No. 801,441. PATENTED OCT. 10, 1905.

L. H. COXE.

ELECTRIC SWITCH THROWING DEVICE.

APPLICATION FILED NOV. 12, 1904.

4 SHEETS—SHEET 1.

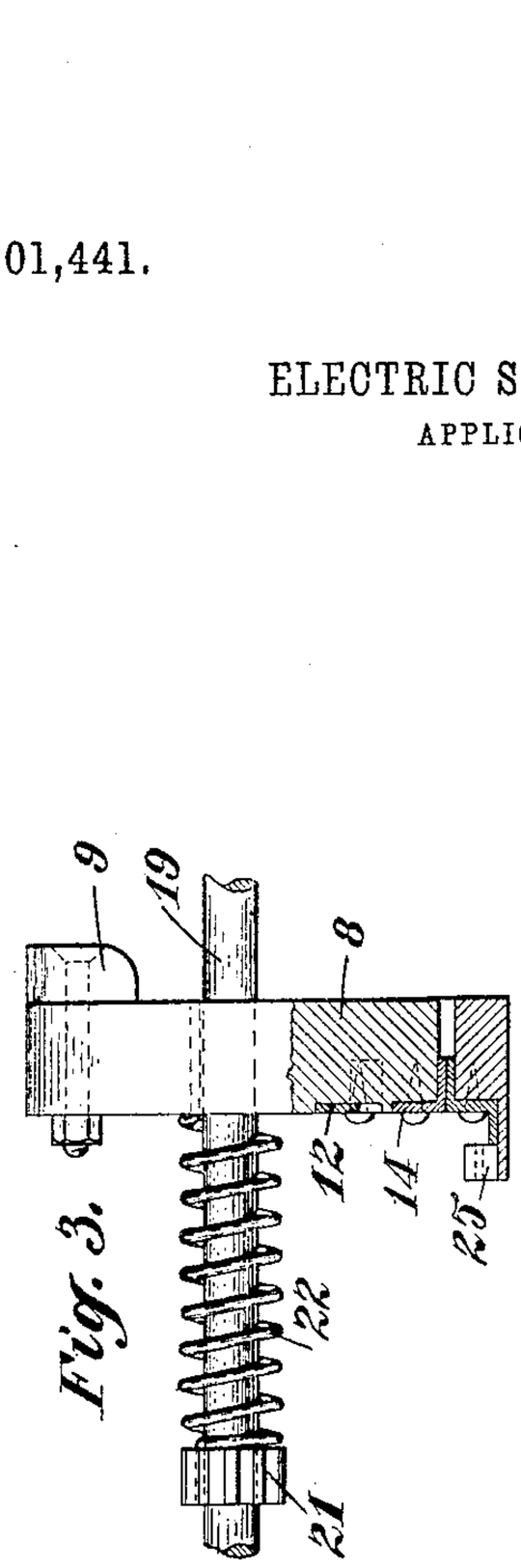

Fig. 3.

