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8 SHEETS—SHEET 1.

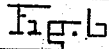


Fig. 1

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BLOCK SIGNALING APPARATUS.
APPLICATION FILED MAY 14, 1906.

Patented Nov. 9, 1909.

3 SHEETS—SHEET 2.

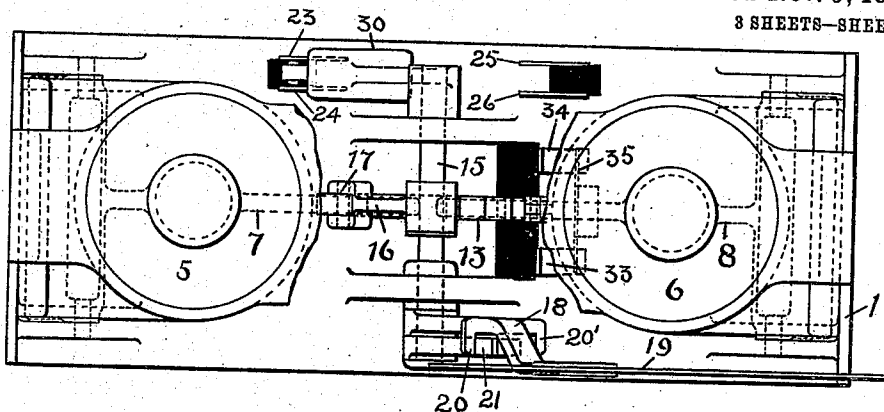


Fig. 2.

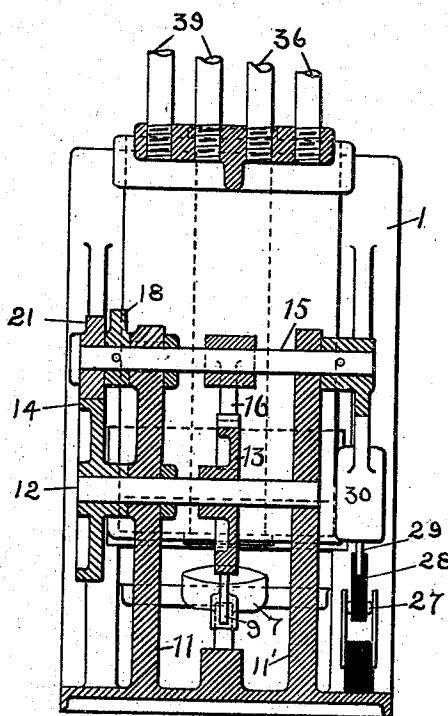


Fig. 3.

