No. 630,974. Patented Aug. 15, 1899.

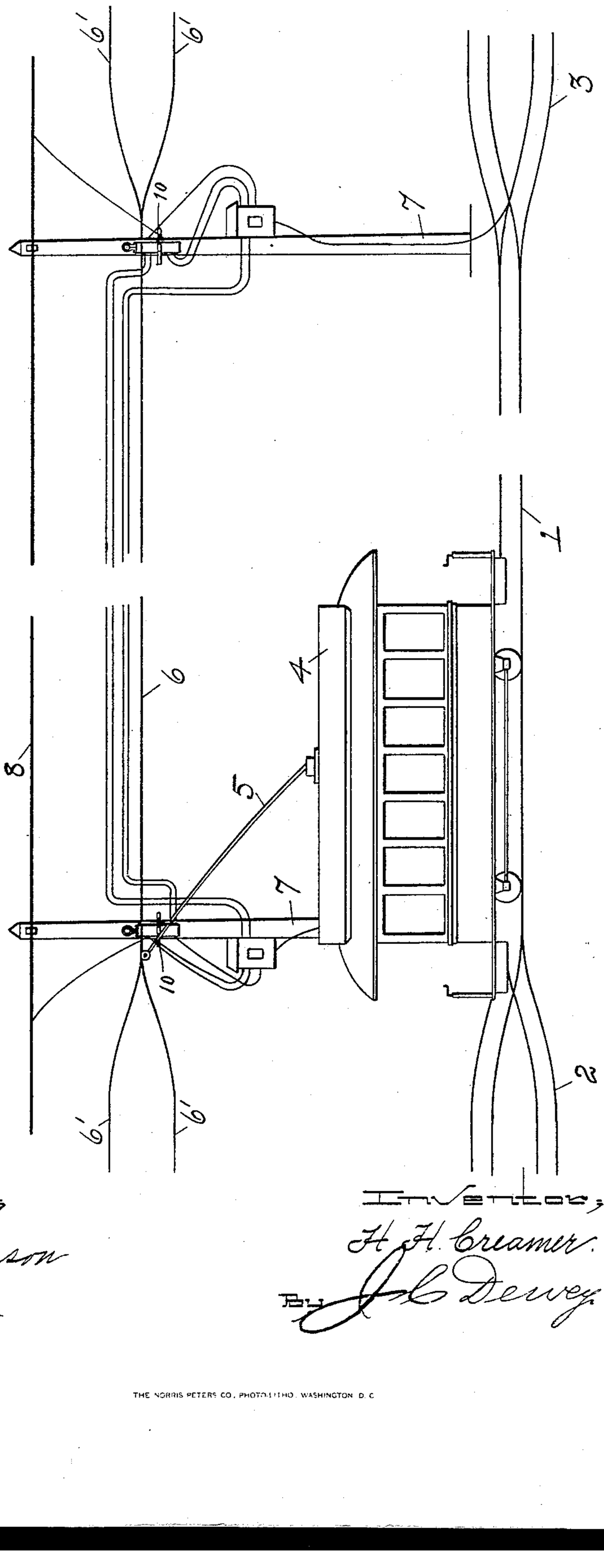
H. H. CREAMER.

ELECTRIC BLOCK SIGNALING APPARATUS.

(Application filed Apr. 7, 1899.)

(No Model.) 5 Sheets—Sheet 1.

FIG. 1.



Witnesses;

C. Forrest Wesson

M. J. Galvin.

Inventor;

H. H. Creamer.

By J. L. Dewey Atty.

No. 630,974. Patented Aug. 15, 1899.

H. H. CREAMER.

ELECTRIC BLOCK SIGNALING APPARATUS.

(Application filed Apr. 7, 1899.)

(No Model.) 5 Sheets—Sheet 2.

