(No Model.) 3 Sheets—Sheet 1.

W. C. HENRY.

AUTOMATIC TRACK SWITCH FOR ELECTRIC RAILWAYS.

No. 559,800. Patented May 12, 1896.

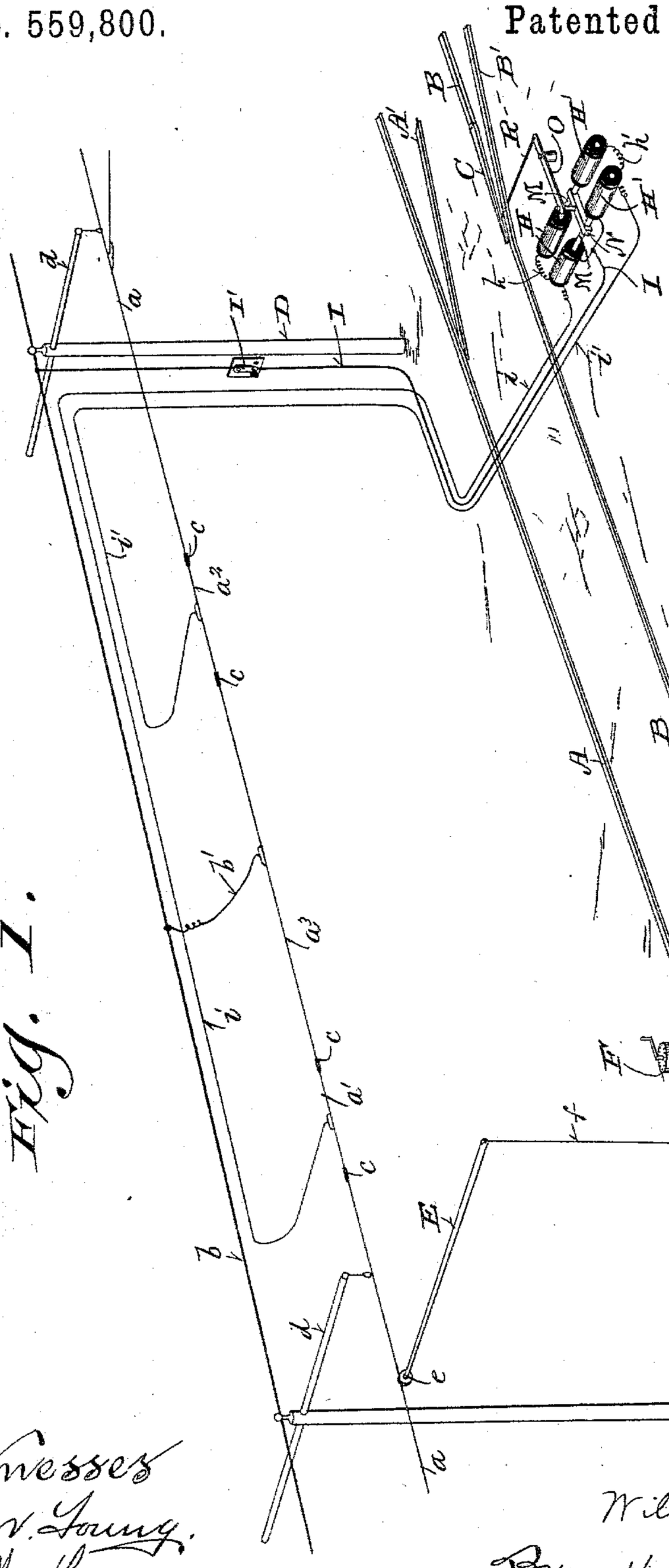

Fig. 1.

Witnesses
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(No Model.) 3 Sheets—Sheet 2.

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AUTOMATIC TRACK SWITCH FOR ELECTRIC RAILWAYS.

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Fig. 2.

