

No. 773,166.

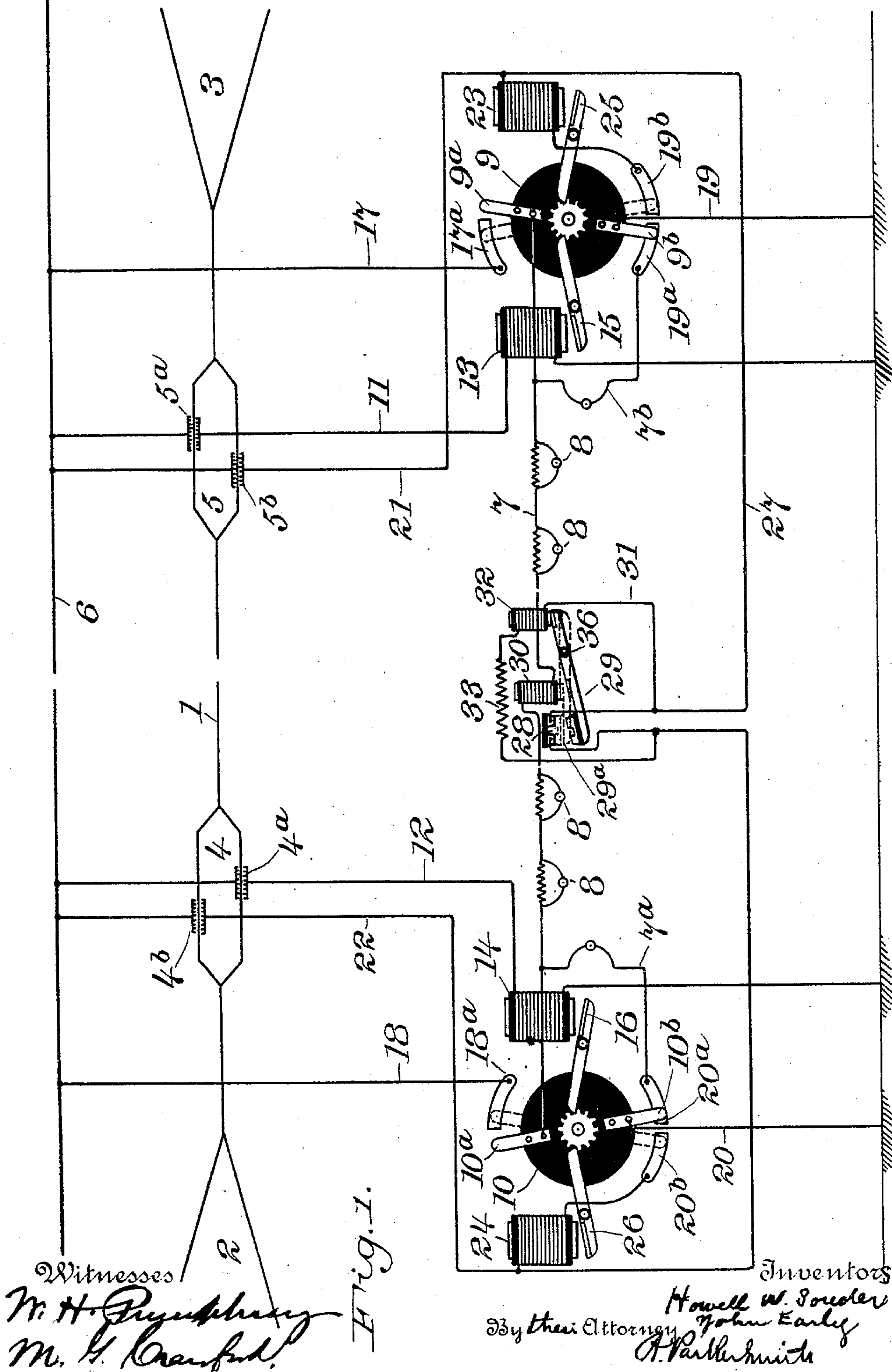
PATENTED OCT. 25, 1904.

H. W. SOUDER & J. EARLY.
ELECTRIC SIGNAL SYSTEM.

APPLICATION FILED DEC. 7, 1903.