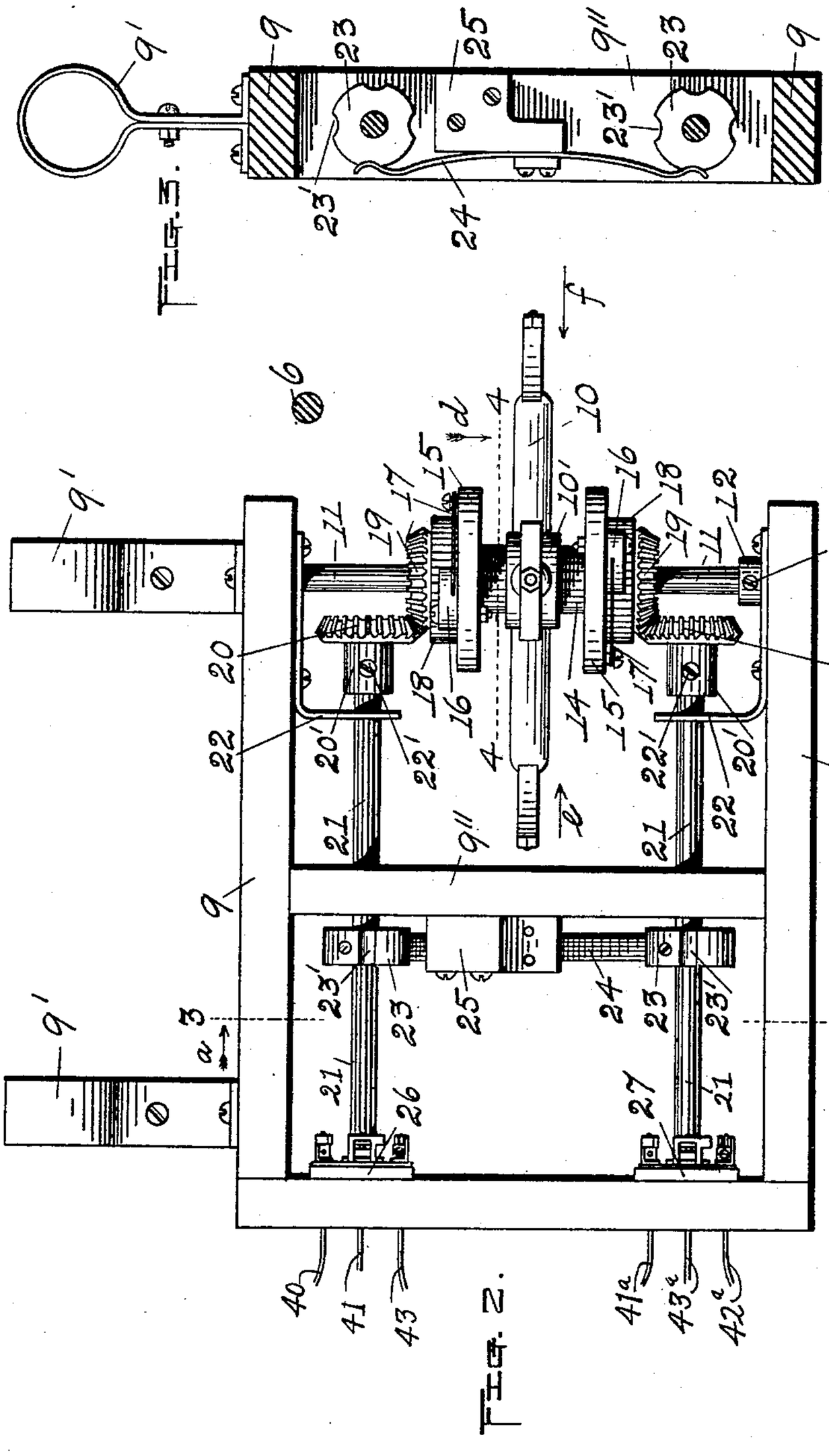


FIG. 2.

Witnesses;
C. Forrest Wesson.
M. J. Galvin.

Inventor;
H. H. Creamer.
By J. C. Dewey Atty.

No. 630,974. Patented Aug. 15, 1899.

H. H. CREAMER.

ELECTRIC BLOCK SIGNALING APPARATUS.

(Application filed Apr. 7, 1899.)

(No Model.) 5 Sheets—Sheet 3.

FIG. 6.

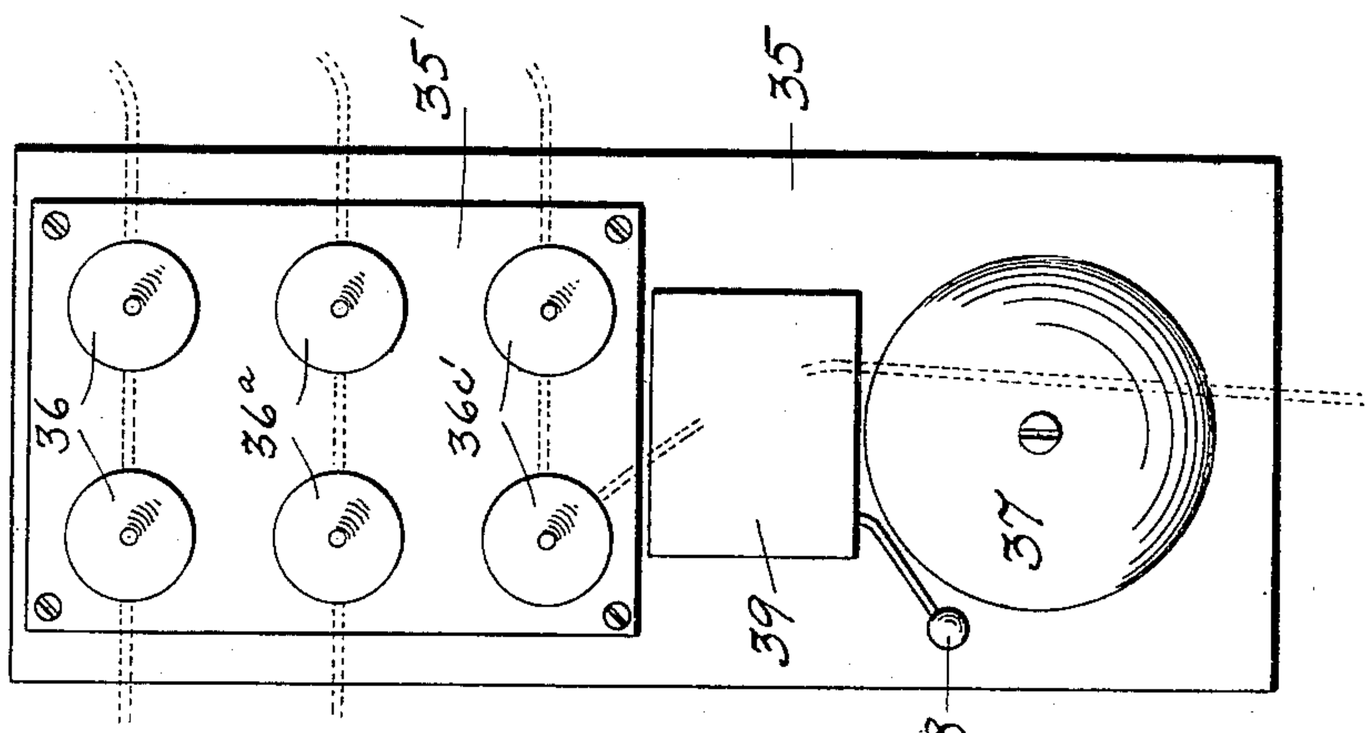


FIG. 5.

