D. J. McCARTHY.

RELAY.

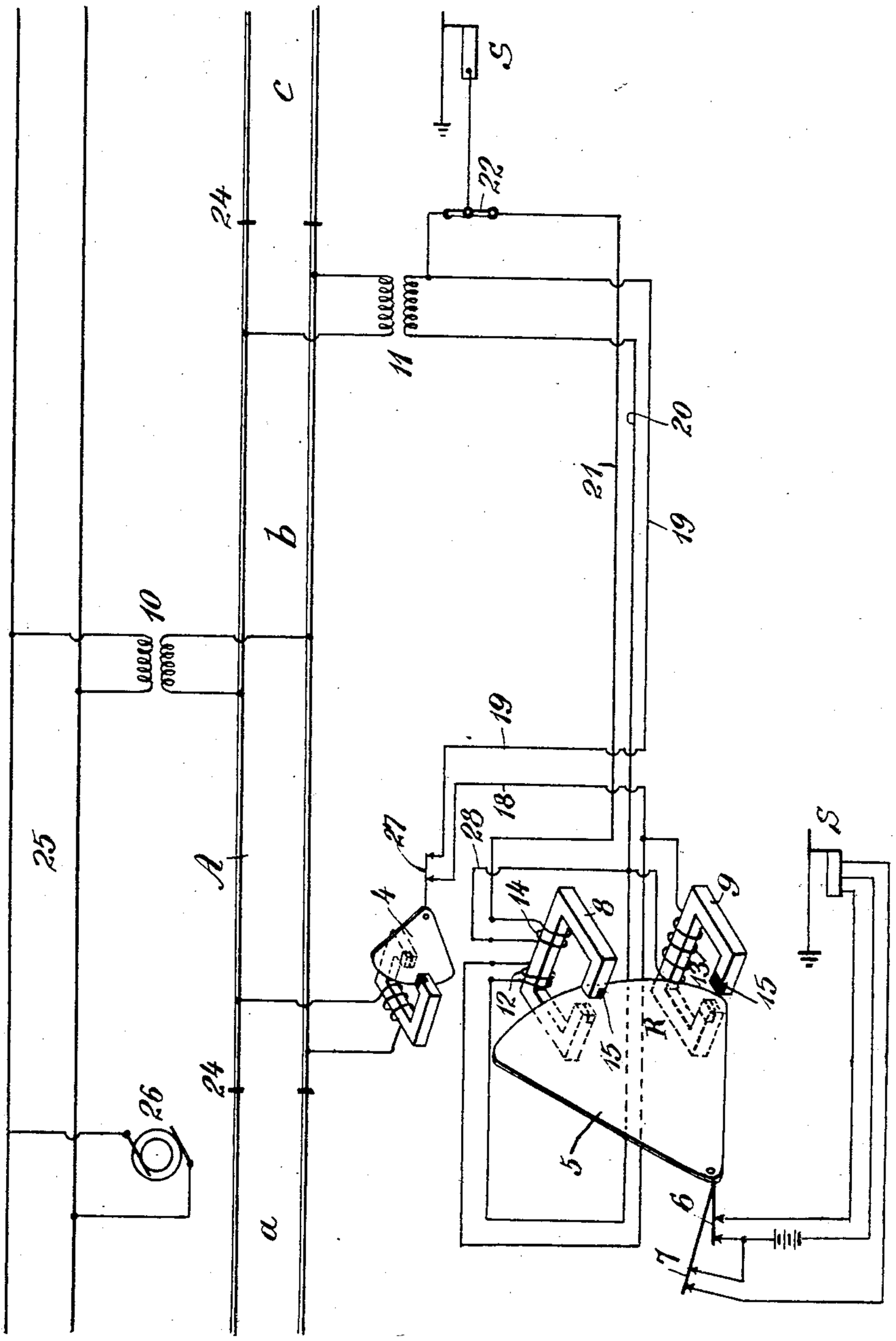
APPLICATION FILED MAR. 5, 1910.

