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C. F. HOOVER.

ELECTRIC RAILWAY SIGNAL.

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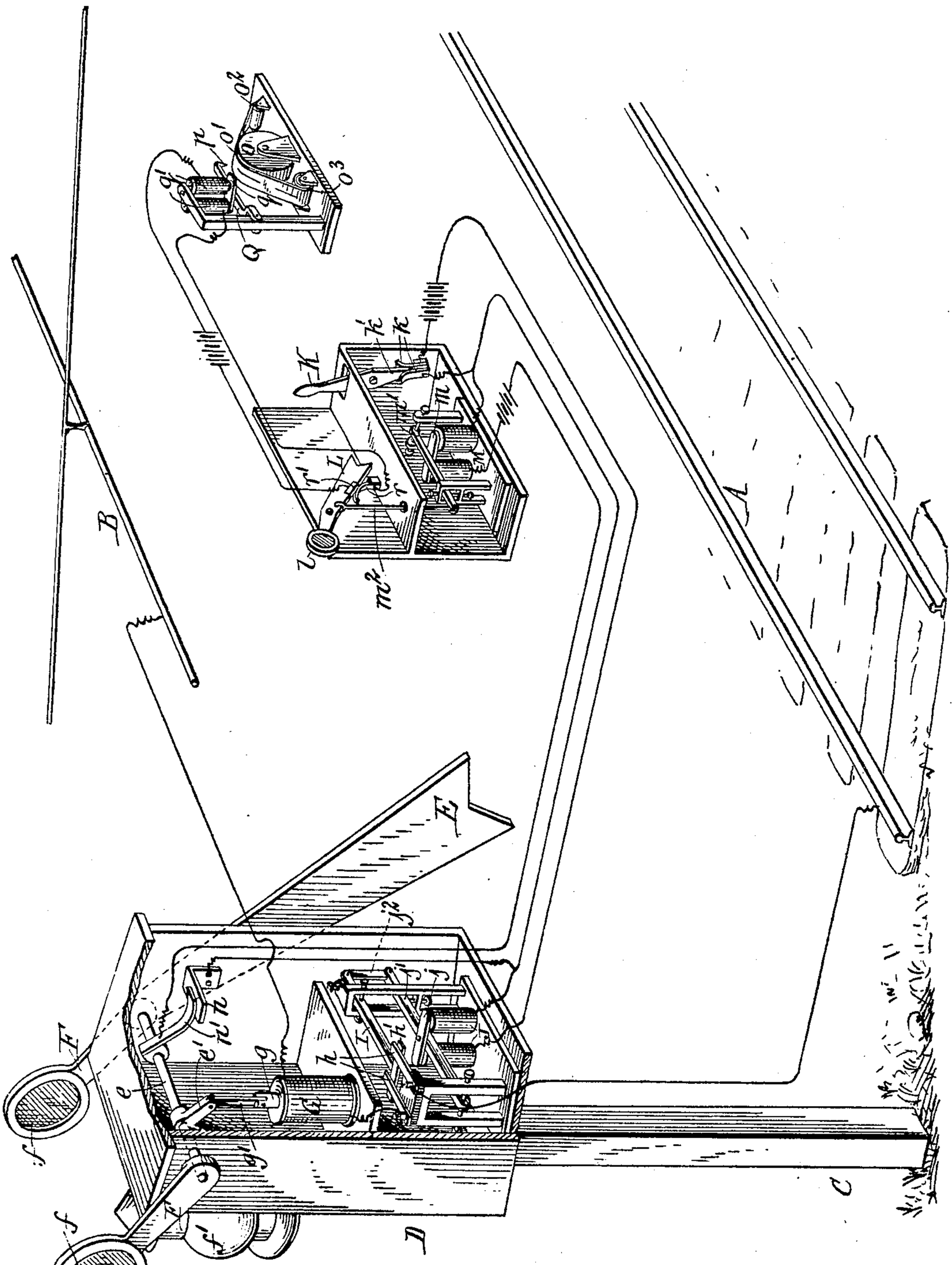

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ELECTRIC RAILWAY-SIGNAL.

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To all whom it may concern:

Be it known that I, CHARLES F. HOOVER, a citizen of the United States, residing at Lockport, in the county of Niagara and State of New York, have invented new and useful Improvements in Electric Railway-Signals, of which the following is a specification.

This invention relates to an electric railway-signal which is controlled at a place located remote from the signal.

The objects of this invention are to provide a signal of this character which is simple in construction and reliable in operation and which permits of positively determining the condition of the signal.

The accompanying drawing is a diagrammatic perspective view showing my improved signal applied to an electric railway.

Similar letters of reference indicate corresponding parts in the drawing.

A represents the railway or track arranged on the road-bed, and B the overhead trolley-wire, which are connected, respectively, with opposite poles of an electric generator or dynamo in any well-known manner commonly employed in electric-railway construction, so that the same serve as conductors for supplying the current to the motor of the electric car running on the track.