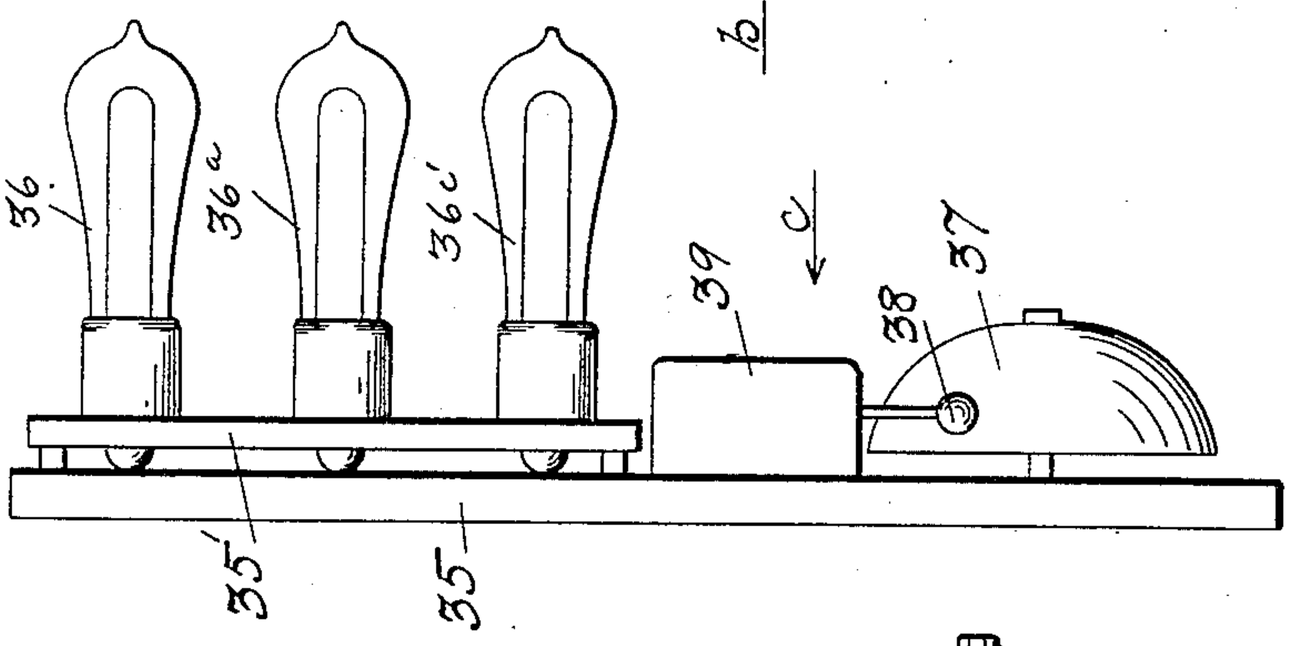


FIG. 4.

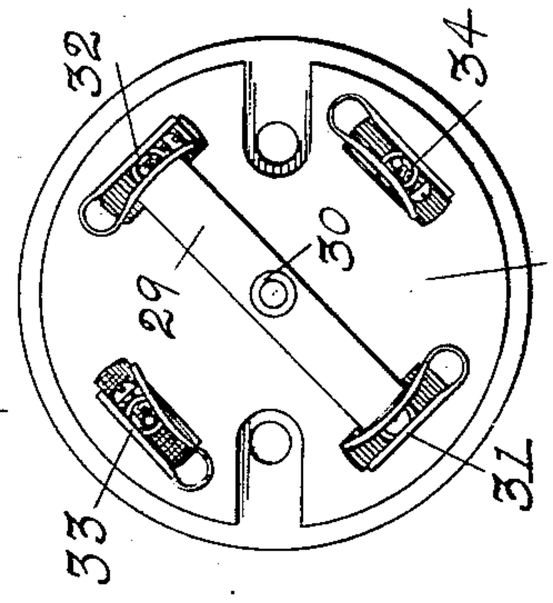
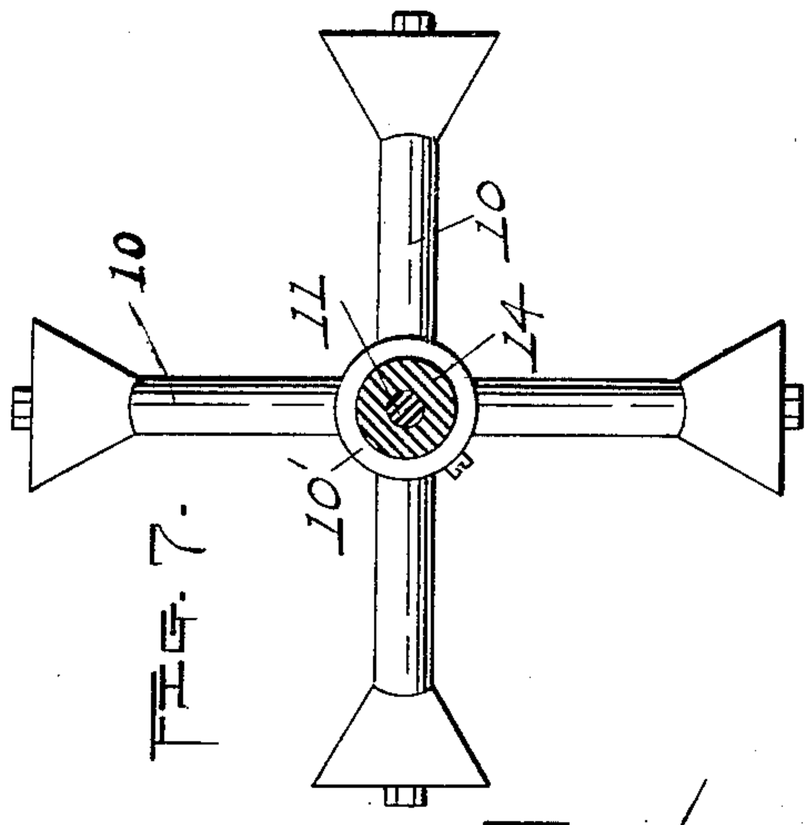


FIG. 7.



Witnesses;

C. Forrest Wesson.

M. J. Galvin.

Inventor;

