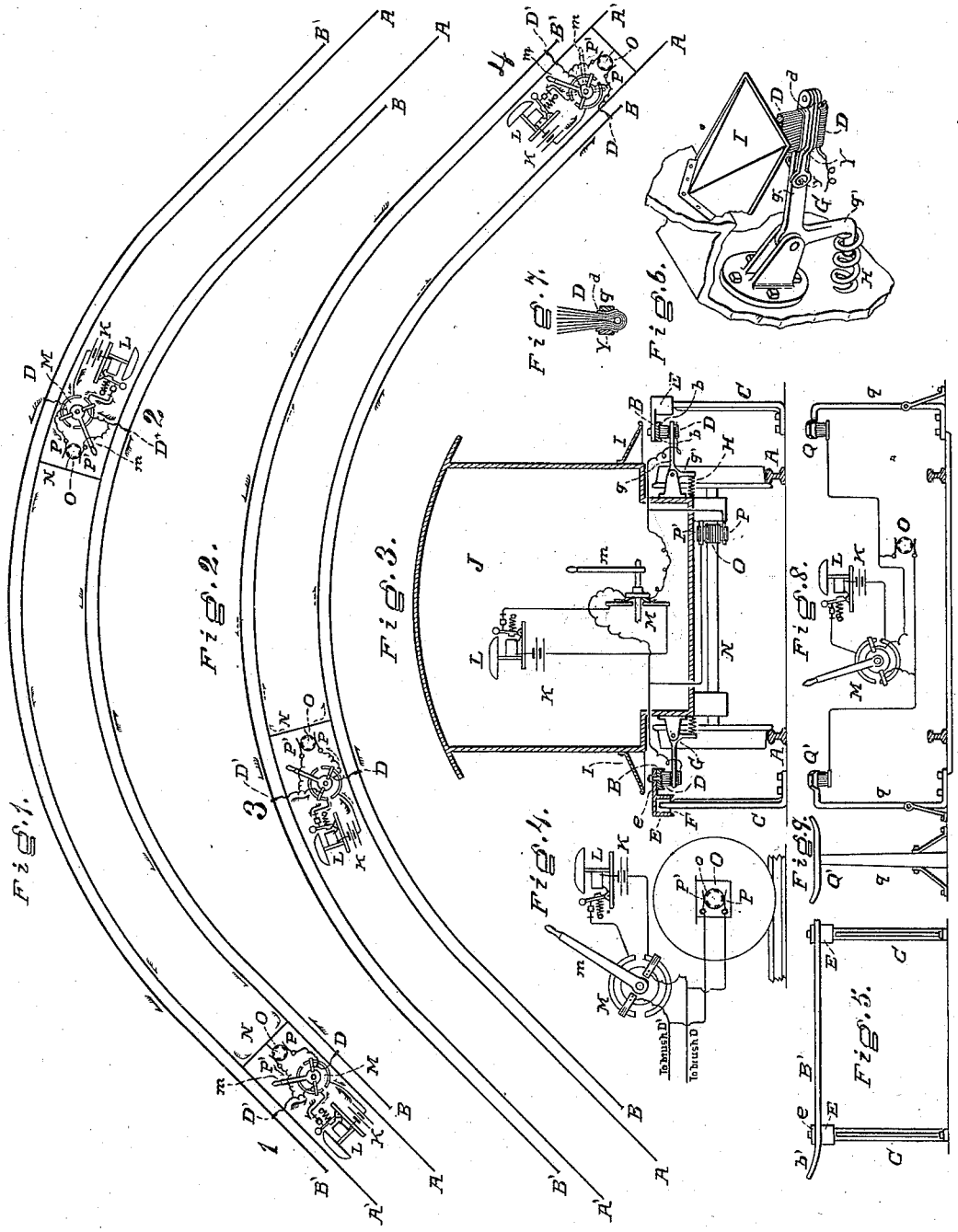
(No Model.)

B. H. GEDGE.

ELECTRIC RAILWAY SIGNAL.

No. 344,099. Patented June 22, 1886.



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ELECTRIC RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 344,099, dated June 22, 1886.