NO MODEL.

3 SHEETS—SHEET 1.



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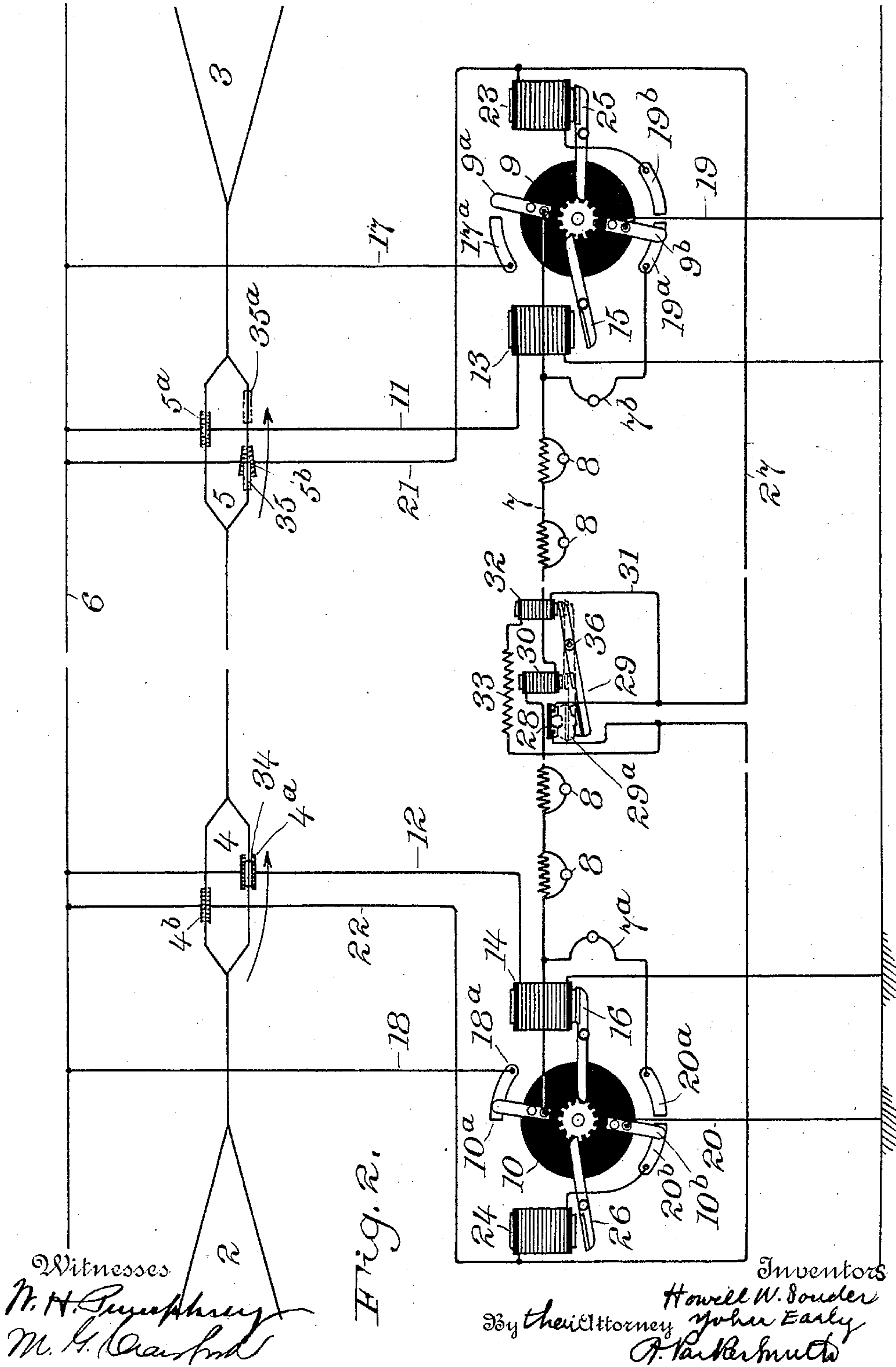