967,222.

Patented Aug. 16, 1910.

3 SHEETS—SHEET 1.

Fig. 1.



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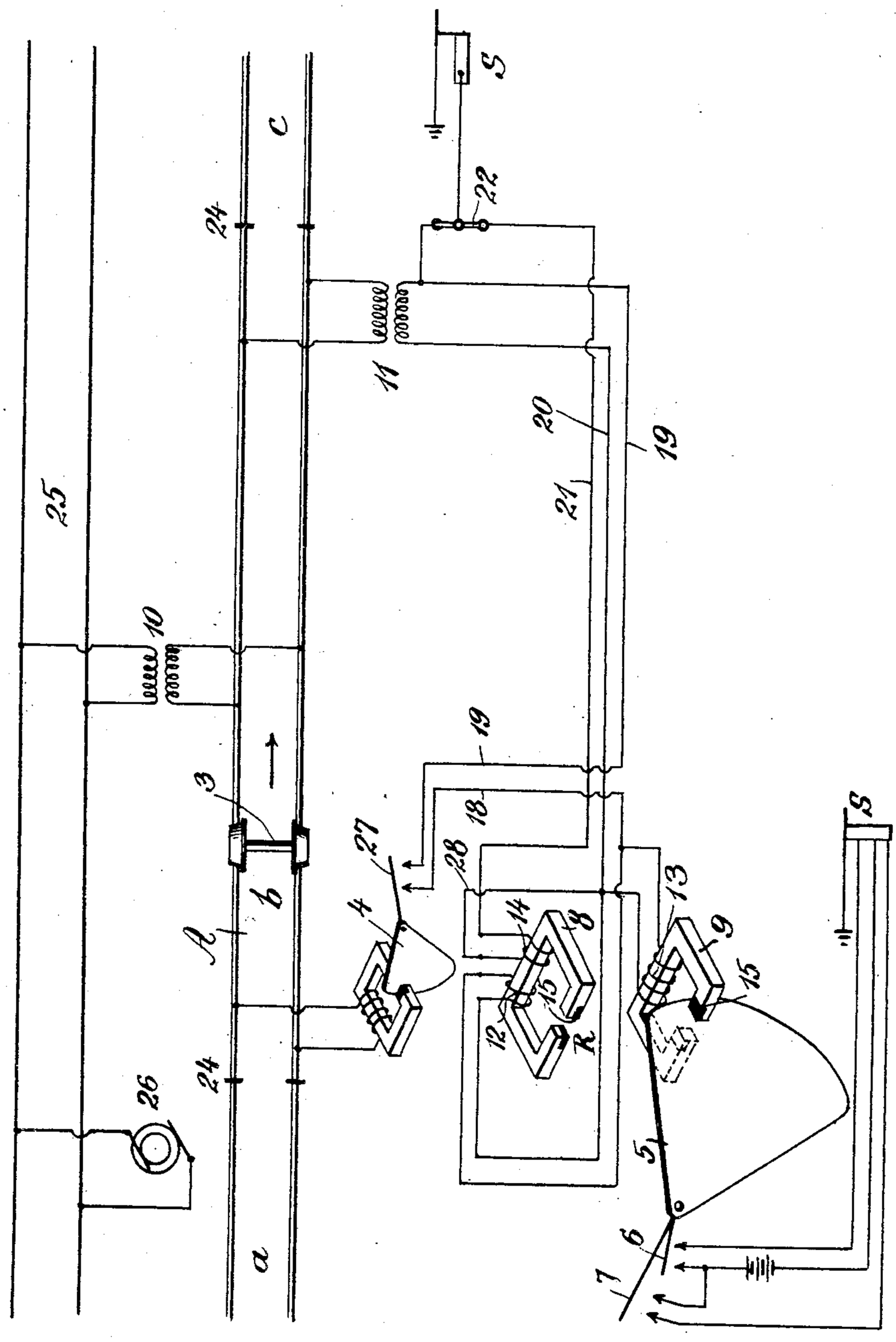
3 SHEETS—SHEET 2.