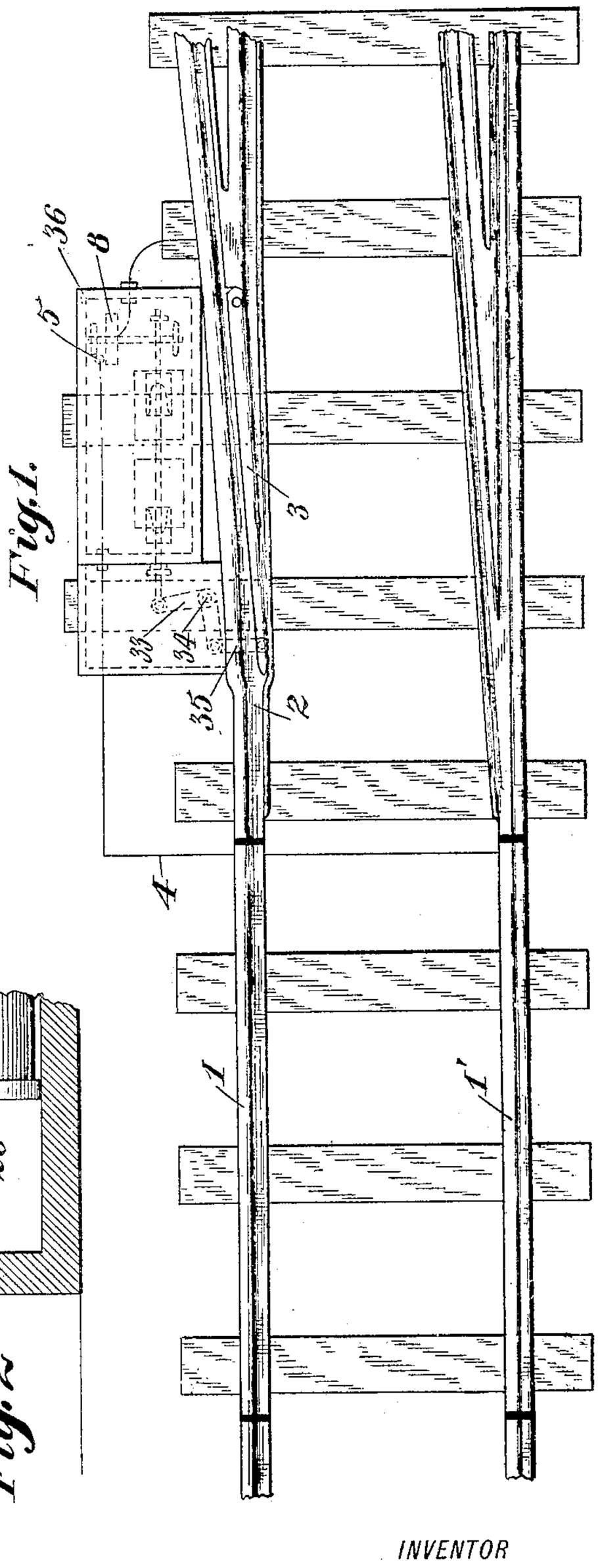

Fig. 1.