C represents a signal pole or standard arranged alongside of the track and carrying an elevated housing or casing D, in which parts of the signal mechanism are inclosed.

E represents the main indicator or signal, consisting, preferably, of a vertically-swinging semaphore-arm, which gives the danger-signal when arranged in a horizontal position and gives either a cautionary or safety signal when in a more or less pendent or inclined position, according to the system in general use. The inner end of the semaphore-arm is connected with one of the outer ends of a horizontal rock-shaft *e*, which extends lengthwise through the upper part of the housing D and is journaled in bearings in the side walls thereof. The rock-shaft is provided with a weight which serves to raise the semaphore into the danger position when unrestrained. This weight preferably consists of two arms F, arranged at opposite ends of the rock-shaft outside of the housing and projecting therefrom in a direction opposite to the semaphore-arm. The weight-arms F are provided with panes *f* of red glass, which in the horizontal position of the semaphore are arranged on opposite sides of a lantern *f'*, so as to give the danger-signal at night in both directions of the track.

The semaphore-arm may be held in its cautionary or safety position by a magnetic shifting device of any suitable construction; but I prefer to employ for this purpose a solenoid-magnet having its coil G arranged vertically in the upper part of the housing and its core *g* connected by a link *g'* with a rock-arm *e'*, which is arranged on the rock-shaft on the same side as the semaphore-arm. Upon energizing the solenoid its core is drawn downwardly, thereby turning the rock-shaft in the direction for depressing the semaphore-arm. When the solenoid in deënergized, its core is released, permitting the weight-arms to turn the rock-shaft in the opposite direction and elevate the semaphore-arm. The coil of the solenoid is arranged in a main electric circuit, which is supplied from a generator of comparatively high voltage in order to obtain the required power for lowering the semaphore. This current is preferably derived from the same source which supplies the current for driving the car-motor by connecting opposite ends of the solenoid-coil with the trolley-wire and the track, as shown in the drawing, whereby the solenoid is arranged in shunt with the car-circuit. The opening and closing of the main or shunt circuit is effected by a main or relay switch, which is controlled from the office of the train despatcher, which is located more or less remote or distant from the main signal. The relay-switch is arranged in the lower part of the housing D and consists, preferably, of two fixed contacts *h h*, arranged in the shunt-circuit on one side of the solenoid, and a movable contact *h'*, which is adapted to connect or disconnect the fixed contacts. The movable contact is mounted on one arm of a rock-lever I. This lever is turned by a relay or auxiliary magnetic shifting device having its coils J arranged in an auxiliary electric circuit, which is opened or closed by a manual switch located at the train-despatcher's office. This manual switch may be constructed in any suitable manner, that shown in the drawing consisting of two fixed contacts *k*, arranged in the auxiliary circuit, and a movable switch-contact *k'*, formed on a hand-lever K and adapted to connect and disconnect the fixed contacts *k*. The armature *j* of the auxiliary shifting device is mounted on a rock-arm *j'*, which is connected at one end by a link j^2 with the other arm of the rock-lever I. Upon closing the auxiliary circuit by means

of the manual switch the coils of the auxiliary magnet become energized and cause the rock-lever I to turn in the direction for raising the movable contact h' into engagement with its companion fixed contacts, thereby closing the main circuit and causing the semaphore-arm to be depressed. Upon opening the manual switch and auxiliary circuit the auxiliary magnet becomes deënergized, permitting the movable contact h' to move out of engagement from the fixed contacts h h, thereby opening the main or shunt circuit and permitting the weights F to raise the semaphore-arm. The movable contact h' when free is preferably disengaged from the fixed contacts by making the respective arm of the rock-lever I which carries the same sufficiently heavy for this purpose.

For the purpose of enabling the train despatcher to determine at his office the position of the main semaphore a return-indicating device is provided which is constructed as follows: L represents a dummy indicator or semaphore-arm, which is pivoted on a support to turn in a vertical plane and provided with a weight l for turning the same into a horizontal or danger-indicating position when the dummy semaphore is unrestrained. This semaphore is turned into a depressed or safety-indicating position by means of a return magnetic shifting device having its coils M arranged in a return electric circuit. The armature m of the return-magnet is mounted on a rock-arm m', which is connected by a link m^2 with the dummy semaphore. The return-circuit is opened and closed by a return-switch, which is controlled by the operating mechanism of the main semaphore and which consists, preferably, of a fixed contact n and a movable contact n', mounted on the rock-shaft e and adapted to connect and disconnect with the stationary contact n. When the main semaphore is depressed, the movable return-contact n' is engaged with the fixed contact n, thereby closing the return-circuit and causing the return-magnet to depress the dummy semaphore. When the main semaphore rises, the return switch and circuit are opened, permitting the dummy semaphore to also rise.