Fig. 2,



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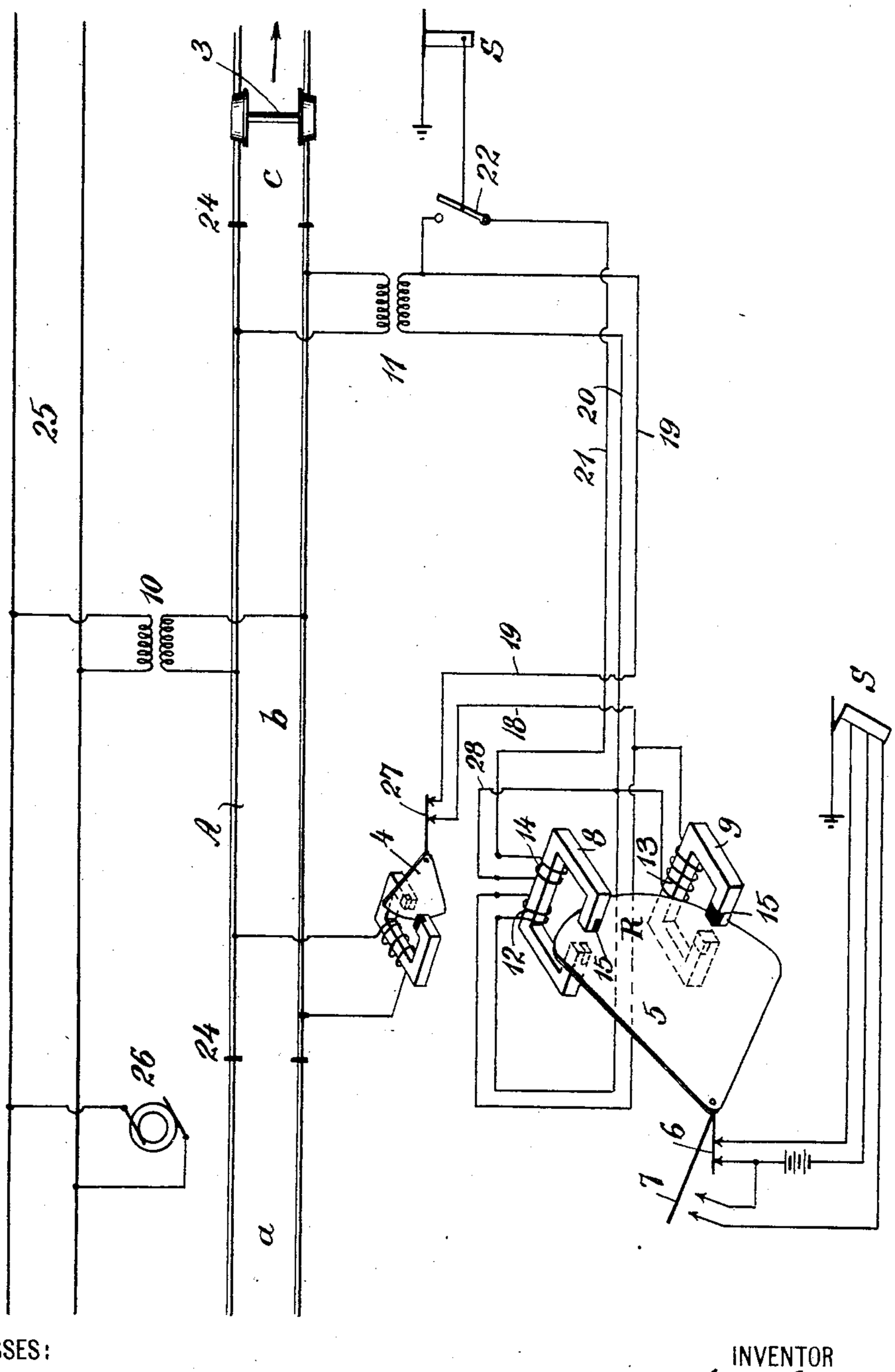
3 SHEETS—SHEET 3.

