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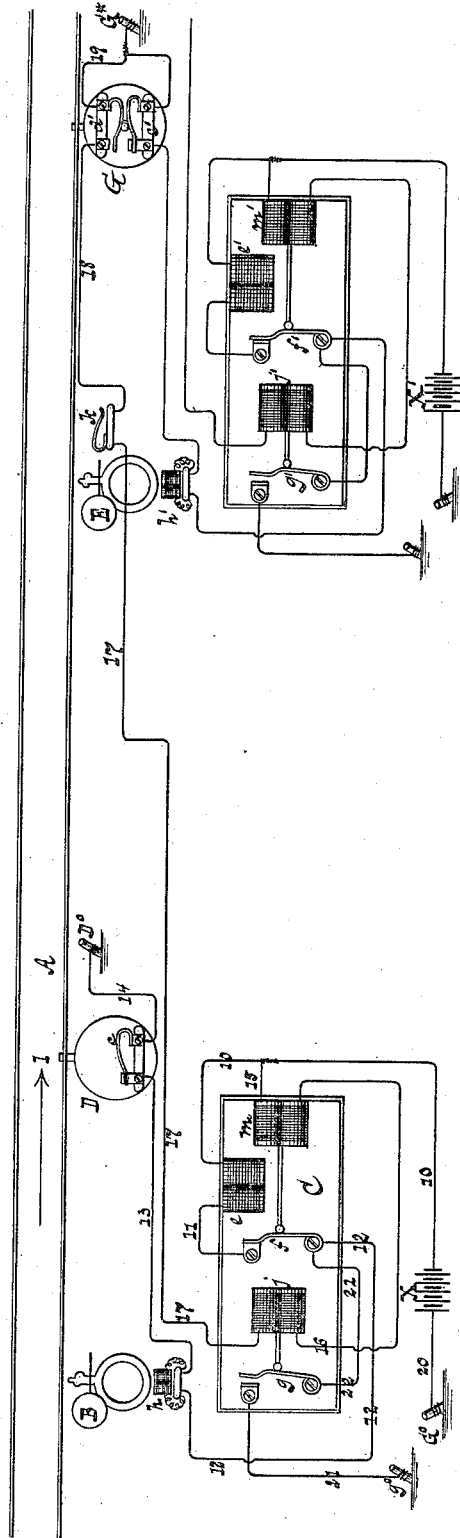
A. W. HALL.

ELECTRIC RAILROAD SIGNAL APPARATUS.

No. 301,361.

Patented July 1, 1884.

Fig. 1.



WITNESSES:

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INVENTOR

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(No Model.)

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Fig. 2.

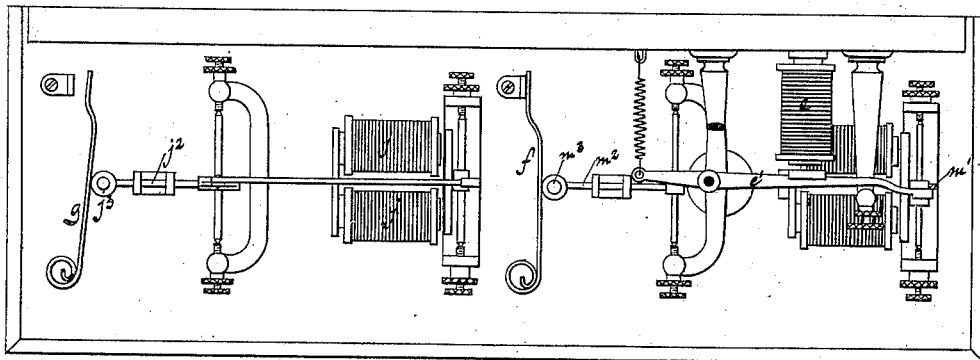


Fig. 3.

