No. 699,119. Patented Apr. 29, 1902.

C. H. STORM.

AUTOMATIC SIGNAL FOR ELECTRIC RAILWAYS.

(Application filed Jan. 19, 1901.)

(No Model.) 3 Sheets—Sheet 1.

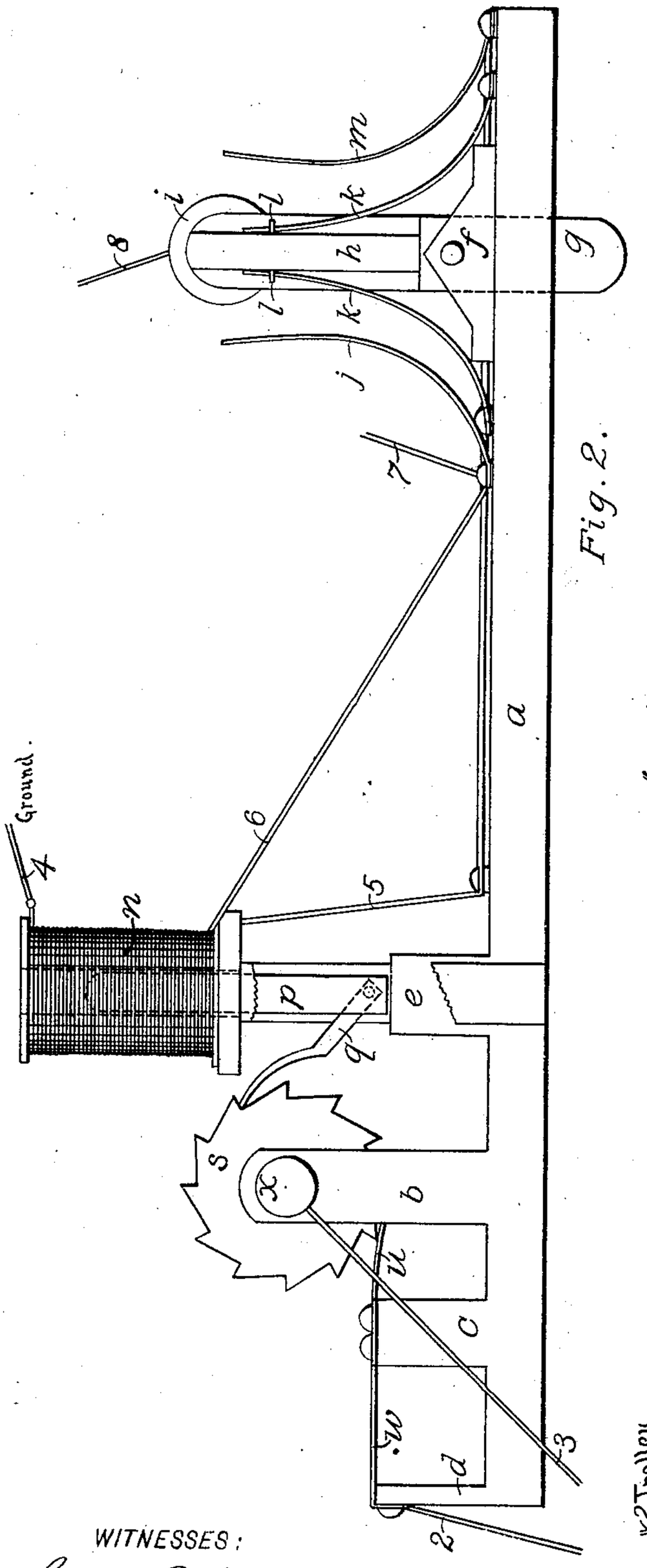

Fig. 2.