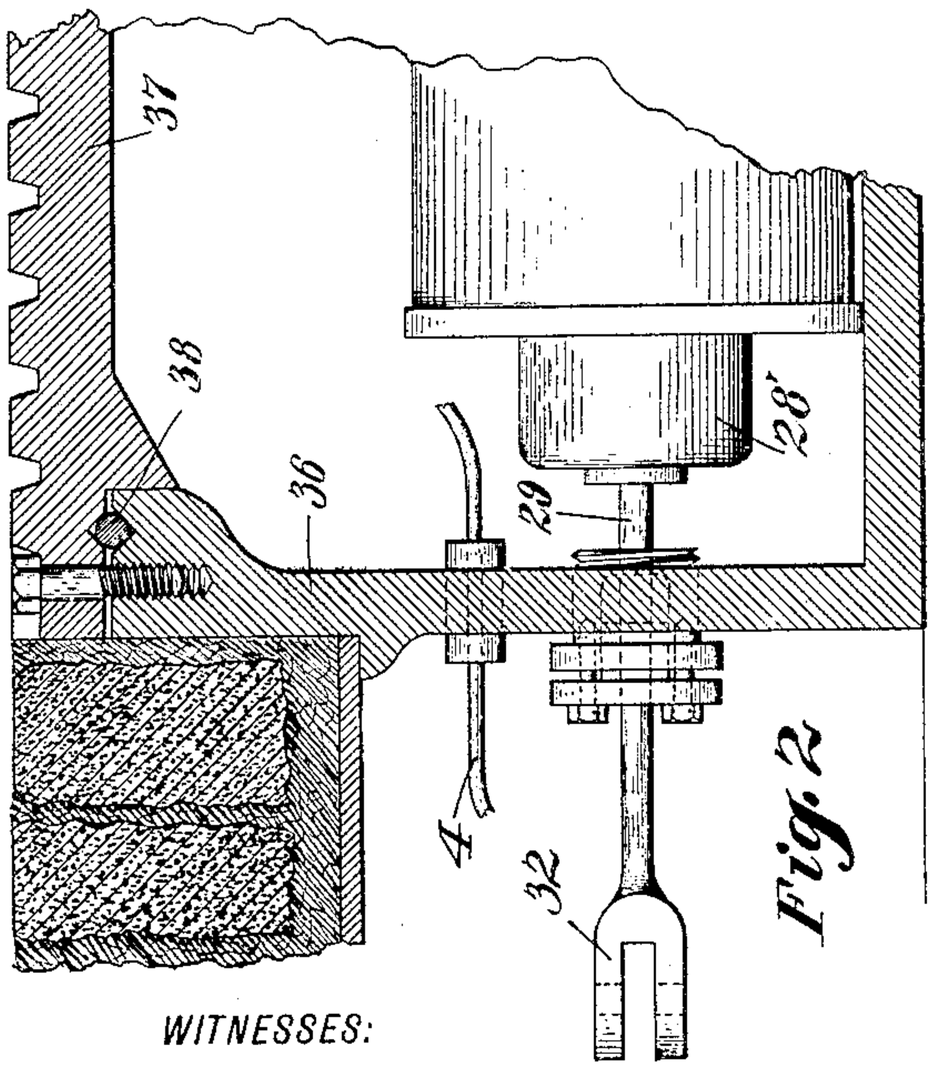

Fig. 2

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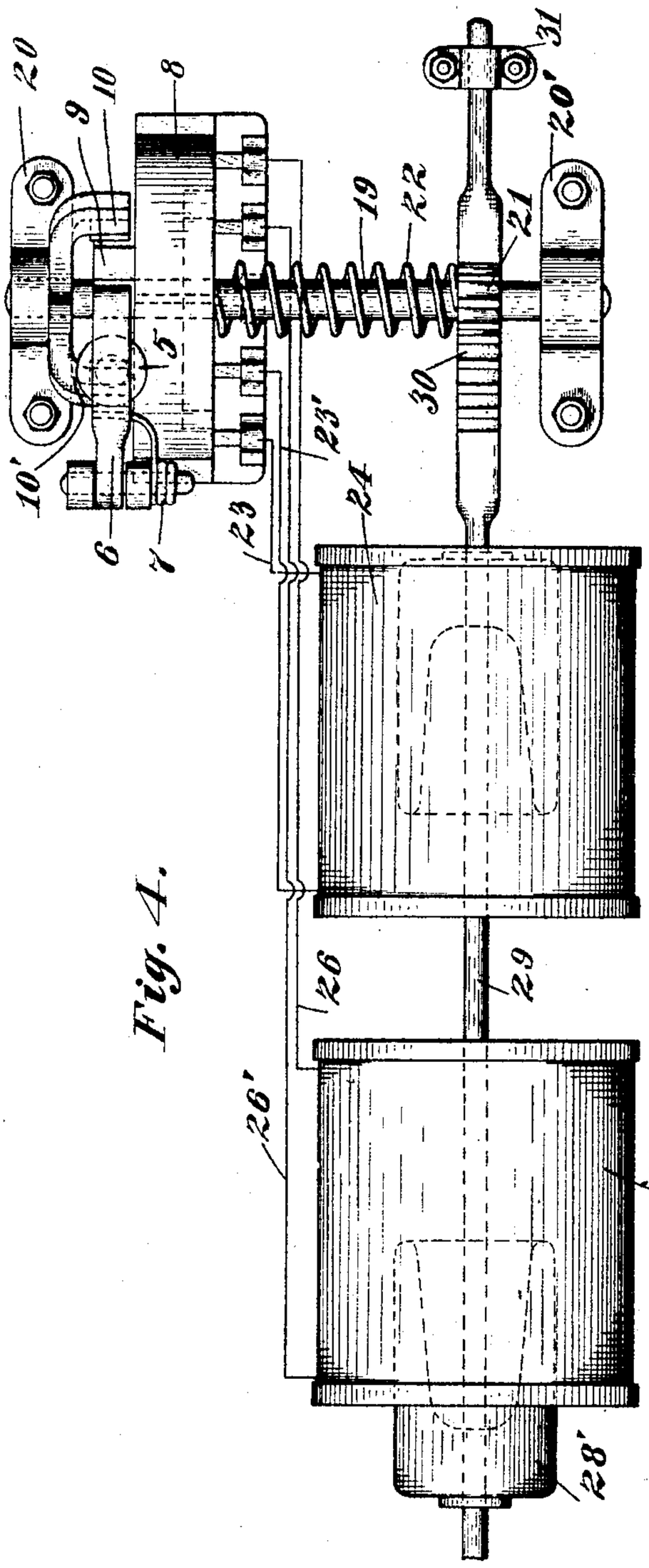

Fig. 4.

