(No Model.) 5 Sheets—Sheet 1.

M. IMMISCH.

SWITCH FOR ELECTRICAL TRAM CARS.

No. 491,483. Patented Feb. 7, 1893.

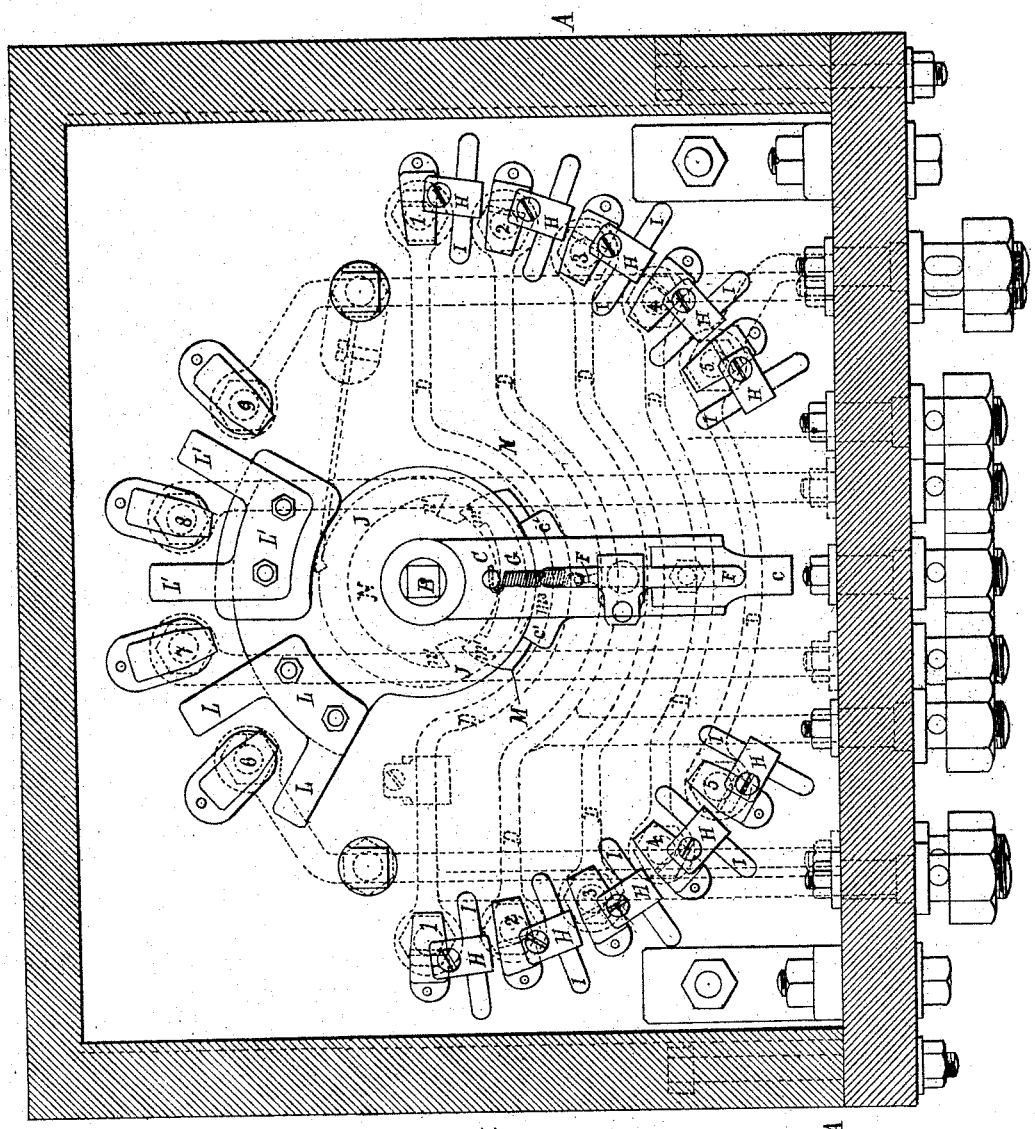

Fig. 1.