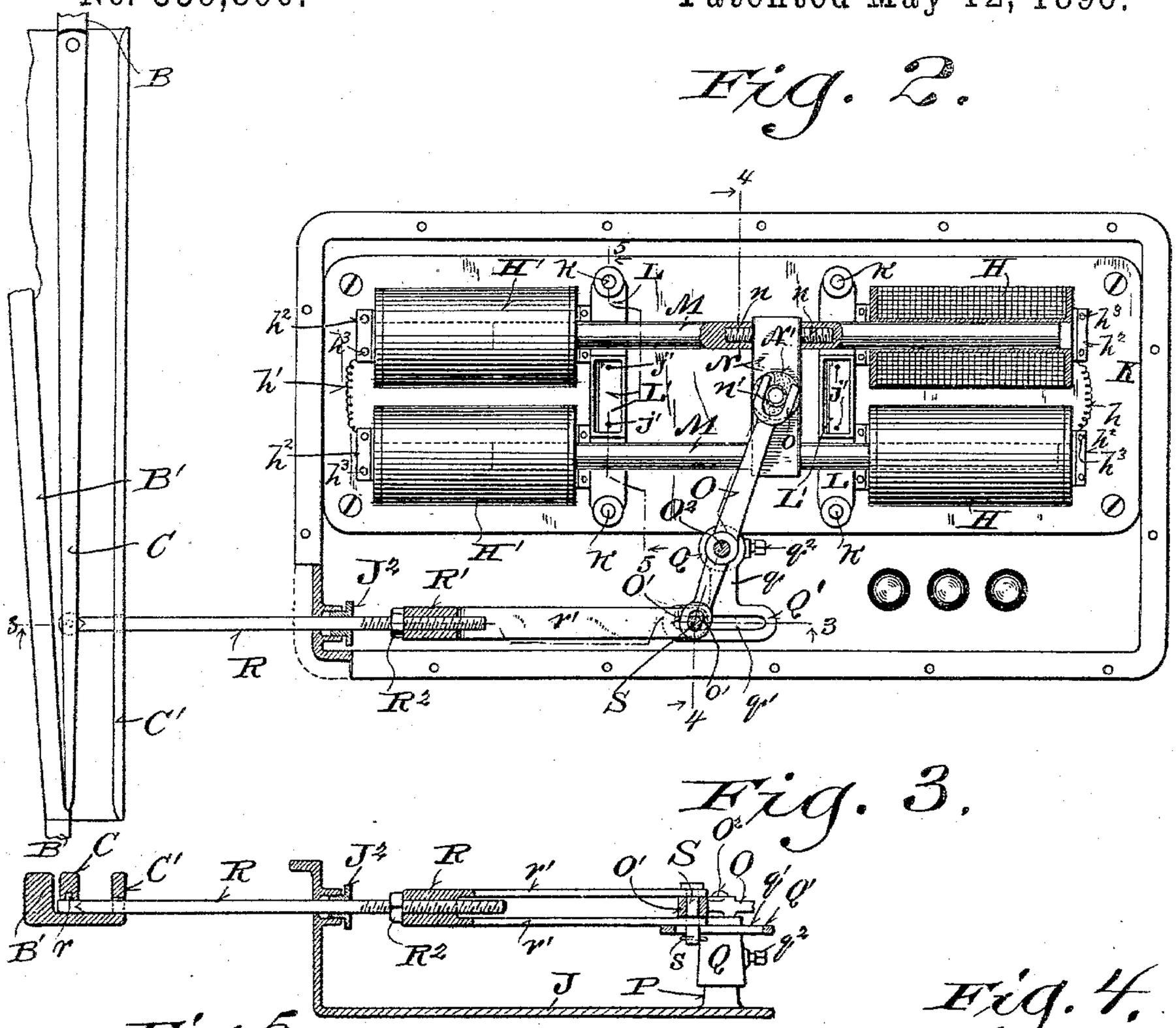


Fig. 3.

Fig. 4.