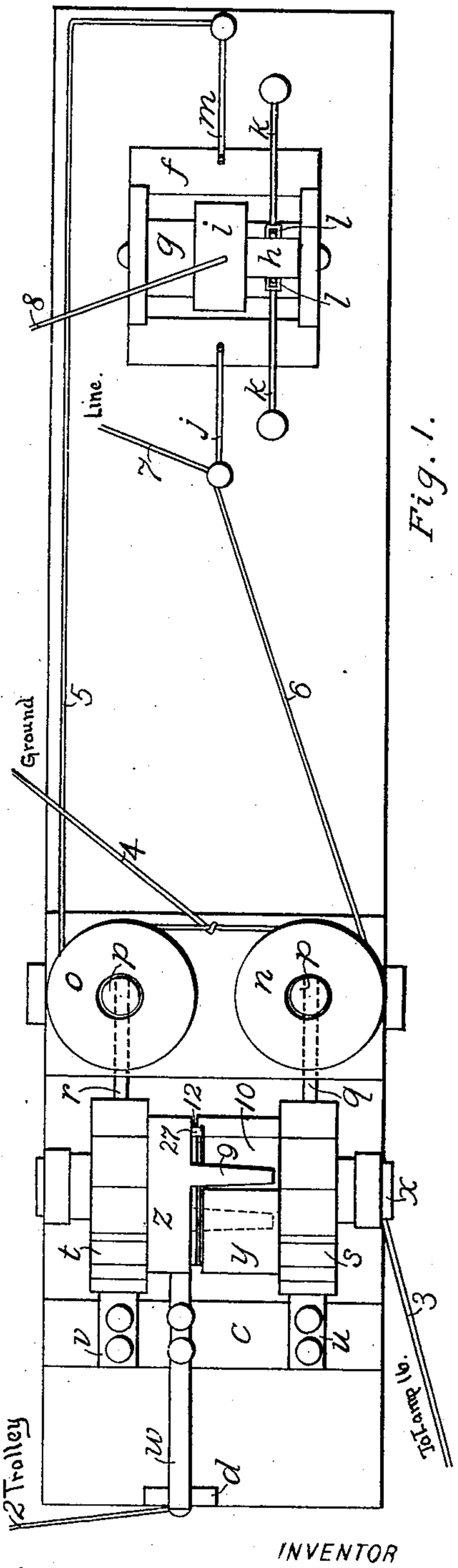

Fig. 1.

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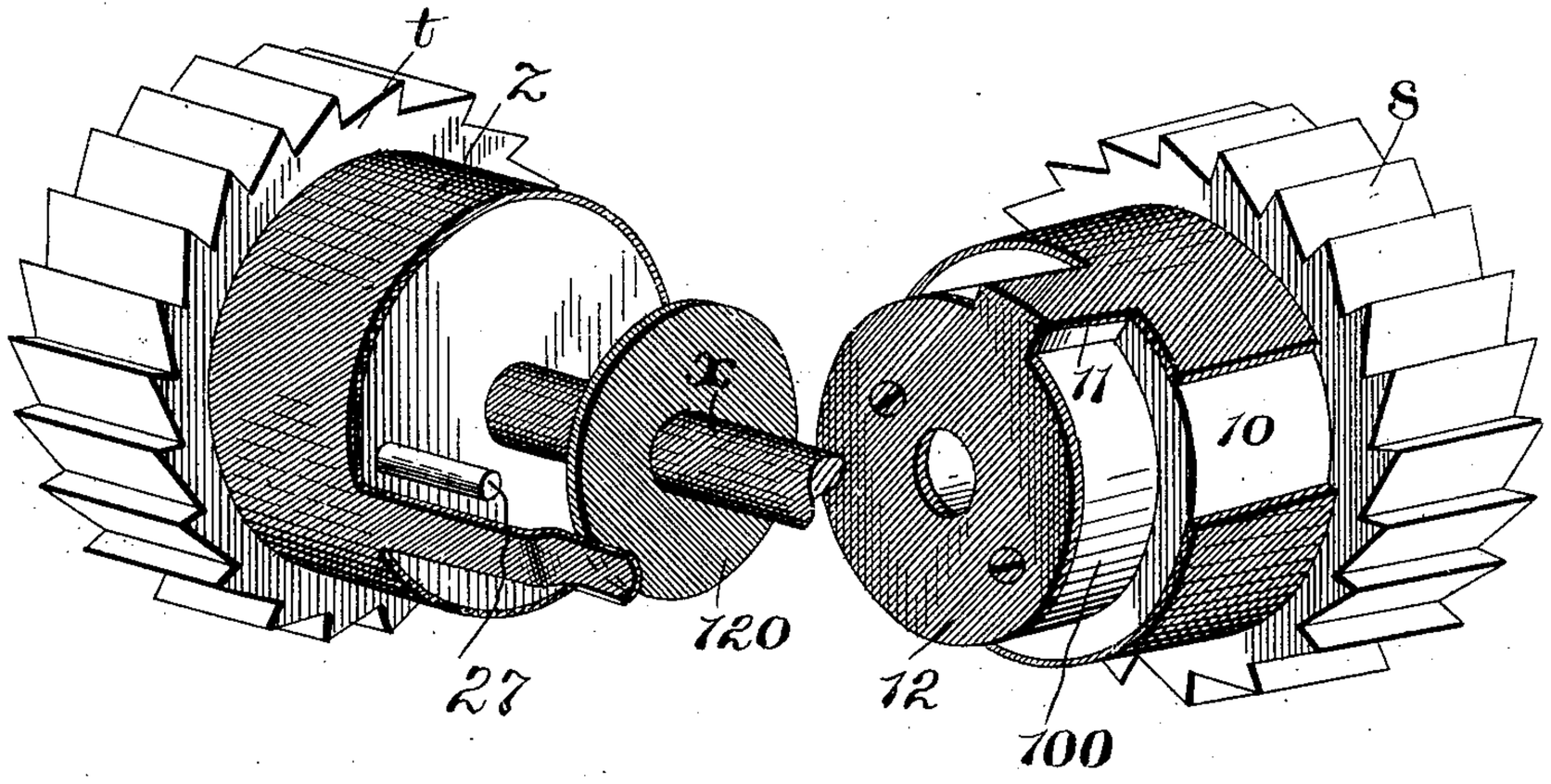
(No Model.) 3 Sheets—Sheet 2.