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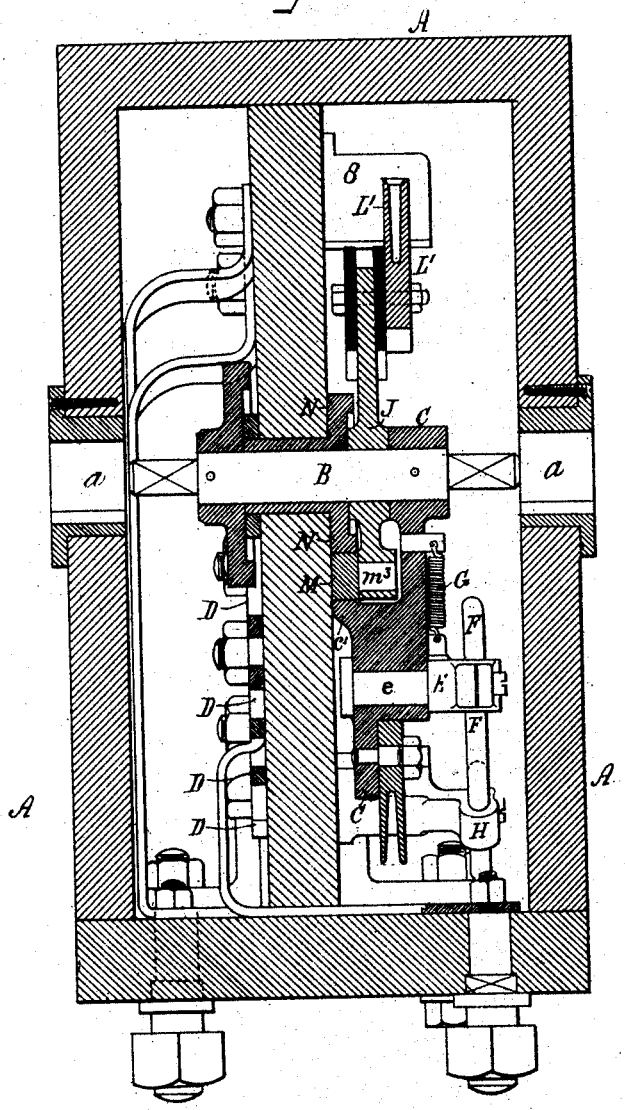
Fig. II.



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SWITCH FOR ELECTRICAL TRAM CARS.

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Fig. III.

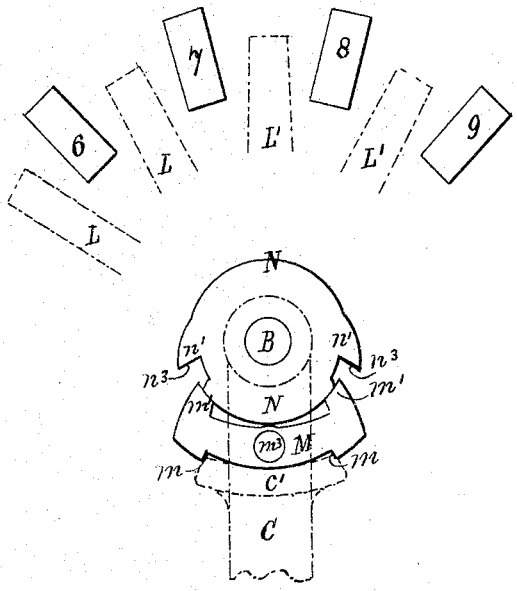
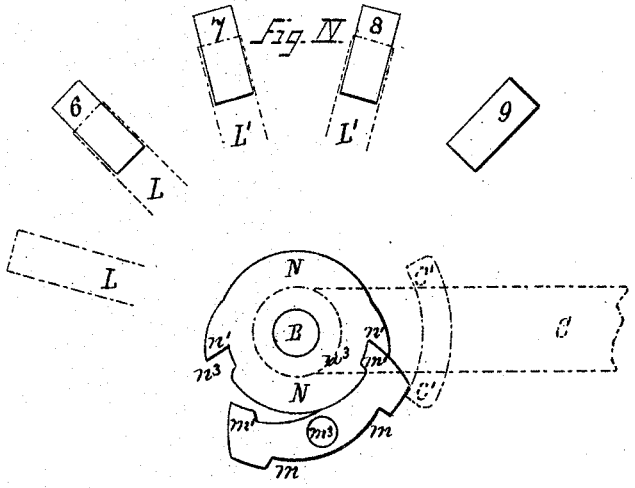


Fig. IV.