Fig. 3.



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DANIEL J. McCARTHY, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO THE UNION SWITCH & SIGNAL COMPANY, OF SWISSVALE, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

RELAY.

967,222. Specification of Letters Patent. **Patented Aug. 16, 1910.**

Application filed March 5, 1910. Serial No. 547,592.

To all whom it may concern:

Be it known that I, DANIEL J. McCARTHY, a citizen of the United States, residing in the borough of Wilkinsburg, county of Allegheny, State of Pennsylvania, have invented certain new and useful Improvements in Relays, of which the following is a specification.

My invention relates to automatic signaling systems employing alternating current in the track circuits, and provides a relay device of novel form for the control of three-position signals and of home and distant signals.

I will describe a relay embodying my invention in connection with a signaling system to which it may be applied and will then point out the novel features thereof in claims.

In the accompanying drawings, Figure 1 is a diagrammatical view of a signaling system employing a relay embodying my invention. Figs. 2 and 3 are views similar to Fig. 1 but showing the relays and signals in the positions they assume when affected by the presence of a train.

Similar reference characters refer to similar parts throughout the several views.

Referring now to the drawings, the reference character A designates a portion of a railway track which is divided into block sections *a*, *b*, and *c* by providing insulation 24 at suitable points in the rails. Generally it is sufficient to divide but one line of rails into insulated block sections, and in some cases the insulation may be dispensed with altogether, the impedance of the rails or other means being depended upon to limit the block sections. A transformer 10 having its secondary winding connected across the rails near the middle of each block section supplies alternating signaling current to the block section. The primary of this transformer is connected with signaling mains 25, to which alternating current is supplied by a generator 26. A relay 4, responsive only to alternating currents, of which several types are well known in the art, has its energizing coils connected across the track rails near one end of the block section. The armature of this relay operates a circuit controller 27. Across the rails near the opposite end of the block section is connected the primary winding of a transformer 11.

For each block section I provide a relay R embodying my invention. This relay comprises a movable element or vane 5 which moves between the pole-pieces of two separate cores 8 and 9, and which operates two circuit controlling contacts 6 and 7. Each of these cores is built up of soft iron laminations, substantially C-shaped, around a portion of the pole faces of which are placed shading bands 15 or metallic bands of high conductivity. A core of this construction is shown and described in U. S. Letters Patent No. 823,086 granted on June 12, 1906 to L. H. Thullen. In the relay of my invention, the shading band on core 9 is so arranged that this core will tend to rotate the vane upward and the band on core 8 is so arranged that this core will tend to rotate the vane downward, when the cores are energized by flux due to alternating current. Wound upon each core is a coil, 12 and 13, the energization of which by the same currents will cause equal magnetic flux to flow in the two cores. These coils are connected in parallel and with the secondary winding of the transformer 11. Upon core 8 is wound an additional coil 14, also energized from the transformer 11, but so connected that it will produce in the core 8 a flux equal and opposite to that produced by coil 12. Hence when both coils 12 and 14 are energized, no flux will flow in core 8, and this core will have no tendency to move the vane 5.

The cores 8 and 9 are so arranged with respect to the vane that when both cores are deënergized the vane will, by gravity, take the position shown in Fig. 2, when it will be out of the influence of core 8, but within that of core 9. Both contacts 6 and 7 operated by the vane 5 will then be open. When now the cores 8 and 9 are energized by alternating current in the coils 12 and 13, the vane will be rotated upward by core 9 until it comes within the influence of core 8, when its upward movement will be arrested and it will be held in substantially the position shown in Fig. 3. In this position contact 6 is closed and contact 7 open. When now coil 14 is energized, the magnetic flux in core 8 is neutralized, and this core has no influence on the vane 5 which is then free to rotate further in an upward direction due to the influence of core 9. The vane will then assume substantially the position shown in Fig. 1, both contacts 6 and 7 being closed.

