(No Model.)

3 Sheets—Sheet 1.

# A. W. HALL.

## ELECTRIC RAILROAD SIGNAL APPARATUS.

No. 301,361. Patented July 1, 1884.

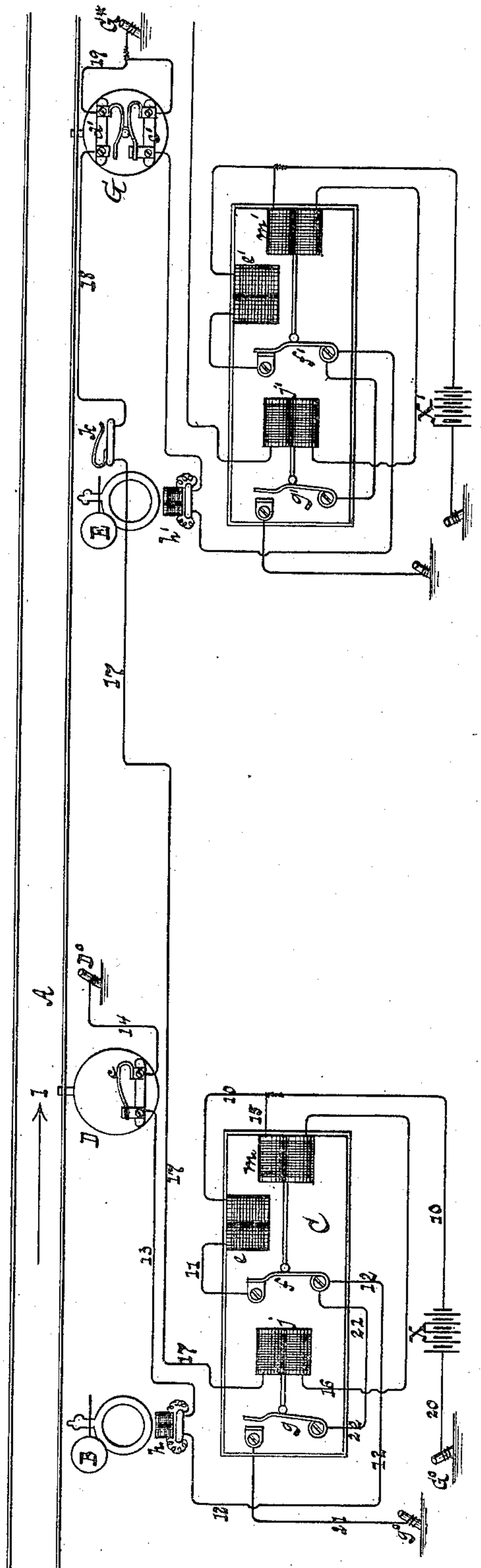

Fig. 1.

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BY

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ATTORNEYS

(No Model.) 3 Sheets—Sheet 2.

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## ELECTRIC RAILROAD SIGNAL APPARATUS.