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SWITCH FOR ELECTRICAL TRAM CARS.

No. 491,483. Patented Feb. 7, 1893.

Fig. V.

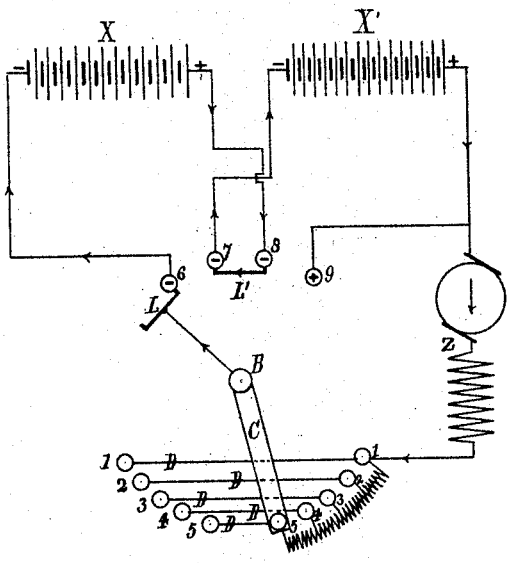
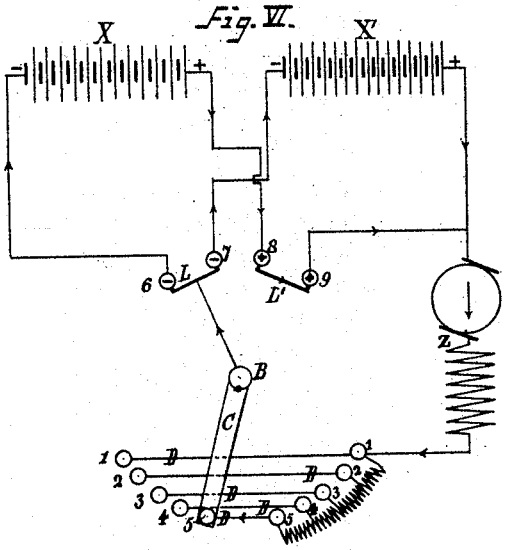


Fig. VI.



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(No Model.) 5 Sheets—Sheet 5.

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SWITCH FOR ELECTRICAL TRAM CARS.

No. 491,483. Patented Feb. 7, 1893.

Fig. VII.

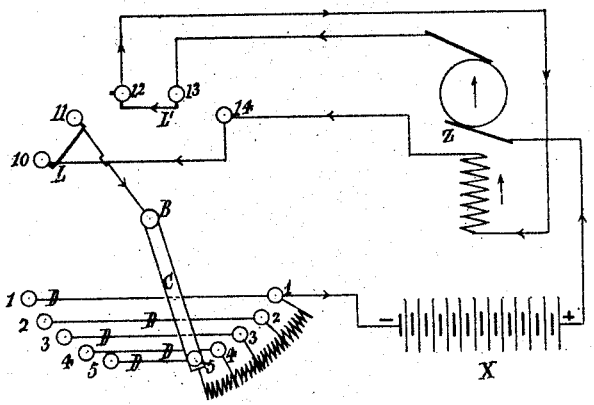
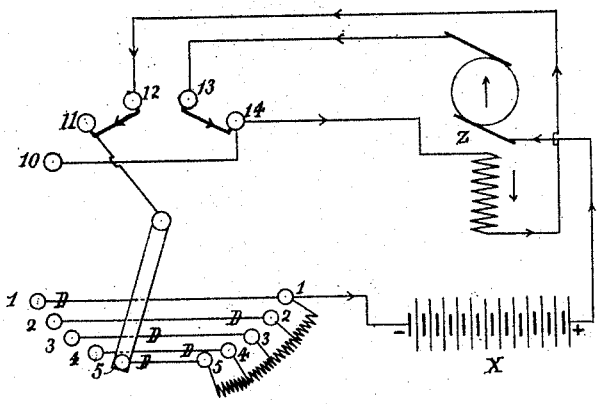


