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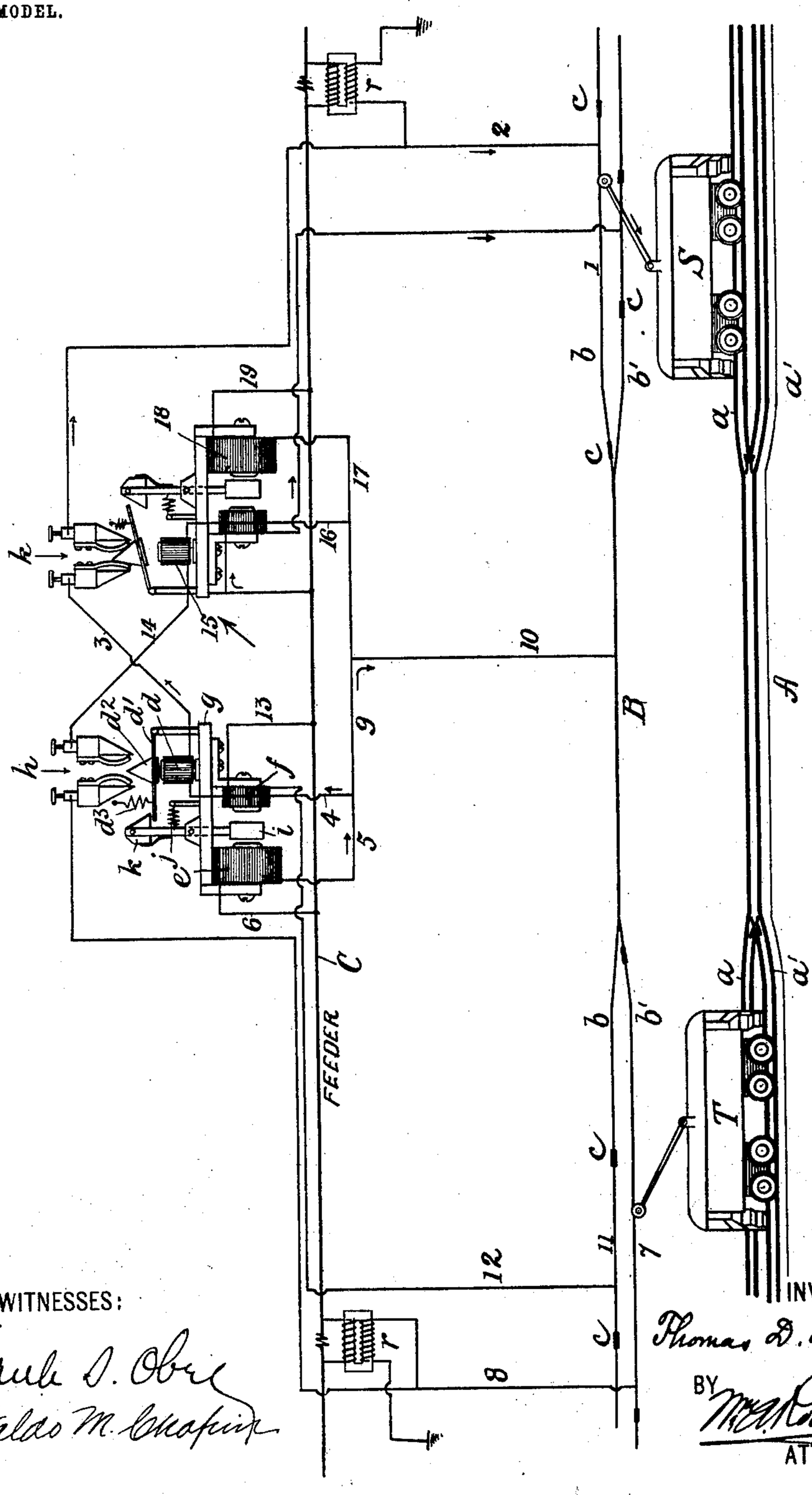
T. D. LOVELL.

ELECTRIC RAILWAY.

APPLICATION FILED NOV. 3, 1903.

NO MODEL.



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No. 756,511. Patented April 5, 1904.

UNITED STATES PATENT OFFICE.

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ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 756,511, dated April 5, 1904.

Application filed November 3, 1903. Serial No. 179,664. (No model.)