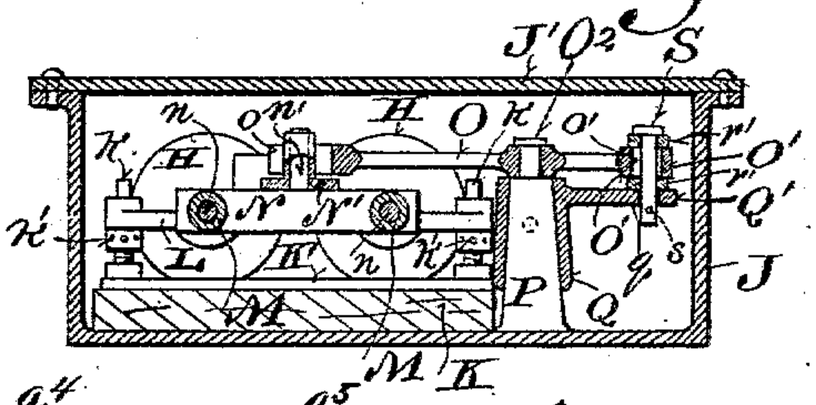


Fig. 5.

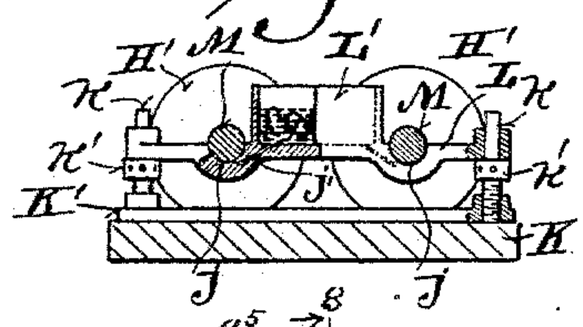


Fig. 6.

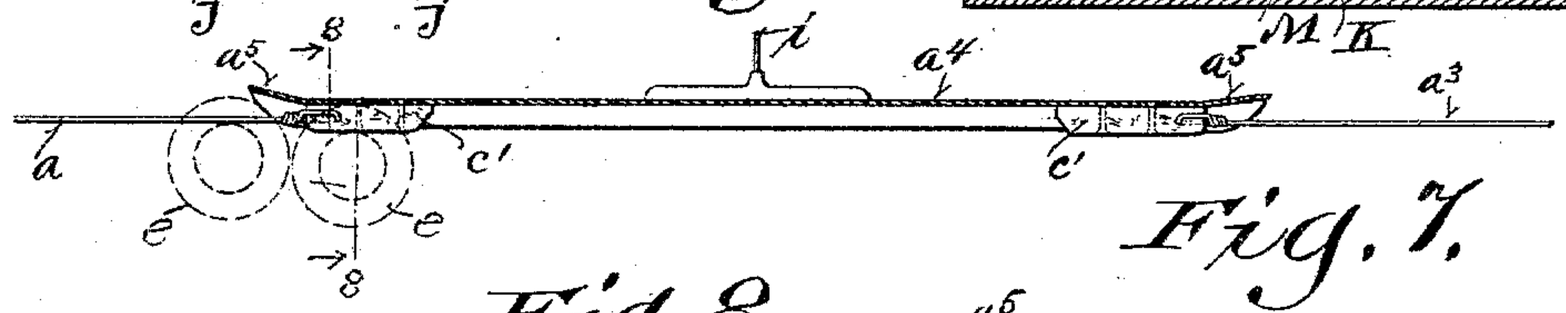


Fig. 7.

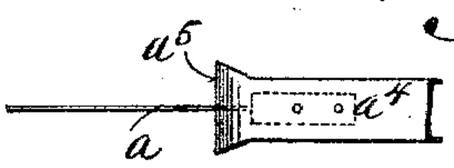
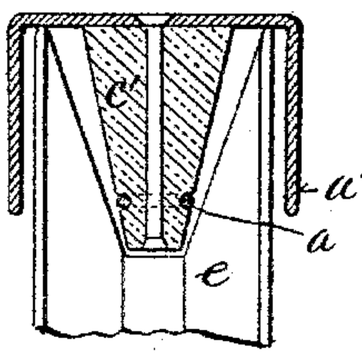


Fig. 8.



Witnesses
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(No Model.) 3 Sheets—Sheet 3.

W. C. HENRY.

AUTOMATIC TRACK SWITCH FOR ELECTRIC RAILWAYS.