Application filed February 25, 1886. Serial No. 193,197. (No model.)

To all whom it may concern:

Be it known that I, BURTON H. GEDGE, of Covington, Kenton county, Kentucky, have invented new and useful Improvements in Electric Danger-Signals for Railroads, of which the following is a specification.

My invention relates to improvements in those electric danger-signals for railroads, whereby the engineers of two approaching trains are warned when their trains come into dangerous proximity.

The primary object of my invention is to provide a device for this purpose which, without the use of any complicated mechanism or any instruments requiring special manipulation by the engineer, shall, in giving such warning of danger, inform the engineers as to whether their trains are running in the same or in opposite directions. To accomplish this object I provide insulated conductors in sections alongside of the track, and a battery and bell apparatus in the cab of each locomotive, communicating through a four-way switch operated by the reversing-lever of the engine, and through contact-brushes with said insulated conductors, and communicating with the rails or "ground" through a commutator operated by the motion of the train.

My invention has also the following additional objects: To enable the aforesaid insulated conductors to be applied to only those parts of the track—such as sharp curves around elevations—where two trains are liable to come dangerously near together before either can be seen by the engineer of the other, to protect the bearing-surfaces of the aforesaid brushes and insulated conductors from incrustations of ice or snow, such as would prevent contact, and to provide means for automatically testing the working condition of the signal apparatus.

In the accompanying drawings, Figures 1 and 2 are diagrams showing the operation of my device with two approaching trains on a curve, Fig. 1 showing the trains as moving and heading toward one another, while Fig. 2 explains the action of the device for trains heading in the same direction, both when they are moving oppositely and when they are moving in the same direction. Fig. 3 is a transverse section of the track and insulated conductors, with a diagrammatic representation of a locomotive-cab and its electrical apparatus. Fig. 4 is another diagram of said electrical apparatus, showing the reversing-lever with the four-way switch and the commutator on the axle by side elevation. Fig. 5 is a side elevation of a portion of one of the insulated conductors. Fig. 6 is a perspective view of one of the brushes with its holding device. Fig. 7 is a vertical section of the brush. Figs. 8 and 9 are respectively a rear and a side elevation of the device for testing the condition of the apparatus, which is represented diagrammatically in Fig. 8 as being tested.

A and A′ are the rails of the track. Two conductors, B B′, insulated from the ground, extend parallel with and one to each side of the track, and are placed a sufficient distance out from the rails to avoid being struck by trains. They are supported at such a height as to be out of reach of snow, on posts or standards C, firmly secured in the ground, or to the cross-ties or other fixtures.

The conductors B B′ consist of flat iron wires or bands having downturned flanges *b* at their edges for shedding water, and thus preventing wetting and rusting, or incrustation with ice of their under sides, which serve as contact-surfaces for brushes D D′, carried by the locomotive and communicating with the electrical apparatus in the cab. In order to allow these brushes to have access to the under sides of the conductors B B′ the latter are placed inwardly from the posts C, and are suspended from arms *e* projecting therefrom.

The conductors B B′ may be insulated from the ground in any suitable manner. For example, each of the arms *e* may constitute a rigid projection from a cap-piece, E, in shape like an inverted cup, which, having been filled with a wooden plug or block, F, is driven down onto the top of the standard C. Each of the brushes D or D′ is attached to the arm *g* of a lever, G, pivoted to the locomotive-frame, and is forced upward by the pressure of a spring, H, against the tail *g′* of said lever.

The conductors B B′ are located at and are conterminous with those portions of the track—such as sharp curves in cuts or around elevations—where two trains are liable to approach dangerously close together before either is

visible from the other train. Said conductors are turned up at both ends to form guides *b'*, which, when a locomotive enters the dangerous portion of the track, engage over the brushes D D' and lead them down beneath the conductors, against which they are firmly pressed by the springs H. Hoods I are secured to the locomotive-frame above the brushes D D', and when the latter are released from the conductors B B' they are thrown up close beneath the hoods by the spring H, and are thus protected from rain and snow, which would otherwise form a non-conducting coating of snow or ice or rust upon them, which would prevent contact with conductors B B'. The latter are kept scoured clean by the frequent passage of the brushes.

