No. 775,529. PATENTED NOV. 22, 1904.

G. H. FRETTS.

ELECTRICALLY OPERATED RAILWAY TRACK SWITCH.

APPLICATION FILED JAN. 20, 1904.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1.

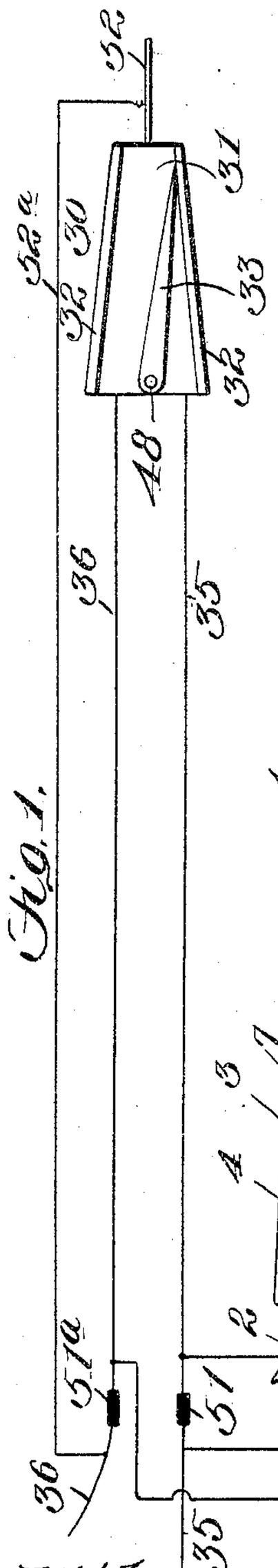


Fig. 3.

Fig. 2.

Witnesses:
C. D. Kesler,
James L. Norris, Jr.

Inventor
George H. Fretts
By James L. Norris.
Atty

No. 775,529. PATENTED NOV. 22, 1904.

G. H. FRETTS.

ELECTRICALLY OPERATED RAILWAY TRACK SWITCH.

APPLICATION FILED JAN. 20, 1904.

NO MODEL. 3 SHEETS—SHEET 2.

Fig. 4.