No. 559,800. Patented May 12, 1896.

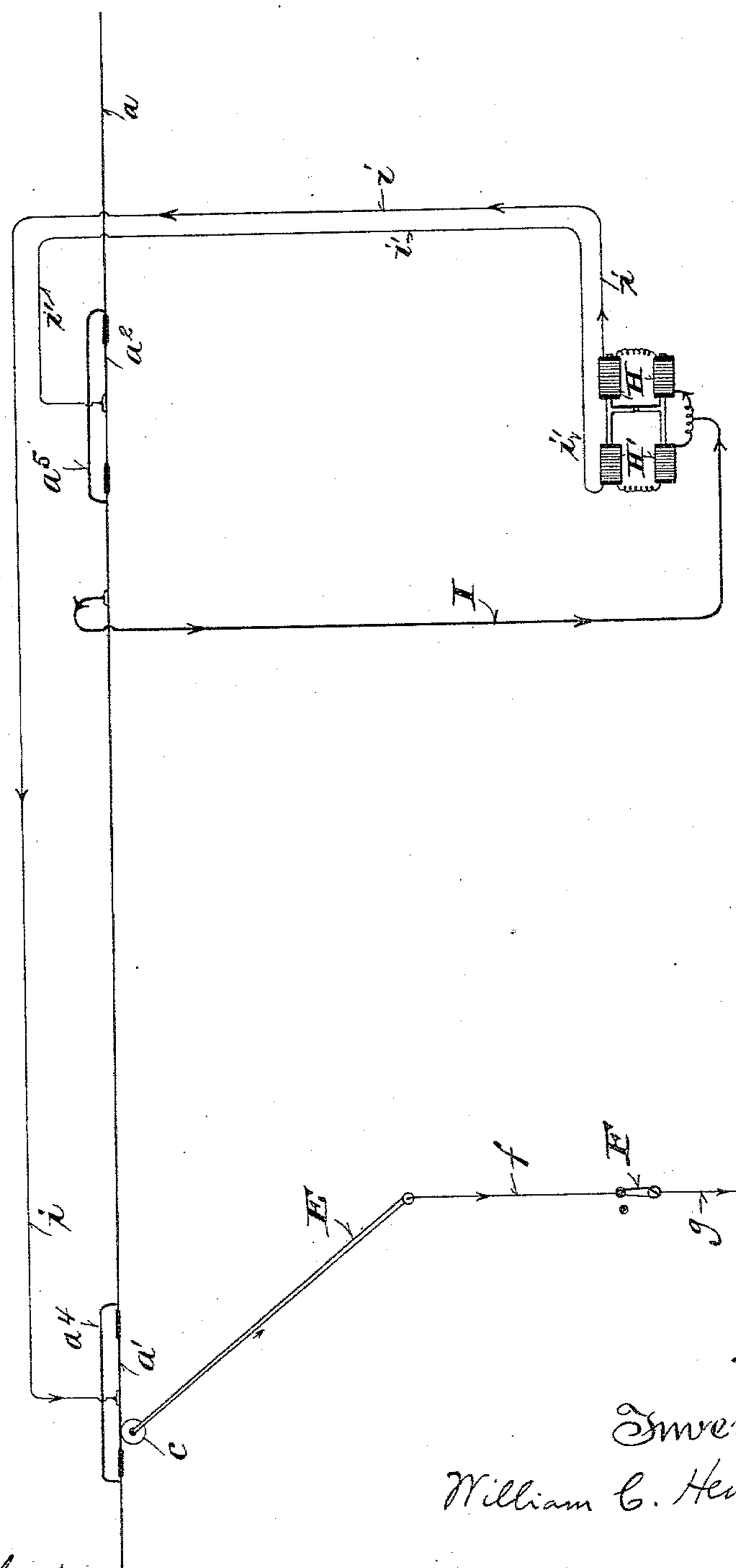

Fig. 9.

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Henry Dankert

Inventor
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Attorney

UNITED STATES PATENT OFFICE.

WILLIAM C. HENRY, OF MILWAUKEE, WISCONSIN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO HIMSELF AND H. SAMUEL ESCH, OF SAME PLACE.

