No. 897,524. PATENTED SEPT. 1, 1908.

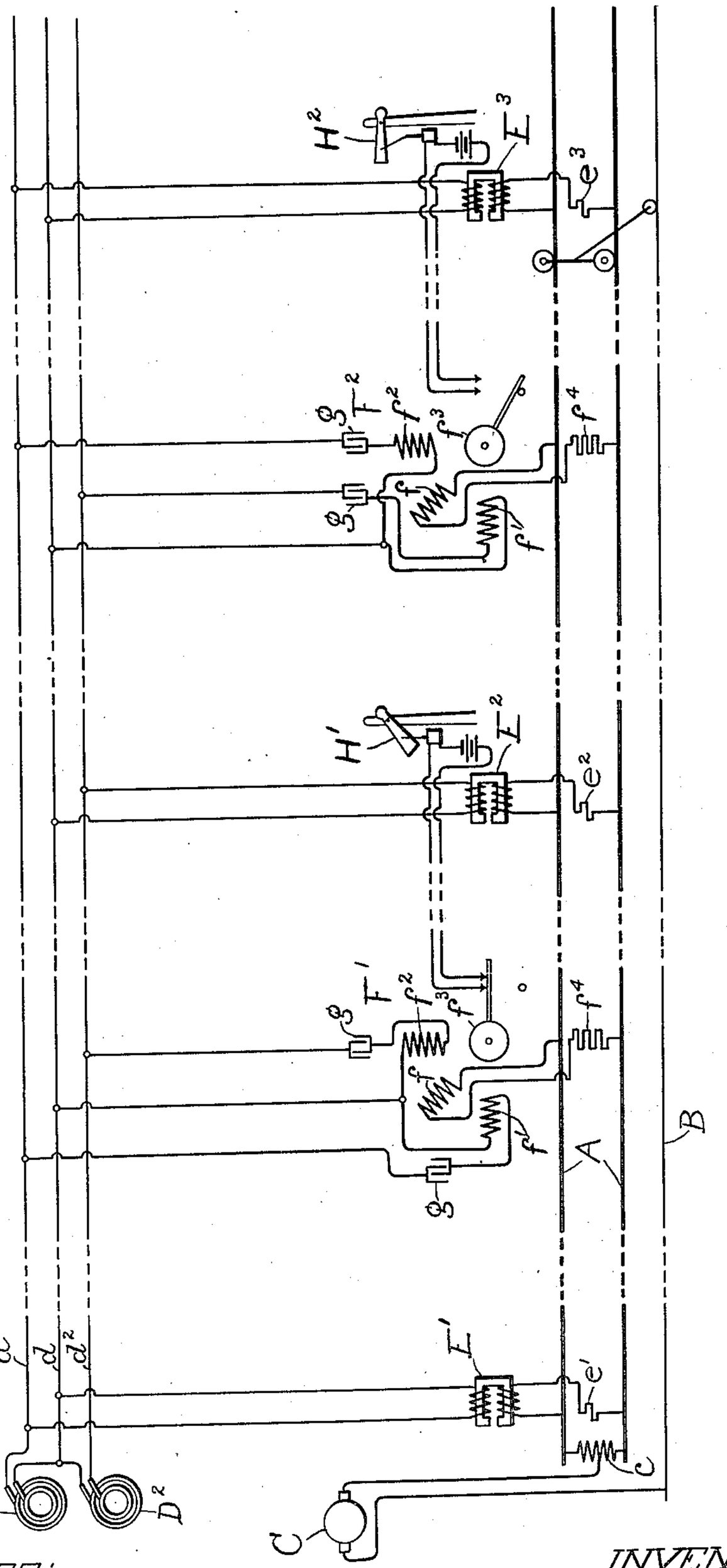
F. B. COREY.

BLOCK SIGNAL SYSTEM.

APPLICATION FILED NOV. 2, 1906.

2 SHEETS—SHEET 1.

Fig. 1



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ATT'Y.

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2 SHEETS—SHEET 2.