H. H. Creamer.

By J. C. Dewey, Att'y

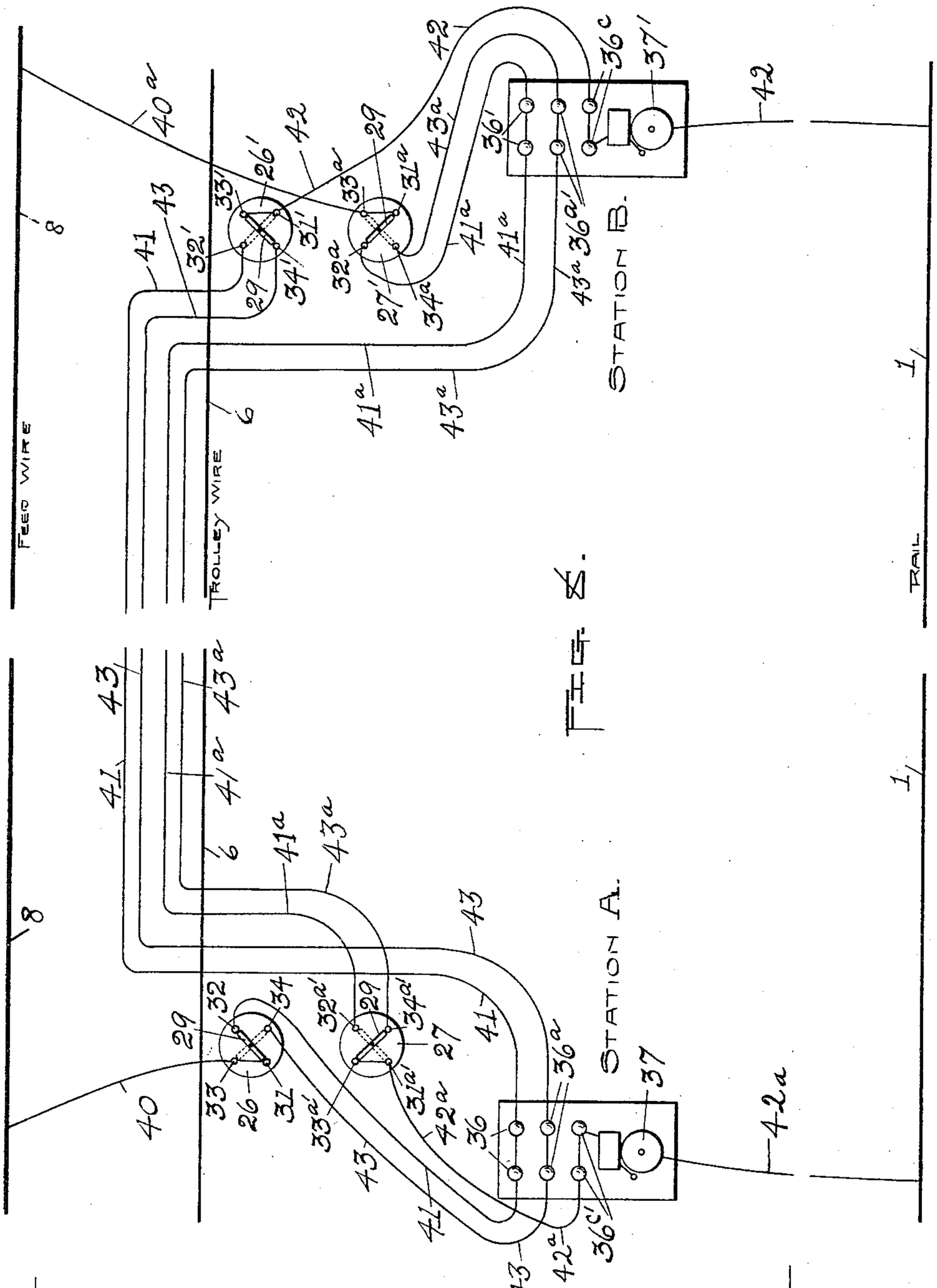
No. 630,974. Patented Aug. 15, 1899.

H. H. CREAMER.

ELECTRIC BLOCK SIGNALING APPARATUS.

(Application filed Apr. 7, 1899.)

(No Model.) 5 Sheets—Sheet 4.



Witnesses;

C. Forrest Wesson

M. J. Galvin

Inventor;

H. H. Creamer.

By J. C. Dewey Atty.

No. 630,974. Patented Aug. 15, 1899.

H. H. CREAMER.

ELECTRIC BLOCK SIGNALING APPARATUS.

(Application filed Apr. 7, 1899.)

(No Model.) 5 Sheets—Sheet 5.

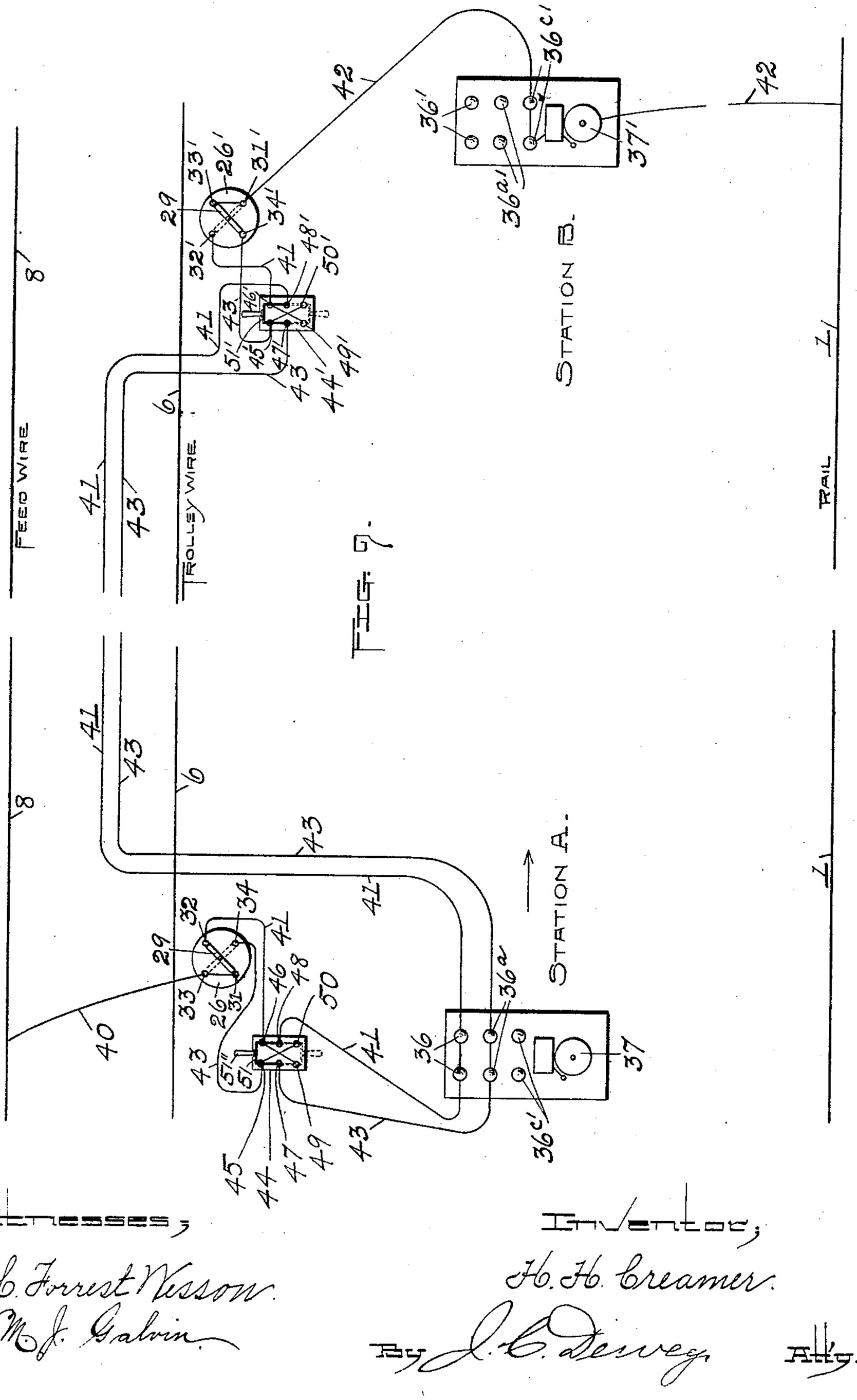


FIG. 9.