AUTOMATIC TRACK-SWITCH FOR ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 559,800, dated May 12, 1896.

Application filed December 20, 1893. Serial No. 494,165. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM C. HENRY, a citizen of the United States, and a resident of Milwaukee, in the county of Milwaukee, and in the State of Wisconsin, have invented certain new and useful Improvements in Electric-Railway Switches; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates to electric-railway switches; and it consists in certain peculiarities of construction and combination of parts, as will be fully set forth hereinafter and subsequently claimed.

In the drawings, Figure 1 is a diagrammatic view illustrating my present invention applied to the overhead or trolley system. Fig. 2 is a detail plan view of the switch-point and switch-controlling magnets, partly in section, to illustrate details of construction. Fig. 3 is a section on the line 3 3 of Fig. 2, illustrating the construction of the switch-throwing rod. Fig. 4 is a cross-section on the line 4 4 of Fig. 2. Fig. 5 is a cross-section on the line 5 5 of Fig. 2. Fig. 6 is a detail sectional view illustrating a somewhat-modified construction of the insulated portion of the trolley-wire. Fig. 7 is a detail view of a portion of the device shown in the preceding figure. Fig. 8 is a detail sectional view on the line 8 8 of Fig. 6. Fig. 9 is a diagrammatic view illustrating my invention applied to another form of the trolley system.

My present invention is in part an improvement on the devices patented to August C. Goetz on January 17, 1893, No. 489,944; but in the present instance the electrical connections are made with the overhead wires of the well-known trolley system, and the insulated rail-sections described in said prior patent are dispensed with.

Referring to the drawings, A B represent the ordinary rails in use in street-railways for the passage of electric cars, and A′ B′ the diverging or branch rails leading therefrom.

C is the switch tongue or point.

D D represent the ordinary poles, having cross-arms *d d* for supporting the trolley-wires *a*, and carrying also the live or feed wire *b*. In Fig. 1 the trolley-wire *a* is shown with portions a' a^2 insulated, as shown at *c c*, from the main portion of said trolley-wire, the insulators being of any suitable material—such as fiber, paper, gutta-percha, or the like.

E represents an ordinary trolley-pole, supposed to be attached in the usual way to the top of the car, (not shown,) and *e* is the trolley.

F is the rheostat on the platform of the car, under the control of the motorman, and *f* the wire connecting same with the trolley, while *g* is the wire connecting the rheostat with the motor G, all as well known in the trolley system. Between the insulated portions a' a^2 of the trolley-wire *a* is a portion a', which may be forty or fifty feet in length, and which is connected with the feed-wire *b* by a branch wire b'.

H H and H′ H′ represent the operating-magnets and may be practically of the same construction as shown in the said prior patent already hereinbefore referred to. H H represent a pair of helices, connected by a wire *h*, and H′ H′ the other pair, similarly connected by wire h'. From the helices H H a wire *i* runs to the insulated portion a' of the trolley-wire, and a like wire i' runs from the helices H′ H′ to the insulated portion a^2 of said trolley-wire, while a wire I connects both pairs of helices with the feed-wire *b*, this wire I being provided with a cut-off I′, to be used whenever it is desired to cut off the current from the wire *b*, as in repairing or placing the magnets and connections.

In Fig. 2 the magnets are shown in somewhat different position relative to the switch-point and track from the position shown in Fig. 1, this being immaterial and of course subject to modification according to the direction of the branch track, which is likewise shown as diverging in a different direction in one figure from that shown in the other.

The devices for throwing the switch-point are preferably constructed as follows: J is a suitable box or case, provided with a removable cover J′ and adapted to be located below the surface of the ground, either between the rails of the tracks or adjacent thereto, as may be most convenient in any given instance. This box is preferably made of cast-iron, and a block or board K, of wood or other insulating material, is placed within the same, and

across the block are placed metallic strips K′ K′, properly secured thereto and provided with screw-threaded holes or sockets to receive the screw-threaded lower ends of pins *k k*, which are provided with nuts *k′ k′*, upon which rest the cross-pieces L, which support the cores M M of the helices, said cross-pieces having transverse semicircular grooves or seats *j j* for said cores, as best shown in Fig. 5, and between these grooves the said cross-pieces are formed with oil-cups L′, there being channels or passages *j′ j′*, leading from said oil-cups to said grooves *j j* to lubricate the same and facilitate the movements of the cores across the said grooves or seats, as hereinafter explained.