Fig. 2

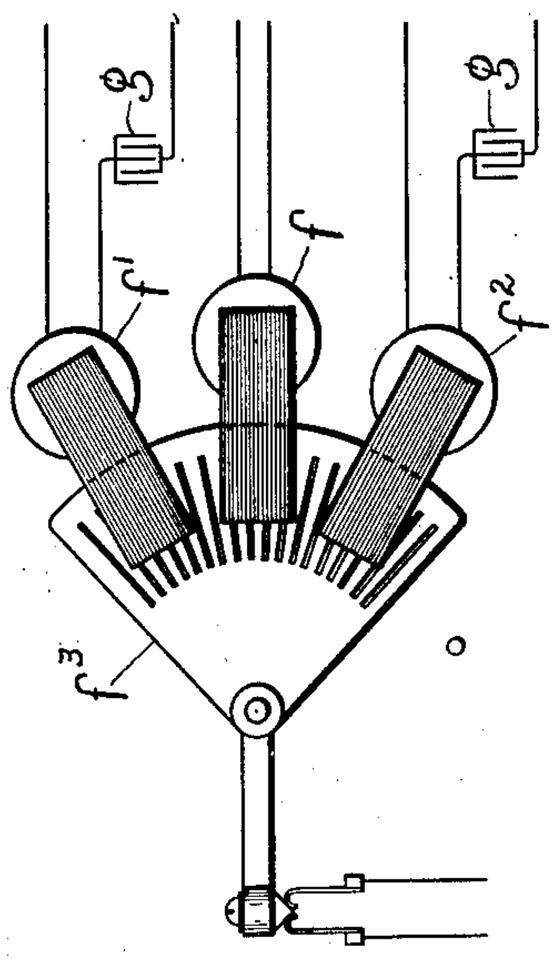
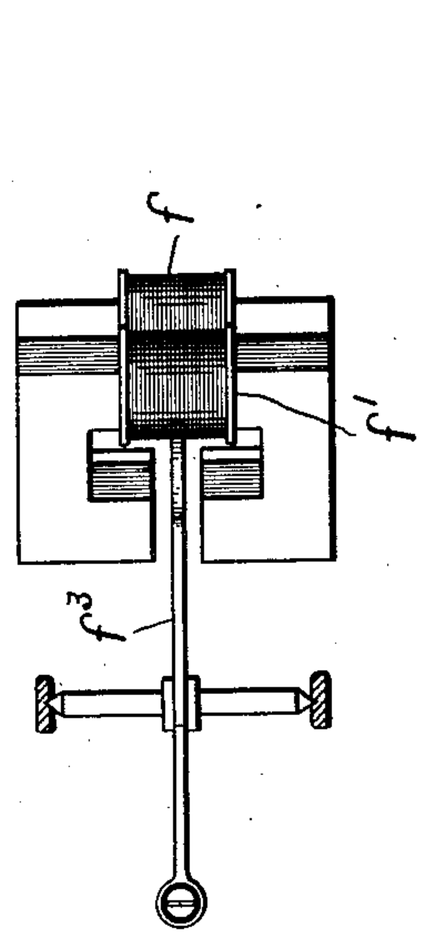


Fig. 3



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UNITED STATES PATENT OFFICE.

FRED B. COREY, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

BLOCK-SIGNAL SYSTEM.

No. 897,524. Specification of Letters Patent. Patented Sept. 1, 1908.

Application filed November 2, 1906. Serial No. 341,762.

To all whom it may concern:

Be it known that I, FRED B. COREY, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Block-Signal Systems, of which the following is a specification.

My invention relates to block signal systems for electric railways, and consists in an improvement in the system disclosed in an application filed August 6, 1906, by L. A. Hawkins, Serial No. 329,347, assigned to the General Electric Company. In that application is disclosed a system in which both the track-rails are continuous to serve as return conductors for the power-current, and alternating voltages of different frequencies are impressed at intervals on the track which actuate relays, each arranged to respond to one frequency only. Two relays may be placed at a point between two sources of different frequency, each relay responding to one of the frequencies, and the two relays jointly controlling the signal for the track section between the sources.

My invention consists in providing a single relay adapted to take the place of the two relays above mentioned. I secure this result by providing the relay, in addition to its track winding, with windings coöperating therewith and supplied independently of the track with currents of the same frequencies as are supplied to the track-rails adjacent to the relay.

My invention will best be understood by reference to the accompanying drawing, in which

Figure 1 shows diagrammatically a signal system provided with relays in accordance with my invention; Fig. 2 shows a side elevation of one of the relays; and Fig. 3 a plan view of the same.