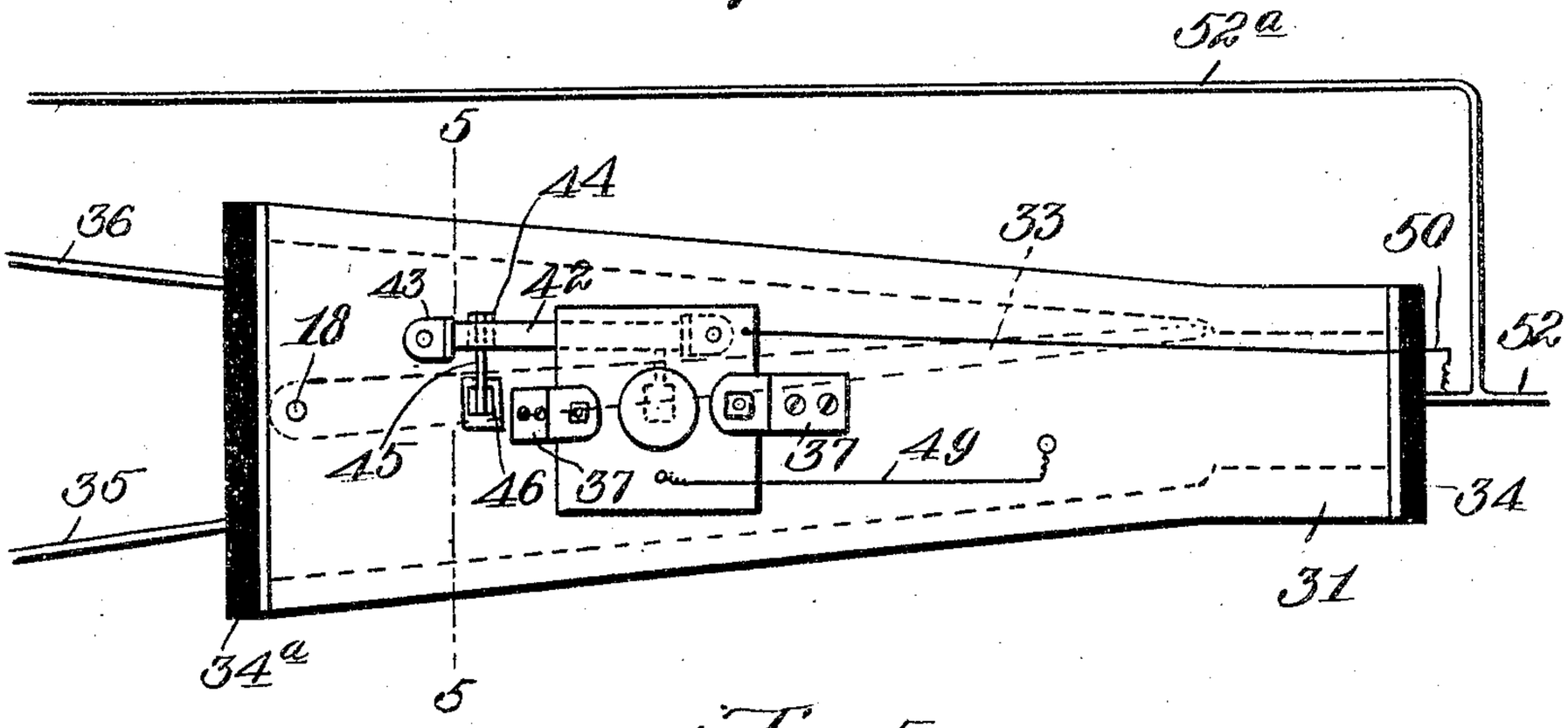
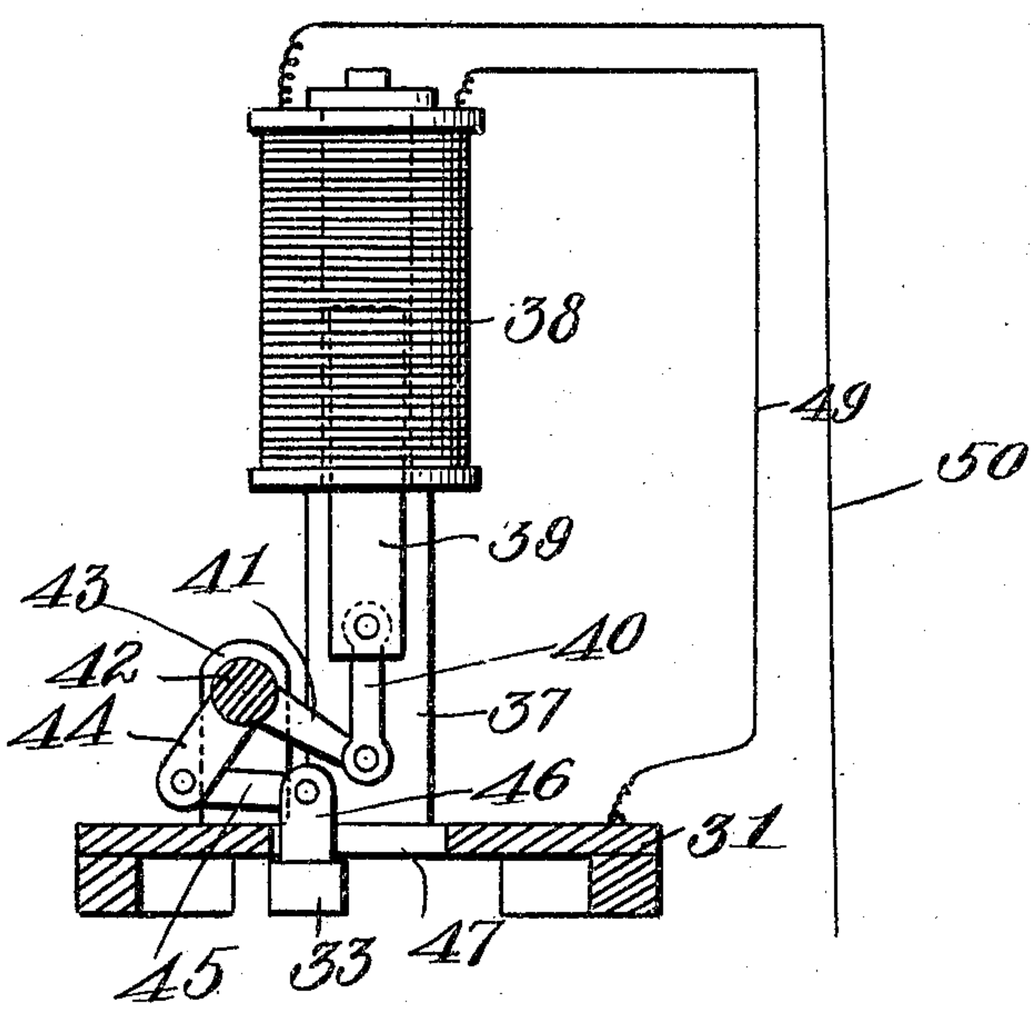


Fig. 5.