Fig. VIII.



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UNITED STATES PATENT OFFICE.

MORITZ IMMISCH, OF LONDON, ENGLAND, ASSIGNOR TO THE IMMISCH ELECTRIC NAVIGATION AND POWER COMPANY, OF NEW JERSEY.

SWITCH FOR ELECTRICAL TRAM-CARS.

SPECIFICATION forming part of Letters Patent No. 491,483, dated February 7, 1893.

Application filed November 21, 1891. Serial No. 412,675. (No model.) Patented in England September 7, 1889, No. 14,114.

To all whom it may concern:

Be it known that I, MORITZ IMMISCH, a citizen of Great Britain, and a resident of London, in the county of Middlesex, England, have invented a new and useful Improvement in Switches for Electrical Tram-Cars, (patented in England September 7, 1889, No. 14,114,) of which the following, taken in connection with the accompanying drawings, is a full, clear, and accurate description.

The object of the present invention is to provide a simple and efficient self-locking switch for use in electrical tram cars, and which may be employed either for enabling the motor to be reversed, or two sets of accumulators which supply the current to the motor to be placed in series or in parallel at will. The switch insures the locking of the parts for effecting the necessary changes in any position to which they have been shifted, that is to say on one side or other of a central position, or in the central position, when the circuit is broken.

The invention is illustrated in the accompanying drawings, in which

Figure I, is a vertical section through the switch-box, showing the switch in elevation therein. Fig. II, is a transverse section through the center of the switch. Figs. III, and IV, are detail views of the locking device, showing the parts in different positions. Figs. V and VI, are diagrammatic views of the connections of a switch for placing two sets of accumulators in series or parallel as desired, Fig. V, showing the switch in the position it occupies when the accumulators are connected in series, and Fig. VI, the position of such switch when the accumulators are connected in parallel. Figs. VII and VIII are diagrammatic views of the connections of a switch for reversing an electro-motor, such views showing respectively the two positions of the switch when the motor runs in opposite directions.

The handle for operating the switch is introduced through an opening *a*, in the switch box A, such opening and also the handle being so shaped that the latter can only be withdrawn when the circuit is broken, and as only one handle is provided to operate the two switches situated at opposite ends of the tram car, the switch not in use is bound to be in the position it occupies when the circuit is broken. The axis B, to receive the operating handle, is supported so that it can turn in suitable bearings in the switch box A, and to it is secured the make and break lever C, which can turn in an arc of a circle of one hundred and eighty degrees. On either side of the central position of the make and break lever C, and in its line of travel, is arranged a series of terminals of resistances 1, 2, 3, 4, 5, the terminals on opposite sides being connected together in pairs by the bars or rods D, so that when the lever C, is moved from such central position into contact with the first terminal 5 in either direction, the circuit will be completed, and as the lever C, continues its movement the resistances connected with the respective terminals will be successively cut out. As the lever C is moved back to the central position, the resistance will be successively introduced, until the circuit is broken.