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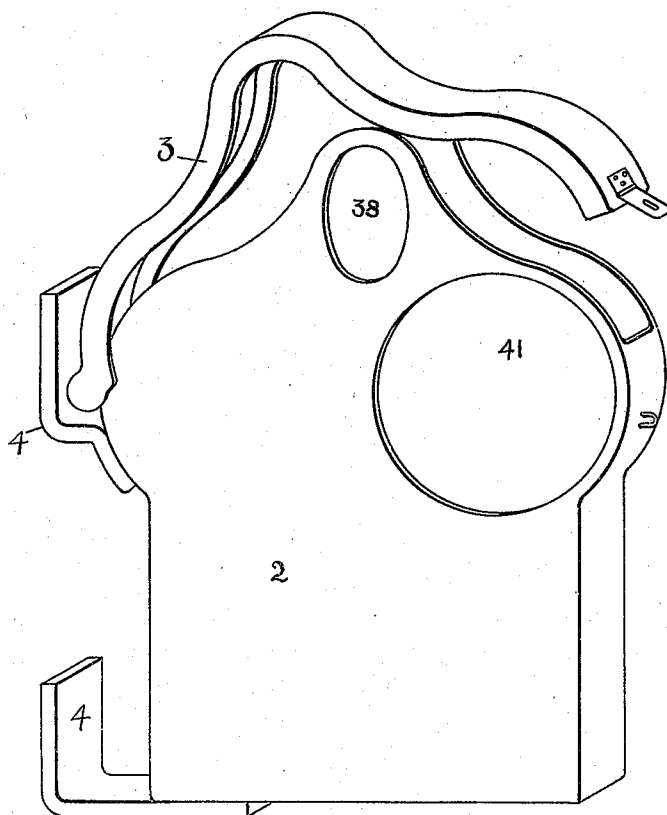
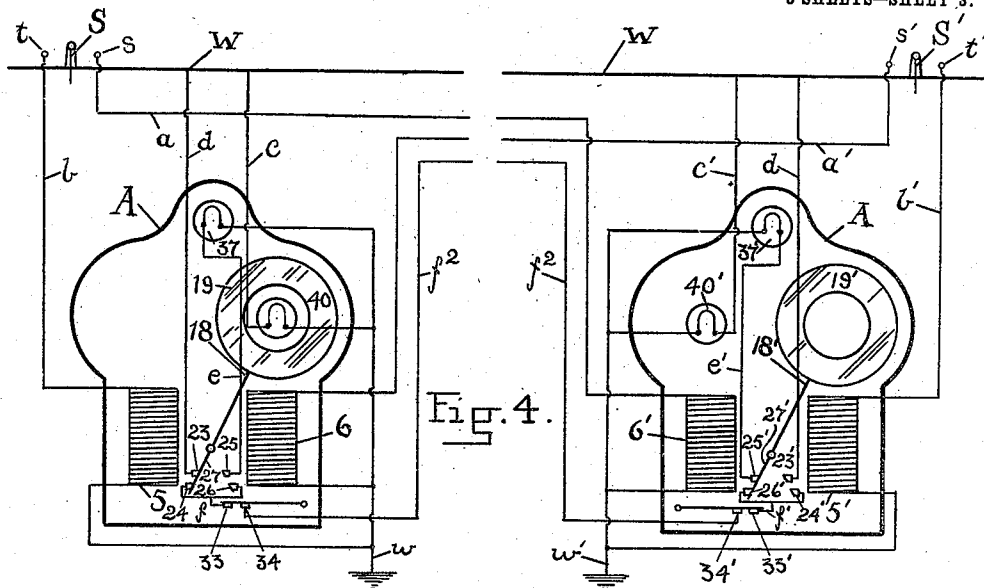
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

STEPHEN A. WOOD, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO UNITED ELECTRIC SIGNAL COMPANY, OF PROVIDENCE, RHODE ISLAND, A CORPORATION OF MASSACHUSETTS.

BLOCK-SIGNALING APPARATUS.

939,370.

Specification of Letters Patent.

Patented Nov. 9, 1909.

Application filed May 14, 1906. Serial No. 316,624.

To all whom it may concern:

Be it known that I, STEPHEN A. WOOD, of the city and county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Block-Signaling Apparatus; and I do hereby declare the following specification, taken in connection with the accompanying drawings, forming a part of the same, to be a full, clear, and exact description thereof.

My invention relates to block-signaling apparatus for railways of the character shown and described in my pending application for Letters Patent, Serial No. 300,960, filed February 14, 1906, and has for its object to produce a device of this character which is more simple in construction and more efficient in operation than my previous device.

To these ends my invention consists primarily in providing means whereby the use of a solenoid or separate electric magnet for operating the target signal is obviated.

My invention further consists in providing means for positively locking the target in operative and inoperative positions, which locking mechanism will not interfere with the operation of the target operating mechanism while said target is in locked position.

My invention further consists in the novel construction and combination of parts hereinafter described and pointed out in the claims.

In describing my invention in detail reference will be made to the accompanying drawings in which—

Figure 1 is a side elevation of my improved signaling apparatus; Fig. 2 is a plan view of the same with the top of the frame removed; Fig. 3 is a sectional view on line *x-x*, Fig. 1; Fig. 4 is a diagrammatic view illustrating my system of wiring between the signals at each end of the block; Fig. 5 is a view of a suitable casing for my apparatus; Fig. 6 is a detail.

Referring to the drawings, 1 represents a suitable frame in which the various parts of my apparatus are mounted, said frame being adapted to be inserted within a suitable casing 2, shown in Fig. 5, provided with a cover 3 and brackets 4 for fastening the same upon a pole or other convenient place to display the signals.

Secured to the frame 1 are two electro-

magnets 5 and 6 and two pivoted armatures 7 and 8 adapted to be operated by each of said magnets respectively. The armatures 7 and 8 are each provided with an actuating pawl 9 and 10 pivoted near the ends thereof and provided with suitable projections or stops adapted to engage said armatures and limit the movement of said pawls upon their pivots.