Witnesses:
C. D. Kesler,
Glenn L. Morris, Jr.

Inventor
George H. Fretts
By
James L. Norris.
Atty.

No. 775,529. PATENTED NOV. 22, 1904.

G. H. FRETTS.

ELECTRICALLY OPERATED RAILWAY TRACK SWITCH.

APPLICATION FILED JAN. 20, 1904.

NO MODEL. 3 SHEETS—SHEET 3.

Fig. 6.

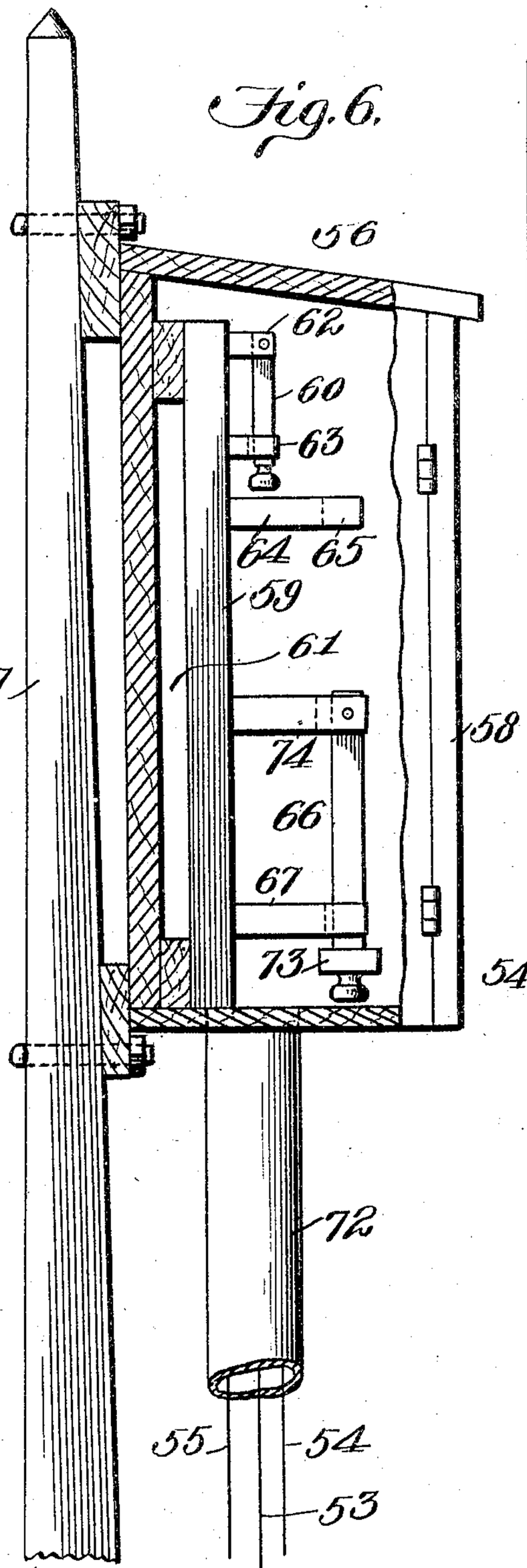
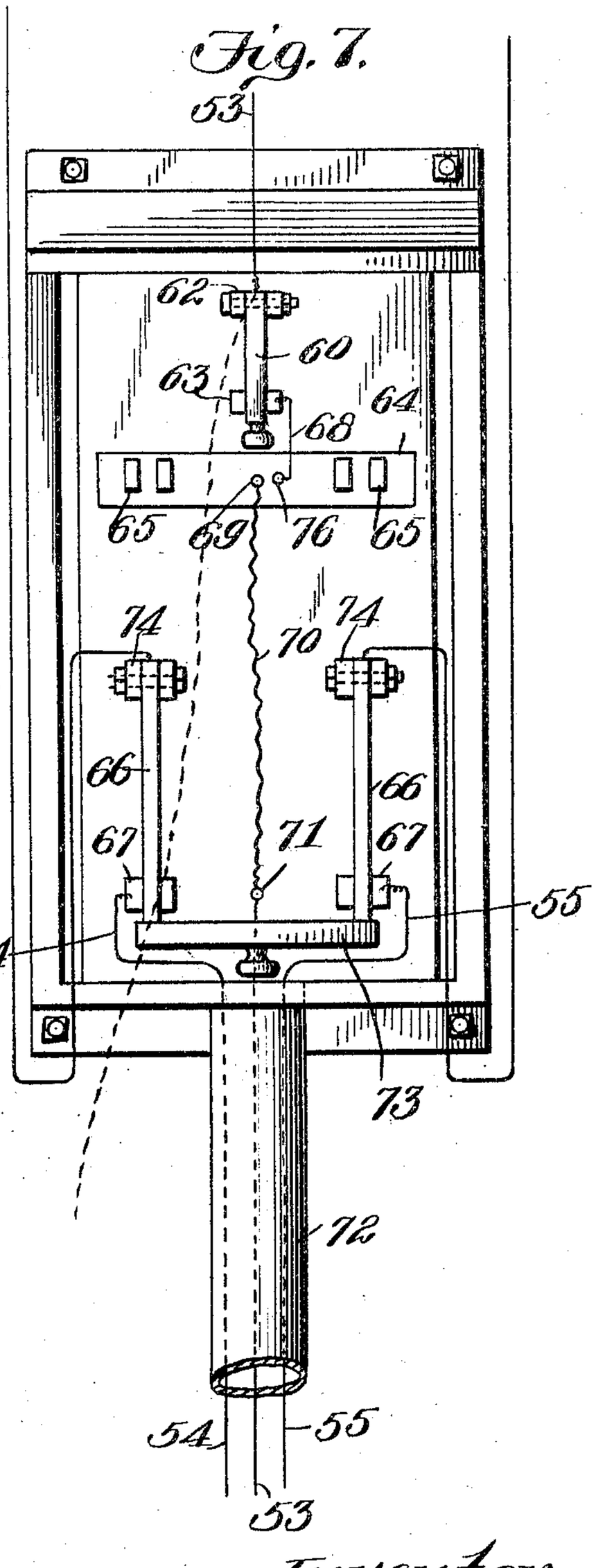


