No. 801,165. PATENTED OCT. 3, 1905.

H. B. TAYLOR.

RAILWAY SIGNALING SYSTEM.

APPLICATION FILED MAY 15, 1905.

FIG. 1.

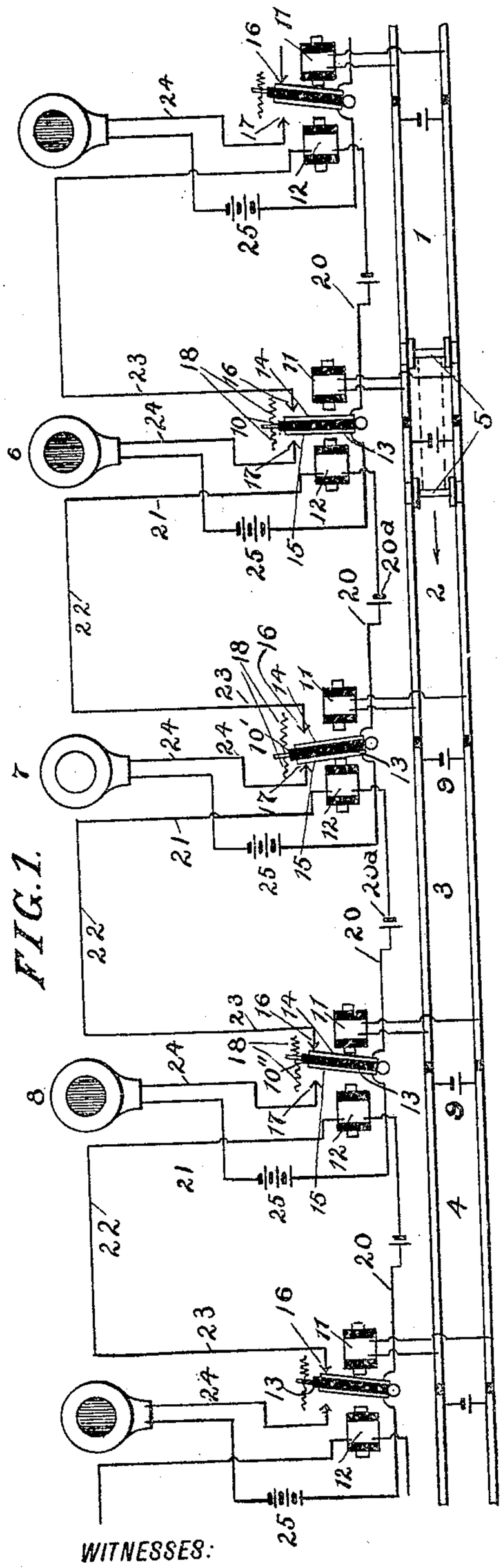
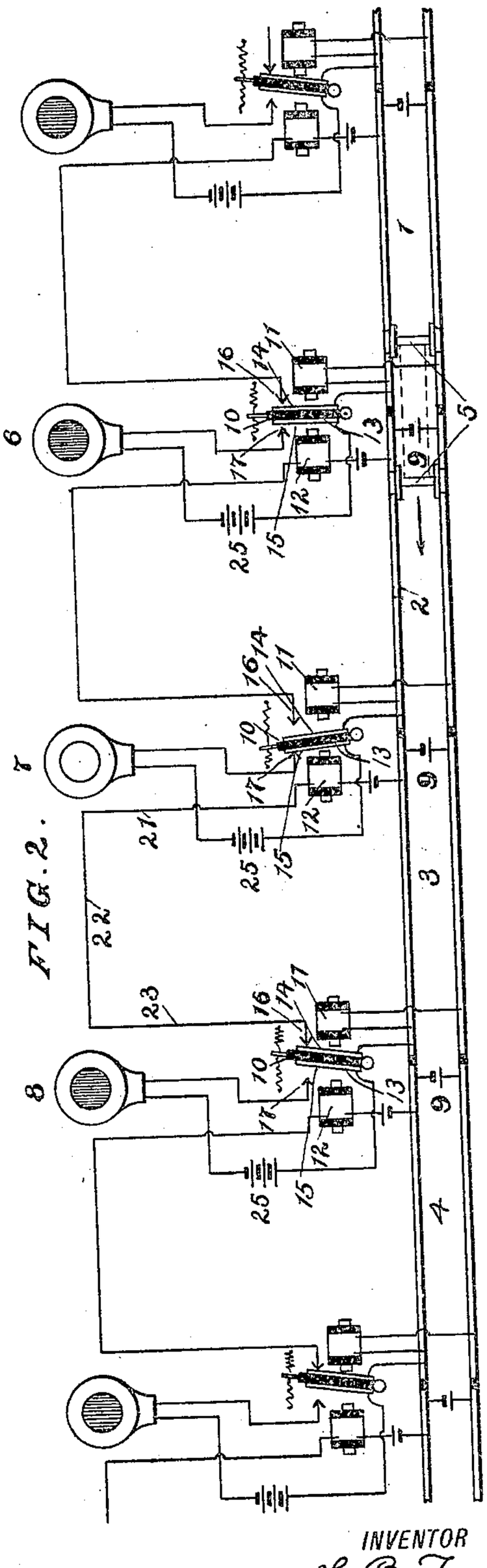