In Fig. 1, A represents the track-rails, which are electrically continuous throughout their length. B represents the third-rail, or other supply-conductor, which is connected to one terminal of the generator C, which furnishes the power-current for the road. The other terminal of the power-generator C may be connected to the track-rails A through a differential choke-coil *c*. D^1 and D^2 represent alternating-current generators of high frequency, the current delivered by the two generators differing in frequency. *d*, d^1 and d^2 represent line-wires connected to the generators; the line-wire *d* serving as a common return for the currents of both frequencies. E^1 E^2 and E^3 represent transformers which have their primary windings connected to the line-wires and secondary windings connected to the track-rails, so as to impress alternating-current voltages on the track-rails at intervals. Small resistances e^1 e^2 may be employed to prevent an excessive flow of power-current through the transformer windings. It will be noted that adjacent transformers have their primaries connected to line-wires of different frequencies. F^1, F^2, etc., represent relays, each of which has a winding *f* connected to the track-rails through a resistance f^4 at a point between two transformers. This winding *f* is in inductive relation to a short-circuited secondary member f^3, which actuates the relay contacts. Coöperating with the winding *f* are two other windings f^1 and f^2, which are connected through suitable phase-controlling devices, such as condensers *g*, to the line-wires. The winding f^1 is connected to the same line-wires as the transformer E^1, and the winding f^2 is connected to the same line-wires as the transformer E^2. Consequently, these windings are supplied independently of the track with currents of the same frequencies as the currents that are impressed upon the track by the transformers E^1 and E^2. Consequently the current in the winding f^1 coöperates with that portion of the current in the winding *f* which is supplied from transformer E^1 to produce a torque upon the secondary member f^3. Similarly the current in the winding f^2 coöperates with that portion of the current in winding *f* which is supplied from the transformer E^2 to produce a torque on the secondary member. The windings are so arranged that these torques assist each other and the relay is so designed and proportioned that the coöperating effect of both windings f^1 and f^2 is required in order to hold the secondary member in closed-circuit position. Consequently, if a rail breaks, or if one of the transformers is short-circuited by a train, the relay torque will be insufficient to hold the relay contact closed, and the signal H^1 controlled by the relay will go to danger. Thus, I have shown a train between the transformers E^2 and E^3 short-circuiting the transformer E^3, so that the relay F^2 has dropped its armature and signal H^2 is at danger. Owing to the high impedance offered by the

rails to the high-frequency current, a train which is on the farther side of a transformer from a relay has little effect on the relay, so that the blocks may be made nearly as definite in length as though insulating joints were used.

A suitable construction of the relay is shown in Figs. 2 and 3. In these figures the short-circuited conducting member f^3 is shown as a slotted sector mounted on suitable pivots and carrying any suitable form of contact. Three C-shaped cores are placed with their poles on opposite sides of the sector f^3 and on the central one of these cores is mounted the track-winding f. The coöperating windings f^1 and f^2 are mounted on the two outside cores, as shown in the figures. With this arrangement both of the outer windings coöperate with the middle winding to produce a torque as long as the middle winding is traversed by currents corresponding in frequency to that of both outer windings.

What I claim as new, and desire to secure by Letters Patent of the United States, is,—

1. In a block-signal system, a signal-controlling relay having one winding connected to the track-rails and a plurality of windings supplied with current from a plurality of different circuits carrying currents of different frequencies and coöperating with the track-winding to control the signal.

2. In a block-signal system, means for supplying to the track-rails simultaneously a plurality of currents differing in character, and a signal-controlling relay having one winding connected to the track-rails and windings supplied independently of the track with currents corresponding in character to those supplied to the track and coöperating with the track winding to control the signal.

3. In a block-signal system, means for supplying to the track-rails a plurality of alternating-currents of different frequencies, and a signal controlling relay having one winding connected to the track-rails and windings coöperating therewith supplied independently of the track with currents corresponding in frequency to those supplied to the track.

4. In a block-signal system, a signal-controlling relay comprising a short-circuited conducting member, a winding connected to the track-rails and in inductive relation to said short-circuited member, and a plurality of windings connected to different circuits and coöperating with the track-winding to produce a torque on said member.

5. In a block-signal system, means for supplying to the track-rails a plurality of alternating-currents differing in character, and a signal-controlling relay comprising a short-circuited conducting member, a winding connected to the track-rails and in inductive relation to said member, and windings supplied independently of the track with currents corresponding in character to those supplied to the track and coöperating with the track winding to produce a torque on said member.

6. In a block-signal system, means for supplying to the track-rails a plurality of alternating-currents differing in frequency, and a signal-controlling relay comprising a short-circuited conducting member, a winding connected to the track-rails and in inductive relation to said member, and windings supplied independently of the track with currents corresponding in frequency to those supplied to the track and coöperating with the track winding to produce a torque on said member.

In witness whereof, I have hereunto set my hand this 1st day of November, 1906.

FRED B. COREY.

Witnesses:
ALEX. F. MACDONALD,
HELEN ORFORD.