Fig. 7.



Witnesses:
C. D. Kesler.
James L. Norris, Jr.

Inventor
George H. Fretts
By James L. Norris.
Atty.

No. 775,529. Patented November 22, 1904.

UNITED STATES PATENT OFFICE.

GEORGE H. FRETTS, OF SPRINGFIELD, MASSACHUSETTS.

ELECTRICALLY-OPERATED RAILWAY-TRACK SWITCH.

SPECIFICATION forming part of Letters Patent No. 775,529, dated November 22, 1904.

Application filed January 20, 1904. Serial No. 189,845. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. FRETTS, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Electrically-Operated Railway-Track Switches, of which the following is a specification.

This invention relates to electrically-operated railway-track switches.

The object of the invention is in a ready, simple, positive, and thoroughly practical manner to shift a track-switch when it is desired for the car to pass from the main to a side track or when turning off upon another street; to effect automatic shifting of the trolley from the main trolley-wire to a wire following the side track; to reduce danger of derangement of the operating mechanism to a minimum; to simplify the construction of the parts in such manner as to permit of ready repairs in case of damage; positively to preclude entrance of dust or moisture to the casing or boxing containing the switch-operating mechanism, thereby to insure certain operation at all times; to insure passage of current to the conductors in the event that a fuse burns out, thereby preventing a stoppage of traffic, and generally to improve the construction and manner of operation of devices of this character.

With the above and other objects in view, as will appear as the nature of the invention is better understood, the same consists in the novel construction and combination of parts of a railway-track-switch-operating mechanism, as will be hereinafter fully described and claimed.