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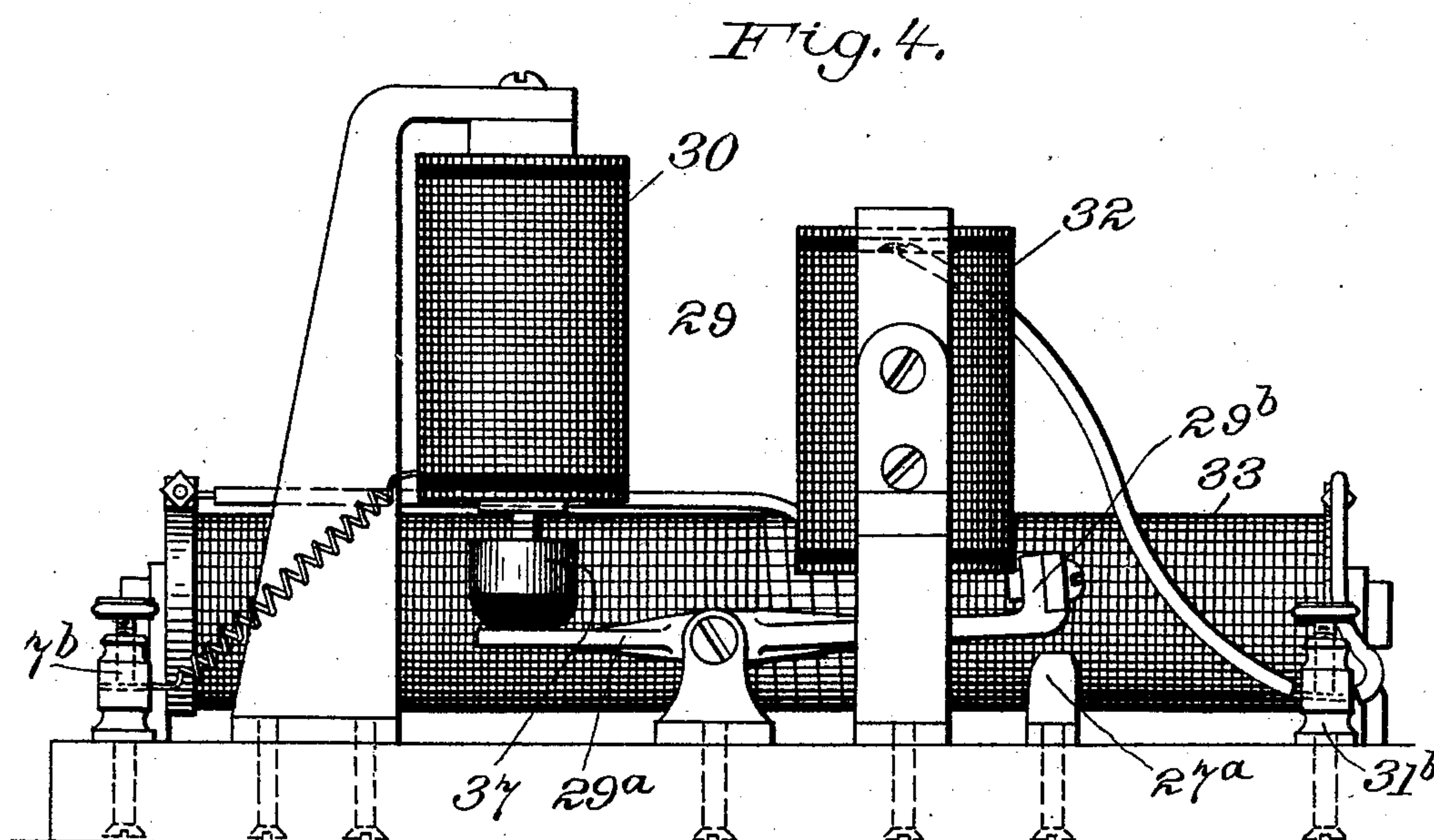
