, and with a lug adapted to contact said pawl to cause it to protrude from the opposite side of said rod.

3. In an apparatus for the purpose described, a hollow standard extending above the ground, a solenoid located in said standard with its axis vertical, a core for said solenoid adapted to fall by its own weight, and to be raised by the action of the current in the solenoid, a pawl upon said core adapted to protrude from one side or the other thereof, two pieces adapted to reciprocate in paths parallel to said rod and upon opposite sides thereof, each of said pieces being provided with a hook arranged to be engaged by said pawl, and with a lug adapted to contact said pawl to cause it to protrude from the opposite side of said core, a double bell-crank lever having opposite arms connected to said pieces, and links connecting said bell-crank lever with the movable part of the switch.

4. In an apparatus for the purpose described, the combination of a line-wire, an insulated section thereof, a connecting-wire between said section and the line-wire, an electrically-actuated mechanism for operating the track-switch, an electrical switch for connecting the line-wire with the return through the track-switch-operating mechanism and a plurality of electromagnets adapted to actuate said electrical switch, the coils of said electromagnets being interposed in said connecting-wire, said electromagnets being adapted to be operated by different currents, and means for cutting out the more easily operated magnets as the current increases.

5. In an apparatus for the purpose described, the combination of a line-wire, an insulated section thereof, a connecting-wire between said section and the line-wire, an electrically-actuated mechanism in or on said connecting-wire for operating the track-switch, an electrical switch for connecting the line-wire with the return through the track-switch-operating mechanism, and a plurality of electromagnets adapted to actuate said electrical switch, the coils of said electromagnets being interposed in said connecting-wire, said electromagnets being wound with the different-sized wires to adapt them to be operated by different currents, and means for cutting out the magnets having the finer wire as the current increases.

In testimony whereof I sign this specification in the presence of two witnesses.

JOSEPH Y. PORTER.

Witnesses:

C. F. BURTON,

ELLIOTT J. STODDARD.