Each of the brushes D D' may consist of a bundle of wire bent double, wrapped with insulating material *d*, and clamped to the arm *g* by an arm, Y, pivoted at one end to the arm *g*, and capable of being drawn toward said arm at its other end by a set-screw, *y*. The wire from the battery or bell is inserted in the loop of said wire bundle.

In each locomotive-cab J is a battery, K, of low resistance, and a bell, L, each having one of its terminals connected to a terminal of the other, and its other terminal communicating through a four-way switch, M, with one or other of the brushes D D'. This switch is operated by the reversing-handle *m* of the engine. When the train is moving forward, the battery K is connected, through the switch M, with the brush D, and the bell L with the brush D'; but backing the train, by reversing the handle *m*, throws the battery into connection with the brush D' and the bell into connection with the brush D. On all trains like battery-poles are connected to the switches M, and the brushes D are on the same side of the trains as regards right and left, the brushes D' being on the other side.

O is a commutator on an axle, N, of the locomotive. The contact-plates of this commutator all communicate through said axle and its wheels with the track or ground, and are separated by insulating-plates *o*. The contact-brushes P P' of the commutator O communicate either directly or through the switch M with the switch-connected terminals of the battery and the bell, and make connection alternately from these terminals through the commutator to the ground.

It will be seen that the apparatus and connections thereof on each locomotive are comprised in two open circuits. One of these open circuits has for its terminals the brushes D D', and includes battery K, bell L, and four-way switch M. The other open circuit has for its terminals the brushes P P', and also includes the battery K and bell L.

In Fig. 1 are shown at 1 and 2 the electrical apparatus of two trains moving and heading toward one another, and within the limits of the conductors B B'. The open circuits having the terminal brushes D D' establish connection through each locomotive between the conductors B B', making a closed circuit through said conductors in which the batteries of the two trains exert their electro-motive forces in the same direction, causing the current to flow, as shown by the heavy arrows, and ringing the bells continuously.

Owing to the rotation of the axles N, probably at different speeds, the commutators O will, at intervals, make ground connection between the battery-terminal of one train and the bell-terminal of the other, as shown in Fig. 1, when the current will flow through the track, as shown by light arrows, the track acting as an auxiliary to that one of the conductors B B' which connects in the same manner. As it is only when this takes place that a current will flow through the track, the commutators do not interfere with the continuous ringing of the bell.

Of the approaching trains shown in Fig. 2, that at 3 is represented as moving forward, while the train at 4 may be supposed to be moving backward or forward, according to whether the handle *m* is considered as in the position shown by strong lines or in that shown by dotted lines. Suppose it moving backward, the bells will be rung continuously, the same as with the case supposed in Fig. 1, for though the brushes D D' of the train at 4 have reversed positions with respect to the conductors B B' from those of the train at 2, the reversal of the handles *m* causes the brushes to exchange their connections with the battery and bell, so that the relative connections of the latter with the aforesaid conductors are the same at 4 as at 2. If we take the train at 4 as moving forward, there is still a closed circuit, including both conductors B and B', but the batteries K exert their electro-motive forces in opposite directions in this circuit and no current is produced therein; but owing to the rotation of the commutator axles N of the two trains, probably at different speeds, the commutators are brought sometimes into the relative positions shown in Fig. 2, when the brush P at 3 and the brush P' at 4 are connected to ground and at other times into the positions when the brush P' at 3 and the brush P at 4 are connected to ground. Between these relative positions the commutators alternate with a rapidity dependent on the relative velocities of the trains, thus establishing, alternately, a closed circuit through the battery and bell at 3, the conductor B', and ground, and a closed circuit through the battery and bell at 4, conductor B, and ground. With the commutators in the position shown the battery at 3 works the bell at 3, the current passing, as per dotted arrows, from the positive pole of said battery to switch M at 3, from there through brush P and commutator O at 3 to ground, from ground through commutator O at 4 and brush P' of the same to brush D' at 4 and conductor B, from said con-