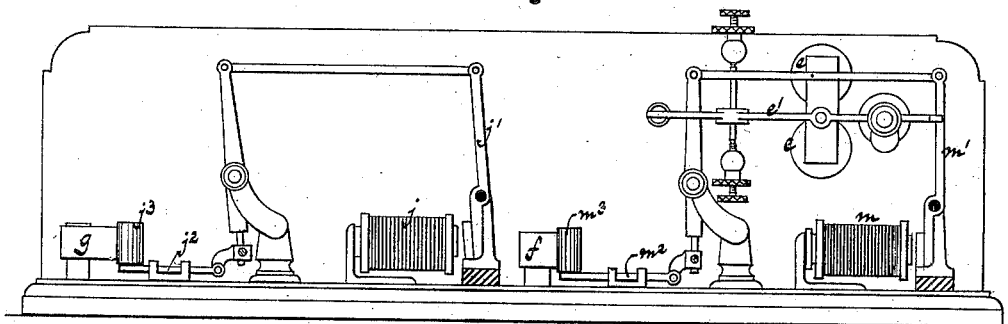
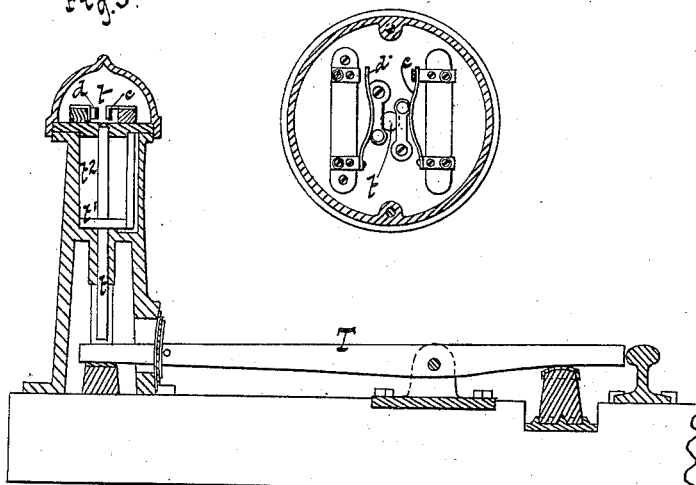


Fig. 4.

Fig. 5.



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(No Model.)

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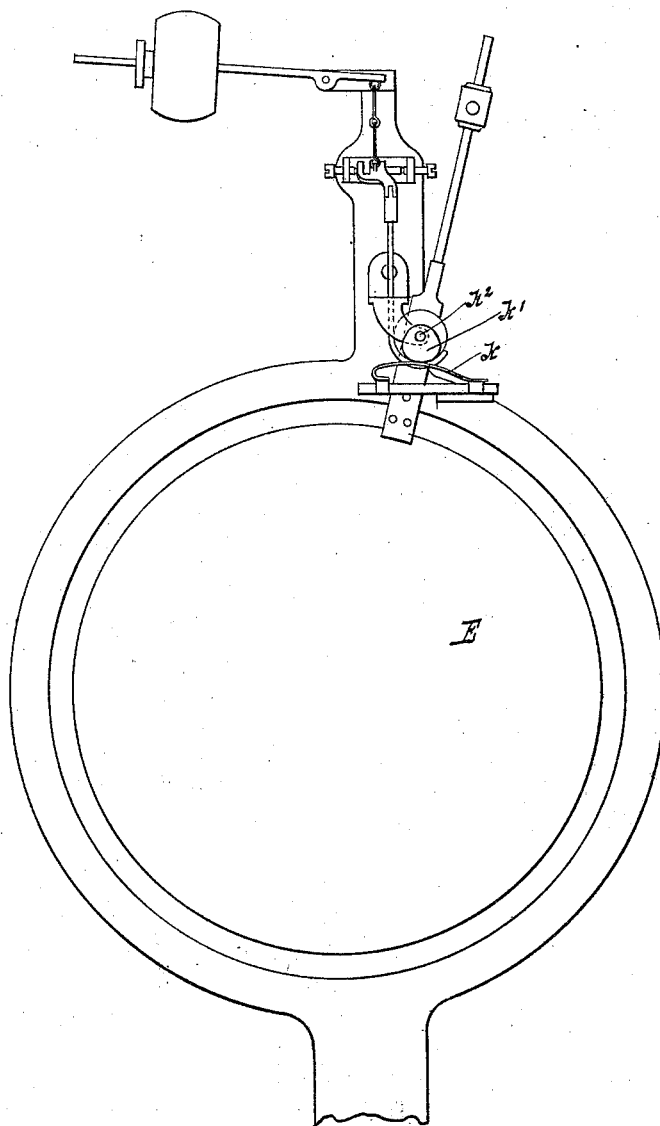
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Fig. 6.



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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, *m²*, which carries a tappet, *m³*, 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, *j²*, which carries a tappet, *j³*, 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, *t²*, 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 *t²* 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 *k²*, 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* *e'* 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 *e*, 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 hereinbefore 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 hereinbefore 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 hereinbefore 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.