(No Model.)

C. D. TISDALE.

ELECTRIC RAILWAY SIGNAL.

No. 359,040. Patented Mar. 8, 1887.

Fig. 1

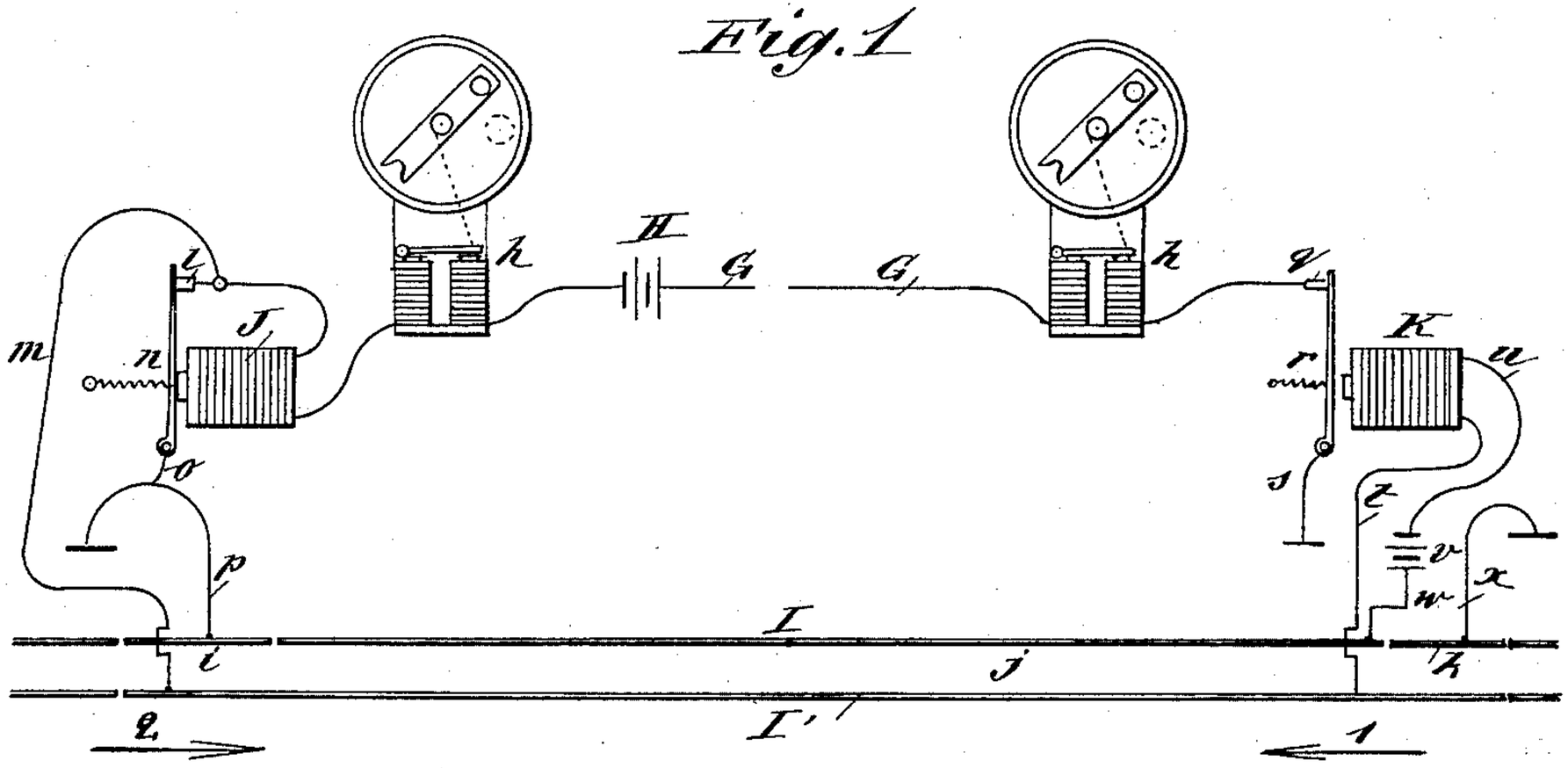


Fig. 3

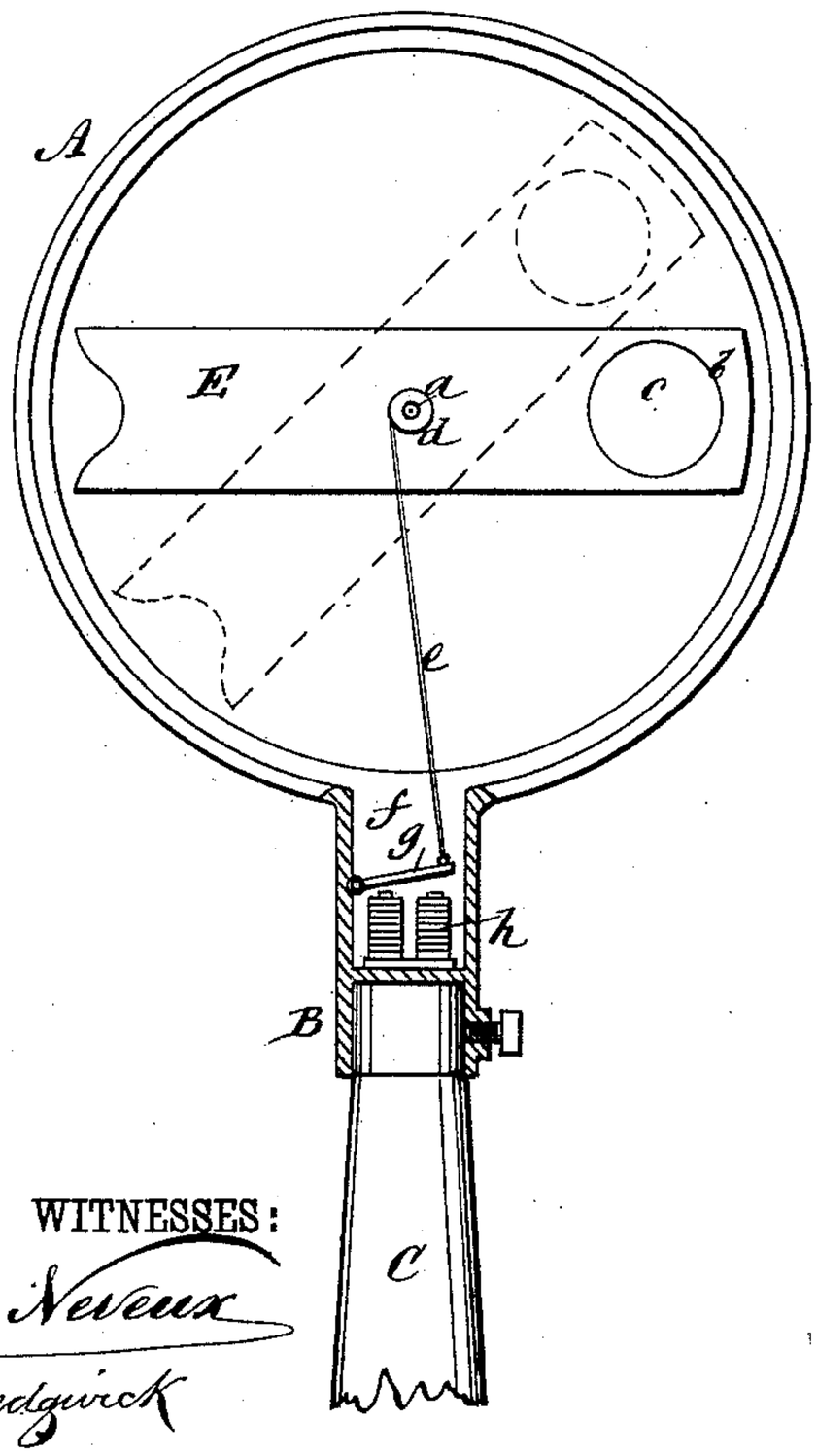
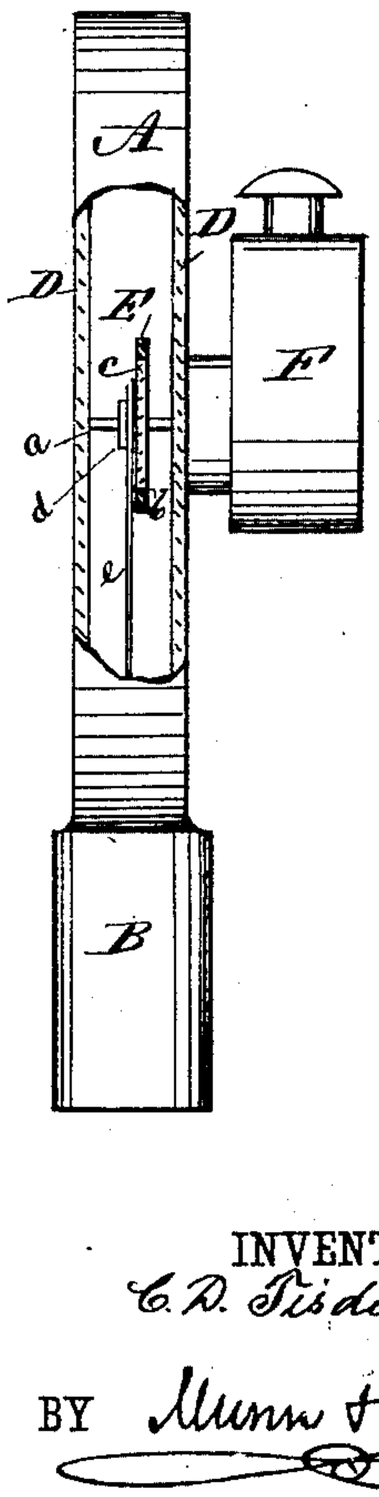


