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A. L. BOWER.

AUTOMATIC BLOCK SIGNAL SYSTEM.

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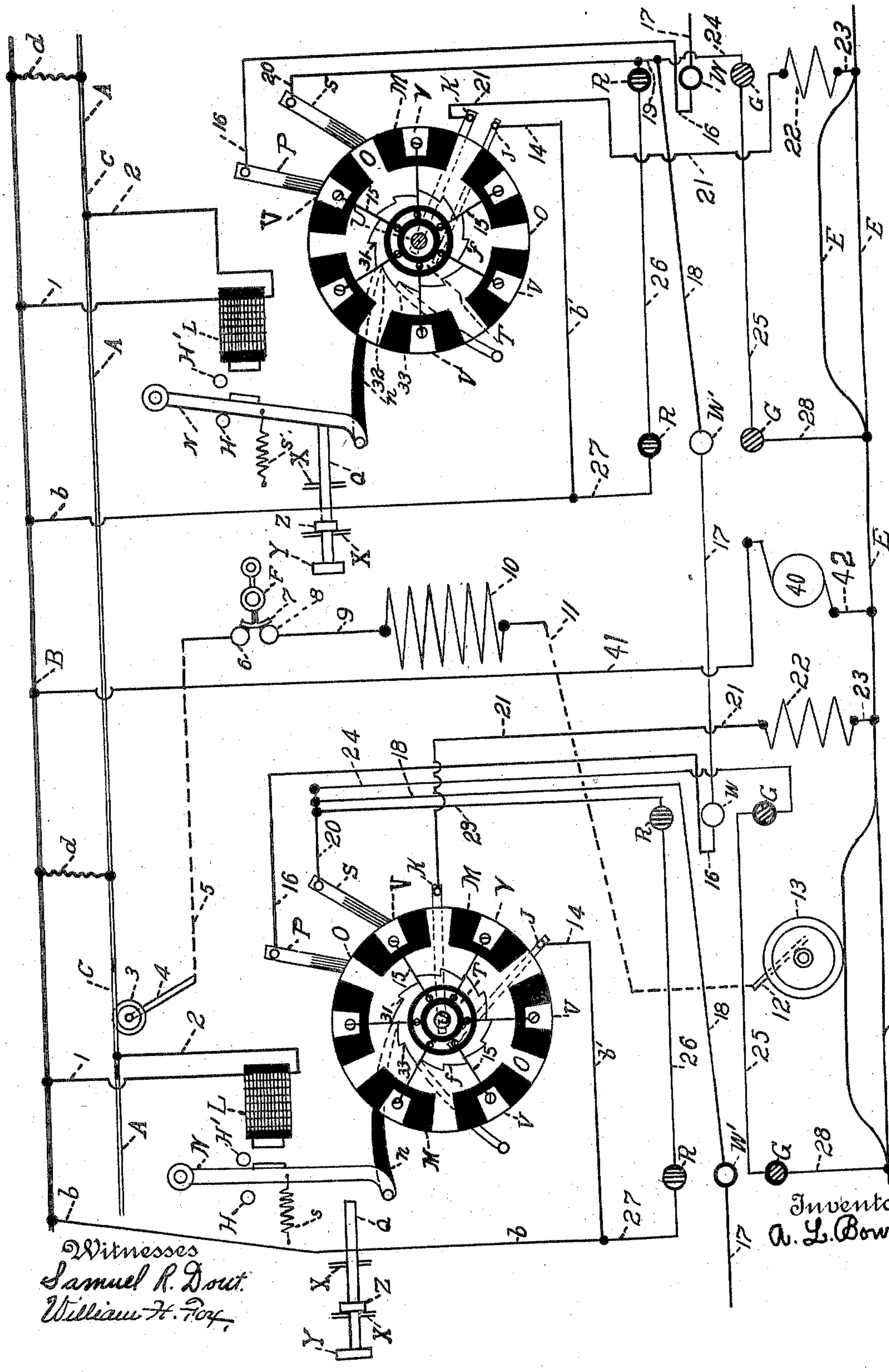

UNITED STATES PATENT OFFICE.

ABRAM L. BOWER, OF BOYERTOWN, PENNSYLVANIA.

AUTOMATIC BLOCK-SIGNAL SYSTEM.

No. 817,036. Specification of Letters Patent. Patented April 3, 1906.

Application filed January 31, 1903. Serial No. 141,355.

To all whom it may concern:

Be it known that I, ABRAM L. BOWER, a citizen of the United States, residing at Boyertown, in the county of Berks and State of Pennsylvania, have invented a new and useful Automatic Block-Signal System, of which the following is a specification.

My invention relates to improvements in signal systems for electric railways in which the connections of the signal-circuits are controlled by commutators operated by ratchet-wheels. Means are provided for operating the signals manually or automatically, as may be desired.

The drawing forming a part of this specification illustrates apparatus embodying the principles of my invention.

In the drawing, A designates the trolley-wire of an electric railway, and B is the main feeder, which has branches *b b* leading to the signal apparatus.