Witnesses;
C. Forrest Wesson.
M. J. Galvin.

Inventor;
H. H. Creamer.
By L. C. Dewey Atty.

UNITED STATES PATENT OFFICE.

HENRY H. CREAMER, OF MILLBURY, MASSACHUSETTS.

ELECTRIC BLOCK-SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 630,974, dated August 15, 1899.

Application filed April 7, 1899. Serial No. 712,041. (No model.)

To all whom it may concern:

Be it known that I, HENRY H. CREAMER, a citizen of the United States, residing at Millbury, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Electric Block-Signaling Apparatus, of which the following is a specification.

My invention relates to automatic electric block-signaling apparatus for electric railways, and particularly overhead-trolley lines, and is intended to prevent collisions between cars traveling in opposite directions on a section of single-track railway between two turnouts or double-track sections.

The object of my invention is to provide an improved electric signaling apparatus of simple construction and automatically operated, preferably, by the trolley-pole on the car; and my invention consists in certain novel features of construction of my automatic electric signaling apparatus, as will be hereinafter fully described.

It will be understood that my signaling apparatus is located at each terminus of a section of single track between two turnouts or double-track sections, so that when a car traveling in either direction passes from the turnout or double-track section onto the single-track section a signal is displayed at that end of the single-track section and another signal is displayed and a bell rung at the other end of the single-track section until the car passes off of the single-track section onto the next turnout or double-track section, when the signals are withdrawn and the ringing of the bell stopped.

Referring to the drawings, Figure 1 is a section of overhead-trolley electric railway, showing my automatic electric signaling apparatus applied thereto. Fig. 2 is a side view of the switch-operating mechanism with the protecting box or cover removed. Fig. 3 is a section on line 3 3, Fig. 2, looking in the direction of arrow *a*, same figure, showing the holding or stop mechanism. Fig. 4 is a front view of one of the switches. Fig. 5 is a side view of the signal-lights and bell with the protecting box or cover removed, looking in the direction of arrow *b*, Fig. 6. Fig. 6 is a front view of the same, looking in the direction of arrow *c*, Fig. 5. Fig. 7 is a view of the sprocket-wheel to be engaged by the trolley-pole, taken at a point indicated by line 4 4, Fig. 2, looking in the direction of arrow *d*, same figure. Fig. 8 is a diagram of the switches and signal apparatus and wire-circuits which are involved in the use of my invention; and Fig. 9 is a diagram showing the upper set of switches and the signal apparatus and wire-circuits shown in Fig. 8 and also two additional switch devices to be operated by hand in case two cars or a double-header enter on one end of the single-track section. Figs. 2 to 7, inclusive, are shown on an enlarged scale.

In the accompanying drawings, 1 is a section of single track of an electric railway and 2 and 3 are sections of double track or turnouts at each end of the single-track section 1.

4 is an electric car of ordinary construction carrying the trolley-pole 5, which engages at its upper end and moves the switch-operating mechanism to work the signals through the electric connections.

6 is the overhead trolley-wire, which extends in double lines 6′ 6′ over the double-track or turnout sections 2 and 3 and is supported on brackets or transverse wires extending out from the poles 7 7. At the upper ends of the poles 7 7 is secured the feed-wire 8.

All of the above parts are of the ordinary construction and operation in electric trolley-lines.

I will now describe my automatic electric signaling apparatus.

There is, as above stated, a signaling apparatus and operating mechanism at each end of the single-track section 1, which are connected by wires through which the circuits are closed and opened to show and withdraw the signals and ring and stop ringing the bell, as will be hereinafter described.

As the mechanisms for operating the signaling apparatus at each end of the single-track section are of similar construction, a description of one will be sufficient.

A frame 9, Figs. 2 and 3, supports the operating mechanism and is in this instance provided with eyes or clamps 9′ upon its upper surface, which are secured upon a bracket or span wire, extending out from the poles 7 in such a position that the trolley-wire 6 will

be just beyond the end of the frame 9 and above the sprocket-wheel 10 of the operating device, as indicated in Fig. 2. A vertical shaft 11 is mounted in bearings at the outer end of the frame 9, and a collar 12, secured upon the lower end of the shaft 11 by a screw 13, supports the shaft and allows it to turn freely in either direction. A hub 14 is fast on the shaft 11 and has at each end thereof made integral therewith or secured thereto a disk 15. Each disk 15 carries a dog 16, held in engagement by a spring 17, secured on the disk 15, with the teeth of the ratchet-wheel 18 loose on the shaft 11, which has fast thereon a beveled pinion 19, meshing with a beveled pinion 20, extending at right angles and fast on a hub 20′, secured on the end of the horizontal shaft 21 in this instance by a screw 22′. The two horizontal shafts 21 have bearings in brackets or hangers 22, secured at the outer end of the frame 9, and also in the upright post or stand 9″, extending through the central portion of the frame 9. Fast upon the shafts 21 are disks or collars 23, having four peripheral grooves or recesses 23′ therein, as shown in Fig. 3. A spring 24, centrally secured to a block 25, has its ends curved to extend into the recesses 23′ in the collars 23, as shown in Fig. 3, and acts to hold and prevent the shafts 21 from turning or getting out of position after each partial revolution thereof.