In the accompanying drawings, forming a part of this specification, and in which like characters of reference indicate corresponding parts, there is illustrated one form of embodiment of the invention capable of carrying the same into practical operation, it being understood that the elements therein exhibited may be varied or changed as to shape, proportion, and exact manner of assemblage without departing from the spirit thereof, and in these drawings—

Figure 1 is a view in plan in the nature of a diagram exhibiting the system for actuating the track-switch. Fig. 2 is an enlarged detail sectional view of the box containing the track-switch-actuating mechanism. Fig. 3 is a sectional detail view of the means employed for excluding the entrance of dust or water through the boxing of the track-switch-actuating mechanism. Fig. 4 is a view in plan of the mechanism for actuating the trolley-switch. Fig. 5 is a transverse sectional view taken on the line 5 5 of Fig. 4, showing certain of the mechanism for switching the trolley not shown in Fig. 4. Figs. 6 and 7 are views in side and front elevation, respectively, of an arrangement of current-switches which may be employed where a fuse burns out and which is employed to turn the current onto the line, and thus prevent stoppage of traffic.

Referring to the drawings and to Fig. 1 thereof, 1 designates the main track, and 2 a siding or track running to another street. Arranged on the track-bed in any suitable manner is a frog-plate 3, in which is pivoted a switch-tongue 4 of the usual or any preferred construction, said tongue being carried by an actuating-bar 5, (shown in Fig. 2,) which works in a transverse groove or slot cut in the frog-plate and is provided with a recess 6 to receive the switch-bar, as clearly shown in Fig. 2, a set-screw 7, entering the end of the bar and bearing against the switch-tongue, serving positively to clamp the latter in position and holding it from riding upward. The bar is housed within a casing 8, preferably of cast-iron, which is sunk into the ground in the usual manner adjacent to the main track 1 and is closed at its upper end by a cap 9, suitable packing 10 being interposed between the cap or lid 9 and the upper edge of the casing to render the latter impervious to the entrance of water or dust from above. The bar 5, as shown in detail in Fig. 3, works in a stuffing-box 11, bolted or otherwise suitably secured to the inner side of the casing, as clearly shown in Fig. 2, and is internally threaded for a portion of its length to receive a gland 12, between the inlet of which and the wall of the stuffing-box is interposed a suitable packing 13, which is adapt-

ed closely to impinge the bar 5, and thus further to preclude the entrance of moisture or dirt to the entrance of the casing. It will be understood, of course, that the frictional contact of the packing and the bar will not be sufficient to interfere with the proper operation of the bar in actuating the switch.

The casing 8, which is preferably a cast-iron structure, is provided at its lower end with a boss 14, provided in its upper face with a socket 15, in which rests a brass thimble 16, the same being an inverted cone in elevation and being provided at its upper end with a circumferential flange 17 for the purpose of reinforcing the structure and also to present a means for holding the thimble rigid within the casing. Within this thimble is mounted an armature 18, the lower end of which bears upon the bottom of the thimble, and the upper end is transversely orificed to receive the bar 5, and on each side of the armature and at a suitable distance therefrom is arranged a collar 19, and between each of the collars and one side of the armature is arranged a spring 20, which is coiled about the bar, the said springs operating as buffers to shield the switch-tongue from violent contact with the wall of the frog-plate when shifted. While it is preferred to employ these springs for the purpose defined, it is to be understood that the invention is not to be limited thereto, as if preferred, the bar may be threaded on each side of the armature and nuts may be arranged on the threaded portions, thus to hold the armature from movement independent of the bar.

Arranged within the casing are two electromagnets 21 and 22, the cores 23 of which have secured to their terminals soft-iron heads 24 and 25, the latter heads serving to hold the thimble in position, as clearly shown in Fig. 2, The thimble being of diamagnetic material will cause the armature to become deënergized as soon as the current is turned off from the magnets. In addition to this function the thimble prevents any particles, such as insulation or small particles or cement, from falling into the recess occupied by the armature. The heads 24 and 25 are rigidly connected with the inner walls of the casing through the medium of brace-bars 26, which are approximately Z shape in plan, and the flanges thereof are bolted to the inner walls of the casing and to the said heads, as shown in Fig. 2.

One side of the casing is provided with a section of tubing 27, through which the wires pass for energizing the magnets. The magnets are held within the casing against possibility of movement through the medium of a filling 28 of any suitable cement, preferably Portland cement, between which and the magnets is interposed suitable insulating material 29, such as tar or the like. It will be seen that when the cement is hardened this in conjunction with the braces 26 will operate positively to hold the magnets against any vibration or movement in use.