FIG. 2.



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RAILWAY SIGNALING SYSTEM.

No. 801,165. Specification of Letters Patent. Patented Oct. 3, 1905.

Application filed May 15, 1905. Serial No. 260,476.

To all whom it may concern:

Be it known that I, HERBERT B. TAYLOR, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Railway Signaling Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to electric railway-signal systems, and particularly to improvements in block-signal systems of the track-circuit type; and my invention consists in the novel arrangement of circuits and apparatus hereinafter described, and more fully set forth in the claims.

The object of my invention is to improve and simplify circuits and apparatus of block-signal systems of the class described.

I will now proceed to describe my invention with reference to the accompanying drawings, illustrating one embodiment of my system, and will then point out the novel features in claims.

In the drawings, Figure 1 shows diagrammatically four successive blocks with circuits, signals, and instruments pertaining thereto, and portions of two adjoining blocks. Fig. 2 is a similar view showing one of the rails used as a conductor of one of the signal-circuits.

While only a few blocks are illustrated in these figures, it will be understood that the number of blocks may be multiplied indefinitely, the several blocks of a railway equipped with my invention, or at least the most of said blocks, having substantially the same circuits.

In the said drawings, 1, 2, 3, and 4 are blocks on a line of railway, each block being insulated from the adjacent blocks, as indicated. Each line of rails of each block is assumed to be electrically continuous; but the two lines of rail of each block are assumed to be insulated from each other, so as to be electrically connected only by the circuits hereinafter described or by the wheels and axles of a car on such track. Two pairs of wheels and axles therefor are diagrammetrically represented in blocks 1 and 2 at 5.

6, 7, and 8 are signals for blocks 2, 3, and 4, respectively. Such signals may be of any type adapted for operation by electricity, and no particular type of electrically-operated signal is intended to be represented.

10 10′, &c., are signal-controlling relays of peculiar construction, one for each signal. Each such relay comprises two magnets 11 and 12, arranged to oppose each other with respect to the armature 13 of the relay, and such armature of each relay carries two contact-pieces 14 and 15, the former adapted to make contact with a stop 16 and the latter to make contact with a stop 17. Each relay further comprises opposed springs 18 or equivalent means, which tend to move the armature of said relay to an intermediate position in which it is out of contact with both stops and to hold it there. Magnet 11 is arranged to exert a stronger pull upon the armature than magnet 12, either by making it a stronger magnet or by placing it nearer the armature, or in any other convenient way.