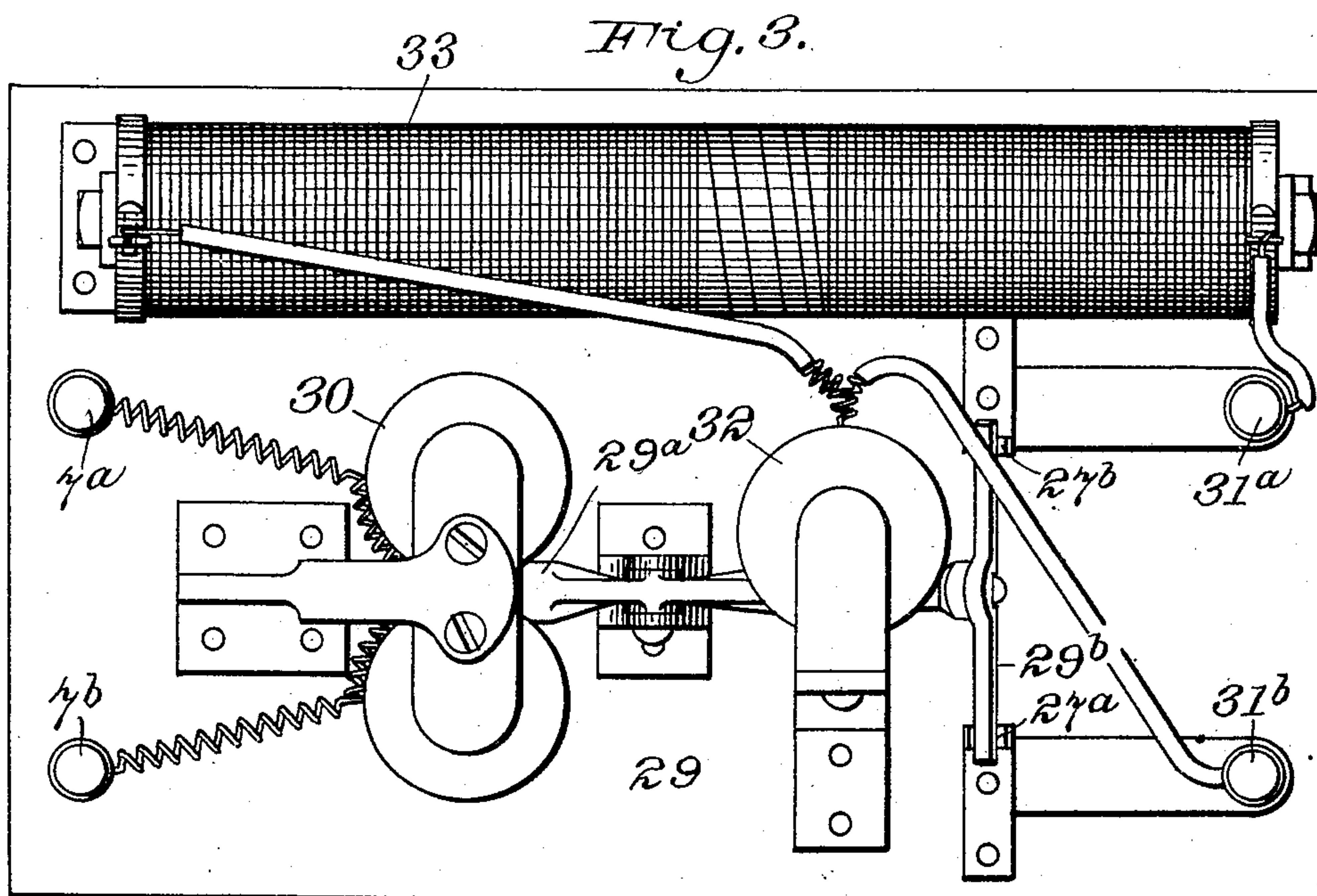
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3 SHEETS—SHEET 3.