The trolley-switch (designated generally by 30 and shown in Figs. 4 and 5) is the same as that constituting the subject-matter of the application filed by me in the United States Patent Office July 14, 1903, Serial No. 165,486, and is constructed as follows: Supported at the proper distance above the track is a switch-plate 31, the same when viewed in plan being approximately trapezoidal and provided along its edges with flanges 32, the function of which is to prevent the trolley-wheel from becoming disengaged from the plate and also in conjunction with the switch-tongue 33 to guide the trolley-wheel onto the appropriate conductor. At each end of the plate there is arranged a block of suitable insulating material 34 and 34ª, and secured to the insulator 34ª and terminating short of the ends of the switch-plate are the main conductor 35 and the side or switch conductor 36, it being seen by this arrangement that the switch-plate is normally dead.

Supported upon the plate in any suitable manner, in this instance by a series of standards 37, is a solenoid-magnet 38, the core 39 of which has its lower end bifurcated, and pivotally mounted in the crotch thus formed is the upper end of a link 40, the lower end of which has connected with it one end of an arm 41, the other end of which is rigid with a shaft 42, journaled in knees or brackets 43, secured to the upper side of the plate. Rigid with the shaft 42 at the end opposite the arm 41 and extending at right angles thereto is an arm 44, the lower end of which has pivotally connected with it one end of a link 45, the other end of which is pivotally connected with a stud 46, secured to the switch-tongue 33, the said stud being movable in a slot 47, cut through the plate. The switch-tongue 33, as shown in Fig. 1, is tapered and is pivotally connected at 48 to the under side of the plate.

The circuit through the solenoid is completed through conductors 49 and 50, the conductor 49 being connected with one terminal of the winding of the magnet and with the plate and the conductor 50 being connected with the other terminal of the winding of the magnet and with the main conductor 35 adjacent to the insulating-block 34.

The conductors are disposed some distance below the under face of the plate, this arrangement being adapted in order to avoid any sparking when the trolley passes from the conductor onto the plate or from the plate back to the conductor. The distance that the conductor is disposed below the under side of the plate corresponds to the distance from the base of the groove of the trolley-wheel to the periphery of the flanges thereof.

As will be seen by reference to Fig. 1, at the point or adjacent to the point where the branch conductor diverges toward another street the two conductors 35 and 36 include an insulator 51 and 51ª, respectively, the insulator 51 being included in the conductor 35 and the insulator 51ª in the conductor 36, so that the conductors between the plate 31 and the insulators are insulated, and thus normally dead. To supply current to the conductors 35 and 36 beyond the insulators 51 and 51ª, the usual feed-wires employed in trolley-lines may be utilized; but if these are not present the current may be conveyed around the switch-plate 31 by a shunt-wire 52ª, tapped into the conductor 52 and into either of the conductors 35 or 36, in this instance into the conductor 36, the shunt-wire being looped around the switch-plate, as shown in Fig. 1.

The means for energizing the magnets 21 and 22 comprise three conductors 53, 54, and 55. The conductor 53 is tapped into the conductor 35 on the outer side and adjacent to the insulator 51 and is connected with both of the magnets. The conductor 54 is tapped into the conductor 36 on the inner side of and adjacent to the insulator 51ª and is connected with the magnet 23. The conductor 55 is tapped into the conductor 35 on the inner side of and adjacent to the insulator 51 and is connected with the magnet 22.

The operation of the trolley-switch described is as follows: The switch-tongue 33 is normally in position to cause the trolley to pass from the main conductor to the branch conductor, so that if the approaching car desires to pass to the branch conductor the switch-tongue remains at rest, and this is effected by the motorman cutting off the current of the motor and permitting the trolley to coast over the switch-plate. If, however, it is intended for the trolley to remain on the main line, the motorman will allow the current to remain on the motor, and as soon as the trolley-wheel touches the switch-plate the circuit is completed through the conductor 52, conductors 49 and 50, and through the solenoid-magnet, thereby energizing the latter and causing its core to lift, rock the shaft 42, and thus throw the switch-tongue to the appropriate position. As soon as the trolley passes from the plate onto the trolley-wire the magnet is deënergized and the core drops to its normal position.