Magnet 11 is connected to the track-circuit of the block in advance of that which the signal corresponding to that relay controls, and magnet 12 is in a circuit controlled by the relay of a signal beyond. This circuit may be traced as follows: from contact-point 16 of relay 10″ of signal 8, for example, through armature-contact 14 of that relay, wire 20, magnet 12 of the relay 10′ of signal 7, and wire 21 to a common conductor 22, and thence through a wire 23 back to contact 16, the starting-point. Each such circuit includes a battery 20^a and is normally closed, the relay-armatures being normally in contact with their stops 16, as in relay 10″, and the relays at the extreme ends of the figures.

When the armature of any one of the relays makes contact with its stop 17, it completes a circuit 24, passing through the corresponding signal, a battery 25, and armature contact-piece 15. These circuits 24 are normally open.

The relay armatures are normally held in contact with their stops 16, because, although the magnet 12 of each relay partly counterbalances the corresponding magnet 11, and although the spring action tends to move the armature to an intermediate position, magnet 12 and the spring action are not together strong enough to move the armature away from magnet 11 when said magnet is fully

energized and the armature is in proximity thereto.

The operation of my system may now be understood. Supposing, as indicated by the drawings, that a train is passing from block 1 into block 2, both of the blocks being occupied, the track-circuits of blocks 1 and 2 are both short-circuited and the armature of relay 10′ is in contact with its stop 17, (magnet 12 of that relay being energized, since block 3 is clear,) so that signal 7 is at "safety," while both magnets 11 and 12 of relay 10 being deënergized the armature of that relay is held in the intermediate position by its springs, and therefore the signal at the entrance to block 1 cannot be set to "safety," since the circuit 20 of block 1 is broken. The rear of the train is therefore protected. When the train clears block 1 altogether and passes entirely into block 2, magnet 11 of relay 10 is energized and attracts its armature, thus closing circuit 20 of block 1, so that a train in the block behind may set the signal at the entrance of block 1 to "safety" and enter said block. As the train passes from block 2 to block 3 the magnet 11 of relay 10″ is deenergized in like manner, and the magnet 12 of that relay draws its armature over, closing the circuit of signal 8 and setting that signal to "safety," and at the same time breaking the circuit 20 of block 2, so that the springs of relay 10′ draw the armature of that relay away from its magnet 12, breaking the circuit of signal 7 and setting said signal to "danger" again. The armature of relay 10′ is moved by the springs merely to the mid-position, so that circuit 20 of block 2 remains broken until the train has passed entirely out of block 2, and when this occurs magnet 11 of relay 10′ is energized and attracts its armature, closing circuit 20 of block 2. As the train passes on from block to block the signals are operated in like manner, the train as it enters a block setting to "safety" the signal of the next succeeding block, providing that block is clear, and causing the signal of the block which it is leaving to go to "danger," but preventing the signal at the entrance of the block which it is leaving from going to "safety" until it has entirely left such block. Thus it will be seen that when a train enters block 3 from block 2 signal 8 will not go to "safety" if block 4 is occupied, since circuit 20 of block 4 is broken in such case and magnet 12 of relay 10″ deënergized, and signal 8 cannot go to "safety" until, the train having cleared block 3, magnet 11 of relay 10″ is energized.

Should a train back from block 3, for example, into block 2, as soon as the rear of the train enters block 2 magnet 11 of relay 10′ will be deënergized and the armature will be drawn into the central position, preventing signal 6 from being set to "safety," and when the train has passed completely into block 2 magnet 11 of relay 10″ will be energized and will attract its armature, in turn energizing the magnet 12 of relay 10′ and causing signal 7 to go to "safety."

It will be seen that my system essentially comprises for controlling each signal a single relay, or, generically, a circuit-closer having two opposing magnets, one adapted to be energized by the track-circuit of a block in rear of such signal, the other adapted to be energized by a circuit which is closed when the block of such signal is unoccupied and is controlled by the relay of a succeeding signal.