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ELECTRIC SIGNAL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 773,166, dated October 25, 1904.

Application filed December 7, 1903. Serial No. 184,020. (No model.)

To all whom it may concern:

Be it known that we, HOWELL W. SOUDER, a resident of Tamaqua, Schuylkill county, and JOHN EARLY, a resident of Lansford, Carbon county, State of Pennsylvania, citizens of the United States of America, have invented certain new and useful Improvements in Electric Signal Systems, of which the following is a specification.

Our invention relates in general to electrical block-signal systems for railroads; and it more specifically consists of an improved system of safety block-signals for electric trolley-roads.

The general arrangement of our system is similar to that shown in Patent No. 735,416, granted to Howell W. Souder August 4, 1903, and as illustrated herein it most nearly corresponds to the arrangement shown in Figure 3 of said Patent No. 735,416. In the patented system the signal-conductor extending along any block is normally grounded at both ends when no car is in the block; but when a car enters either end of the block it throws in the feed connection at that end and cuts out the ground at that end, thereby sending a current through the signal-conductor. If while a car is in the block another car enters the block from the opposite end, that car also throws in the feed connection at that other end and throws out the ground connection, thereby looping the signal-conductor into shunt with the feed-wire and cutting off all current therefrom. If then one car backs out of the block, it throws out the feed connection at that end and throws in the ground connection. This would reestablish a circuit through the signal-conductor if the action stopped there; but where a single conductor extends from end to end of the block connecting the two resetting-magnets, as is the case with the best form of the patented system, the current which turns the circuit-controller back at that end of the block out of which the car is backing also turns back the circuit-controller at the other end of the block, with the result that both feed connections are cut out and both ground connections thrown in, so that the signal system is disarranged. Our invention is designed to overcome this

difficulty and accomplishes the same by the interposition in the resetting-conductor of a circuit-breaker, as will hereinafter be pointed out. An arrangement of circuits and connections embodying our invention is shown in the accompanying three sheets of drawings, in which—

Fig. 1 is a diagrammatic representation of the circuits for a block, the parts being shown in full lines in the position which they would occupy when no car is in the block. Fig. 2 is a similar diagrammatic representation of circuits, the parts being shown in full lines in the position which they would occupy when two cars are in the block, one of said cars in the act of backing out. Fig. 3 is a plan view, and Fig. 4 a side elevation, of a practicable form of resetting circuit-breaker which is diagrammatically shown in the other views.

Throughout the drawings like reference-figures indicate like parts.

1 indicates the trolley-wire, broken away at the middle of the drawings.

2 represents a turnout at the west end of the block, and 3 a turnout at the east end of the block.

4 represents a signal-frog near the west end of the block, and 5 a similar signal-frog near the east end of the block. The normally open contact-maker 4^a is temporarily closed by the passage of the trolley-wheel of a car entering the block, and the normally open contact 4^b is temporarily closed by the passage of a trolley-wheel passing out of the block. The contact-makers 5^a 5^b on the signal-frog at the east end of the block perform similar functions.

6 is the feed-conductor, extending along the line of the track, and 7 is the signal-conductor, extending along the block and having a number of incandescent lamps 8 8 or other signal devices operated by the current passing through said signal-conductor.

9 represents a circuit-controller at the east end of the block, and 10 similar circuit-controller at the west end of the block. These circuit-controllers, while diagrammatically represented, may be constructed in actual

practice like those shown in Figs. 4, 5, and 6 of Patent No. 735,416. As represented, the east circuit-controller has a contact-arm 9^a, connected to the signal-conductor 7, and a contact-arm 9^b, connected to the ground by the wire 19, while the circuit-controller 10 has a contact-arm 10^a, connected to the other end of the signal-conductor 7, and a contact-arm 10^b, connected to the ground by wire 20.

From the contact-maker 5^a extends a wire 11, connected to the coils of the electromagnet 13 and thence to the ground. In the same way a wire 12 extends from contact-maker 4^a, is connected to the coils of the electromagnet 14, and thence to the ground. The magnet 13 operates a pawl-lever 15, and the magnet 14 operates a pawl-lever 16, which are normally in the positions shown, said pawl-levers coöperating with ratchet-wheels on their respective circuit-controllers.

A feed connection 17 extends from the feed-wire 6 to the stationary contact 17^a, which coöperates with the contact-arm 9^a of the circuit-controller 9. In the same way a feed connection 18 extends to the stationary contact 18^a, which coöperates with the contact-arm 10^a on the circuit-controller 10.