The operation of the track-switch is as follows: Should the motorman desire to remain on the straight or main track 1, the power is retained on the motor until the car pásses the trolley-switch 30, which will cause the trolley-wheel to pass onto the conductor 35. The path of the current under these conditions is as follows: from the conductor 35 to the conductor 53, to the magnet 22, to conductor 55, to conductor 35, to the trolley-wheel, to the motor, and to the ground, completing the circuit, and thus energizing the magnet 22, causing the latter to attract the armature 18, thereby projecting the bar 5 and shifting the switch-tongue to the position shown in Fig. 2, under which arrangement the car will remain upon the main track. When these latter operations are taking place with the track-switch, the switch-tongue 33 will be shifted in the manner described to cause the trolley-wheel to pass from the switch-plate 31 to the conductor 35 and thence onward. Should it be desired to switch the car to the side track, the power is cut off from the motor before it approaches the switch-plate 31, and the car will, by its own impetus, pass by the switch-plate and the trolley-wheel will pass to the conductor 36. After the car has passed the switch-plate 31 and has brought the trolley-wheel into engagement with the conductor 36 power is then applied to the motor and the path of the current is as follows: from the conductor 35 to the conductor 53, to the magnet 23, to the conductor 54, to the conductor 36, to the trolley-wheel, to the motor, and to the ground, thus completing the circuit. By energizing the magnet 23 the armature 18 is drawn over to the said magnet and the bar 5 is retracted from its original position to bring the switch-tongue to the position to cause the wheels of the car to pass onto the branch track. It is to be understood that power is always to be applied to the motor while the trolley-wheel is in contact with either of the conductors 35 or 36. Stopping or starting while upon the said conductors on that portion between the switch-plate 31 and the insulators 51 and 51ª will have no effect whatever in operating the switch-tongue 4; but as long as the current is upon the motor the said tongue is held firmly to whichever position it is moved, thereby rendering it impossible for the forward trucks to move the tongue slightly, as by leverage, and thereby permit the rear trucks to take the wrong track. This frequently happens to long double-truck cars, resulting in loss of time and heavy expense for repairs to the cars and motors. It will also be seen from the foregoing that the motorman has absolutely no control over the track-switch, as each trolley-wire has separate magnet connections which will always operate the switch correctly.

If from any cause the fuse should burn out, until another fuse can be positioned the conductors 35 and 36 would be dead, so that a car on the section of track between the switch-plate 31 and the insulators 51 and 51ª could not move. To obviate this, there is a novel form of current-switch employed. (Shown in detail in Figs. 6 and 7.)

The device embodies a switch-box 56, which is suitably secured to the trolley-pole 57, supporting the trolley-wires, and is provided with a door 58 to permit ready access to the

interior. Within the box is secured a slate switchboard 59, suitably secured to the back of the box. Carried by the said switchboard is a single-post switch 60, to which is connected the conductor 53. The switchboard 59 is spaced from the back of the box to present a wire and air-space 61, as clearly shown in Fig. 6. The switch 60 is provided with the usual posts 62 and 63, and disposed adjacent to the posts 63 is a plate 64, having two sets of posts 65 to be engaged by a double-post switch 66, said switch being adapted to engage with the posts 65 or with similar posts 67 for a purpose that will presently appear. The posts 63 are electrically connected with the plate 64 by a wire 68, and the plate 64 is provided with a fuse-stud 69, to which is connected one end of a fuse 70, which in this instance represents a three-hundred-and-fifty-ampere fuse. The lower end of the fuse 70 is connected with a fuse-stud 71, and to the latter stud is connected the conductor 53. Under the arrangement shown it will be observed that when the switches are in proper position the current will pass through the conductor 53, through the switch 60, fuse 70, and to the conductor 53, which, in conjunction with the conductors 54 and 55, pass out through the bottom of a switch-box through a tubing 72. The conductor 53 is shown as entering the casing at the top; but, if desired, it may come out through the bottom of the boxing, as indicated by dotted lines in Fig. 7. The two arms of the double switch are connected by a fiber cross-head 73 or other suitable insulating material, the arms of the switch 66 being suitably pivoted between posts 74, to which are connected the conductors 54 and 55. It will be observed by reference to Fig. 7 that the conductors 54 and 55 are connected with the switch 66, said conductors, as before stated, being in electrical connection with the magnets 21 and 22, while the conductor 53 is in electrical connection with the switch 60. This arrangement is employed to obviate danger in replacing a fuse while standing on the ground. By connecting the two posts 65 with a suitable conductor, such as the copper or brass bar 64, it is immaterial which of the conductors 35 or 36 is in use. When the ground connections are cut out, the current will be applied as follows: from the conductor 35 to the conductor 53, to the switch 60, through the connections 62, to the posts 63, to the wire 68, to the contact 76, to the plate 64, to both of the posts 65, to the switch 66, to the switch-posts 74, to the conductors 54 or 55, and to the conductors 35 and 36, as the case may be. When the magnets 22 and 23 are energized, the current is supplied as follows: from the conductor 35 to the conductor 53, to the switch 60, to the posts 63, to the wire 68, to the plate 64, to the fuse-stud 69, to the fuse 70, to the fuse-stud 71, to the conductor 53, and thence to one of the magnets 21 or 22, to the conductor 54 or 55, to the posts 67, to the switch-arms 66, to the switch-arm posts 74, to the conductor 54 or 55, and thence to the conductor 35 or 36. The switch-box is lined with asbestos or other refractory material to prevent destruction of the box should the fuse burn out.