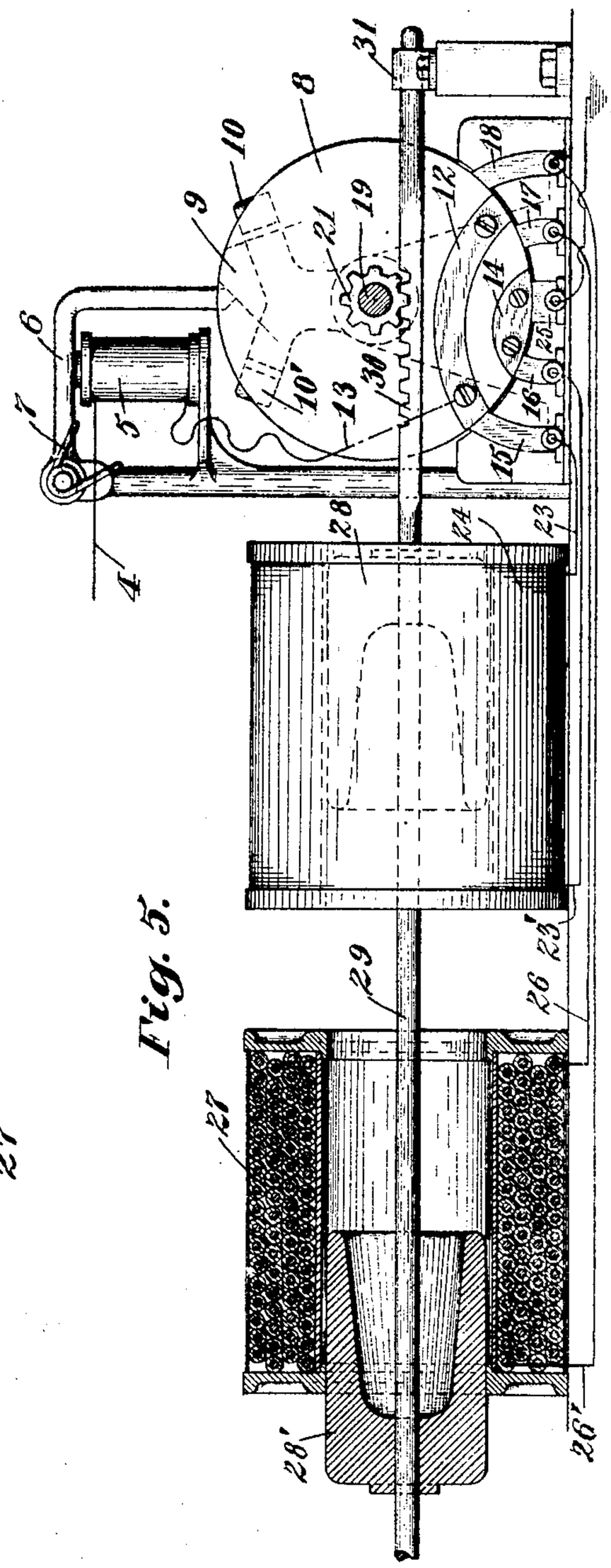

Fig. 5.

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4 SHEETS—SHEET 3.

Fig. 6.

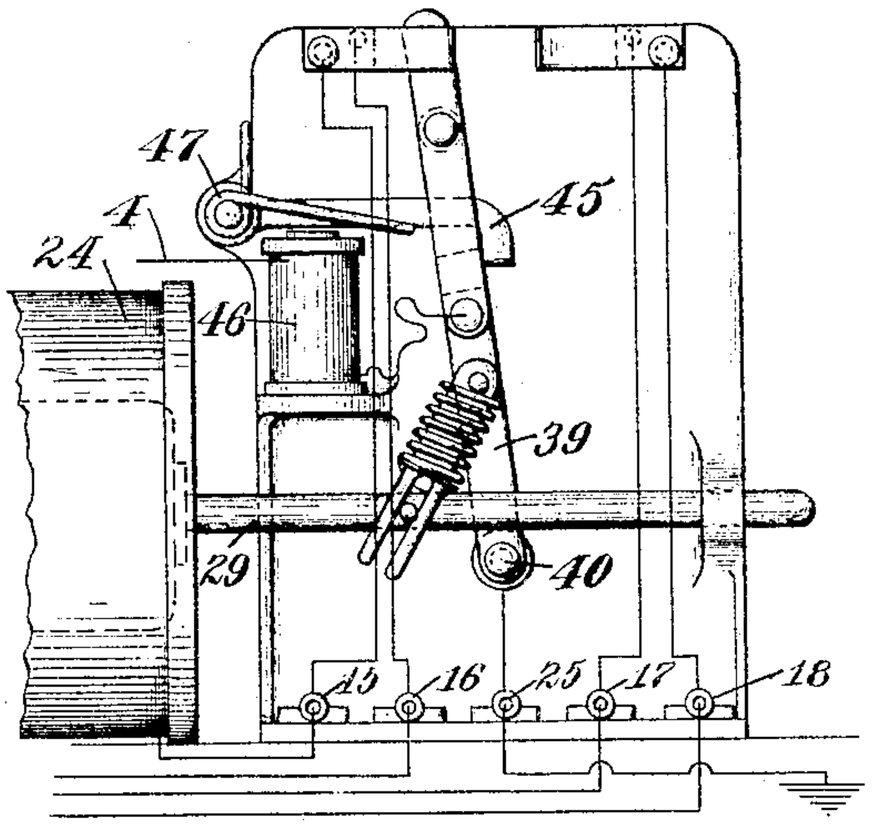


Fig. 7.

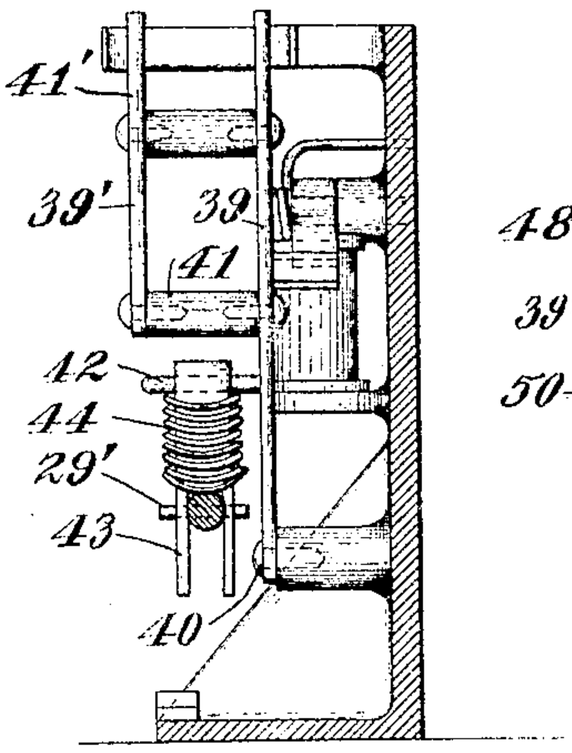
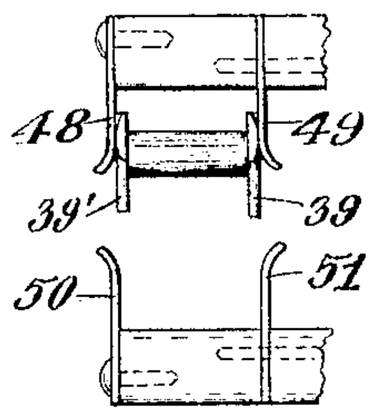


Fig. 8



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4 SHEETS—SHEET 4.