To operate the two horizontal shafts 21 21 to cause them to operate the electric switches 26 and 27 at their ends, I employ in this instance a sprocket or four-spoke wheel 10, having four spokes or arms extending out in opposite directions from the hub 10′, fast on the hub 14. The outer ends of the spokes or arms are preferably made of the shape shown in Fig. 7—that is, broadened out to be engaged by the trolley-pole 5. The upper ratchet-wheel 18 has the teeth arranged oppositely from the teeth of the lower ratchet-wheel 18, Fig. 2, and the dog 16, engaging the upper ratchet-wheel 18, is hung in the opposite direction from the dog 16 of the lower ratchet-wheel 18, so that the revolution in one direction, as indicated by arrow *e* of the four-spoke wheel 10, moves the upper ratchet-wheel 18 and through intermediate connections rotates the upper shaft 21 and allows the dog 16 of the lower ratchet-wheel 18 to slide over the teeth of said ratchet-wheel without turning the same, while the revolution of the spoke-wheel 10 in the opposite direction (indicated by arrow *f*, Fig. 2) will move the lower ratchet-wheel 18 and through intermediate connections rotate the lower shaft 21 and allow the dog 16 of the upper ratchet-wheel 18 to slide over the teeth of said ratchet-wheel—that is, when the car is going in one direction and entering upon the single-track section one of the shafts 21 will be rotated to operate the switch and close the circuit and light the signals at each end and ring the bell at one end of the single-track section—the farther end. When the car passes off the single-track section, it operates the switch-operating mechanism to open the circuit and withdraw the signals and stop the bell ringing, as will be hereinafter described. When a car is going in the opposite direction and passing onto the single-track section, the other shaft 21 will be rotated to operate the switch and close and open the circuit in like manner as above stated. Switches 26 and 27 are located at the ends of the shafts 21. The signaling apparatus connected with the switches 26 and 27 consists in this instance of the bracket or supporting-board 35, to which is secured an insulated plate 35′, on which are secured incandescent lights, six in number, extending out horizontally in this instance. Four of the lights on each board 35 may be white and the other two red. In addition to the incandescent lights and electrically connected with some of them I may use a bell 37 and vibrating striker 38, electrically operated and secured upon an insulated plate 39 on the board 35. Each switch 26 and 27 at the ends of the shafts 21 and operated by the revolution of said shafts consists in this instance of the insulated disk or plate 28, Fig. 4, upon the central portion of which is pivoted a two-armed switch-lever 29, having the insulated stud 30 extending out therefrom, which is connected with the end of the shaft 21 to turn therewith, so that the rotation of said shaft will move the switch-lever 29 to cause it to come in contact with the binding-posts 31 and 32 or with the binding-posts 33 and 34, according as the electric circuit is to be closed or opened, in the manner to be hereinafter described. The binding-posts 31 32 and 33 34 are secured on the insulated plate 28 and with the connecting and circuit wires to be hereinafter described, which extend through and out of the back of said plate and through the rear end of the frame 9, as shown in Fig. 2.

I will now describe the arrangement of the wires electrically connecting the two switch-operating mechanisms, one at each end of the section of single track, and also connecting the signaling mechanisms therewith. I will designate one switch-operating mechanism and signaling apparatus as "Station A" and the other switch-operating mechanism and signaling apparatus as "Station B."

Referring now to Figs. 1 and 8, in the switch 26, station A, the binding-posts 31 and 33 are short-circuited and connected, through wire 40, with the feed-wire 8. The binding-post 32 is connected, through wire 41, with the pair of upper white lights 36 at station A, and the wire 41 leads from said white lights to the switch 26′, station B, (see Fig. 8,) and connects with the binding-post 32′ on the said switch 26′. From the binding-posts 33′ and 31′, which are short-circuited, switch 26′, station B, a wire 42 leads to two red lights 36ᶜ and the bell 37′, station B, and then to the rail to be grounded. From the binding-post 34, switch 26, station A, a wire 43 leads to the second

pair of white lights 36^a, station A, and from said lights the wire 43 leads to the binding-post 34′, switch 26′, station B, and ends there. In the switch 27′, station B, the binding-posts 31^a and 33^a are short-circuited and connected, through wire 40^a, with the feed-wire 8. The binding-post 32^a is connected, through wire 41^a, with the pair of upper white lights 36′, station B, and said wire 41^a leads to the switch 27, station A, and connects with the binding-post $32^{a\prime}$ on said switch and ends there. From the binding-posts $31^{a\prime}$ and $33^{a\prime}$, switch 27, which are short-circuited, a wire 42^a leads to the two red lights $36^{c\prime}$ and the bell 37, station A, and then to the rail to be grounded. From the binding-post 34^a, station B, switch 27′, a wire 43^a leads to the second pair of white lights $36^{a\prime}$, station B, and from said lights the wire 43^a leads to the binding-post $34^{a\prime}$, station A, on switch 27 and ends there.

The above description, in connection with the drawings, gives the mechanism and the wire connections of my improvements, and when there is no car on the single-track section the mechanism is out of circuit and inoperative, and at station A, switch 26, the switch-lever 29 connects the two binding-posts 31 and 32, as shown, and at station B, switch 26′, the switch-lever 29 connects the two binding-posts 33′ and 34′, and the circuit is open, stopping at binding-post 32′, switch 26′.

Supposing now a car, No. 1, to be approaching station A and entering on the single-track section from said station, as shown in Fig. 1, the trolley-pole 5 engages a projecting arm on the fore spoke-wheel 10 and gives a one-quarter turn to said wheel and, through the intermediate mechanism, the upper horizontal shaft 21 a quarter-turn to move the switch-lever 29 from binding-posts 31 and 32 to binding-posts 33 and 34, as indicated by dotted lines, Fig. 8, and closing the circuit through wires 40, binding-post 33, lever 29, and binding-post 34, wire 43, leading through and lighting the second pair of white lights 36^a, station A, through wire 43 continued, to binding-post 34′, switch 26′, station B, switch-lever 29, and binding-posts 33′ and 31′, and wire 42, leading through and lighting the pair of red lights 36^c and ringing the bell 37′ at station B, to be grounded. These signals continue as long as the car remains on the single-track section and until it reaches station B, when, through the engagement of the trolley-pole 5 with the spoke-wheel 10, a quarter-revolution is given to said wheel and, through intermediate mechanism, to the upper shaft 21 to move the switch-lever 29, switch 26′, station B, from the binding-posts 33′ and 34′ to binding-posts 31′ and 32′ (see dotted lines, Fig. 8) and open the circuit and extinguish the lights and stop ringing the bell, the wire 41, leading from binding-post 32′, switch 26′, station B, terminating at binding-post 32, station A, the lever 29 having been moved into the position shown by dotted lines between binding-posts 33 and 34, switch 26, station A, Fig. 8. A second car, No. 2, entering on the single-track section at station A after car No. 1 has passed off of the single-track section, again operates the switch-operating mechanism and moves the switch-lever 29, switch 26, from binding-posts 33 and 34 to binding-posts 31 and 32, as shown by full lines, Fig. 8, closing the circuit through wire 40, binding-posts 33 and 31, lever 29, binding-post 32, and wire 41 to the upper pair of white lights 36, and through wire 41 continued to binding-posts 32′, lever 29, binding-post 31′, at station B, and through wire 42 to the two red lights 36^c and the bell 37′ and be grounded to light said lights and ring the bell. As car No. 2 passes off from the single-track section at station B it operates the switch-operating mechanism and moves switch-lever 29, switch 26′, from binding-posts 31′ and 32′ to binding-posts 33′ and 34′ (shown by dotted lines, Fig. 8) and opens the circuit and extinguishes the lights and stops ringing the bell, the wire 43, leading from binding-post 34′, switch 26′, station B, terminating at binding-post 34, switch 26, station A, the lever 29 having been moved into the position shown by full lines between binding-posts 31 and 32. A third car, or car No. 3, entering on the single-track section at station B, repeats the operation of car No. 1.