Fig. 2



WITNESSES:

C. Neveux

C. Sedgwick

INVENTOR:

C. D. Tisdale

BY Munn & Co.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

CHARLES D. TISDALE, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO JOSEPH BENSON, OF SAME PLACE.

ELECTRIC RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 359,040, dated March 8, 1887.

Application filed January 13, 1886. Serial No. 188,482. (No model.)

To all whom it may concern:

Be it known that I, CHARLES DARWIN TISDALE, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Electric Railway-Signals, of which the following is a specification, reference being had to the annexed drawings, forming a part thereof, in which—

Figure 1 is a diagram representing the circuit. Fig. 2 is a side elevation of a semaphore. Fig. 3 is a front elevation.

Similar letters of reference indicate corresponding parts in the different figures of the drawings.

My invention relates to the class of railway-signals employed to protect a section of the track occupied by a train from the entrance on the same section of another train while the section is occupied.

My invention consists in an improved arrangement of circuits, relays, and signal-magnets, whereby a signal of "danger" is displayed when a train enters the section to be protected, and is withdrawn when the train leaves the section and the track is clear.

My invention further consists in a semaphore arranged to be operated by an electro-magnet in the main-line circuit, the semaphore-arm being provided with a colored disk and inclosed in a glass casing to protect it from the lateral pressure of wind and to shield it from snow, rain, and sleet.

In carrying out my invention I employ for each section two or more electric semaphores, two relays, two electric batteries, a line-wire, and the track-rails.

The frame A of the semaphore is annular in form, and is provided with a socket, B, for receiving the top of the post C, which supports the signal. To the sides of the annular frame A are secured circular glass plates D, in the centers of which are formed journal-bearings for the spindle *a*. To the spindle *a* is secured the semaphore-arm E, which is formed of any suitable material having very little weight, and in one end of the arm E is formed a circular aperture, *b*, which is closed by a transparent disk, *c*, of colored glass, gelatine, or cloth.

The glass sides D of the semaphore-case are transparent, and to one side of the casing is secured a lantern, F, of ordinary construction, opposite the path of the colored disk *c* in the semaphore-arm E and in position to shine through the colored disk when the arm E is in a horizontal position, as represented in full lines in the drawings.

On the spindle *a* of the semaphore arm E is secured a small drum, *d*, for receiving a cord, *e*, one end of which is wound around the drum and fastened thereto, the opposite end extending downward into the magnet-chamber *f* in the socket B, where it is secured to the free end of the armature-lever *g* of the signal-magnet *h*. When the track protected by the signal is clear, the current flows through the magnet *h*, which, through the attraction of its armature *g*, draws the cord *e*, turning the semaphore-arm E on its pivot, and, withdrawing the colored disk *c* from before the lantern, holds the semaphore in an inclined position, as indicated in dotted lines in Fig. 3.