ductor through brush D′ at 3 to switch M at 3, and thence through bell at 3 to negative pole of the battery at 3. When the brush P′ at 3 and the brush P at 4 are in connection with the ground through commutators O, the battery and bell at 3 are cut out of the commutator or ground circuit, while those at 4 are in a closed circuit, including the conductor B, and precisely similar to the one just traced. Thus, in this position of the commutators the battery at 4 rings the bell at 4. Thus, while the bell at 3 is being rung that at 4 is silent, and vice versa, so that an intermittent ring is in this case produced in each locomotive. When each of the brushes P makes and breaks connection with ground simultaneously with the brush P of the other train, neither of the bells will be rung; but such a state of things can only last an exceedingly short time, unless both trains are going nearly at the same rate, when there is no danger of collision. The four-way switch M renders the relative connections of the batteries of the two trains with the conductors B B′ independent of the direction of heading of the trains, and dependent only upon whether the trains are moving in the same direction or are moving toward one another, so that (whether both trains are backing or both advancing, or one backing and the other advancing,) the bells will be rung intermittently, as in the case just described, if the trains are moving in the same direction; but if they are moving toward one another, the bells will be rung continuously, as in the case illustrated by Fig. 1. If, therefore, a train enters on a part of the track which is provided with conductors B B′ while another train is moving on such portion, the bells on both trains will be rung continuously if the trains are running in opposite directions, intermittently if they are moving in the same direction. If the latter is the case, the engineer, who hears the signal at the instant his locomotive enters between the conductors B B′, knows that the other train is in advance of him, and that he should stop, while the other engineer knows that his own train is in advance of the other and may proceed. The commutators O may of course be attached to and operated by any of the running parts of the engines.

As a means for automatically testing the condition of the electrical apparatus on the locomotive, I provide at a point or points on the track, say near its terminus, two contact-plates, Q Q′, adapted, like the conductors B B′, to engage and make contact with the brushes D D′. Said contact-plates are supported on posts *q* without insulation from the ground, and are electrically connected. As the locomotive passes between them they make contact with the brushes D D′ and close the circuit, causing a ringing of the bell, which assures the engineer that the apparatus is in working order.

The above-described apparatus on the locomotive may be, and preferably is, used also in connection with a railroad-switch signal invented by me and shown and described in an application for patent of even date herewith, Serial No. 193,198, in which a conductor similar to the conductors B B′ is placed in advance of each switch and is connected to the track or ground by opening the same, so that if a train then comes toward the switch said conductors connect to ground one terminal of the signal apparatus thereon, and the other terminal of the same being intermittently grounded by the commutator O, the bell is rung intermittently.

I claim as new and of my invention—

1. In an electric danger-signal for railroads, the combination of the following elements, to wit: a battery, K, and a bell, L, on each locomotive, an open circuit including said battery and bell and having terminal brushes P P′, a commutator, O, making alternating connection between brushes P P′ and the track or ground, an open circuit including the battery K and bell L, and having terminal brushes D D′, a four-way switch, M, in said open circuit, operated by the reversing mechanism of the locomotive, and insulated conductors B B′ alongside of the track and adapted to make contact with the brushes D D′, substantially as and for the purpose set forth.

2. In an electric danger-signal for railroads, the combination, with the upwardly-springing contact-brushes D D′, secured to the locomotive, of the insulated conductors B B′, hung inwardly from their supporting-posts and having upturned ends *b*′, substantially as and for the purposes explained.

3. In an electric danger-signal for railroads, the combination, with upwardly-springing brushes D D′ on the locomotive, of conductors B B′, arranged to have sliding contact with said brushes and provided with downturned edge flanges, substantially as and for the purpose designated.

4. In an electric signal for railroads, the combination, with the terminal brushes D D′ of an open circuit including a battery and a bell on the locomotive, of the electrically-connected plates Q Q′, arranged to make contact with said brushes as the latter pass them, substantially as and for the purpose set forth.

In testimony of which invention I hereunto set my hand.

BURTON H. GEDGE.

Attest:
A. P. KNIGHT,
N. ROCKHOLD.