Fig. 3.



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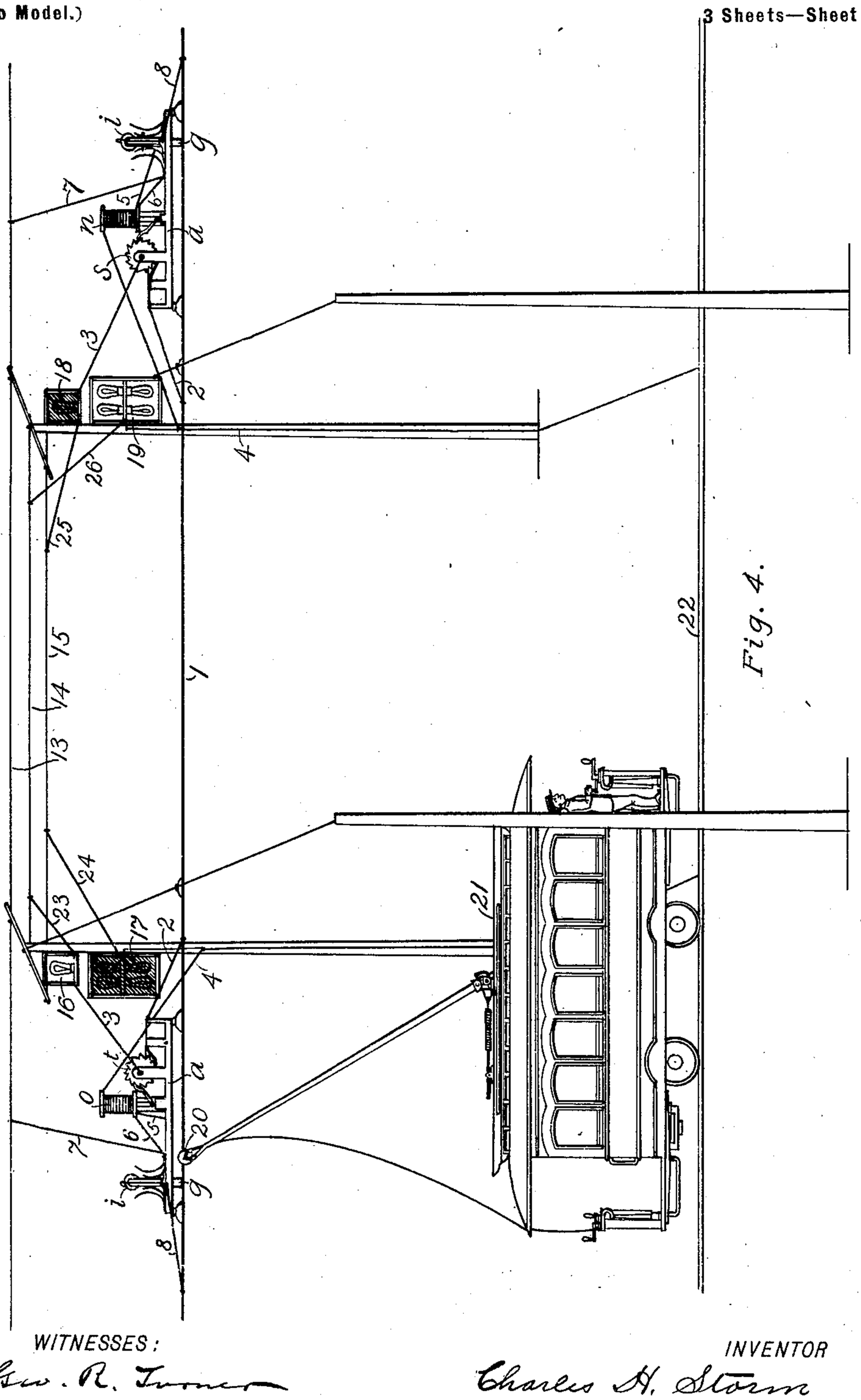

Fig. 4.