The end of the semaphore-arm E, which is provided with the colored transparent disk *c*, being heaviest, the semaphore-arm is thrown into the position shown in full lines in Fig. 3 by its own gravity, when the current ceases to flow through the signal-magnet *h*. It remains in this position so long as the track is occupied, indicating "danger" while it is in a horizontal position in the day-time, or while the light emitted by the lantern passes through the colored disk *c* at night; but by the arrangement of the circuit presently to be described, when the section to be protected is not occupied, the current is made to flow through the signal-magnet *h*, when the magnet attracts its armature *g*, and by drawing down the cord *e* removes the colored disk *c* from before the lantern and places the semaphore in an inclined position, thus indicating by the white light at night and by the inclined position of the semaphore in the day-time that the track-section is clear.

In the diagram shown in Fig. 1, in which the circuit and the semaphore are represented diagrammatically, the signal-magnets *h* are placed in the line G, near the ends of the track-section to be protected, and a main-line battery, H, is inserted in the line at some convenient point.

The track-rails I I′ form part of the con-

ductors of the system, the rail I being divided into sections *i j k*, and the rail I′ being separated at the ends of the section from the rail I′ of the adjacent sections.

The line-wire G, at one end of the section outside of the signal-magnet *h*, is connected with one terminal of a relay-magnet, J, the other terminal of the magnet being connected with a front contact-point, *l*, and with the track-rail I′ by the wire *m*. The armature-lever *n* of the relay-magnet J is connected with the ground by the wire *o*, and is brought into contact with the contact-point *l* when the current passes through the magnet, and grounds the line through the wire *o*.

The short section *i* of the track-rail I is connected with the ground by the wire *p*. The line-wire G, at the opposite end of the section, terminates in a back contact-point, *q*, which lies in the path of the armature-lever *r* of the relay-magnet K, the armature-lever *r* being connected with the ground by the wire *s*.

The armature-levers of the relay-magnets J K are provided with the usual retractile springs. One terminal of the relay-magnet K is connected by a wire, *t*, with the track-rail I′. The other terminal is connected by a wire, *u*, with the battery *v*, and the battery communicates electrically with the track-rail section *j* by the wire *w*.

The short section *k* of the track-rail I is connected with the ground by the wire *x*. When a train enters the track-section formed of the rails I I′ in the direction indicated by the arrow 1, the contact of the wheels of the locomotive and cars with the rail-section *j* and the rail I′ closes the circuit of the battery *v* through the axles of the locomotive and cars, the rail-section *j* and rail I′, the wire *t*, relay-magnet K, wire *u*, and wire *w*. The magnet of the relay, becoming active, draws the armature *r* toward it, breaking the main-line circuit between the contact-point *q* and the armature-lever *r*. The armatures *g* of the signal-magnets *h*, being released, allow the heavier ends of the semaphore-arms E to drop, bringing the semaphore-arms into a horizontal position, which will indicate in the day-time by the position of the arm that the track-section is occupied, and in the night the colored disk *c*, being in front of the lantern, colors the light emitted by the lantern, so that the danger-signal is given, indicating that the track-section is occupied.

When the main-line circuit is broken between the contact-point *q* and the lever *r*, the ground of the opposite end of the line, which was effected through the contact-point *l*, armature-lever *n*, and ground-wire *o*, is destroyed by the release of the armature-lever *n*.

Should the train be derailed, or should any accident happen which would prevent the train from leaving the track-section, the signal on the line-wire G will continue to indicate "danger;" but when the train runs upon the short section *i* of the rail I and brings it into electrical communication with the rail I′, the circuit of the battery *v* will be broken.

When the train leaves the section *j* of the track-rail I, the armature-lever *r* will fall back upon the contact-point *q*, and the line will be grounded at that end of the section through the armature-lever *r* and wire *s*. By the contact of the car-wheel with the short section *i* of the track-rail I, the line is grounded through the track-section *i* and the wire *p*. The signal-magnets *h* are again rendered active, and through the agency of their armatures *g* and the cord *e* turn the semaphore-arms E into a position indicating "safety." At the same time the relay J, which is in the main line, attracts its armature *n*, establishing a ground for the line through the contact-points *l*, armature-lever *n*, and wire *o*, so that when the train leaves the short section *i*, destroying the ground-connections with the track, the line will have a ground through the contact-point *l*, armature-lever *n*, and the ground-wire *o*.