From the foregoing description it will be seen that provision is made for automatically and positively shifting the trolley-switch synchronously with the shifting of the switch-tongue, so that the operation of the parts will be positive, avoid possibility of damage either to the system or to the rolling-stock, which would inevitably result if the front wheels of the truck were to pass onto a side track while the rear wheels remain on the main track, such as frequently happens.

All of the parts of the invention are constructed and combined in such manner as to insure certainty of operation and readiness of repair in case of injury.

The cap 9 of the casing 8 is suitably bolted in place, and is thus held against easy removal from unauthorized persons who might desire to tamper with the switch-operating mechanism within the casing.

It is to be understood that the adoption of the present invention will not necessitate any change in the structural arrangement of the car, as the invention is adapted for use on any railway system employing overhead or underground trolleys, the only change in the trolley-line being the inclusion of the switch and its operating mechanism and with the track, the suitable placing of the box-casing 8 and its contained mechanism for operating the switch-tongue.

Having thus described the invention, what I claim is—

1. In an apparatus of the class described, insulated conductors, a trolley-switch supported thereby and insulated therefrom, electrical trolley-switch-actuating mechanism adapted to be energized by a current established through the trolley, electrical track-switch-actuating mechanism, and means for causing the latter mechanism to become energized simultaneously with the trolley-switch-actuating mechanism when the insulated conductor-sections are energized by the trolley.

2. In an apparatus of the class described, insulated sections or conductors, a trolley-switch supported thereby, a track-switch, an armature connected by interposed mechanism with the switch, electromagnets between which the armature is mounted, and means for electrically operating the trolley-switch and thereby simultaneously energizing the electromagnets to cause them to actuate the track-switch synchronously with the trolley-switch.

3. In an apparatus of the class described, a pair of insulated conductors, trolley-switch-actuating mechanism supported thereby, a

track-switch, an armature operatively connected with the latter switch, electromagnets disposed on each side of the armature, and connections between the insulated sections of the conductors and the live portion of one of the conductors and the electromagnets, said conductors being adapted to be energized by the passing of the trolley to actuate the trolley-switch and track-switch simultaneously.

4. In an apparatus of the class described, a casing, spaced electromagnets therein, a thimble between the electromagnets, an armature loosely mounted within the thimble, a rod operatively connected with the armature, and a track-switch held in engagement with the rod.

5. In an apparatus of the class described, electromagnets, and means for energizing the same, a thimble of diamagnetic material interposed between the electromagnets, an armature loosely mounted within the thimble, a bar passing through the upper end of the armature, a track-switch connected with the bar, and means for cushioning the bar against excessive jar.

6. In an apparatus of the class described, a casing provided at its lower end with a socketed boss, a thimble mounted in the socket of the boss, electromagnets rigidly mounted within the casing and spaced by the thimble, an armature having its lower end resting in the bottom of the thimble and its upper end provided with a transverse orifice, a bar engaging the orifice of the armature and carrying cushioning means, a stuffing-box through which the bar passes, a track-switch engaging the outer portion of the bar, and means for clamping the switch to the bar.

7. In an apparatus of the class described, a casing, and means for hermetically sealing the same, electromagnets rigidly secured within the casing, energizing means connected with the magnets, a thimble disposed between the electromagnets, an armature having its lower end resting in said thimble, a bar passing through the upper end of the armature, springs disposed on each side of the armature and operating to cushion the same, and a track-switch connected with the outer end of the bar.

8. In an apparatus of the class described, a track-switch-actuating element embodying a bar provided with a recess to receive the track-switch, an adjusting-screw extending into said recess, and a vertically-disposed loosely-supported armature for actuating the bar.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

GEORGE H. FRETTS.

Witnesses:

GEO. A. LEIB,

B. K. FRETTS.