N is the head-block connecting the cores, which are connected as follows: This head-block is made, preferably, of metal and is transversely bored to receive the screw-threaded pins *n*, which project on each side thereof, as shown in Fig. 2, and each of the cores M is made in two parts, (of soft iron,) the adjacent ends of said parts being bored out and tapped and then screwed upon the said projecting pins *n*. The length of these cores, when united, is less than the distance from end to end of the helices when the latter have been secured to place upon the block or board K, as by the end pieces h^2 and screws h^3. Secured upon the head-block N is a base-block N′ of insulating material, such as fiber or gutta-percha, and a stud or pin *n′* of the same material rises from this base to receive the forked end *o* of a lever O, hereinafter described.

P is a post rising from the bottom of the box or casing J and preferably cast therewith, which post is preferably tapering, as shown, to receive a similarly-shaped thimble Q, which latter has a shank *q*, terminating in a transverse plate Q′, provided with a slot *q′*, the said thimble being secured to the post P by a set-screw q^2.

R is the switch-throwing rod, provided at one end with an upright pin *r*, which fits into a hole in the under side of the switch-tongue C, as best shown in Fig. 3, and which rod passes through a hole in the frog or plate C′ and through a hole in the box or casing J, having a stuffing-box J^2, the adjacent inner end of this rod being screw-threaded for adjustable connection with the head R′ of the double strap or link *r′ r′*, the free ends of the latter resting above the slotted plate Q′ and receiving between them the adjacent end O′ of the hereinbefore-named lever O, which lever is pivotally secured to the post P by bolt O^2. This end O′ of said lever is provided with an elongated slot *o′*, and a bolt S is passed down through holes in the ends *r′ r′* of the said double strap or link and the interposed slotted head O′ and through the slot *q′* in plate Q′, and then secured by a cross-pin *s*, all as best shown in Fig. 3, thereby securing all of said parts together. The double strap R′ *r′ r′* is first adjusted to the proper point on the rod R, then the connection just described is made, and then a jam-nut R^2 is screwed to place on the rod R against the head R′ of the double strap or link to prevent accidental disarrangement of the parts.

In Figs. 6, 7, and 8 I show another form of insulating the trolley-wire. Here in place of the wire-sections *a′* I have substituted an inverted metallic trough or casing a^4, with flaring outer ends or approaches a^5, adjacent to which I secure blocks of insulating material *c′ c′*, as shown, and to these blocks I secure the ends of the adjacent wire-sections *a* and a^3. The wire *i* leads to this casing a^4 just as it does to the wire portion *a′* in the form of device illustrated in Fig. 1. It will be understood that another and precisely similar casing a^4 takes the place of the wire portion a^2 in the system and is similarly connected to the wire *i′*. With this form of device there is less liability of the trolley *e* "jumping the track" at the critical time when it is needed to aid in operating the switch than when a plain wire-section is employed, as first illustrated and described, the flaring ends a^5 serving as guides to receive the trolley, and the downturned edges of the casing guarding against its slipping from place.

The operation of my device will be readily understood from the foregoing description of its construction, taken in connection with the accompanying drawings.