To all whom it may concern:

Be it known that I, THOMAS D. LOVELL, a citizen of the United States, residing at Beverly, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Electric Railways, of which the following is a full, clear, and exact description.

This invention relates to means for controlling the running of electric cars on single-track roads, the object being to provide a plan of operation which does not depend upon signals to prevent cars from entering dangerous blocks, but automatically cuts off the power from any car that approaches a block upon which another car or cars is running in the opposite direction.

The invention is designed more particularly to prevent head-on collisions, the protection of cars following each other not being so necessary and the demands of traffic often requiring one or more cars to follow another into a block.

In carrying out my invention I provide the trolley wire or rail with insulated joints which divide it into sections, said sections being connected by branch wires with the feeder, and the branch wires including electromagnetic circuit-controllers which cut off from or admit power to other insulated sections in such manner that the first car to enter a block will at once deprive a section of the trolley at the opposite end of the block of current, so that a car approaching from the opposite direction would automatically come to a stop as soon as it encountered the dead section and will there remain until the block ahead of it is entirely free of cars.

The particular manner of carrying out my invention will be described in detail with reference to the accompanying drawing, in which the figure is a conventional plan and diagram of the apparatus and circuits constituting my invention.

The drawing shows one complete block of a single-track railway.

A indicates the track, which at each end of the blocks is provided with the usual turnouts *a* and *a'*, the track, as usual, constituting the return-circuit for the power-current.

B is a trolley-wire, which may be the usual suspended overhead conductor or a third-rail or subsurface conductor of any character from which the cars derive their power. This trolley-wire is provided adjacent to the track-turnouts with corresponding conductor-turnouts *b* and *b'*. C is a feeder extending from the power-station and supplying the trolley-wire B with power at various points. The trolley-wire is divided into sections by means of insulating-joints *c*. Each of the turnouts *b* and *b'* contain one of these sections, while along the block the wire is continuous and constitutes a long insulated section.

Along the roadside at any point where they will be properly protected are arranged for each block two sets of electromagnetic apparatus, each set consisting of similar parts, which in one instance comprises, essentially, a cut-out electromagnet *d*, a locking-magnet *e*, and a smaller releasing-magnet *f*, all located upon a base *g*, and a pair of terminals *h*, suitably supported and arranged to coöperate with the armature of the cut-out magnet *d* and a latch-lever *i* under the control of magnets *e* and *f* and arranged to lock and release the armature of the cut-out magnet. The latch-lever *i* is normally held in a neutral position with respect to magnets *e* and *f* by a light spring *j*, and it carries at its upper end a spring-actuated dog *k*, which is adapted to engage the end of armature-lever *d'* of the cut-out magnet. This armature-lever carries a metallic wedge-shaped block d^2, which is thrust between the terminals *h* by a spring d^3 when the armature-lever is released and the magnet *d* is deënergized. The other set of apparatus, while being a duplicate of the first, is indicated by different reference characters, as will hereinafter appear.

The circuits will be described in connection with the operation of the system, which is as follows: Let it be assumed that the car S has the right of way and is traveling from east to west. While it is traversing the turnout *a* its contact device or trolley engages the insulated section 1 of the trolley-wire, and its propelling-current is therefore taken from the following circuit: trolley-wire section 1, wire