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UNITED STATES PATENT OFFICE.

CHARLES H. STORM, OF WATERLOO, IOWA, ASSIGNOR TO RALPH L. STORM, OF WATERLOO, IOWA.

AUTOMATIC SIGNAL FOR ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 699,119, dated April 29, 1902.

Application filed January 19, 1901. Serial No. 43,857. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. STORM, a citizen of the United States of America, and a resident of the city of Waterloo, Blackhawk county, Iowa, have invented certain new and useful Improvements in Automatic Signals for Electric Railways, of which the following is a specification.

My invention relates to improvements in automatic signals for electric railways; and the object of my improvement is to provide a device whereby a signal is set when one or more cars enter a track-section in order to prevent head-end collisions caused by cars approaching each other from opposite directions. I attain this object by the means illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of this apparatus. Fig. 2 is a side elevation of the same. Fig. 3 is a perspective detail of the parts of the circuit-closer slightly separated, and Fig. 4 is a diagram showing the method of connecting the circuit-closers and switches with the lamp-signals.

Similar letters and numbers refer to similar parts throughout the several views.

Attached to suitable supports on the frame *a* are two electromagnets *n* and *o*, having their armatures movable in a vertical direction within the spools. To the lower ends of the said armatures are pivoted the operating-pawls *q* and *r*, which respectively engage the teeth of the ratchet-wheels *s* and *t*. The ratchet-wheels *s* and *t* are separately mounted, so as to be revoluble about the bolt *x*, the latter being set in standards *b*, attached to the frame *a*.

Attached to the standard *c* are the flat springs *u* and *v*, their free ends bearing, respectively, against the lower teeth of the ratchet-wheels *s* and *t*. The ratchet-wheels *s* and *t* are provided with drums extending inwardly toward each other and are entirely constructed of any suitable non-conducting material.

The outer periphery of the drum on the ratchet-wheel *s* is nearly covered with a strip *y* of conducting material, a space 10 being uncovered to expose the non-conducting surface of the drum. As shown in Fig. 3, the conducting-strip communicates, by means of a shoulder 11, with a disk 12, which is secured to the inner end of a hub 100, the latter being fast to and of smaller diameter than the drum of the ratchet-wheel *s*. This hub stands between the two drums, with its disk-covered face 12 adjacent the drum of the ratchet-wheel *t*, and between said drum and disk stands a metallic washer 120, which is in constant contact with the bolt *x*, upon which it rotates, but is separated from the drum of the ratchet-wheel *t* by means of the non-conducting drum of the latter. An insulated stud 27 on the inner face of the drum of ratchet-wheel *t* is so placed as to engage with the edge of the shoulder 11 when said ratchet-wheel *s* is rotated under impulse of the current caused by the releasing mechanism at the releasing-switch. At this time the projecting piece 9 is in contact with the non-conducting surface 10 and in a position to be reset. The conducting-strip *z* surrounds the entire outer periphery of the drum of the ratchet-wheel *t* and has a projecting piece 9, which extends over the hub of the ratchet-wheel *s* and comes into frictional contact with it.

A metallic conducting band or brush *w* is so attached to the standards *d* and *c* as to bear against the lower surface of the strip *z*. *g* is a setting-lever pivoted in bearings in a box *f*, and its lower portion passes through and extends below an opening in the frame *a* to a sufficient distance to allow it to rest upon the upper side of the trolley-wire when the frame has been properly suspended over said wire. The upper end of the lever *g* is surrounded by a conducting-cap *i*, permanently connected with the trolley-wire 1 by wire 8. The lever *g* is kept normally in a vertical position by means of the springs *k k*, which bring a light pressure to bear against its opposite sides. The said springs are kept in position by means of staples 11. The springs *j* and *m* are also attached at their base to the frame *a* and are terminal conductors communicating with the wires 5 and 6, respectively.