In order to obtain a record of the condition of the signal and enable the responsibility of railway accidents to be definitely placed, a recording device is combined with the signaling system, which is constructed as follows: Although various recording devices may be employed, I prefer to employ a recorder in which a movable recording-surface is moved past a marker. The essential parts only of this recording device are shown in the drawing and consist of a drum o, which is rotated regularly by a spring-motor, such as is commonly used in clockworks, a recording band or tape o', which unwinds from one roll o^2 and winds upon another roll o^3, while its intermediate part passes over the drum, and a marker p, which is movable toward and from the surface of the band. The record is preferably produced by blackening the face of the band and scratching off the blackening from the band by means of the marker for producing white record-lines. The movement of the marker toward and from the recording-surface is controlled by a recording-magnet, the armature q of which is secured to a rock-arm Q, which carries the marker. The coils q' of the recording-magnet are arranged in a recording electric circuit containing a recorder-switch, which is controlled by the signaling mechanism. This switch preferably consists of a fixed contact r and a movable contact r', arranged on the arm of the dummy semaphore. When the latter is depressed, the record-switch is closed, causing the record-magnet to raise the marker out of engagement from the recording-surface; but when the dummy semaphore is raised the record-switch is opened, causing the record-magnet to release the marker and permit the latter to drop on the recording-surface. While in this position, the marker produces a record on the band, which is moved past the same at the same rate as the movement of a clock. By this means an automatic record is obtained of the position of the semaphore at all times, and any dispute relative thereto is avoided.

It is of course understood that a plurality of main semaphores or indicators are arranged at suitable intervals or stations along the track and that a manual switch, a dummy semaphore or indicator, and a recorder are arranged at the train-despatcher's office for each main semaphore.

The current necessary for operating the auxiliary or relay magnet, the return-signal magnet, and the recorder-magnet is comparatively light, the current for the several relays and return-signal magnets being varied according to their respective distance from the main signal with which they coöperate.

It will be observed that in my improved signaling system the various parts of the mechanism are held in safety position when the several circuits are closed. If any of the wires become broken or the circuits are otherwise interrupted, the signal mechanism indicates "danger," thus increasing the reliability of the system, owing to the immediate detection of trouble.

I claim as my invention—

1. In an electric railway-signal, the combination of the track and the overhead wire which supply the current for electric cars, a rock-shaft having an actuating rock-arm and a semaphore-arm, a solenoid-magnet having its coil arranged in a shunt-circuit connected with said track and wire and having its core connected by a link with said rock-arm, a relay-switch for said solenoid comprising two fixed contacts arranged in the shunt-circuit and a movable contact adapted to connect or

disconnect the fixed contacts, a rock-lever supporting the movable contact on one of its arms, an auxiliary electromagnet for operating the movable switch-contact having its coils arranged in an auxiliary electric circuit, a rock-arm carrying the armature of said auxiliary magnet and connected by a link with the other arm of said rock-lever, and a manual switch for opening or closing said auxiliary circuit, substantially as set forth.

2. An electric railway-signal comprising a rock-shaft carrying a main semaphore, a magnetic shifting device for operating said shaft arranged in a main electric circuit, a return-semaphore pivoted on a support arranged remote from the main semaphore, a return-magnet having its coils arranged in a return electric circuit, a rock-arm carrying the armature of the return-magnet and connected by a link with the return-semaphore, and a switch controlling said return-circuit and consisting of a stationary contact and a movable contact secured to said shaft and adapted to be engaged or disengaged with the stationary contact, substantially as set forth.

3. An electric railway-signal comprising a main indicator, a main magnetic shifting device for operating the main indicator arranged in a main electric circuit, a relay-switch controlling the main circuit, an auxiliary magnet operating the relay-switch and arranged in an auxiliary electric circuit, a manual switch for controlling the auxiliary magnet located remote from the main indicator, a return-indicator located near said manual switch, a return-magnet for operating the return-indicator arranged in a return electric circuit, and a return-switch controlling the return-circuit and operated by the shifting device of the main indicator, substantially as set forth.

4. An electric railway-signal comprising a main indicator, a main magnetic shifting device for operating the main indicator, a return-indicator located remote from the main indicator, a magnetic shifting device for operating the return-indicator arranged in a return electric circuit, a return-switch controlling said return-circuit and operated by said main-indicator-shifting device, a recording device, a magnetic controller for said recording device arranged in an electric circuit, and a switch arranged in the circuit of said magnetic controller and operated by the shifting device of the return-indicator, substantially as set forth.

5. An electric railway-signal comprising a main movable indicator, a main magnetic shifting device for operating the main indicator arranged in a main electric circuit, a return-indicator located remote from the main indicator and consisting of a pivoted semaphore-arm, a return-magnet operating said return-indicator and arranged in a return electric circuit, a return-switch arranged in said return-circuit and operated by the shifting device of the main indicator, a recording device comprising a movable record-surface, a marker movable toward and from said surface, a rock-arm carrying said marker, a recorder-magnet arranged in a recording electric circuit and having its armature connected with said rock-arm, and a switch controlling the recording-circuit and having a stationary contact and a movable contact mounted on said return semaphore-arm, substantially as set forth.

Witness my hand this 8th day of January, 1904.

CHARLES F. HOOVER.

Witnesses:

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