2, terminals *k*, wire 3, cut-out magnet *d*, wire 4, wire 5, locking-magnet *e*, and wire 6 to the feeder C. The cut-out magnet being energized, its armature is attracted and the circuit across the terminals *h* opened. The armature in making this movement slips under the pawl *i* and becomes locked, the lock being made positive by the vitalizing of magnet *e*, which holds the pawl to the right to securely engage the end of the armature-lever. If now a car T approaching from the opposite direction—that is, from west to east—should endeavor to pass into the block, when its trolley reaches the insulated section 7 of the trolley-wire it would find no current and the car would come to a stop. This occurs because the branch wire supplying current to section 7 of the trolley-wire is opened, as will be seen by following the wire 8 to the terminals *h*. Thus car T must remain upon the turnout *a* until it can receive power from the section 7. Car S continues on through the block, and when its trolley passes off section 1 no more current flows through the cut-out magnet *d*, which therefore becomes deënergized; but as the car immediately passes onto the main trolley-wire a current will continue to flow through the locking-magnet *e*, the course of which can be traced through the wire 6, the locking-magnet *e*, wire 5, wire 9, and wire 10 to the trolley-wire. Thus the armature of the cut-out magnet *d* is retained in its former position and the terminals *h* remain open. The insulated joints *c* are constructed to be bridged by the trolley-wheel, so that no cessation of current will occur in magnet *e* when the car runs from section 1 to the main wire B. Car S, continuing on, reaches the end of the block, enters the turnout *a*, and its trolley engages the insulated section 11, whereupon the propelling-current flows through the wire 12, magnet *f*, and wire 13 to the feeder and the circuit through magnet *e* is opened. Magnet *f* then being energized swings the locking-lever *i* to the release position, and spring d^3 throws armature-lever *d'* upward and bridges the terminals *h*. This then completes the circuit for car T, as can now be traced, as follows: section 7, wire 8, terminals *h*, wire 14, cut-out magnet 15, wires 16 and 17, locking-magnet 18, and wire 19 to the feeder. Magnet 15 being energized opens the circuit at *k* of any car approaching the block from the east, and therefore car T is protected through the block.

Returning now to the first car S, let it be assumed that before it has traversed the block and entered the insulated section 11 another car traveling in the same direction enters the block. Such a car would close the same circuits as were closed by the car S on its passage and magnet *e* would be maintained in its energized condition, either by the way of wire 2 or by the way of wire 10, and as magnet *e* is stronger than magnet *f* the energizing of the latter magnet by car S when it makes contact with section 11 of the trolley-wire will not be sufficient to withdraw lever *i* from its engagement with the armature-lever *d'*. Consequently the circuit supplying power to car T will remain open at the terminals *h*. Likewise so long as other cars follow the first one into the block before the latter has passed out of it no car can enter the block from the opposite direction. This protection exists for cars moving in either direction, as can now be easily traced by the circuits described.

I have shown at *r r* transformers with their primaries connected with the feeder and their secondaries with the branch wires to supply sufficient current to a car which may be stalled on a turnout to keep its lamps burning and its heaters in operation when necessary, such current, however, being insufficient to propel the car.

Having described my invention, I claim—

1. In an electric railway, the combination of a sectional conductor supplying current to the cars or trains, normally closed branch conductors supplying current to the sections of the sectional conductor, two electromagnets in said branch conductors, one adapted when energized to open the circuit of a different branch, and the other adapted to lock said circuit open.

2. In an electric railway, the combination of a sectional conductor supplying current to the cars or trains, normally closed branch conductors supplying current to the sections of the sectional conductor, two electromagnets in said branch conductors, one adapted when energized to open the circuit of a different branch, and the other adapted to lock said circuit open, and other branch conductors including an electromagnet adapted to release said locked circuit, substantially as described.

3. In an electric railway, the combination of a track-block, a trolley-wire extending along the same and having an insulated section at each end of the block, branch conductors supplying current to the insulated section respectively, a circuit-controller in one branch controlling the circuit of the other, and another branch conductor supplying the trolley-wire between the two insulated sections and including a locking-magnet adapted to lock said circuit-controller, substantially as described.

4. In an electric railway, the combination of a single track divided into blocks and having turnouts at each end, a trolley-wire extending along the track and having corresponding turnouts, said trolley-wire having an insulated section on each turnout, branch conductors supplying current respectively to each insulated section, the branch conductor leading to a section at one end of the block including a circuit-breaking electromagnet adapted to open the circuit of a branch leading to a section at the other end of the block and two other branch conductors leading respectively to the other insulated sections at the opposite

ends of the block and including a circuit-closing electromagnet adapted to close the circuit previously opened by a circuit-breaker, substantially as described.

5. In an electric railway, a track and trolley-wire divided into blocks, a circuit-breaking electromagnet energized by a car going in one direction and adapted to open the circuit of a car going in the opposite direction, in combination with two electromagnets, one adapted to lock the said circuit open and the other adapted to release said lock, the locking-magnet being stronger than the releasing-magnet and means whereby a second car following the first into a block before the first leaves it, will energize the locking-magnet while the releasing-magnet is energized by the first car, for the purpose set forth.

In witness whereof I subscribe my signature in presence of two witnesses.

THOMAS D. LOVELL.

Witnesses:

A. W. HODGKINS,

GEORGE E. RYDER.