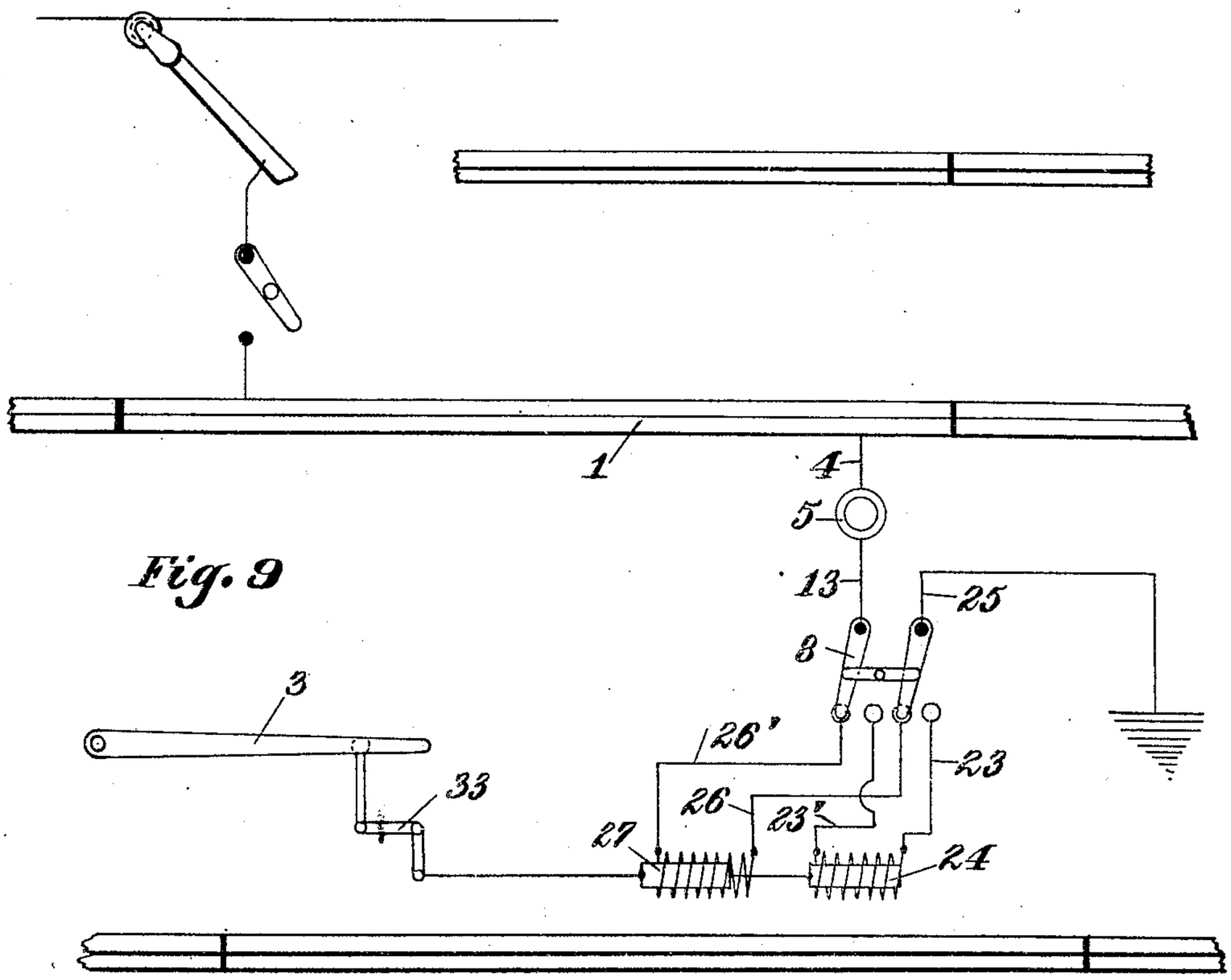

Fig. 9

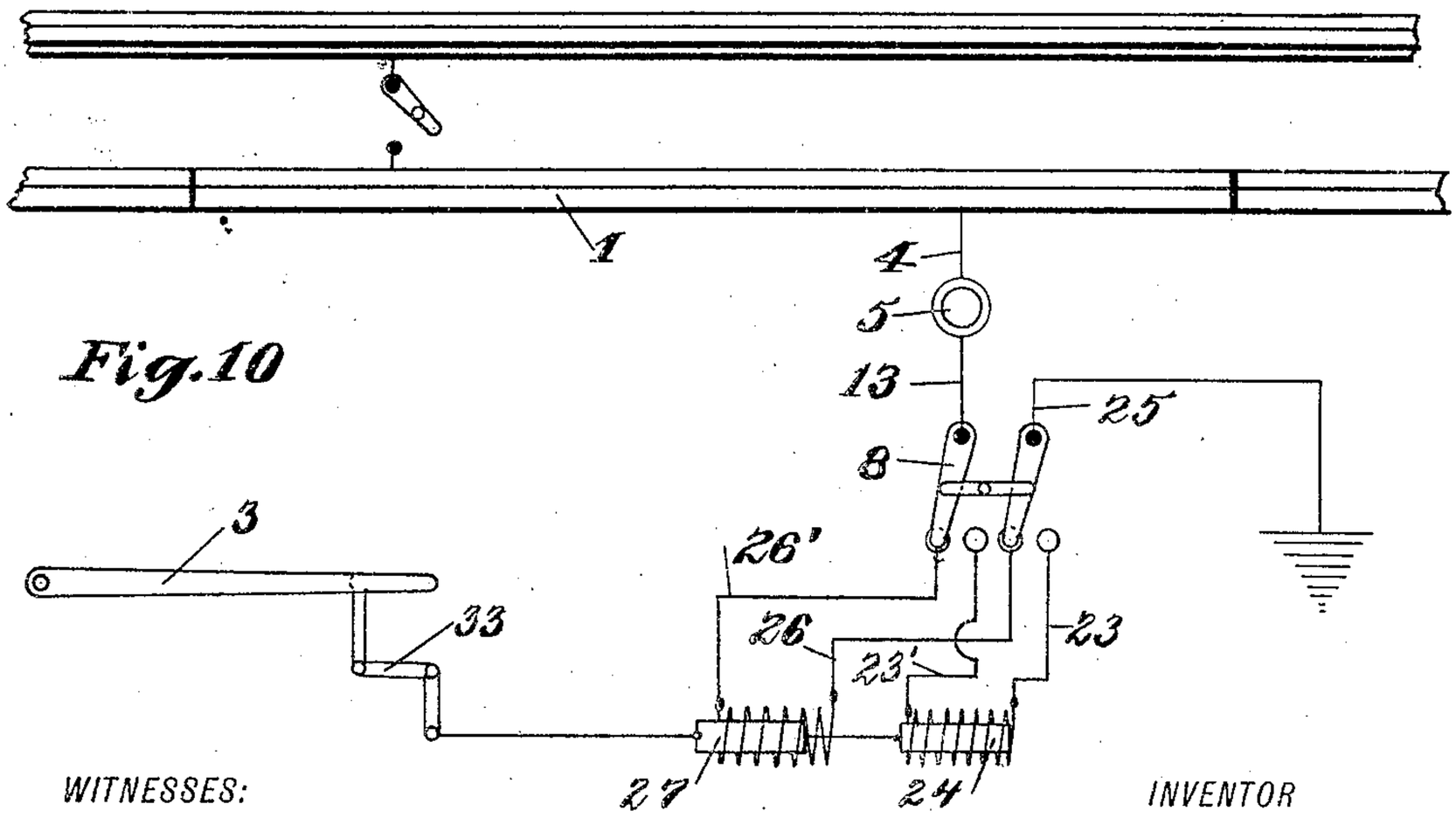

Fig. 10

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ELECTRIC SWITCH-THROWING DEVICE.

No. 801,441. Specification of Letters Patent. Patented Oct. 10, 1905.

Application filed November 12, 1904. Serial No. 232,433.

To all whom it may concern:

Be it known that I, LOUIS H. COXE, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Electric Switch-Throwing Device, of which the following is a specification.

My invention relates to electric railway-switch-operating mechanisms, and particularly to that class of devices operated by the use of electric currents derived from the motive power ordinarily employed in energizing the car-motors. Its objects are to provide means for automatically moving the tongue in such said switches in either direction desired; to enable the operator to have the switch-tongue under entire and instant control without moving from his accustomed position and without the exercise of manual labor as usually involved; to provide an efficient device having a minimum number of parts for the purpose that can readily be applied at a low expense and which has no unsightly or obtrusive parts in view; to provide a device that shall be compact and occupy a small amount of space, while it is so disposed as to be readily accessible, yet protected from accident or injury. I attain these objects by a novel combination of parts hereinafter fully described, and shown in the accompanying drawings, forming part of this specification, and in which—

Figure 1 is a general plan view of a section of railway-track to which my device is attached. Fig. 2 shows a fragmentary section of the box and operating mechanism at the street-level. Fig. 3 is a sectional view of the semirotatable electric switch and torsional spring. Fig. 4 is an assembled plan of the mechanism. Fig. 5 is a partial horizontal section of the same. Fig. 6 shows an alternative form of electric switch. Fig. 7 is a side view of the same. Fig. 8 is a plan view of the connections to the alternative form of electric switch, and Fig. 9 is a diagram showing the general electrical arrangements and connections for overhead-trolley-wire system. Fig. 10 is a similar diagram showing the general electrical arrangements and connections for third-rail systems.

In the drawings, 1 and 1′ represent the sections of insulated railroad-track, located at any point deemed practical in advance of the point of the track-switch 2 and which should be of an appropriate length to have a motor-car entirely on them and to allow for its advance movement while the track-switch tongue 3 is being operated.