So as to insure the contact pieces of the terminals 1, 2, 3, 4, 5, not being damaged by sparking as the contact is made and the resistances are successively cut out, the following arrangement is employed: Upon the front of the make and break lever C, is pivoted a holder E carrying a steel rod F, such holder being acted upon by a spring G, so as to hold the rod in its normal position. In advance of each of the terminals 1, 2, 3, 4, 5, in the direction in which the make and break lever C, moves in completing the circuit and cutting out the resistances, each of such terminals is provided with a holder H, carrying a rod I, situated in the same plane as the rod F on lever C, will pass through when it is moved with such lever. When lever C, is moved in either direction from the central position, the rod F it carries, will first come in contact with rod I, carried by terminal 5, and in the continued movement of lever C, will cause the holder E of such rod F, to turn on its pivot *e*, against the action of spring G, before the contact piece *c*, of lever C, can come into contact with terminal 5. The rods F and I, will thus first complete the circuit and so receive the spark. As lever C is again moved toward the next terminal 4, holder E of rod

F will turn still farther on its pivot *e*, against the action of spring G, until rod F can clear the inner end of rod I, when the tension of such spring will cause the holder to suddenly resume its normal position in relation to lever C, which by this time is in such a position that rod F is thereby brought suddenly into contact with the next rod I of terminal 4, thus cutting out the resistance between terminals 4 and 5 before contact piece *c* of lever C, comes in contact with terminal 4. The same action takes place as each of the resistances is cut out, so that any sparking which may occur, will be between the rods F and I, and the contacts themselves will remain undamaged, while when damaged the rods F and I can be readily removed from their holders and replaced by new ones.

Mounted so that it can turn freely upon the axis B, of the make and break lever C, is a disk J, carrying two separate pairs of contact pieces L, L′, which (in the case of an accumulator switch) act in conjunction with four terminals 6, 7, 8, 9, arranged in the other half of the switch box A, to that in which the make and break lever C turns, and these terminals 6, 7, 8, 9, are connected so as to enable two sets of accumulators X, X′, (see Figs. V and VI) of the car to be placed in series or in parallel as desired, when the disk J is shifted so as to bring its contact pieces L, L′, into contact with the proper terminals.

In the case of a switch for reversing the motor, five terminals 10, 11, 12, 13, 14, (see Figs. VII and VIII) will be necessary, and these will also have to be suitably connected as hereinafter described.

The contact pieces L, L′, of the disk J, are so arranged in relation to the terminals 6, 7, 8, 9 or 10, 11, 12, 13, 14, (as the case may be,) that when the make and break lever C is in its middle or central position, they are out of contact with such terminals, in conjunction with which they operate, as will be seen in Figs. I and III. On the vertical axis of the disk J when in this position and near its periphery, is pivoted an anchor piece M, the outer surface of which is recessed in the center of *m*, while at each end is an inwardly projecting tooth *m′*.

Upon the make and break lever C, is a part or projection *c′* which fits the recess *m*, in the outer surface of the anchor M when the lever C and the disk J are in their central positions, while the anchor M is prevented from turning on its pivot m^3 by the teeth *m′* on its inner surface resting on the periphery of a fixed disk N within which the axis B of the make and break lever C can turn, so that at this point the anchor M and consequently the disk J upon which it is pivoted, are locked to the make and break lever C. In this position, as above stated, the circuit is broken, and the contact pieces L, L′, of the disk J, are out of contact with their terminals. Upon the make and break lever C being turned either to the right or to the left, the anchor M and its disk J, are carried with it, thus bringing the contact pieces L, L′, of the latter, into contact with the proper terminals for effecting the required change, but still leaving the circuit broken, as at this position the make and break lever C has not yet come into contact with the first terminal 5 in its path. In this position also one end of the anchor piece M comes into contact with a projection *n′* formed on the fixed disk N above-referred to, so that it can no longer move with the make and break lever C, and the contact disk J to which the anchor M is pivoted, is therefore also prevented from turning farther around the central axis B in this direction. At the point where the movement of the anchor M is arrested, the fixed disk N has a recess n^3 formed in its periphery opposite the position then occupied by the end tooth *m′* (in the direction of its previous movement) of the anchor M, and the continued movement of the central axis B to which the make and break lever C is secured, causes the projection *c′* on such lever to bear upon one side of the recess *m*, into which it fits in the outer surface of the anchor M, and thus compels the latter to turn on its pivot m^3, and its tooth *m′* to enter the recess n^3 in the periphery of the fixed disk N. By thus turning upon its pivot m^3, one end of the anchor M is lowered until the projection *c′* on the make and break lever C, clears the recess *m*, in the outer surface thereof, and can consequently continue its movement with the central axis B independently of the anchor M and its contact disk J, and thus be brought successively into contact with the resistance terminals 5, 4, 3, 2, 1, the resistances connected with which are consequently cut out in succession after the first contact is made, and as the lever C completes it movement.