Mounted in suitable standards 11 and 11' secured to the bottom of the frame 1 is a rock-shaft 12 carrying a ratchet-wheel 13 and a segment-wheel 14. The ratchet-wheel 13 is mounted directly over the pawls 9 and 10 and in operative relation thereto. Mounted in the standards 11 and 11' directly over the rock-shaft 12 is a second shaft 15 upon which is loosely mounted an arm 16 carrying at its free end a friction roller 17 adapted to engage the ratchet-wheel 13 and prevent said wheel from any accidental turning when the pawls 9 and 10 are out of engagement therewith. Secured to the shaft 15 is a target-arm 18 provided at its free end with a target 19 in the center of which is a transparent red glass or other suitable transparent material. The arm 18 is provided with laterally projecting studs 20 and 20' upon each side thereof. Loosely mounted on the shaft 15 directly over the segment-wheel 14 is an arm 21, one end of which is arranged to engage and disengage the projections 20 and 20' on the target-arm 18. The other end of the arm 21 is provided with a segment-gear 22 arranged to cooperate with the segment-wheel 14. The segment-wheel 14 is provided with a locking segment 14' which is adapted to engage the locking segments 22' on the segment-gear 22, and lock the arm 21 and the target-arm 18 in operative or inoperative position.

Mounted upon the bottom of the frame 1 on one side of the axis of shaft 15 are two spring wire terminals 23 and 24, and upon the other side are two similar terminals 25 and 26, as shown in Fig. 2, said terminals being arranged and adapted to be connected and disconnected by the switch-blade 27 mounted in a piece of fiber 28 which is secured to an arm 29 mounted on the shaft 15, as shown in Fig. 6. The arm 29 is preferably provided with a weight 30 to assist in counteracting the weight of the target 19 and cause the parts to operate more freely.

The standard 11 is provided with upright projections 31 and 31' to limit the movement of the target arm 18.

Secured to the bottom of the frame 1 is an insulating block 32 supporting two spring terminals 33 and 34 adapted to be engaged and disengaged by the switch-blade 35 secured to the armature 8 and insulated therefrom.

Mounted upon suitable supports 36 are two electric incandescent lamps 37 arranged to shine through the opening 38 in the casing 2, which opening is provided with a green glass or other suitable green transparent material. Mounted upon similar supports 39 are two electric incandescent lamps 40 arranged to shine through the opening 41 in the casing 2, which opening is provided with a white glass or other suitable transparent material. While there are shown two lights 37 and two lights 40, it will be understood that only one light at each opening is necessary and that when two lights are used, one is a spare or reserve light which is adapted to be automatically switched into circuit when the other burns out or becomes inoperative.

Referring to Fig. 4, the wiring for my signaling apparatus is as follows: The current by which my apparatus is operated is taken from the trolley-wire W. Each end of the block section is provided with a signaling apparatus A and A', both of which apparatus are identical in construction and are actuated at the same time to set the necessary signals when a car enters an empty block and to restore said signals to normal conditions when the last car leaves said block. Mounted above or adjacent to the trolley-wire W at each end of the block are the gravity return switch-levers S and S' adapted to be operated by the passing of the trolley-wheel or by any other convenient method. Located upon either side of the switch levers S and S' and adapted to be engaged thereby are the switch points s, t and s', t'. Extending from the switch-points s and s' are the signal circuits a and a' which include the electric magnets 6' and 6 respectively in the signaling apparatus A' and A. Extending from the switch-points t and t' are the electric circuits b and b' which include the electric magnets 5 and 5' respectively and are connected to the ground-wires w and w'. Extending from the trolley-wire W are the circuits c and c' which include the electric lights 40 and 40' which it will be seen are always lighted. The electric circuits for operating the green signal lights 37 and 37' comprise the circuits d and d' extending from the trolley-wire W to the terminals 23 and 23' respectively. Extending from the terminals 25 and 25' are the circuits e and e' which include the green lights 37 and 37' respectively, and are con-

nected to the ground wires w and w'. Extending from the terminals 24, 24' and 26, 26' are circuits f and f' which include the terminals 33 and 33' and connecting the terminals 34 and 34' is the electric circuit f².