Let it be understood that the main track and switch are in the relative positions shown in Fig. 1, so that without change the car would take the branch track. Now if it is desired to have the switch operated so that the car will continue on the main track all the way when the trolley approaches the first insulated portion *a′* of the trolley-wire, as shown in said Fig. 1, the motorman keeps the current on, and as the trolley reaches the insulated-wire portion *a′* and makes contact therewith a circuit is established from the live wire *b*, through wire I, magnets H H, wire *i*, wire portion *a′*, trolley *e*, wires *f g*, and so to ground through the car and rails, and this current energizes the helices H H and draws the cores M M into them away from the helices H′ H′, this action drawing the long arm of the lever O in toward the helices H H, and thereby forcing the short arm of said lever outward and setting the point of the switch-tongue C to place against the rail B, so that the switch is closed. To keep it closed till the car passes over, the motorman, just as the trolley is about to leave the long stretch of wire a^3, must shut off his current at the rheostat, so that as the trolley encounters the short insulated portion a^2 there will be no circuit and the momentum of the car will cause the trolley to pass along this short strip, (about five feet in practice,) and as soon as the trolley reaches the wire-section *a*, beyond the said insulated portion a^2, the motorman will turn on the current again and proceed in the ordinary manner. If the next car that follows desires to go upon

the branch line, then (the switch now being closed) the motorman will simply keep the current on, and when the trolley strikes the second insulated portion a^2 circuit will be made through wires b I, magnets H′ H′, wire i', and trolley c, wires f g to ground, as before, and this current will energize the helices H′ H′, drawing the cores M M into them and operating the lever O and rod R in the opposite direction to that heretofore just described, opening the switch and permitting the car to pass onto the branch track.

While I prefer the style of magnets shown, I do not wish to be understood as confining my invention thereto, as any form will answer wherein one set of the helices is temporarily energized by the described electrical contact between the trolley and either of the described short insulated portions or sections of the trolley-wire and the other set of the helices simultaneously deënergized.

When my invention is applied to a trolley system in which the separate feed-wire is dispensed with, it is obvious that the electric magnets may be in circuit with any live portion of the trolley-wire a and that loops a^4 a^5 may be added to the said trolley-wire to connect the portions on each side of the short insulated sections a' a^2, all as shown in Fig. 9.

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

1. In a trolley system of electric railways a continuous-current conveyer, and two insulated sections a certain distance apart in the path of a trolley, in combination with electromagnets jointly in circuit with the current-conveyer and severally in circuit with the insulated sections, and a switch-tongue controlled by the magnets, either of the latter being energized by contact of the trolley with the relative insulated section when current is on a car carrying said trolley.

2. In a trolley system of electric railways, the combination of a trolley-wire having two short insulated sections and an intermediate live section, electromagnets severally in circuit with the said separate short insulated sections of the trolley-wire, and also in circuit with a live portion of said trolley system, a railway-track and a branch track having a movable switch-tongue therein, and a device connected to the switch-tongue adapted to be reciprocated by the energizing of one or the other of the magnets electrically and by its reciprocation to shift the switch.

3. In a trolley system of electric railways, the combination of a feed-wire, a trolley-wire having two short insulated sections and an intermediate section connected electrically with said feed-wire, electromagnets severally in circuit with the said separate short insulated sections of the trolley-wire and jointly in circuit with said feed-wire, a railway-track and a branch track having a movable switch-tongue therein, and a device connected to the switch-tongue adapted to be reciprocated by the energizing of one or the other of the magnets electrically and by its reciprocation to shift the switch.

4. In a trolley system of electric railways, the combination with a feed-wire, a trolley-wire having two short insulated sections and an intermediate section connected electrically to said feed-wire, helices severally connected electrically to the said separate short insulated sections of the trolley-wire, and jointly connected electrically to the said feed-wire, a railway-track and a branch track having a movable switch-tongue therein, reciprocating cores within the helices, and a device mechanically connected to said cores and to said switch-tongue, and adapted to be reciprocated by the energizing of one or the other of said helices to shift the switch when electrical contact is made between either of said short insulated sections of the trolley-wire and a trolley on a passing car.

5. In an electric-railway switch, the combination of a suitable casing, two sets of helices within the same, each set adjacent to one end thereof, a pair of cores of less length than the distance from end to end of the said helices, vertically-adjustable supports beneath said cores, a head-block connecting said cores, a switch-throwing rod extending through said casing and connected to the switch-tongue, a pivoted lever within the casing connecting said rod with said head-block, and electric connections between the said helices and the current-conveyer of the railway system for energizing one or the other of said sets of helices and thereby reciprocating the said cores and switch-tongue.