The projection *c′* on the make and break lever C rides over the anchor piece M, and still engages the end of same when it has completed its movement (as shown in Fig. IV), so that the tooth *m′* of the anchor piece M, cannot leave the recess *m* it has engaged in the fixed disk N^3, and consequently the contact disk J to which such anchor piece M is pivoted, is locked in the position to which it has been moved to make the desired connection.

When desired to change the connections or to break the circuit, the reverse operations occur, the movement of the make and break lever C in the opposite direction first introducing a gradually increasing resistance as it passes in succession over the resistance terminals 1, 2, 3, 4, 5, until it leaves the last terminal 5 and breaks the circuit, when the projection *c′* on such lever C, will engage the forward end of the recess *m*, in the anchor piece M, and cause the latter to turn on its pivot m^3 thus disengaging its tooth *m′* from the recess n^3 in the fixed disk N, and causing the anchor M to again lock with the make and break lever C. The make and break lever C will then carry the anchor M and the contact disk J to which it is pivoted, with it during the rest of its movement to the central position,

when the key can be withdrawn from the switch box if desired.

To change the connections, the make and break lever C will be moved to the opposite side of its central position, when exactly the same actions as described in the previous movement will occur.

Referring to Figs. V and VI, it will be seen that in the case of an accumulator switch, the switch terminal 6 is connected to the — terminal of one set of accumulators X; terminal 7 to the — terminal of the other set of accumulators X′; terminal 8 to the terminal of the set of accumulators X; and terminal 9 to one terminal of the motor Z, which is also connected to the terminal of the set of accumulators X′, while the other terminal of such motor is connected to the first resistance terminal I. The pair of contact pieces L of the switch is connected to the switch lever C, and when this pair rests on the terminal 6 only, while the pair L′ rests on terminals 7 and 8, as shown in Fig. V, the two sets of accumulators X, X′, will be connected in series, while when the pair of contact pieces L, rests on terminals 6 and 7 and the pair L′ rests on terminals 8 and 9, such accumulators will be connected in parallel, as shown in Fig. VI.

Referring to Figs. VII and VIII, it will be seen that in the case of a switch for reversing the motor Z, the switch terminal 10, is connected to terminal 14, and the latter to one terminal of the field of the motor Z; terminal 11 is connected to the switch lever C; terminal 12 is connected to the other terminal of the field of the motor Z; terminal 13 is connected to one terminal of the armature of motor Z, and the other terminal of such armature is connected to the terminal of the accumulators X, while the — terminal of such accumulators is connected to resistance terminal I.

When the pair of contact pieces L rests on terminals 10 and 11 and the pair L′ on the terminals 12 and 13, as shown in Fig. VII, the motor Z will run in one direction, while when (as shown in Fig. VIII) the pair of contact pieces L rests on terminals 11 and 12 and the pair L′ on the terminals 13 and 14, as will be seen by the arrows the direction of current through the field of the motor Z will be reversed, and the motor will therefore run in the opposite direction.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:

In a switch, the combination with the make and break or switch lever, of an oscillating disk, as J, on the axis of the switch lever, carrying contact pieces to work in conjunction with terminal contacts for making the desired changes, a pivoted anchor, as M, on said oscillating disk, having a recess in its outer surface, a fixed disk, as N, on the axis of the switch lever, having recesses to alternately receive and engage one of the teeth of said anchor, and a projection, as c' on the switch lever, to engage said recess of the anchor, the whole adapted to operate substantially as herein described, for the purpose set forth.

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Witnesses:
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HARRY A. MCLELLAN.