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Fig. 2

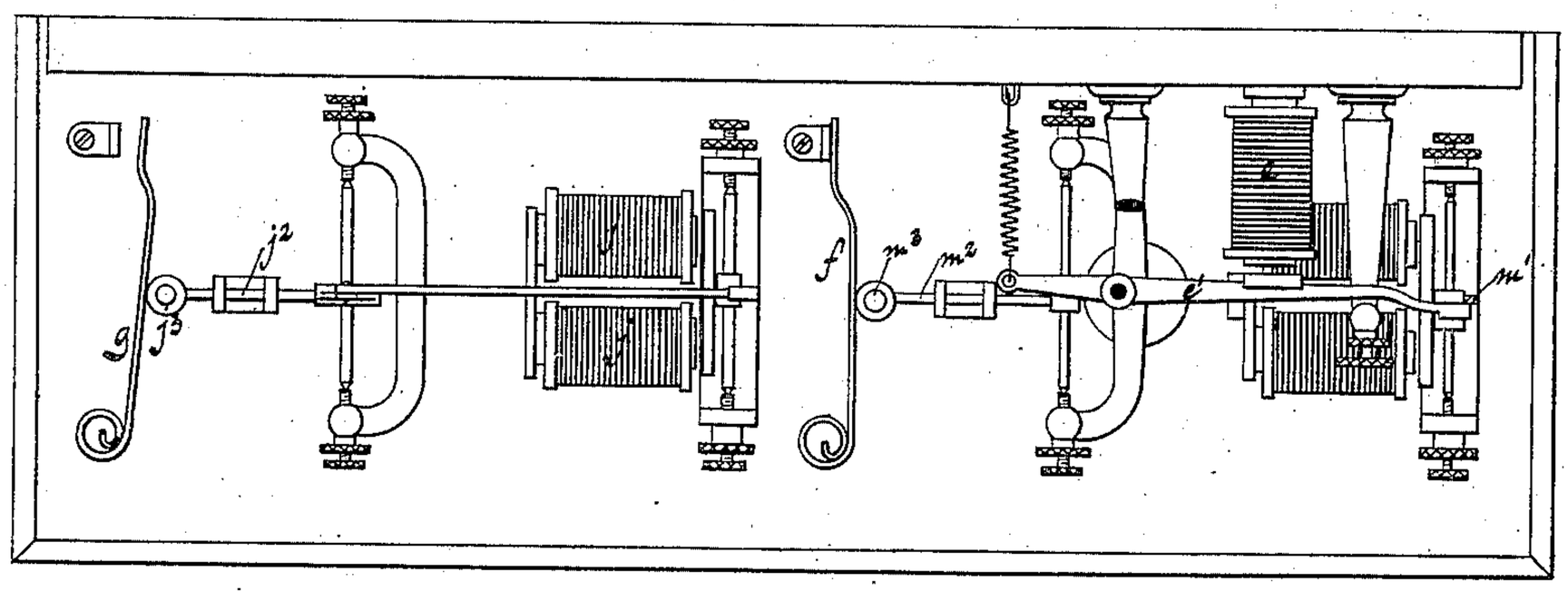


Fig. 3.

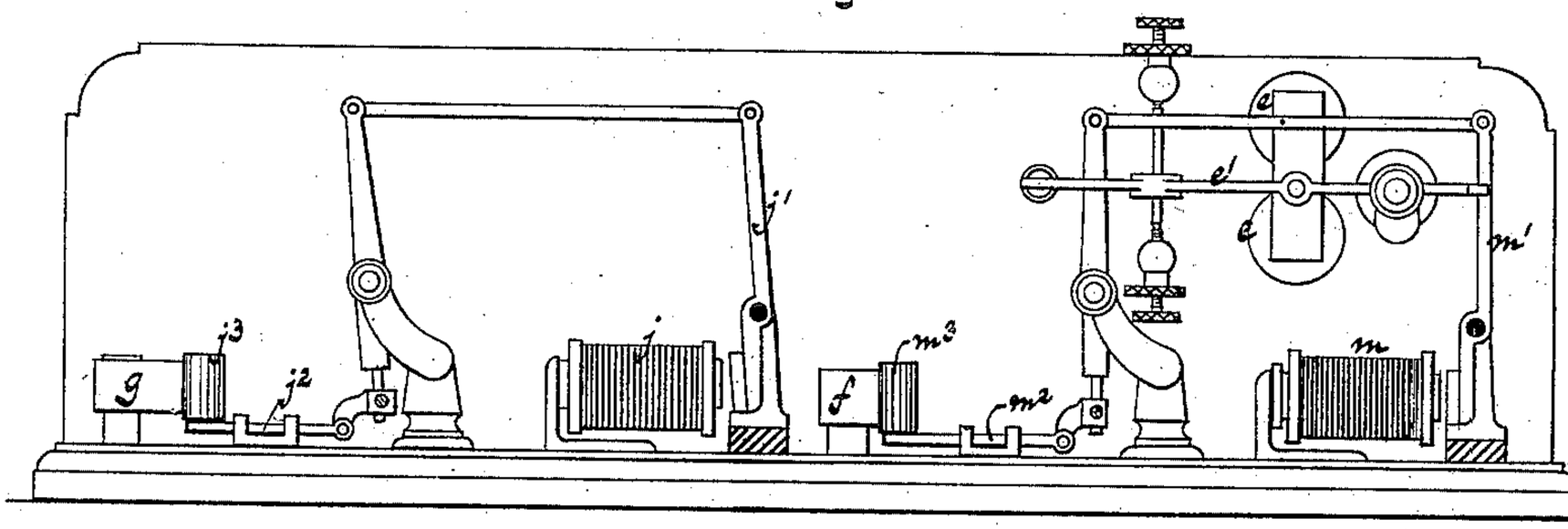


Fig. 4.