19^a and 19^b are stationary contacts on which the contact-arm 9^b alternately bears, and 20^a and 20^b are stationary contacts on which the contact-arm 10^b alternately bears.

21 is a connection from the contact-maker 5^b to one extremity of the coil of the magnet 23, and 22 is a similar connection from the contact-maker 4^b to one end of the coil of the electromagnet 24. The other end of the coil of the electromagnet 23 is connected to the contact 19^b, and said magnet actuates the pawl-lever 25. In the same way the other end of the coil of the electromagnet 24 is connected to the contact 20^b, and said magnet actuates the pawl-lever 26.

27 is a conductor extending along the block, which we call the "resetting-conductor" and which connects the feed-wires 21 and 22. This resetting-conductor 27 has a break at 28 in its main line, said break being controlled by a normally open circuit-closer 29, shown as a lever pivoted at 36. This lever is shown in its normal position in full lines and in its closed position at 29^a in dotted lines. This circuit-closer is controlled by the electromagnet 30, which is energized by the passage of current in the signal-conductor 7. There is a shunt 31 extending around the break in the resetting-conductor, and the current in this shunt energizes the magnet 32, which also controls the circuit-closer 29, its attraction being opposite to that of the magnet 30.

33 is a resistance included in the shunt 31, so as to make it a high-resistance shunt.

In Fig. 2 the positions of two cars are represented by the trolley-wheels 34 and 35, another position of the car at the east end of the block being indicated by the dotted line rep-

resentation of the trolley-wheel 35^a. 7^a is a branch from the west end of the signal-conductor to the contact 20^a, and 7^b is a branch from the east end of the signal-conductor to the contact 19^a.

The operation of our invention is as follows: The block being empty, the parts are in the position shown in Fig. 1. If now a car enters the west end of the block, its trolley-wheel 34 will close the contact 4^a and current will pass from feed-conductor 6 through the wire 12 to the ground, energizing the magnet 14. This will pull the pawl-lever 16 into the position shown in Fig. 2, move the circuit-controller 10 one tooth and throw the contact-arm 10^a on to the contact 18^a and the contact-arm 10^b off of the contact 20^a on to the contact 20^b. This will send the current from the feed-wire 6 through the connection 18 to the signal-conductor 7, through the branch 7^b, contact 19^a, arm 9^b, and ground-wire 19 to the ground. This will of course cause the signal-lamps 8 8 to glow and also energize the magnet 30, which will attract its armature on the left-hand arm of the circuit-closer 29, throwing said circuit-closer into the position shown in dotted lines at 29^a and closing the break 28 in the main line of the resetting-conductor 27. If a car comes up to the east end of the block and the motorman overruns his signals and enters the block, he will in the same way before described energize the magnet 13 and throw the circuit-controller 9 into the position shown in dotted lines in Fig. 1, thereby cutting out the ground 19 and looping the signal-conductor 7 into a shunt with the feed-wire 6. Accordingly no current will pass through the signal-conductor 7, and not only will the lamps 8 8 go out, but the magnet 30 will become dead and no longer attracting its armature on the circuit-closer 29, and the same will fall back into its normally open position, opening the break in the main line of the resetting-conductor 27. The motorman of the second car, discovering by the extinguishment of the lamps that he has run into a block already occupied by a car going in the opposite direction, proceeds to back out, and the moment his trolley-wheel touches the contact 5^b a current passes from feed-wire 6 through the wire 21, the magnet 23, contact 19^b, contact-arm 9^b, and wire 19 to the ground. The magnet 23 accordingly attracts the pawl-lever 25 and throws the circuit-controller 9 back into the position shown in full lines in both figures, thereby reëstablishing the original circuit through the signal-conductor 7 and causing the signal-lamps to glow again, conveying the information to the first car that the second car is backing out of the block and that the first car may proceed. If it were not for the break 28 in the main line of the resetting-conductor 27, an amount of current equal to that which goes through the magnet 23 would also go through the magnet 24 and set back the