To the insulated rails is attached an electrical connection 4, which passes the current from the car in all cases through the magnet 5 in such manner that the armature 6 is held in magnetic connection with the core of magnet against the tension of the armature-spring 7.

The end of the magnet-armature is arranged to hold the reversing semirotatable electric switch 8 in either of its extreme positions against the lug 9, formed on its rear side and which is adapted to abut against appropriate projections 10 and 10′, extending inwardly from the bearing 20. On the face of the said electric switch 8 is arranged an electric contact-piece 12, connected by the wire 13, that carries the electric current from the magnet 5. Below the contact-piece 12 is another contact-piece 14, both so arranged that by the oscillations of the electric switch they will be in contact with the terminals 15 and 16 or, if at the reverse position of the switch, with the terminals 17 and 18.

I prefer to make use of the reversing electric switch 8 in the form of a disk properly insulated and free to oscillate on a shaft 19, supported in the bearings 20 and 20′. Near the opposite end of the shaft 19 is a toothed pinion 21, also free to turn on the shaft. Between the pinion 21 and the switch-disk 8 is a coiled torsional spring 22, connected at one end to the pinion and at the other to the disk in such manner that it will cause the disk to turn on the shaft in the direction in which the pinion has previously turned, when the said disk shall have been liberated by the action of the magnet's armature 6.

From the terminal 15 leads an insulated wire 23 to the solenoid 24, and the return-current follows the wire 23′ to the other terminal 16 and from thence to the ground connection at 25. Similarly the wire 26 leads from the terminal 17 to the solenoid 27 and returns on the wire 26′ to the same ground connection 25.

From the above it will be evident that both solenoids cannot operate at the same time.

Within the solenoids is arranged a core 28 and 28′ of increasing sectional area, so that the later action of the core shall be increasing in power as it advances within the coils of the solenoid. Both cores are secured on a bar 29, passing through their longitudinal center and extending beyond the coils. Near one end

the said bar or rod 29 is formed with rack-teeth 30, that are adapted to engage with the teeth in the pinion 21, causing it to revolve as the bar is advanced in either direction and to impart torsional tension to the coiled spring 22. The extreme end of the bar, which is positioned below and at approximately ninety degrees to the shaft 19, rests in the bearing 31. At the other end of the bar 29 is a clevis-jaw 32, connected with a bell-crank lever 33, pivoted at 34, the other extremity of which is connected to a link 35, which in turn is secured direct to the track-switch tongue 3.

All the mechanism is contained in a tight case 36, having a separable cover-plate 37, secured by bolts or screws in such manner as to permit of ready access. The cover-plate 37 is packed by a lead wire 38, set in a groove running around the edge of the casing as a protection against the entrance of moisture or dirt. The top is level with the paving of the street when the case is in position below the surface alongside of the track-switch.

It will be noticed that any form of track-switch can be used with my device and that no special conditions or arrangements are necessary to the car or track except the insulation of a section of rails and the attachments to the track-switch tongue.

In the alternative form of reversing electric switch (shown in Figs. 6, 7, and 8) the movable contact-levers 39 and 39′ are fulcrumed at 40 and connected rigidly together by tie-rods 41 and 41′. Below the lower rod 41 is a stud-pin 42, set in the lever 39, having a forked lever 43 with bifurcated sides pivotally attached to it. Within the forks is positioned the rod 29 from the solenoids, but in this case used without the rack-teeth, having a pin 29′ inserted rigidly in it and extending beyond its diameter equally on each side. This pin is positioned within the fork of the lever 43 and between the open sides thereof in such manner that when the rod 29 moves in either direction the end of the lever 43 will be carried with it.

Between the stud-pin 42 and the upper side of the bar 29, coiled about the lever 43, is a compression-spring 44. When the bar 29 moves so as to carry the pin 29′ toward the contact-lever fulcrum 40, the said spring will be compressed and exert a tendency to throw over the lever 39. This action is prevented by the armature 45 of the magnet 46 so long as it is held to its core by the magnetic current. When the current is broken, the armature-spring 47 causes the armature 45 to release the levers 39 and 39′, whereupon they are thrown over from the contact-points 48 and 49 to the contact-points 50 and 51, creating an effect upon the solenoids, as in the arrangement previously described. From these contact-points are suitable connections to the terminals 15, 16, 17, and 18, arranged as before stated, as is also the ground connection 25, and it will be evident that the same results are attained by the use of this form of electric switch as from the other.

In the diagram Fig. 9 the energizing source is represented by an overhead wire 52 or a third rail 53, both being taken through the car-switch 54, the remaining characters have already been described in their relation to the operating mechanism.

I will now describe the operations and effects produced by my invention.