In case of a car coming in the opposite direction from car No. 1, referred to above, and approaching station B and entering on the single-track section at that end thereof the trolley-pole 5 of the car engages with the projecting spoke of the wheel 10 and gives a quarter-turn to said wheel in the direction of arrow *e*, Fig. 2. This rotates the lower horizontal shaft 21 through the intermediate connections between the wheel 10 and said shaft, above described and shown in Fig. 2, and operates the switch connected therewith, and through connecting-wires lights the lights and rings the bell, as above described in connection with car No. 1 entering the opposite end of the single-track section.

I will briefly describe the operation of the signaling apparatus in the case of a car entering the single-track section from station B. The two lower switches 27 27′ (shown in Fig. 8) will be utilized as follows: The movement of the wheel 10 will move the switch-lever 29 of switch 27′ from the binding-posts 31^a 32^a, in which position the circuit is open and the signaling apparatus is out of operation, to the binding-posts 33^a and 34^a, as shown by dotted lines, Fig. 8, closing the circuit through wire 40^a and 43^a to the second pair of white lights $36^{a\prime}$ at the signaling apparatus, station B, through wire 43^a to binding-post $34^{a\prime}$, switch 27, station A, to binding-post $31^{a\prime}$ through lever 29 and through wire 42^a to the red lights $36^{c\prime}$ and the bell 37, station A, thus lighting the two white lights $36^{a\prime}$ at station B and the two red lights $36^{c\prime}$ and ringing the bell 37 at station A. As the car passes off of the single track at station A onto the turnout a quarter-revolution

of the spoke-wheel 10, engaged by the trolley-pole 5, moves the switch-lever 29, switch 27, station A, from binding-posts $31^{a'}$ $34^{a'}$ to binding-posts $32^{a'}$ and $33^{a'}$, as shown by dotted lines, Fig. 8, thus opening the circuit, as the current terminates at the binding-post 32^{a}, switch 27′, station B, and extinguishing the lights and stopping the ringing of the bell. A second car following from station B onto the single-track section gives a quarter-turn to the spoke-wheel 10 and moves the switch-lever 29, switch 27′, from binding-posts 33^{a} 34^{a} to 31^{a} 32^{a}, as shown by full lines, Fig. 8, thus closing the circuit, which passes through wire 40^{a}, binding-post 33^{a}, binding-post 31^{a}, and through switch-lever 29 to binding-post 32^{a}, then through wire 41^{a}, through the upper pair of white lights 36′, station B, to light said lights, and through wire 41^{a} to binding-post $32^{a'}$, switch 27, station A, and through switch-lever 29 to binding-post $31^{a'}$, through wire 42^{a} to the pair of red lights 36^{a}, and through wire 42^{a} to the ground to light said red lights and ring the bell. This car in passing off of the single-track section moves the spoke-wheel 10 one quarter-revolution and turns the switch-lever 29, station A, from binding-posts $32^{a'}$ $31^{a'}$ to binding-posts $33^{a'}$ $34^{a'}$, thus opening the circuit which terminates at binding-post 34^{a}, switch 27′, station B, and extinguishing the lights and stopping the ringing of the bell.

From the above description, in connection with the drawings, the operation of my electric block-signal will be readily understood by those skilled in the art and briefly is as follows: When there is no car upon the single-track section 1, my electric block system is not in action; but as soon as a car passes from either double-track section or turnout 2 or 3 onto the end of the single-track section 1 the upper end of the trolley-pole of the car comes in contact with one of the arms of the spoke-wheel 10, which extends out from the box or case inclosing the frame 9 of the operating mechanism and in the path of the upper end of the trolley-pole 5, as shown in Fig. 1, and gives to the spoke-wheel 10 a one-quarter turn, which, supposing the car to be going in the direction indicated by Fig. 1, through the disk 15, pawl 16, ratchet-wheel 18, and beveled gears 19 and 20 turns the upper shaft 21 and moves the switch-lever 29, switch 26, to close the circuit, so that two white lights 36^{a}, station A, are lighted and the two red lights 36^{c} lighted and the bell 37′ rung at the other end of the single-track section 1. These signals will be continued until the car reaches the opposite end of the single-track section 1, when the upper end of the trolley-pole will engage the extending arm of the spoke-wheel 10 of the signaling operating mechanism at that end of the track-section and give one quarter-revolution to said spoke-wheel, and through intermediate connections, as above described, to the shaft 21 to give another quarter-turn to said shaft and open the circuit, and thus extinguish the lights and stop the ringing of the bell, as above described. If a car is coming in the opposite direction from that shown in Fig. 1, a similar operation will be performed as above described, except that the spoke-wheel 10 will be revolved in the opposite direction to rotate, through intermediate mechanism, the lower shaft 21 to close and open the circuit through the switches 27 and 27′ in the same way as above described in connection with switches 26 and 26′.

In Fig. 9 of the drawings I have shown an additional switch device combined with each of the upper switches 26 and 26′ and each signal apparatus and the connecting-wires at station A and station B (shown in Fig. 8) as the same would be used in the case of cars going from station A to station B. In case of cars going in an opposite direction—from station B to station A—two additional switch devices, similar to those shown in Fig. 9, would be used in connection with the two lower switches 27 and 27′. (Shown in Fig. 8.)

I will now explain the object of the additional switch devices shown in Fig. 9 and the operation thereof. In case of only one car entering on the single-track section intermediate the two turnouts and passing off of the same before another car enters thereon the additional switch devices shown in Fig. 9 will not be required. If two cars or a double-header enter on the single-track section at station A, the first car will operate the switch-operating mechanism to give the signals, as above described, the switch-lever 29, switch 26, being moved from the position shown by full lines, Fig. 8, to the position shown by dotted lines, Fig. 8, to close the circuit, as above described; but the car following after the first car will again operate the switch mechanism and move the switch-lever 29, switch 26, Fig. 8, from the position shown by dotted lines to the position shown by full lines and open the circuit, the same terminating at binding-post 32′, switch 26′, Fig. 8, and thus withdraw the signals. To overcome this, it is necessary to provide an additional switch device to be operated by the conductor on the second car after the second car has passed onto the single-track section at station A to throw the current onto the proper wires to keep the circuit closed and the signals displayed until both cars pass off of the single-track section.