controller 10, thereby cutting out both feed connections and leaving the signal-wire dead, and both cars would be blocked by the signals. The break 28, however, prevents a sufficient current getting through to the magnet 24 to energize it sufficiently to attract the pawl 26, and this difficulty is avoided. If this were all that were done, however, it is evident that during the instant of time that the trolley-wheel 35 was running through the contact-maker 5^b the reestablished current through the signal-conductor 7 would reenergize the magnet 30, attract the circuit-closer 29, close the break 28, and give the necessary current to the magnet 24 to produce this undesirable result before the trolley-wheel 35 had freed itself from the contact-maker 5^b. To avoid this, we employ the second magnet 32 and the shunt 31, in which the same is included. This magnet 32 being either wound to a higher resistance or the shunt being preferably provided with a separate dead resistance 33, the weak current which passes through the shunt, although not sufficient to operate the magnet 24, energizes the magnet 32 sufficiently for it to hold the circuit-closer 29 in the open position in opposition to the pull of the magnet 30 so long as there is any current passing through the wire 21 and resetting-conductor 27. Consequently the premature action of the magnet 30 on the circuit-closer 29 is prevented, and the circuit-closer is held positively in its open position until the trolley-wheel 35 has left the contact-maker 5^b, as indicated in dotted lines at 35^a, when, all current being cut off from the connection 21 and resetting-conductor 27, the magnet 32 becomes dead, and the circuit-closer 29 is allowed to close under the influence of the magnet 30. When the first car goes out of the block at the east end, it again sends a current through the wire 21, resetting-conductor 27, to the magnet 24, and to ground through wire 20, thereby actuating the pawl-lever 26 and setting the circuit-controller 10 back in the position shown in full lines in Fig. 1, so extinguishing the lamps and leaving the block ready for the admission of another car.

The advantages of our invention, as already explained, comprise the prevention of the disturbance of the system by the backing out of a car from the block while another car is in the block without deranging the operation of the system under other conditions. That is to say, without our invention a car entering a block at the west end cuts in the feed connection at that end and cuts out the ground connection. The same car leaving the block at the east end cuts out the feed connection at the west end and cuts in the ground connection there, or the same car backing out at the west end also operates the west circuit-controller only; but if after a car has entered the west end of the block another car enters from the east end and then either of the

cars backs out it resets both circuit-controllers and disarranges the system.

With our invention the normal operation of the system with one car passing through the block or into the same and backing out is not disturbed; but the derangement of the system consequent upon the entry of two cars from opposite directions of the same block and the backing out of one of them is entirely obviated.

It is evident, of course, that various changes could be made in our invention without departing from the spirit and scope thereof. The circuit-closer 29 is illustrated in the drawings in a conventional manner, and other forms of circuit-closer might be used. The arrangement of the magnets 30 and 32 might also be varied so long as they operated upon this circuit-closer in a manner opposed one to the other. The currents supplied to these magnets also might be derived in a different manner, so long as they were controlled in the way described herein. These and other modifications, which might readily occur to one skilled in the art as soon as the underlying principle of our invention is understood, we should consider mere mechanical variations and still within the boundaries of our invention.

In the practicable form of resetting circuit-breaker (shown in Figs. 3 and 4) the magnet 30 is shown as formed of two spools or bobbins, acting when energized to lift the weighted armature 37. The signal-wire 7 is connected to the binding-posts 7^a 7^b. When the armature 37 is lifted, the circuit-closer bridge 29^b drops into the clips 27^a and 27^b, which constitute the terminals of the resetting-conductor 27, and the circuit is complete. When the magnet 30 is deenergized, the weight 37 drops on the tail 29^a of the circuit-breaker and lifts the bridge-piece 29^b out of the clips 27^a 27^b, thereby breaking the circuit through the resetting-conductor. The magnet 32 and the resistance-coil 33 are in series in the circuit 31, bridged across the binding-screws 31^a 31^b, to which the terminals of resetting-conductor 27 are connected. This magnet when energized attracts and lifts the end of the pivoted circuit-breaker 29, which carries the bridge 29^b, thus holding the circuit 27 open. These circuits are controlled in the manner before set out in the general description of the system.