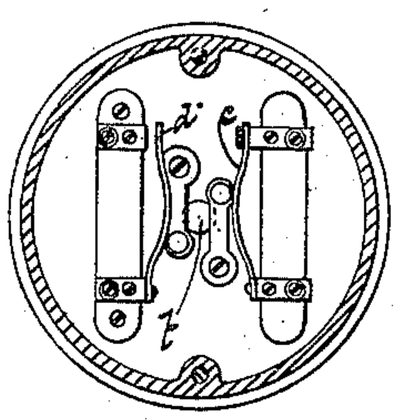


Fig. 5.




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## ELECTRIC RAILROAD SIGNAL APPARATUS.

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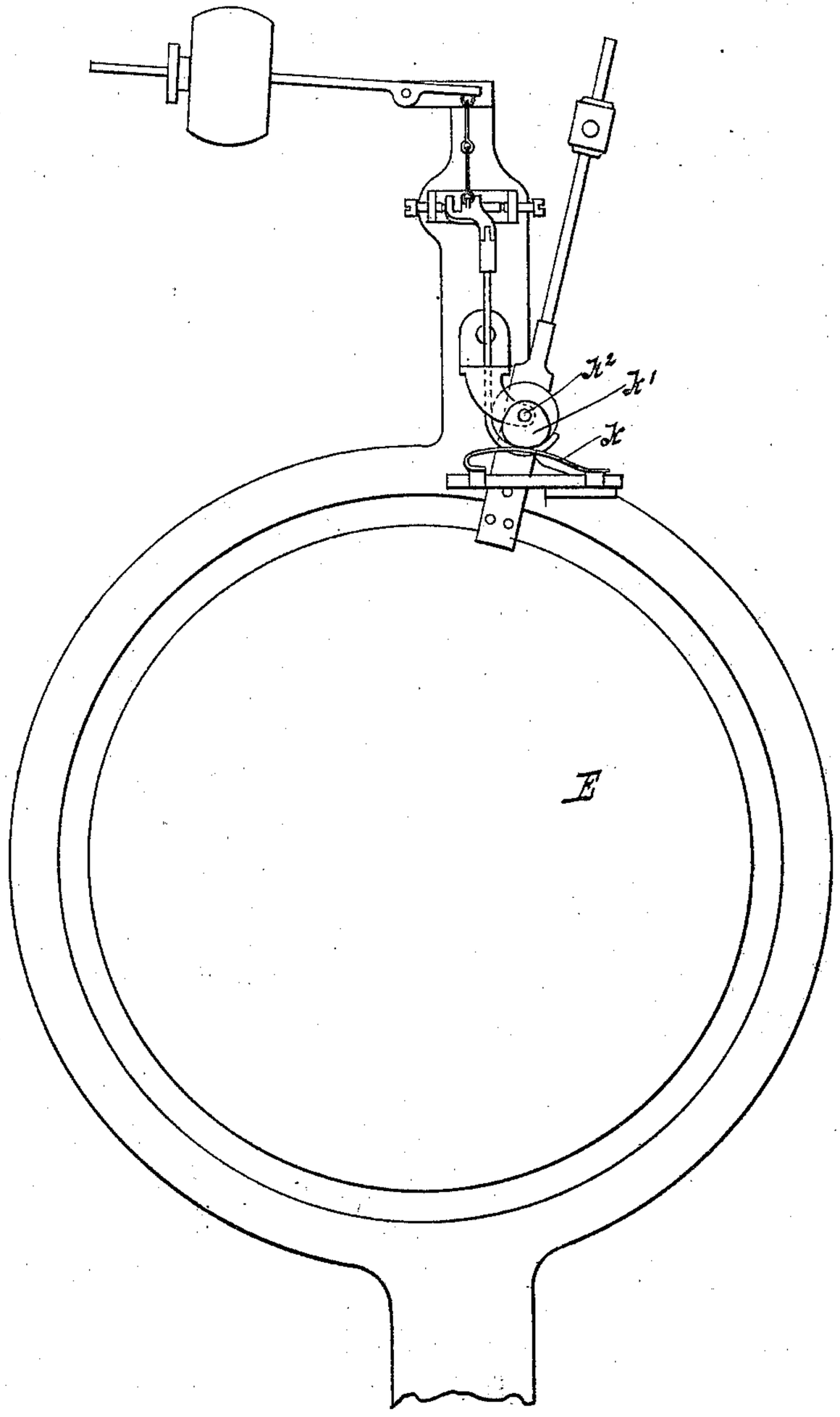
Fig. 6.