A source of electric energy 40 is connected by wire 41 to the feeder and by wire 42 to the rails or ground connection.

E represents the rails of a section of track, including two turnouts.

C C represent insulated sections of the trolley-wire located in the vicinity of the turnouts. This insulated section may be at either end of the turnout, or there may be two insulated sections in each turnout, one above the siding and one above the main track.

L L are track-relays connected by wire 1 to feeder B and by wire 2 to the insulated section C of the feed-wire A.

3 represents the trolley-wheel; 4, the support; 5, a wire connecting the trolley-wheel electrically with contact 6 of the controller F of the car; 7, the bar of metal which is adapted to connect or disconnect at will contact 6 with another contact 8, from which a wire 9 leads to the motors or a resistance 10 on the car. Wire 11 leads from the resistance to the wheel 13 of the car.

A commutator M, composed of an even number of segments, (preferably twelve,) is fastened to a ratchet-wheel *f*, the ratchet-wheel being adapted to be turned by a pawl *n*, operated by an armature-lever N, which lever in turn is operated by relay L. Half of the segments are connected electrically with the axis of the wheel against which the brush K rests. This brush is connected to the earth conductor by wire 21. The alternate segments are connected by wires 15 to a ring T, insulated from the rest of the commutator. Brush J rests upon this ring, connecting it with the feeder B by wire 14 and branch *b*. Segments O are connected to the earth and segments V with the feeder B.

The movements of the armature-lever N are limited by stops H and H′, and it is drawn away from relay L by spring *s* when that relay is not energized.

Any suitable device may be used to operate the ratchet-wheel manually. A chain attached to lever N may be used, or the rod Q may be used. This rod is supported by the parts X X, and its movement is limited by a nut Z between the supports. The end of the rod rests against lever N when that lever is drawn against stop H, and the nut and supports permit the movement of the rod just sufficient to move the lever as far as top H′, which movement will turn the ratchet-wheel one point. In the drawing one point corresponds to one-twelfth of a revolution.

A single line-wire 17 runs through each section, connecting with a light *w* at one end of the section and with another light *w′* at the other end of the section. Wire 16 connects light *w* to brush P, resting upon the periphery of the commutator, and wires 18, 19, and 20 at the other end of the section connect light *w′* to brush S at that end of the section. Brushes P and S rest upon alternate segments of the commutator. As shown on the left of the drawing, brush P connects with the earth via segment O, brush K, and wire 21, and brush S connects with the feeder B, segment V, wire 15, ring T, brush J, wire 14, and branch *b*.

To indicate whether the device has operated or not, two circuits are provided, as follows: from branch *b* of the feeder through wire 27, light R, wire 26, light R, wires 29 and 20, brush S, and the commutator and earth connections. The other circuit includes the rails, wire 28, light G, wire 25, light G, wire 24, wire 20, brush S, the commutator, and the feed connections. Lights R R are red lights and lights G G are green ones. A light R and a light G are placed at each end of the turnouts. It is preferable to use separate brushes as the terminals of these circuits; but for the purpose of avoiding crowding brush S is shown as the terminal of the advance circuit and also of the two indication-circuits. The circuits including the red and green lights are local branch circuits at the end of each single-track section or block. Lights *w* and *w′* in-

dicate whether the next block is occupied or not. Lights R and G merely show whether the devices have operated or not. Every movement of the commutator shifts the current from the circuit of the red lights to that of the green ones, or vice versa.

The operation of the device is as follows: Let it be assumed first that both commutators occupy positions such as shown by the commutator on the right. The circuit to the red lights is as follows: from branch *b* of the feeder B through wire 27, light R, wire 26, light R, wire 20, brush S, segment O, brush K, wire 21 to the rails. The circuit through the green lights is as follows: from the rails through wire 28, light G, wire 25, light G, wires 24, 19, and 20, brush S, segment O, brush K, and wire 21 to the rails. The circuit to the red lights is supplied with current and the red lights burn, but the green ones do not. The main signal-circuit is as follows: from branch *b* of feeder B (on the left) to wire 14, brush J, ring T, wire 15, segment V, brush P, wire 16, light *w*, wire 17, light *w'*, wires 18, 19, and 20, brush S, segment O, brush K, and wire 21 to the rails. The signal-circuit is supplied with current, and lights *w* and *w'* at the ends of the section display safety-signals. Magnet L is not energized, and armature-lever N rests against the backstop H, and pawl *n* rests in notch 32. When a car approaches from the left, the red lights are seen and also the safety-signal *w*. When the trolley-wheel reaches the insulated section C of feed-wire A, the current flows as follows: from feeder B through wire 1, relay L, wire 2, conductor C, wheel 3, pole 4, wire 5, contact 6, bar 7, contact 8, wire 9, resistance 10, wire 11, and wheel 13 to the rails. Relay L is energized and draws the pawl *n* and lever N forward against stop H' (see apparatus on the left) and turns the ratchet-wheel and commutator one notch, or one-twelfth of a revolution where a twelve-segment commutator is used. Brush P now rests upon segment O and brush S upon segment V. The circuits are as follows: from feeder B through branch *b*, wire 27, light R, wire 26, light R, wires 29 and 20, brush S, segment V, wire 15, ring T, brush J, and wire 14 to branch *b* of the feeder B. No current flows through this circuit. A current flows through the circuit of the green light as follows: from feeder B through branch *b*, wire 14, brush J, ring T, wire 15, segment V, brush S, wires 20 and 24, light G, wire 25, light G, and wire 28 to the rails. The green lights burn. The safety-signal circuit is as follows: from the rails (on the left) through wire 21, brush K, segment O, brush P, wire 16, light *w*, wire 17, light *w'*, wires 18 and 19 and 20, brush S, segment O, brush K, and wire 21 to the rails. No current flows, and a car at the other end of the section cannot receive a safety-signal. When the trolley-wheel leaves the insulated section C of the feed-wire, relay L is deënergized and spring *s* pulls the armature-lever N and pawl *n* back and pawl *n* slides from notch 32 to notch 33. As the car leaves the turnout it is observed that a green light G burns, showing that the device has operated. When the car reaches the turnout on the right, the same changes take place in the indication-circuits and in the commutator and connections. The signal-circuit then is as follows: from feeder B to branch *b*, wire 14, brush J, ring T, wire 15, segment V, brush S, wires 20, 19, and 18, light *w'*, wire 17, light *w*, wire 16, brush P, segment O, brush K, and wire 21 to the rails. The current flows and safety-signal light *w* at the other end of the section again burns and displays a safety-signal.