The single-lamp signals 16 and 18 are of red or any other colored light, while the multiple-lamp signals 17 and 19 are intended to emit a white light or a light of any color dis-

tinguishable from that of the one-lamp signals. 13, 14, and 15 are conducting-wires supported on insulators at one side of the track-section, the wire 13 being a continuous feed-wire and the wires 14 and 15 extending only from the devices at one end of a block or section of those at the other.

Each end of a section of track is provided with one of the switches reversed in position in relation to each other.

When properly suspended over the trolley-wire, the different parts of the switches are connected together and to each other and the lamps in circuit as follows: The wire 2 serves to carry the current from the trolley-wire 1 to the brush w, strip z, projection 9, strip y, disk 120, bolt x, wire 3, and lamp 16. Thence the current is carried to the lamps 19 at the opposite end of the section by the wires 23 14 26 and thence to the ground by wire 4 to the rail 22. The wire 6 connects the terminal j with the electromagnet n. The wire 4 also grounds the current, which may pass through either of the electromagnets. The wire 7 on the clearing-switch serves to connect the clearing-terminal j by means of the wire 13 with the wires 7 and 6 and the electromagnet n on the setting-switch.

For the purpose of setting the signals on the section when it is clear by car entering from the opposite side to that described the wire 3 conducts the current from switch to single lamp 18. Thence the current is carried, by means of wires 25, 15, and 24, to the multiple-lamp signal 17, thence to ground by wire 4.

The car 21 is represented as just entering upon a track-section 22, its trolley-wheel 20 having just passed under and actuated the setting-lever g of the setting-switch and illuminated the single red-lamp signal 16 at the hither end and the white multiple-lamp signal 19 at the farther end of the track-section.

The operation of the signals is thus described: The trolley-wheel 20 impinges upon the setting-lever g, throwing it back into contact with the terminal m, establishing a circuit through the wire 5 and electromagnet o, drawing up the movable armature p, and by means of the pawl r rotates the ratchet-wheel t through the space of one tooth, causing the projection 9 to pass over into contact with the surface of the conducting-strip y, as is indicated by the dotted lines in Fig. 1. The current passes thence through the disk 12 (shown in Fig. 3) to the bearing-bolt x, then to the wire 3, and thence to the single red lamp 16, illuminating it. The current then passes by way of the wires 23, 14, and 26 to the white signal-lamps 19, lighting them, and then passing to the ground-wire 4. When the car 21 arrives at the other end of the section, the trolley-wheel 20 impinges upon the releasing-lever g of the second switch, throwing it back into contact with the clearing-terminal j, creating a circuit through the wire 7 on the clearing-switch, the wire 13, and the wires 7 and 6 and electromagnet n on the setting-switch, raising the movable armature p, and by means of the pawl q rotates the ratchet-wheel s through the space of one tooth, bringing the non-conducting surface 10 under the projection 9, thus breaking the circuit and extinguishing the lights in signal-lamps 19 and 16. The red lamp 16 by its light informs the motorneer of car 21 as it enters the track-section 22 that the circuit is complete through both lamp-signals 16 and 19 and also gives notice to the motorneer of a following car that a car precedes it, moving over the section in the same direction. The illuminated lamp-signal 19 also warns the motorneer of a car coming toward the section from an opposite direction that a car is on the section, approaching him.

The great advantage of this over other systems is in this, that where it is necessary to have several cars on a track-section at one time the first car entering a clear section sets the signal and the motorneer of each successive car becomes aware as his car approaches the section that it is clear of cars coming toward him, but has one or more ahead of him proceeding in the same direction. The red signal thus becomes an index of safety; but should the unlighted multiple-lamp signal under the red signal become illuminated it warns the motorneer that a car is approaching from an oppposite direction. As each car enters a section whose red signal indicates the track clear ahead except for cars moving forward in the same direction its trolley-wheel by impinging upon the setting-lever gives a momentary impulse of current through the electromagnet o, which, by means of magnet-controlled pawl r, moves the ratchet-wheel t through the space of one tooth, causing a like movement of the tongue-piece or projection 9 over the strip y. If ten cars pass over the section, the ratchet-wheel t is rotated through a space of ten teeth. When the tenth and last car by means of its trolley-wheel impinging upon the releasing-lever releases the ratchet-wheel s, it allows said ratchet-wheel s to rotate until it has passed over a space of ten teeth and then is locked by the engagement of the stud 27 with the shoulder 11, leaving the projection 9 over the non-conducting surface 10. The circuit is thus broken and the signal-lights extinguished. It is obvious that any number of cars may thus be permitted to enter a section of track, proceeding in the same direction, and limited only by the number of teeth in the ratchet-wheels in the operation of the system. In the event that it becomes necessary to turn back one or more cars which have already entered the track-section the car or cars turned back clear the signals by means of the setting-switch in the same manner as if they had passed off going in the other direction.