In Fig. 9 I have shown an additional switch device for the purpose above stated. Said switch device consists in this instance at station A of a plate 44, on which are six binding-posts 45, 46, 47, 48, 49, and 50. The opposite corner binding-posts 45 50 and 46 49 are short-circuited, as shown. One of the upper pair of binding-posts 45 is connected with the wire 43 from the binding-post 34, switch 26, and the other upper binding-post 46 is connected with the wire 41 from the binding-post 32, switch 26. With the intermediate pair of binding-posts 47 and 48 the wires 43 and 41, lead-

ing to the lights 36 and 36ª, are respectively connected, as shown in Fig. 9. Combined with the plate 44 and the binding-posts thereon is a double-throw double-pole knife-switch 51, provided with an operating-handle 51″, as shown, and of ordinary and well-known construction and operation, to close or open the electric circuit through the binding-posts on the plate 44. A corresponding additional switch device is used at station B, comprising the plate 44′, six binding-posts 45′, 46′, 47′, 48′, 49′, and 50′, and the double-throw knife-switch 51′, as shown at the right, Fig. 9.

The operation of the additional switch devices shown in Fig. 9 is briefly as follows: The first car entering onto the single-track section at station A moves the lever 29, switch 26, to the position shown by dotted lines, Fig. 9, to close the circuit and display the signals, as above described in connection with Fig. 8. The car following the first car onto the single-track section will move the switch-lever 29, switch 26, from the position shown by dotted lines to the position shown by full lines, Fig. 9, so that the current from the wire 40, through binding-posts 33 31, lever 29, binding-post 32, wire 41, and the binding-post 46, plate 44, knife-switch 51, binding-post 48, wire 41, through lights 36 to binding-post 48′, knife-switch 51′, binding-post 46′, wire 41 to binding-post 32′, station B, will terminate there, and thus open the circuit and withdraw the signals. To throw the current onto the other wires to keep the circuit closed and display the signals, the knife-switch 51, station A, is moved down by the conductor on the second car after said car has passed onto the single-track section into the position shown by dotted lines, station A, so that the current from the wire 40 can pass through switch-lever 29, switch 26, wire 41, binding-posts 46 49, through the knife-switch 51 to the binding-post 47 and wire 43 to light the lights 36ª, and to the binding-post 47, station B, through the knife-switch 51′ to binding-post 45′, and through wire 43 to binding-post 34′ and lever 29, binding-posts 33′ 31′ and wire 42 to the lights 36ᵉ′ and ring the bell 37′ and to the ground, thus closing the circuit and displaying the signals. The first car passing off of the single-track section at station B moves the lever 29, switch 26′, Fig. 9, from the position shown by full lines to the position shown by dotted lines and breaks the circuit and withdraws the signals. The second car as it passes off of the single-track section at station B moves the switch-lever 29 from the position shown by dotted lines to the position shown by full lines to close the circuit and display the signals. The conductor of the second car after the car has passed off of the single-track section moves the knife-switch 51′ at station B from the position shown by full lines to the position shown by dotted lines, and thus shifts the current onto the other wires, and opens the circuit, the same terminating at binding-post 34, switch 26, station A, and withdraws the signals. In case of a third car entering onto the single-track section after the second car said third car operates the switch-operating mechanism to display the signals in the same manner as the first car.

It will be understood that a duplicate set of additional switch devices are used in connection with switches 27 and 27′ for cars coming in the opposite direction from station B to station A. As the construction and operation of these switches correspond with what is shown in Fig. 9, it is not thought necessary to show the same.

The advantages of my electric block-signaling apparatus will be readily appreciated by those skilled in the art. It is of simple construction and operation and can be readily attached and operated in connection with the ordinary overhead-trolley system of electric railways, and can be used on elevated railways, as well as surface railways, and also in case of underground trolleys, if desired. The switches and operating mechanism and signaling apparatus will be inclosed in suitable boxes or cases, as shown in Fig. 1. I have shown six electric lamps in the signaling apparatus shown in the drawings; but a greater or less number of lamps may be employed. The lamps may be of different color, so that by using four white lights and two red lights and a bell at each signaling apparatus and connecting them so that each car going in one direction will light two white lights at the end of the single track it is entering on and two red lights and ring the bell at the farther end, as above described, the car on the turnout at the farther end seeing the red lights and hearing the bell will know that a car is approaching on the single track, while a car following the first car and seeing only the white lights will know that a car is preceding it on the single-track section.

It will be understood that the details of construction of my electric block-signaling apparatus may be varied, if desired.

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

1. An electric block-signaling apparatus for railways, comprising two or more signals at each end of a single-track section, between two turnouts or double-track sections, two switches at each end of said single-track section, and switch-operating mechanism at each end of said section, wires connecting the signals and switches, to cause a signal to be given at one end of the single-track section, and a different signal to be given at the other end thereof, as a car enters on either end thereof, and the signal at one end to be repeated by a car following, and another signal given at the other end, substantially as shown and described.

2. An electric block-signaling apparatus for railways, comprising signals at each end of a single-track section, between two turnouts or

double-track sections, two switches at each end of said single-track section, the signals and switches electrically connected by wires in circuits to be closed and opened, and switch-operating mechanism at each end of the single-track section, to close and open the circuits, and give and withdraw the signals, by a car passing on and off of the single-track section, and going in either direction, said switch-operating mechanism consisting of a sprocket or spoke wheel to be engaged by the trolley-pole, intermediate connections to a shaft, and said shaft connected with and operating the switch-lever of one of the two switches at one end of the single-track section, at each partial revolution of said shaft, to close and open the circuit when a car is going in one direction, and a second shaft and intermediate connections to said sprocket or spoke wheel, said second shaft connected with and operating the switch-lever on one of the two switches at the opposite end of the single-track section, at each partial revolution of said shaft, to close and open the circuit when a car is going in the other direction, substantially as shown and described.

3. An electric block-signaling apparatus for electric railways, comprising signals at each end of a single-track section, and switches at each end of said section, wires connecting the signals and switches, and switch-operating mechanism to close the circuit and cause a signal to be given at one end of the single-track section, and a different signal to be given at the other end thereof as a car enters on either end of the single-track section, and additional switch devices to be used in case of two cars entering on one end of the single-track section, to change the current and renew the signals, substantially as shown and described.

HENRY H. CREAMER.

Witnesses:
M. J. GALVIN,
J. C. DEWEY.