Having therefore described our invention, what we claim as new, and desire to protect by Letters Patent, is—

1. In an electric block-signal system for railroads, the combination of a signal-conductor extending along the block, circuit-controlling devices for said signal-conductor located near each end of the block, a resetting-conductor extending along the block, and having a break in its main line, a circuit-closer for said break and an electromagnet included

in circuit with the signal-conductor and controlling said circuit-closer to close the break in the resetting-circuit when there is current passing through the signal-conductor and means for opening said resetting-circuit when said current ceases.

2. In an electric block-signal system for railroads, the combination of a signal-conductor extending along the block, circuit-controlling devices for said signal-conductor located near each end of the block, a resetting-conductor extending along the block, and having a break in its main line, a circuit-closer for said break, and an electromagnet included in circuit with the signal-conductor and controlling said circuit-closer to close the break in the resetting-circuit when there is current passing through the signal-conductor, and means for opening said resetting-circuit when said current ceases, together with a high-resistance shunt around the break in the resetting-conductor and a second magnet in said shunt acting on the circuit-closer in opposition to the first-mentioned magnet.

3. In an electric block-signal system for railroads, the combination of a signal-conductor extending along the block, feed connections and ground connections therefor near each end of the block, a circuit-controller near each end of the block adapted to alternately connect that end of the signal-conductor with the feed and ground connections, electromagnetic means operated by the passage of a car into the block to throw in the feed connection at that end of the block and throw out the ground connection, electromagnets at each end of the block adapted when energized to throw out the feed connection and throw in the ground connection, a feed connection for each magnet temporarily closed by a car passing out of the block, a ground connection for each magnet controlled by the circuit-controller at that end of the block, a resetting-conductor uniting said magnet feed connections, having a break in its main line, a normally open circuit-closer for closing said break, and an electromagnet which moves the circuit-closer to close said break when current passes through the signal-conductor.

4. In an electric block-signal system for railroads, the combination of a signal-conductor extending along the block, feed connections and ground connections therefor near each end of the block, a circuit-controller near each end of the block adapted to alternately connect that end of the signal-conductor with the feed and ground connections, electromagnetic means operated by the passage of a car into the block to throw in the feed connection at that end of the block and throw out the ground connection, electromagnets at each end of the block adapted when energized to throw out the feed connection and throw in the ground connection, a feed connection for each magnet temporarily closed by a car pass-

ing out of the block, a ground connection for each magnet controlled by the circuit-controller at that end of the block, a resetting-conductor uniting said magnet feed connections, having a break in its main line, a normally open circuit-closer for closing said break, and an electromagnet which moves the circuit-closer to close said break when current passes through the signal-conductor, together with a high-resistance shunt around the break in the resetting-conductor, and a second electromagnet adapted to hold said circuit-closer open while current is passing through the resetting-conductor.

5. In an electric block-signal system for railroads, the combination of a signal-conductor extending along the block, electrical mechanism and connections for sending a current through the signal-conductor while a car is passing through the block, but to cut off said current when a second car enters the block from the other end while the first car is still in the block, a resetting-conductor extending along the block and electrical connections therewith, and mechanism for reversing the signal-operating connections when one of the cars backs out of the block, said resetting-conductor having a normally open break in its main line, a circuit-closer for said break, and electrical mechanism operated by the passage of current through the signal-conductor to throw said circuit-closer into operative position.

6. In an electric block-signal system for railroads the combination of a signal-conductor extending along the block, electrical mechanism and connections for sending a current through the signal-conductor while a car is passing through the block, but to cut off said current when a second car enters the block from the other end while the first car is still in the block, a resetting-conductor extending along the block and electrical connections therewith, and mechanism for reversing the signal-operating connections when one of the cars backs out of the block, said resetting-conductor having a normally open break in its main line, a circuit-closer for said break, and electrical mechanism operated by the passage of current through the signal-conductor to throw said circuit-closer into operative position, together with a high-resistance shunt around the break in the main line of the resetting-conductor, and electrical mechanism operated by the passage of current through said shunt-circuit to positively hold the circuit-closer out of operative position.

Signed at Lansford, Pennsylvania, this 2d day of December, 1903.

HOWELL W. SOUDER.
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Witnesses:

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