The claims below are intended to cover the construction of the circuit-closer herein shown

and described when used in connection with a switch such as shown and described herein or of any other construction which is covered by the terms of the claims themselves. No claim is made in this application to any of the other features described and shown in applications filed by Ralph L. Storm July 25, 1901, and bearing Serial Nos. 69,670 and 69,671. Those applications are intended to cover, respectively, the gravity drop and the register, both of which are adapted to be used with the circuit-closer covered in this case.

What I claim as new is—

1. A switch in constant circuit with a trolley-wire and adapted to be moved by a trolley-wheel passing in either direction, two electromagnets, and terminals at opposite sides of the switch respectively in circuit with said magnets; combined with a circuit-closer comprising two drums mounted on a common shaft and each having a ratchet-wheel, pawls for said wheels actuated by the armatures of said magnets, flat springs also engaging said wheels for preventing retrograde movements, an insulated hub fast on one drum and standing between the two, mechanism whereby the drums are thrown into and out of electrical connection with each other through step-by-step rotation, a source of electrical power in circuit with one drum, and a circuit leading from the other drum through the work to be performed, as and for the purpose set forth.

2. A switch adapted to be moved by a trolley-wheel passing in either direction, two electromagnets, terminals at opposite sides of the switch, and electrical connections between them and the magnets; combined with a circuit-closer comprising two drums mounted on a common shaft and one of them in electrical connection therewith, mechanisms whereby said drums are rotated by step-by-step movements by the armatures of said magnets, an insulated hub fast on one drum and standing between the two, a disk between this hub and the other drum, a shoulder connecting the disk with the metallic face of its drum, a stud on the other drum adapted to be engaged by this shoulder, a projecting piece on the last-mentioned drum adapted to contact with the face of the other drum or to rest in an insulated space therein when the shoulder engages the stud, electrical connections between this piece and a source of power, and electrical connections between said shaft and the work to be performed, as and for the purpose set forth.

3. A circuit-closer consisting of a shaft in circuit with the work to be performed, two insulated drums mounted thereon and having metallic faces, one having an insulated space and the other being solid, a piece projecting from the solid face and adapted to rest on said broken face or stand in such space, mechanisms for rotating said drums by step-by-step movements, an insulating-hub of smaller diameter than and secured to the inner end of the drum which has the broken face, a disk at the inner end of this hub in electrical connection with the shaft, a metallic shoulder standing on the periphery of the hub and connecting its face with said disk, an insulating-stud in the inner end of the other drum adapted to be struck by said shoulder when the projecting piece stands on the insulation, a brush bearing on the unbroken face of the last-mentioned drum, and electrical connections leading from this brush to a source of energy, as and for the purpose set forth.

4. In a block-signaling system, differently-colored lights at opposite ends of each block those of one color at one end being in circuit with those of a different color at the remote end, a switch in circuit with a source of energy and adapted to be moved in either direction by the passing trolley-wheel, and terminals at opposite sides of said switch; combined with a circuit-breaker consisting of two drums mounted on a common shaft and insulated from each other, electrically-operated mechanisms connected with said terminals for rotating said drums independently with a step-by-step movement, means for making and breaking electrical connection between the drums at certain points, positive mechanism for reëstablishing this connection after it is broken, connections from a source of power to one drum, and connections from the other drum through one pair of signals to the ground, as and for the purpose set forth.

5. In a block-signaling system, differently-colored lights at opposite ends of each block, those of one color at one end being in circuit with those of a different color at the remote end, a switch in constant circuit with a source of energy and adapted to be moved in either direction by the passing trolley-wheel, and terminals at opposite sides of said switch; combined with a circuit-breaker consisting of two drums mounted on a common shaft and insulated from each other, electrically-operated mechanisms connected with said terminals for rotating said drums independently with a step-by-step movement, means for breaking electrical connection between the drums at certain points, connections from a source of power to one drum, and connections from the other drum through one pair of signals to the ground, as and for the purpose set forth.

Signed at Waterloo, Iowa, this 19th day of December, 1900.

CHARLES H. STORM.

Witnesses:

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M. E. KENNEDY.