The operation of the device is as follows: When the block is clear and the signaling mechanism is in its normal position, the switch 27' is in position to keep the circuit d' open, as shown in the signaling apparatus A' at the right in Fig. 4, and the target 19' is held in its inoperative position and the lights 40 and 40' at each end of the block will show a white light through the opening 41 in the casing 2, thereby indicating that the block is clear. When a car enters from the right of Fig. 4 the switch-lever S' is thrown in contact with the switch point or wire terminal s' and allows a current to pass over the circuit a', which energizes the magnet 6 and attracts the armature 8. As the armature 8 is attracted its pawl 10 engages the ratchet wheel 13 and revolves said ratchet-wheel a partial revolution to the left, as shown in Fig. 1. The segment-wheel 14, being mounted upon the same shaft with the ratchet-wheel 13, is likewise given a partial revolution to the left, and the engagement of the toothed portion of said segment-wheel 14 with the segment-gear 22 on the end of the arm 21 will move the arm 21 into engagement with the projection 20' and throw the target 19 to the right and between the lights 40 and the opening 41 in the casing, thereby showing a red or danger signal and indicating that the block is occupied. The distance the ratchet-wheel 13 moves is limited and governed by the end of the armature 8 which engages said ratchet-wheel and locks it against further rotation. As the target 19 is moved to the right in Fig. 1 the switch-arm 29 is thrown to the left and the switch-blade 27 is brought between the terminals 23 and 24 and connects the circuit d with the circuit f, thereby allowing a current to pass from the trolley-wire W over the circuits d, f, f², f' and e' to the ground-wire w', thereby lighting the green light 37' in the apparatus A'. As the circuits f and f², forming a part of the green light circuit are connected and controlled by the switch-blade 35 on the armature 8, it will be seen that this cautionary green signal can only be set when the target 19 has been moved to give the danger signal at the opposite end of the block and thus said green light notifies the entering car that the danger signal at the other end of the block has been set. The engagement of the switch-lever S' with switch-point s' continuing but a moment, the armature 8 immediately drops by gravity upon completing its stroke, and the pawl 10 drops down past the next tooth on the ratchet-wheel 13 into position to engage said next tooth and re-

involve said ratchet-wheel another partial revolution when a second car enters the block and moves the switch-lever S' again into contact with the switch-point s' to energize the magnet 6. When another car enters the block before the first car has left said block the magnet 6 will again be energized and through the mechanism above described turn the ratchet-wheel 13 and segment-wheel 14 another partial revolution to the left. Such further revolution of the segment-wheel 14 disengages the toothed portion of the segment-wheel from the segment-gear 22, thus preventing any further revolution of the target-arm 18, and the locking segment 14' engages one of the locking segments 22', thereby locking the target 19 in position.

As will be seen, the green light 37 remains lighted as long as the block is occupied, and while the first car to enter the block is notified that the danger signal has been set at the opposite end of the block by the lighting of said green light, all subsequent cars entering the block will also be notified that the mechanism for operating said danger signal has been further operated by a flash from the green light 37 caused by the switch 35 breaking the green light circuit as the armature 8 is raised when the magnet 6 is again energized, thereby extinguishing the green light 37. As soon as the armature has operated to revolve the ratchet wheel 13 it will again drop back to normal position by gravity and bring the switch 35 again in contact with the terminals 33 and 34 and complete the green light circuit, thereby relighting the green light 37. As this operation takes but a moment, it produces a flash of said green light 37. Thus it will be seen that every car entering a block is notified that it has operated the signal at the opposite end of said block. As the cars pass out of the block to the left they in turn operate the switch lever S and close the circuit 7 which energizes the magnet 5 and operates the armature 7 and operating pawl 9 to revolve the ratchet-wheel 13 and segment-wheel 14 to the right. When the last car passes out of the block the toothed portion of the segment-wheel 14 engages the segment gear 22 and moves the arm 21 to the left so that its end will engage the projection 20 on the target-arm 18 and throw the target 19 into inoperative position against the stop 31 and at the same time the switch-blade 27 is moved out of engagement with the terminals 23 and 24 and into engagement with the terminals 25 and 26, thereby breaking the green light circuit and extinguishing the cautionary signal. It will thus be seen that each car indicates the operation of the danger signal when it enters a block and that said indication is maintained so long as any car remains on said block, and a clear block

is indicated only when the last car has passed out of the block.

It will be understood that changes may be made in the details of construction without departing from the spirit and scope of my invention.

What I claim as my invention and desire to secure by Letters Patent is:

1. In a signaling apparatus, the combination, with a target arm, of means normally out of engagement with said target-arm which is adapted to engage said target-arm to operate the same, and magnetically actuated means for actuating said target-operating means.

2. In a signaling apparatus, the combination, with a target-arm, of a second arm for operating said target-arm, said second arm being arranged and adapted to engage and disengage said target-arm, and means for rocking said second arm.