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# UNITED STATES PATENT OFFICE.

ALVAH W. HALL, OF MERIDEN, CONNECTICUT, ASSIGNOR TO THE HALL RAILWAY SIGNAL COMPANY, OF SAME PLACE.

## ELECTRIC RAILROAD-SIGNAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 301,361, dated July 1, 1884.

Application filed May 28, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, ALVAH W. HALL, a citizen of the United States, residing at Meriden, in the county of New Haven and State of Connecticut, have invented new and useful Improvements in Electric Railroad-Signal Apparatus, of which the following is a specification.

This invention relates to a railroad-signal apparatus in which the signals are held out of sight, or in a position indicating "safety," by the action of electro-magnets, while said signals drop in sight, or to a position indicating "danger," by their own gravity, whenever their electro-magnets are not vitalized. The peculiar and novel construction of my apparatus is pointed out in the following specification and illustrated in the accompanying drawings, in which—

Figure 1 represents a diagram showing the connection of the various parts. Fig. 2 is a plan or top view of the double-circuit instrument which forms an essential part of my new apparatus. Fig. 3 is a side view of the same. Fig. 4 is a plan or top view of one of the track-instruments. Fig. 5 is a sectional side view of the same. Fig. 6 is a front view of one of the signals.

Similar letters indicate corresponding parts.

The double-circuit instrument used is illustrated in detail in Figs. 2 and 3, consisting, as there shown, of the main magnet *m* and locking-magnet *e*. Whenever the circuit through the locking-magnet *e* is closed, so that it is vitalized or charged, attracting its armature *e'*, its armature locks the armature *m'* of the main magnet *m*, preventing its movement, retaining it (*m'*) in the position shown in Figs. 2 and 3, in which respect this double-circuit apparatus differs from that hitherto used. The armature-lever *m'* connects with a rod, $m^2$, which carries a tappet, $m^3$, that acts upon a spring, *f*, and closes the same whenever the main magnet is vitalized, and this spring remains closed as long as the armature-lever *m'* is locked by the armature-lever *e'* of the locking-magnet. With the two magnets *m e* is combined an additional magnet, *j*, which is in the circuit of the main magnet *m*. The armature-lever *j'* of the additional magnet is connected with a rod, $j^2$, which carries a tappet, $j^3$, that acts on a circuit-closing spring, *g*, so as to close the same.

In Fig. 1, the letter A designates the railroad-track. B and E are signals. D and G are track-instruments, and X X' are batteries.

The track-instruments, Figs. 4 and 5, consist of track-levers T, which, when their free ends are depressed by the wheels of a passing train or otherwise, act upon a rod, *t*, which carries a piston, *t'*, moving in an air-cylinder, $t^2$, and the upper tapering end of said rod acts upon circuit-closing springs *c d*, Fig. 5, so that the spring *c* is opened and the spring *d* is closed. The cylinder $t^2$ forms an air-cushion which retards the downward motion of the rod *t*, so that the spring *c* is held open and the spring *d* is held closed for a short period of time after the wheels have passed the track-lever. With each of the signals, except the first in the line, is combined a circuit-closing spring, *k*, which is closed by a cam, *k'*, mounted on the pin $k^2$, which forms the axis of the signal, said cam being in such a position that it depresses and closes the spring when the signal is down in its position of "danger." (See Fig. 6.)