It will be obvious that the common conductor 22 might be ground. However, railway companies usually prefer that such conductor shall not be ground or grounded largely for the reason that said conductor affords an easy means for setting signals at "danger" in case of an emergency, which may be done by simply cutting said conductor. It will further be obvious that instead of employing a conductor 20, connecting the armature-contact 14 of one relay with the magnet 12 of the relay in advance, one of the rails may be used as such conductor. Fig. 2 illustrates this. When using the rail in this manner, the operation of the track-circuit is not interfered with in any way, and the only line conductor required other than the rails is the common conductor 22, and, as above stated, even this conductor may be dispensed with by grounding the connections.

It will be apparent that breaking of one of the line of rails has the same effect upon the signal of the block in which the break occurs that short-circuiting the block of that track would have. In the following claims I use the phrase "operate the track-circuit" to include either the short-circuiting of such circuit or the interruption thereof by breaking the same.

It will be noted that in the local ciruit of each signal there is but one break and that such circuit is controlled by but one relay or circuit-controlling device.

It will be obvious that the above is only one embodiment of my invention and that said invention is susceptible of many variations and modifications and also that various forms of signals, relays, &c., may be used in the system, and I do not limit myself, therefore, to the particular circuits and instruments herein illustrated and described.

What I claim is—

1. In a block-signal system, the combination with a series of signals, and a controlling signal-circuit for each such signal, of a series of electromagnetic circuit-controlling devices, one only for each such signal, and each controlling the circuit of the corresponding signal, a circuit for each such circuit-controlling device, controlled by a similar circuit-controlling device of another signal, and a track-circuit for each such circuit-controlling device; said circuit-controlling devices

each arranged to be operated by the operation of its track-circuit and by the operation of its said circuit controlled by a similar circuit-controlling device of a distant signal.

2. In a block-signal system, the combination with a series of signals, normally at danger, and a controlling signal-circuit for each such signal, of a series of electromagnetic circuit-controlling devices, one only for each such signal, and each controlling the circuit of the corresponding signal, and circuits controlling the operation of said circuit-controlling devices comprising track-circuits, said circuit-controlling devices each controlling the operation of another similar circuit-controlling device of said series through one of said controlling-circuits.

3. In a block-signal system, the combination with a series of signals, and a controlling signal-circuit for each such signal, of a series of electromagnetic circuit-controlling devices, one only for each such signal, and each having a normally open contact controlling the circuit of the corresponding signal, and circuits controlling the operation of said circuit-controlling devices comprising track-circuits, said circuit-controlling devices each controlling the operation of another similar circuit-controlling device of said series through one of said controlling-circuits.

4. In a block-signal system, the combination with a series of signals, and a controlling signal-circuit for each such signal, of a series of electromagnetic circuit-controlling devices, one for each such signal, and each controlling the circuit of the corresponding signal, and having a normally closed contact for controlling a circuit of a similar controlling device of another signal, and circuits controlling the operation of said circuit-controlling devices comprising track-circuits and other circuits, one for each such circuit-controlling device, passing through said normally closed contact of another circuit-controlling device of the series.

5. In a block-signal system, the combination with signal-circuits, a series of rail-circuits and a series of signals, of a circuit-controlling device for each such signal comprising an armature and two magnets which oppose each other with respect thereto, one magnet in a rail-circuit, and another circuit for each such circuit-controlling device, passing through the other magnet thereof, and controlled by a similar circuit-controlling device of another signal of the series.

6. In a block-signal system, the combination with signal-circuits, a series of rail-circuits and a series of signals, of a circuit-controlling device for each such signal comprising an armature and two magnets which oppose each other with respect thereto, one magnet in a rail-circuit, and another circuit for each such circuit-controlling device, passing through the other magnet thereof, and controlled by a similar circuit-controlling device of another signal of the series; said circuit-controlling devices each provided with means tending to move said armature toward that one of its magnets which is included in a track-circuit.