Instead of connecting relay L in the circuit from an insulated section of the feed-wire to the main feeder B that relay may be connected in a circuit from an insulated pair of rails to the rails proper. The results will be the same.

The commutator connections may be altered in various ways and still produce the same results. Brushes J and K may be connected to the circuits of the light and brushes P and S may be connected to the feeder and to the rails, respectively, without altering the mode of operating or the results.

Various other modifications may be made without departing from the spirit and scope of the invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a signaling system for electric railways, a main signal-conductor extending between stations located at intervals along the railway, signals at said stations connected in circuit with said main conductor, feed-wire and return terminals at each station, a switch at each station arranged to connect the said main signal-conductor alternately to said feed-wire and to said return, a trolley-conductor having an insulated section at each station, an electromagnet at each station for operating the switch thereat and having its coils connected in circuit from the feed-wire to the insulated section of the trolley-wire, means operated by said magnet to operate said switch, and means carried by an electric car to complete the circuit from said insulated section to the return, substantially as described.

2. In a signaling system for electric railways, a main signal-conductor extending between stations located at intervals along the railway, signals at said stations connected in circuit with said main conductor, feed-wire and return terminals at each station, local branch circuits at each station connected respectively to said feed-wire and return, a switch at each station arranged to connect the said main conductor and local branch signal-circuits alternately to said feed-wire

and to said return, a trolley-conductor having an insulated section at each station, an electromagnet at each station for operating the switch thereat and having its coils connected in circuit from the feed-wire to the insulated section of the trolley-wire, means operated by said magnet to operate said switch, and means carried by an electric car to complete the circuit from said insulated section to the return, substantially as described.

3. In a signaling system for electric railways, a main signal-conductor extending between stations located at intervals along the railway, signals at said station connected in circuit with said main conductor, feed-wire and return terminals at each station, local branch circuits at each station connected respectively to said feed-wire and return, a rotary switch at each station arranged to connect the said main conductor and local branch signal-circuits alternately to said feed-wire and to said return, a trolley-conductor having an insulated section at each station, an electromagnet at each station for operating the switch thereat and having its coils connected in circuit from the feed-wire to the insulated section of the trolley-wire, means operated by said magnet to operate said switch means carried by an electric car to complete the circuit from said insulated section to the return, and means to operate said switch manually, substantially as described.

4. In a signaling system for electric railways, a main signal-conductor extending between stations located at intervals along the railway, signals at said stations connected in circuit with said main conductor, feed-wire and return terminals at each station, a rotary switch having a plurality of insulated segments, alternate segments connected to said feed-wire and the remaining segments connected to said return, a pair of brushes arranged to be brought into engagement with successive segments and so spaced apart that the two will not at the same time engage segments of the same set, one of said brushes being connected alone to one end of a main signal-conductor, and the other connected to a terminal of a main signal-conductor and branches from the feed-wire and return, automatic means operated electrically and controlled by an electric circuit through a car to impart step-by-step motion to said commutator, and signals connected in said branch circuits, substantially as described.

5. In a railway signal system, the combination of relay L, lever N, pawl n, ratchet-wheel f, and commutator M, alternate segments being connected respectively to the two poles of a source of electric energy, brushes P and S in relation to the commutator-segments, a signal-circuit containing signals w and w', said signal-circuit consisting of a line-wire 17, terminating in brush P at one end of the block and in brush S at the other end of the block, substantially as described.

Signed at Boyertown, in the county of Berks and State of Pennsylvania, this 30th day of January, 1903.

ABRAM L. BOWER.

Witnesses:
W. W. WREN,
CHAS. E. MAYER.