When a train enters the section from the direction indicated by the arrow 2, the contact of the car-wheels with the section *j* of the rail I and with the rail I′ again completes the circuit of the battery *v* through the relay-magnet K, as before described, and draws the armature-lever *r* forward, breaking the main line between the contact-point *q* and the armature-lever *r*, so that the armatures of the signal-magnets are again released, and the semaphore-arms E drop into a position to indicate "danger." At the same time the relay-magnet J, being deprived of the current, releases the armature-lever *n*, breaking the contact between the armature-lever *n* and the contact-point *l*.

When the train leaves the section *j* of the track-rail, the circuit of the battery *v* is again broken, and the armature *r* falls back into contact with the point *q*, completing the line at that end of the section through the ground-wire *s*, and when the wheels form an electrical communication between the rail-sections *k* and I′ the line at the opposite end of the track-section will be grounded through the relay-magnet J, wire *m*, rail-section I′, the wheels and axles of the train, rail-section *k*, and the ground-wire *x*, when the relay-magnet J will be again rendered active and its armature will be drawn forward, completing the ground through the contact-point *l*, lever *n*, and ground-wire *o*, so that when the ground through the rail-section I is destroyed the line will continue to be grounded through the ground-wire *o*.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, in electric railway signaling apparatus, of a track-circuit including the relay-magnet K, battery *v*, conductors *t u w*, the rail-sections *j* I′, and the line G, line-battery H, signal-magnet *h*, back contact-point, *q*, armature-lever *r*, placed within the field of the relay-magnet K, and the wires grounding

the line G at opposite ends, substantially as herein shown and described.

2. In electric railway signaling apparatus, the combination, with the track formed of rails I I′, the rail I being divided into sections *i j k*, insulated from each other, the ground-wires *p x*, connected with the sections *i k*, the relay-magnet K, battery *v*, and conductors *t u w*, forming, with the rail-sections *j* I′ and the wheels and axles of the train, circuit for the battery *v*, of the line G, provided with the line-battery H, the signal-magnets *h*, inserted in the line, the relay J, conductor *m*, communicating between the relay and the track-rail I′, the contact-point *l*, connected with the conductor *m*, the ground-wire *o*, and armature-lever *n*, substantially as herein shown and described.

3. In electric railway signaling apparatus, the combination, with the line G, provided with the battery H, and having at one end the contact-point *q* and at the opposite end a relay-magnet, J, contact-point *l*, and conductor *m*, connected with the track-rail I′, of the armature-lever *n*, connected with the ground by the wire *o* and arranged to ground the line-wire by bringing the armature-lever *n* against the front contact, *l*, the relay-magnet K, its armature *r*, arranged to fall back upon the contact-point *q* when released by the relay-magnet K, the ground-wire *s*, the battery *v*, conductors *t u w*, and the track-section formed of the rail-section I′, and the rail-section I, formed of the parts *i j k*, the parts *i* and *k* being grounded, substantially as herein shown and described.

4. In electric railway signaling apparatus, the combination, with the line G, of the magnet *h*, armature *g*, straight-bar semaphore E, provided with the drum *d*, the cord *e*, connecting the drum *d* and the armature *g*, and the casing formed of the annular frame A and the glass sides D, exposing the entire length of the semaphore to view, the magnet being arranged wholly without the annular frame to furnish a clear open field for the semaphore, substantially as herein shown and described.

5. In railway signaling apparatus, the semaphore-casing formed of the annular frame A and glass sides D, the straight-bar semaphore E, pivoted in the casing between the glass sides and wholly exposed to view, and means for turning the semaphore on its pivot, arranged exteriorly to the semaphore-casing, substantially as herein shown and described.

6. The combination, in electric railway signaling apparatus, of the semaphore-case formed of the annular frame A, the glass sides D, the straight-bar semaphore E, pivoted in the case between the glass sides, carrying in one end thereof a transparent colored disk, *c*, and the lantern F, secured to one side of the semaphore-case opposite the path of the colored disk *c*, substantially as herein shown and described.

7. In electric railway signaling apparatus, the combination of the annular frame A, provided with the socket B and chamber *f*, and outside of the annular frame A, and having glass sides D, the signaling-magnet *h*, and armature *g*, placed in the chamber *f*, the straight-bar semaphore E, turning on the pivot *a*, the drum *d*, and the cord *e*, connecting the drum with the armature *g*, the colored disk *c*, and the lantern F, secured to one side of the semaphore-case, substantially as herein shown and described.

Witnesses: CHAS. D. TISDALE.
ALBERT W. BROWN,
JOHN D. GOULD.