7. In a block-signal system, the combination with signal-circuits, a series of rail-circuits and a series of signals, of a circuit-controlling device for each such signal comprising an armature and two magnets which oppose each other with respect thereto, one magnet in a rail-circuit in advance of such signal and the other in a circuit controlled by a similar circuit-controlling device of a succeeding signal, and means tending to move said armature toward the first-mentioned of said magnets.

8. In a block-signal system, the combination with signal-circuits, a series of normally closed rail-circuits, and a series of signals, of a series of circuit-controlling devices, one for each such signal, each such circuit-controlling device comprising an armature and two magnets which oppose each other with respect thereto, one of said magnets in a rail-circuit in advance of the signal of such circuit-controlling device, the other magnet in a normally closed signal-circuit controlled by a similar circuit-controlling device of a succeeding signal.

9. In a block-signal system, the combination with signal-circuits, a series of normally closed rail-circuits, and a series of signals, of a series of circuit-controlling devices, one for each such signal, each such circuit-controlling device comprising an armature and two magnets which oppose each other with respect thereto, one of said magnets in a rail-circuit in advance of the signal of such circuit-controlling device, the other magnet in a normally closed signal-circuit controlled by a similar circuit-controlling device of a succeeding signal, and means tending to move said armature toward the first mentioned of said magnets.

10. In a block-signal system, the combination with a series of closed rail-circuits, a series of signals, normally at danger, and signal-circuits, comprising a controlling-circuit for each signal, of a series of unitary circuit-controlling devices, one only for each such signal, controlling the circuit thereof, controlled by the rail-circuit in advance of said signal and by the rail-circuit of the block to which said signal belongs.

11. In a block-signal system, the combination with a series of signals, and a controlling signal-circuit for each such signal, of a series of electromagnetic circuit-controlling devices, one only for each such signal, and each controlling the circuit of the corresponding signal, a circuit for each such circuit-controlling device, passing through one of the lines of rails as a conductor and controlled by a similar circuit-controlling device of another

signal, and a track-circuit for each such circuit-controlling device, said two circuits of each circuit-controlling device acting in opposition with respect thereto.

12. In a block-signal system, the combination with a series of normally closed rail-circuits, and a series of signals, normally at danger, of a series of normally open or broken signal-circuits, a series of unitary circuit-controllers, one only for each such signal-circuit, each having a normally open contact in the corresponding signal-circuit, each such circuit-controller controlled by two rail-circuits, and arranged to be operated to close said contact by the action of a train on the first of said rail-circuits and to be operated to break said contact by the action of the train on the other rail-circuit.

13. In a block-signal system, the combination with a series of rail-circuits, a series of signals, and signal-circuits comprising a controlling-circuit for each signal, of a relay for and controlling each such signal-controlling circuit, comprising two opposing magnets and an armature, the latter provided with means for moving it to an intermediate position when its magnets are deënergized, one of said magnets controlled by a rail-circuit in advance of the corresponding signal, the other controlled by a corresponding relay of a succeeding signal and arranged to be deënergized by said relay when the track-circuit magnet of said latter relay is deënergized, the pull of said magnets of each relay on their armature and the action on said armature of the means tending to move it to the intermediate position being so adjusted that when the track-circuit magnet is energized the armature moves toward or remains in proximity thereto.

14. In a block-signal system, the combination with a series of rail-circuits, a series of signals, and signal-circuits comprising a controlling-circuit for each signal, of a relay for and controlling each such signal-controlling circuit, comprising two opposing magnets and an armature, the latter provided with spring-retracting means tending to move it to an intermediate position, one of said magnets controlled by a rail-circuit in advance of the corresponding signal, the other controlled by a corresponding relay of a succeeding signal and arranged to be deënergized by said relay when the track-circuit magnet of said latter relay is deënergized, the pull of said magnets of each relay on their armature and the action of the retracting means thereon being so adjusted relatively that when the track-circuit magnet is energized the armature moves toward or remains in proximity thereto.

In testimony whereof I affix my signature in the presence of two witnesses.

H. B. TAYLOR.

Witnesses:
HARRY M. MARBLE,
ROGER H. LYON.