In their normal position the signals E show "safety," and the circuits through the springs *c c'* of the track-instruments D G are closed. If the train which moves in the direction of arrow 1 reaches the track-instrument D, Fig. 1, the spring *c* is opened and the circuit through wire 10, electro-magnet *e*, wire 11, spring *f*, wire 12, signal-magnet *h*, wire 13, spring *c*, wire 14, and ground, back to battery X, is broken, the signal B drops down to "danger," and the train in the section is protected against a following train. At the same time the circuit through the locking-magnet *e* is broken, the armature of the main magnet *m* falls back, and the spring *f* opens. The signal B cannot be raised to "safety" until the spring *f* is again closed, as will be presently explained. As the train proceeds and reaches the track-instrument G the spring *c'* is opened and the spring *d'* is closed. By opening the spring *c'* the circuit through the signal-magnet *h'* is broken and the signal E drops down to "danger," and as it drops the cam *k'*, Fig. 6, on the signal-shaft closes the spring *k*, and since the spring *d'* is held closed as long as the train passes over the track-in-

strument, and a little longer, by the air-cushion, as previously stated, a circuit is closed from battery X, through wires 10 15, main magnet *m*, wire 16, additional magnet *j*, wire 17, spring *k*, wire 18, spring *d'*, wire 19, to ground G*, and through ground G° and wire 20 back to battery X, the armature of main magnet *m* is attracted, spring *f* is closed, and a circuit is closed from battery X, through wire 10, locking-magnet *e*, wire 11, spring *f*, wire 12, signal-magnet *h*, wire 13, spring *c*, wire 14, to ground D°, thence through ground G° and wire 20 back to the battery; but at the same time, by the circuit through spring *k* and wire 17, above named, the additional magnet *j* is vitalized and the spring *g* is closed, and a short circuit is closed, from battery X, through wire 10, locking-magnet *e*, wire 11, spring *f*, wire 22, spring *g*, wire 21, to ground *g*°, thence through G and wire 20 back to the battery, and as long as this short circuit remains closed the signal B remains at "danger," while the locking-magnet is vitalized and the armature of the main magnet *m* is locked, so as to retain the spring *f* in its closed position. The short circuit above named is kept closed as long as the wheels of the passing train act upon the track-instrument G, and it is not opened before the spring *d'* opens. When this spring opens, the circuit through additional magnet *j* is broken, the spring *g* opens, the short circuit is broken, and the circuit through signal-magnet *h* raises the signal B to "safety." The signal B, therefore, will not be raised to "safety" until the train has passed clear out of the section. As the train passes the track-instrument G the spring *c'* is opened and the signal E drops to "danger," so as to protect the train until it passes the next succeeding track-instrument.

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

1. The combination, substantially as herein-before described, of the locking-magnet *e*, the main magnet *m*, the spring *f*, actuated by the armature of main magnet, the signals B E, the signal-magnets *h h'*, the spring *k*, actuated by the signal-magnet, and the springs *c c' d'*, actuated by the wheels of a passing train, and the batteries X X' and circuit-connections, as described.

2. The combination of the magnet *e*, constructed to lock the armature of the main magnet, (when it is vitalized,) the main magnet *m*, the additional magnet *j*, the springs *f* and *g*, and the circuit-connections therefor, as set forth, the main and additional magnets being situated in the same circuit, all as and for the purpose described.

3. The combination, substantially as herein-before described, of the circuit-breaking spring *c*, actuated by the wheels of a passing train, the signal-magnet *h* and its signal B, the magnet *m*, the spring *f*, actuated by the armature of the main magnet, the locking-magnet *e*, an additional circuit-closer, the circuit-connections through *e* and *m*, and the battery X, said locking-magnet and spring *f* being in the circuit of the signal-magnet.

4. The combination, substantially as herein-before described, of the additional magnet *j*, the spring *g*, actuated by the armature of said additional magnet, the main magnet *m*, the spring *f*, actuated by the armature of the main magnet, the spring *k*, actuated by the signal E, the spring *d'*, actuated by the wheels of a passing train, the battery X, and the shunt and signal circuits, as described, the main magnet, the additional magnet, and the springs *k d'* forming parts of the same circuit.

In testimony whereof I have hereunto set my hand and seal in the presence of two subscribing witnesses.

ALVAH W. HALL. [L. S.]

Witnesses:
W. HAUFF,
E. F. KASTENHUBER.