Near the entrance end of each block section I provide a signal S, the operating mechanism of which is controlled by the contacts 6 and 7 of relay R. While I have here shown these signals as being of the one-arm three-position type, I do not wish to be limited to this type, as two-arm home and distant signals may be used equally well, the control of the signal by the relay being essentially the same in either case. At each signal I place a circuit controller 22 operated by the movement of the signal blade in the well-known manner. This circuit controller governs the energizing circuits for the relay R as hereinafter described.

The operation of the system is as follows: Referring first to Fig. 2, it will be seen that the rails of the block section *b* are short-circuited by the wheels and axles of a car 3, and that the relay 4 is therefore deënergized. The contact 27 of this relay being open, all current is cut off from the coils 12 and 13 of relay R, whose vane is therefore in the downward position. Both contacts 6 and 7 are open, and hence the signal S is held in the danger position. As the car moves in the direction of the arrow and passes the middle of the block *b*, the relay 4 may become energized to close its contact 27, but signaling current will still be cut off from the relay R owing to the transformer 11 being short-circuited by the car. As the car 3 passes into block-section *c*, the signal S for that block will be moved to danger as heretofore described for the signal of block *b*, and the circuit controller 22 will thereby be moved to the open position shown in Fig. 3. Relay 4, being now energized, a circuit is closed through coils 12 and 13 of relay R, as follows: from transformer 11 through wire 20, coils 12 and 13 in parallel, wire 18, contact 27, wire 19, to transformer 11. The vane 5 will then move to its middle position, closing contact 6 and thereby moving the signal S of block-section *b* to its caution position. Upon the car 3 leaving block section *c*, the signal S for that block will move to its caution or clear position, either of which movements shifts the circuit controller 22 to the closed position shown in Fig. 1. A circuit will then be closed through coil 14 as follows: from transformer 11 through wires 20 and 28, coil 14, wire 21, circuit controller 22 to transformer 11. The flux in core 8 being then neutralized, the vane 5 is free to rotate further upward under the influence of the core 9, and thereby closes both contacts 6 and 7, causing signal S of block *b* to move to its clear position.

It will be seen from the foregoing description that by the use of a relay embodying my invention, the control of three-position signals and of home and distant signals may be effected by the use of but one signal relay, and this relay is of a simple and more economical construction than has been heretofore used for this purpose.

Although I have herein shown the source of signaling current connected near the middle of the block section, and an auxiliary relay 4 at one end, I do not wish to be limited to this arrangement of the parts, as in some cases the source of current may be connected with one end of the block section and the auxiliary relay dispensed with.

Having thus described my invention, what I claim is:

1. A relay comprising a vane capable of assuming three control positions, a magnetic field tending to move the vane in one direction when energized by alternating current; a second magnetic field tending to limit the vane to one of its control positions when energized by alternating current, and, when deënergized, permitting the vane to move to another of its control positions under the influence of the first magnetic field.

2. A relay comprising a vane capable of assuming three control positions, a magnetic field and a winding therefor, tending to move the vane in one direction when energized by alternating current; a second magnetic field and two oppositely connected windings therefor, said second field tending to limit the movement of the vane to one of its control positions when one of its coils is energized by alternating current, and permitting the movement of the vane under the influence of the first magnetic field to another of its control positions when both of said oppositely connected coils are energized by alternating current.

3. A relay comprising a vane capable of assuming three control positions, a magnetic field and a winding therefor tending to move the vane in one direction when energized by alternating current; a second magnetic field and two coils therefor oppositely connected with a source of alternating current, said second field tending to limit the movement of the vane to one of its control positions when only one of its coils is energized, and said second field being neutralized to permit the movement of the vane under the influence of the first magnetic field to another of its control positions when both of said oppositely connected coils are energized.

In testimony whereof, I have hereunto signed my name to this specification, in the presence of two subscribed witnesses.

DANIEL J. McCARTHY.

Witnesses:
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A. L. Vencill.