6. In an electric-railway switch, the combination of a suitable casing, two sets of helices within the same, each set adjacent to one end thereof, a pair of cores of less length than the distance from end to end of the said helices, cross-pieces having grooves or seats for supporting said cores, and provided with oil-receptacles and lubricating-passages leading therefrom to said core-seats, a head-block connecting said cores, a switch-throwing rod extending through said casing and connected to the switch-tongue, a pivoted lever within the casing connecting said rod with said head-block, and electric connections between the said helices and the current-conveyer of the railway system for energizing one or the other of said sets of helices and thereby reciprocating the said cores and switch-tongue.

7. In an electric-railway switch, the combination of a suitable casing, two sets of helices within the same located at some distance apart, a pair of cores of less length than the distance from end to end of said helices, a head-block connecting said cores, a pin and base of insulating material upon said head-block, a post within said casing, a switch-throwing rod extending through said casing and connected to the switch-tongue, a lever supported by said post, and connected at one end with said rod, and having a forked con-

nection at its other end with said insulated pin on the head-block, and electric connections between the said helices and the current-conveyer of the railway system for energizing one or the other of said sets of helices and thereby reciprocating the said cores and switch-tongue.

8. In an electric-railway switch, the combination of a suitable casing, two sets of helices within the same located at some distance apart, a pair of cores of less length than the distance from end to end of said helices, a head-block connecting said cores, a pin and base of insulating material upon said head-block, a post within said casing, a thimble upon said post having a shank terminating in a slotted transverse plate, a switch-throwing rod extending through said casing and connected to the switch-tongue, a double strap or link adjustably secured to the inner end of said rod, a lever pivoted to said post and having a forked connection at one end with the insulated pin on the head-block, and connected at its other end by a pin to the inner ends of the said double strap or link and the said slotted transverse plate, and electric connections between the said helices and the current-conveyer of the railway system for energizing one or the other of said sets of helices and thereby reciprocating the said cores and switch-tongue.

9. In an electric-railway switch, the combination with a trolley-wire of inverted troughs or casings having downwardly-extended side flanges and flaring ends or approaches, with blocks of insulating material adjacent to each end connected to said trolley-wire and forming insulated sections thereof, an electromagnetic switch-operating device, and wires electrically connecting said magnets with said insulated portions of the trolley-wire, and other electrical connections between said magnets and a live portion of said trolley system.

10. The combination of a railway-track having a branching track connected therewith, a trolley-wire, insulated sections of said trolley-wire, one section arranged in advance of the other, so as to adapt the trolley to pass freely from the trolley-wire to the insulated sections, and a device having electrical connection with a source of electrical supply, and with the insulated sections of the trolley-wire, and also connected with the movable switch-point for shifting said switch-point by the energy of the electric current delivered to the device, when the current is completed through one of the insulated sections.

11. The combination of a railway-track having a branch track and a movable switch-point therein, oppositely-arranged helices, an electric conductor leading from the feed to the helices, a trolley-wire having electrically-insulated sections with which the helices are severally connected electrically, a device reciprocable by the energizing of one or the other of the helices, a rod connected to the switch-point, a slotted arm, a pivoted lever having one end connected to the reciprocable device, and a pin or bolt connecting the inner end of the rod to the lever, and passing through the slotted arm.

12. The combination of a trolley-wire, supplemental conductors located one in advance of the other along the trolley-wire, a track switch-point and separate electromagnetic devices respectively in circuit with the said supplemental conductors and connected to operate the switch-point in opposite directions.

13. In an electric railway, the combination with the point-rail of a shunt-track, of electrically-operated mechanism for moving said point-rail, independent electric circuits for giving current to said mechanism, to produce movement in opposite directions, and successive insulated sections of the trolley-wire, one of which is included in each of said circuits, the latter being completed by the trolley on the car.

In testimony that I claim the foregoing I have hereunto set my hand, at Milwaukee, in the county of Milwaukee and State of Wisconsin, in the presence of two witnesses.

WILLIAM C. HENRY.

Witnesses:
H. G. UNDERWOOD,
HENRY DANKERT.