3. In a signaling apparatus, the combination of a shaft having a target-arm mounted thereon, a second arm mounted adjacent said target-arm and adapted to engage and disengage said target arm to operate the same, and means for rocking said second arm, substantially as described.

4. In a signaling apparatus, the combination, with a target-arm, of an oscillating arm for operating said target-arm, said target-arm and oscillating arm being so arranged that the initial movement of the oscillating arm brings said arm into engagement with said target-arm to operate the same, and means for operating said oscillating arm.

5. In a signaling apparatus, the combination of a target, an oscillating arm for operating said target, said target and arm being so arranged that the initial movement of the arm in either direction brings said arm into engagement with said target to operate the same, and means for oscillating said arm, substantially as described.

6. In a signaling apparatus, the combination, with a suitable frame, of a shaft mounted therein, and having a target-arm and a switch-arm secured thereon, and a second arm loosely mounted thereon, said arms being arranged so that the operation of the second arm will operate both of the other arms, and means for operating said second arm.

7. In a signaling apparatus, the combination of a shaft having a target-arm and switch-arm secured thereto, a second arm loosely mounted on said shaft and adapted to engage and disengage the target-arm to oscillate said shaft, and magnetically-actuated means for operating said second arm, substantially as described.

8. In a signaling apparatus, the combination of a shaft having a target arm and switch-arm secured thereto, a second arm

loosely mounted on said shaft and adapted to engage and disengage said target arm to operate the same, said second arm being provided with a segment gear, a third arm
 5 loosely mounted on said shaft and provided with a friction roller, a rock-shaft, a segment-wheel secured thereto and cooperating with said segment-gear, a ratchet-wheel secured on said shaft, said ratchet-wheel being engaged by the friction-roller,
 10 and magnetically-actuated means for operating the rock-shaft, substantially as described.

9. In a signaling apparatus, the combination of a shaft having a target-arm secured thereto, a second arm loosely mounted on said shaft and adapted to engage and disengage said target-arm to operate the same, and means for rocking said second arm, substantially as described.
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10. In a signaling apparatus, the combination of a shaft having a target-arm secured thereto, a second arm loosely mounted on said shaft and adapted to engage and disengage said target-arm, said second arm being provided with a segment-gear, a rock-shaft provided with a segment-wheel adapted to engage said segment-gear, and magnetically-actuated means for operating said
 25 rock-shaft, substantially as described.
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11. In a signaling apparatus, the combination of a shaft having a target-arm and an operating arm mounted thereon, means for rocking said operating arm, and means
 35 for locking said operating arm against movement in both directions after it has operated, substantially as described.

12. In a signaling apparatus, the combination, with two sets of wire terminals, of a shaft provided with a switch-arm adapted to alternately engage each set of said
 40 terminals, means for locking said switch-arm in engagement with said terminals, and switch-operating mechanism adapted to be operated without operating said switch, substantially as described.
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13. In a signaling apparatus, the combination, with two sets of wire terminals, of a shaft provided with a switch arm adapted

ed to alternately engage each set of said terminals, means for operating said switch-arm, said operating means being provided with means for locking said switch-arm in engagement with either set of said terminals, said locking means being adapted to permit
 55 the operation of the operating means when said switch-arm is locked against said terminals, substantially as described.

14. In a signaling apparatus, the combination of a shaft having a target-arm and a switch-arm secured thereto, an operating arm loosely mounted on said shaft and adapted to operate said target-arm and switch-arm, means for operating said operating arm, and means for locking all of
 60 said arms in position after they have operated, substantially as described.
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15. In a signaling apparatus, the combination of a shaft, a target-arm secured thereto and provided with laterally extending projections, an operating arm loosely mounted on said shaft and arranged to engage and disengage said projections, and magnetically-actuated means for rocking said operating arm, substantially as described.
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16. In a signaling apparatus, the combination of a shaft, a target-arm and switch-arm secured thereto, said switch-arm being upon the opposite side of the axis of said shaft from the target-arm and provided with means tending to counterbalance said target-arm, and a magnetically-actuated arm arranged and adapted to rock said target and switch arms, substantially as described.
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17. In a signaling apparatus, a target-circuit and a lamp-circuit normally open, means for closing the target-circuit when a car enters a block, means for closing the lamp-circuit when the target-circuit is closed, and means for opening and closing said lamp-circuit when a second car enters said block.
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Witnesses:

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