By the use of the controller-handle at the resistance-box on the motor-car the motor may be shut off, but not the lower-powered current operating the lights, air-pumps, &c., which may work uninterruptedly and continually, if need be. Obviously this shunted current of lower amperage must pass through the magnet 5, as well as the main current, and it is one of the peculiarities of my invention that the magnet is so constructed as to be non-operative under the lower-powered current, but responsive to the full current. In all cases the electric connection is continuous from the insulated sections of rails to the ground or return-leads. I desire to point out that the direct or alternating current can be used with equal effectiveness, as the vibrations of electric energy of the alternating current in the coils of the solenoids will cause equal but dissimilar vibrations in the molecules of its core, so that the resultant action is the same in this case as in the direct current. The current as taken off by the car passes, as usual, through the controller, readily accessible to the operator. From the controller it is transmitted through the motors, driving mechanism, and wheels to the track on its return. If the car be on an insulated section of rails, obviously the current would be interrupted and no power transmitted by it because of the said insulation. If, however, from the insulated section of track-rails there be attached wires ultimately connecting with the return-leads or ground, the current would pass and energize the driving mechanism. I make use of this wire, first, by passing it through a magnet, causing its armature to move, the said movement holding it in connection with an insulated semirotatable electric switch and not allowing it to be turned, so that one set of its connections are held in contact with the ends or terminals of electric attachments, one of which leads to a solenoid and the other to a ground connection. The electric current after passing through the magnet is connected direct to the semirotatable switch in such manner that it may be directed thereby to either one or the other of the solenoids, which are arranged, preferably, in tandem—that is, one in advance of the other. If now the current be turned on, one of the said solenoids is caused to act on its core, drawing it into the coil, while the rod extending from it ending in a toothed

rack causes the pinion to revolve and give torque or torsional effect to the coiled spring, one end of which is attached to it. The other end of the said spring is attached to the semirotatable switch in such manner that energy is stored in the spring until the said switch is liberated by the armature 6, whereupon it will revolve until brought up by stops arranged on it and which bring it into correct relation with the aforesaid electrical connection, the selection of which is open to the operator.

If it be desired to reverse the position of the tongue of the track-switch, it is accomplished instantaneously by switching off the electric current, with the controller, on the motor-car while it is on the insulated section of track, which action deprives the magnet of its attractive power, allowing the armature to rise therefrom under the tension of its spring and release the semirotatable electric switch, whereupon it will revolve and form connection to operate the reversing-solenoid. When the full electric current is again applied, the semirotatable electric switch is secured in its position, the solenoid then in electrical contact is energized, its core drawn in, the track-switch tongue moved, and a reverse tension produced simultaneously in the coiled torsional spring, ready for another reversal. Evidently while the car remains on the insulated section of railroad-track these operations may be continued at will, causing the tongue of the railroad-track switch to move in alternate directions at each interruption of the electric current by the operation of the motor-car controller-handle.

It will be noticed that no appreciable time is taken in operating and that the car does not need to stop or even slacken its speed. It is also noticeable that my contact-points are all arranged to be "wiping," so that no corrosion and consequent failure will occur to the electrical connections and that I provide a hermetically-sealed case for the mechanism, the switch-rod entering through packed openings, while the cover-plate is sealed by a lead wire; yet the arrangements are such that by the removal of a few screws the whole working parts can be readily gotten at and removed when desired.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an electrical railway-switch-operating device the combination of a section of insulated track; a track-switch having a movable tongue; a semirotatable electric switch; means for causing the said semirotatable electric switch to partially revolve in either direction, and means for normally holding it in either extreme position against revolution; a pair of solenoids, arranged one in advance of the other, and adapted to act on a bar common to both; mechanical connections between the said bar and tongue of the said track-switch, and electrical connections from the sections of insulated rails to the semirotatable electric switch and therefrom to the solenoids, and from the solenoids to ground, all substantially as shown and described.

2. In an electric railway-switch-operating device, the combination of a source of electrical energy, having a divisible and divided current and means for controlling the greater portion of the said current; a magnet and its armature arranged to hold or liberate a reversing electric switch and so constructed as to be inoperative under less than the full strength of the said electric current; a reversing electric switch and means for operating it; a plurality of solenoids adapted to act on a common bar and the said bar having mechanical connections to operate the said reversing electric switch; a track-switch tongue and suitable mechanical connections between it and the opposite end of the said bar and electrical connections between the various members, all as and for the purposes set forth.

3. In an electric railway-switch-operating device, the combination of a semirotatable switch, loosely mounted on a shaft, having arranged thereon connections for receiving an electric current; connections for delivering the current to either of two solenoids; means for determining and limiting its revolution to agree with said connections; means for normally holding it in either of its extreme positions, or releasing it therefrom and means for causing it to revolve; a magnet and its armature arranged to release the said semirotatable electric switch; a coiled torsional spring to actuate the said semirotatable electric switch and connected thereto at one of its ends; a toothed pinion, loose mounted on the same shaft with the said semirotatable electric switch and connected to the other end of the said torsional spring; a pair of solenoids, arranged in tandem, adapted to act in opposite directions, having their cores mounted on a common bar, the said bar terminating at one end with suitable connections to the tongue of the track-switch and the other end of the bar, through a toothed rack, with the aforesaid pinion; and electrical connections between the various members all as and for the purposes set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LOUIS H. COXE.

Witnesses:
HENRY HAHN,
FRANK A. PHILLIPPI.