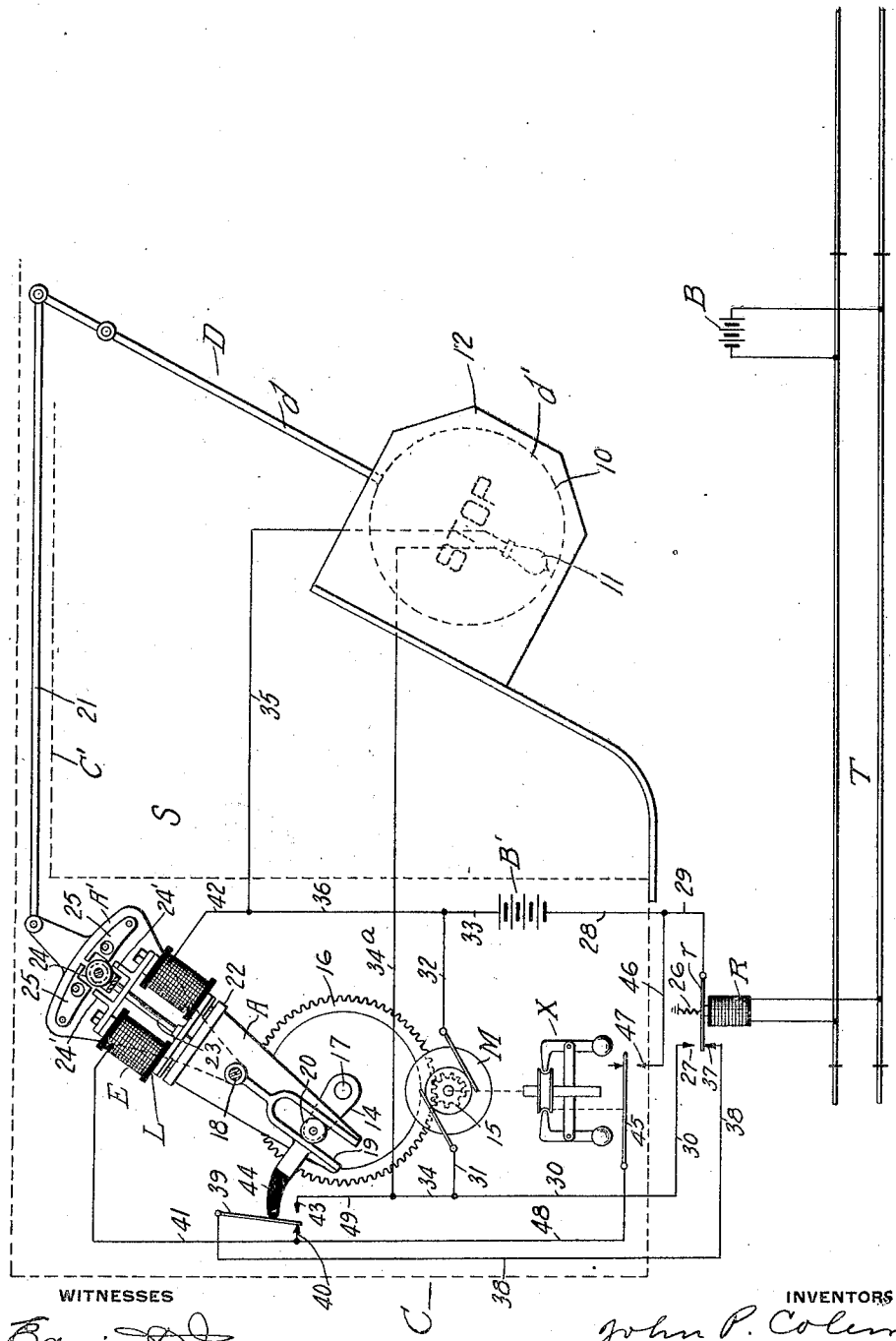
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GRADE CROSSING SIGNAL

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GRADE-CROSSING SIGNAL.

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To all whom it may concern:

Be it known that we, JOHN P. COLEMAN and PER UTNE, citizens of the United States, both residing at Edgewood Borough, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Grade-Crossing Signals, of which the following is a specification.

This invention relates to grade crossing signals for use at the intersection of highways and railways.

We will describe one form of crossing signal and one means for controlling such signal, embodying our invention, and will then point out the novel features thereof in claims.

The accompanying drawing is a view, partly in elevation and partly diagrammatic, showing one form of signal and one means for controlling the signal embodying our invention.

Referring to the drawing in detail, S designates generally a crossing signal embodying our invention and which as here shown comprises a semaphore D and mechanism for operating the semaphore. The operating mechanism is arranged within a casing C, while the semaphore D is pivotedly mounted on the outer end of a tubular extension C′ formed on the casing C. To simplify the drawing, the casing C and extension C′ are shown in dash lines. The semaphore D comprises an arm *d* and a bob *d′*, the latter carrying an electric lamp 11. The disk 10 and lamp 11 are colored red to indicate danger, while painted upon opposite sides of the disk is the word "Stop."

The "stop" aspect of the signal S is obtained by continuously oscillating the semaphore D. When the semaphore is held in obscured position between a pair of fixed shields 12, 12, the "proceed" aspect is given. When the semaphore assumes a vertical position due to failure of the mechanism or circuits, which position fully displays the disk 10 and lamp 13, it indicates "stop" and at the same time, owing to the absence of motion of the semaphore, an indication that such failure has occurred is also given. We obtain these aspects of the semaphore by means of the mechanism arranged within the casing C, which mechanism will now be described.

M designates an electric motor which is in this instance of the direct current type. This motor drives a crank 14 through the medium of a pinion 15 fixed to the motor shaft and meshing with a relatively large gear 16, the latter gear in turn driving a shaft 17 to the outer end of which is secured the crank 14. Pivoted on an axle 18 is an arm A, the lower end of which is bifurcated to provide a longitudinally extending slot 19. The crank 14 when rotated rocks the arm A about the axle 18 as center by means of a pin 20 carried by the crank and moving within the slot 19. Pivoted upon the axle 18 is a second arm A′ to which the pendulum *d* is connected for movement therewith by means of a connecting rod 21 arranged within the tubular extension C′. This arm A′ is normally disconnected from the arm A but may be connected to the same for movement therewith by a clutch L. This clutch comprises in this instance an electromagnet E having an armature 22 to which is connected one end of a rod 23, the other end of this rod being provided with a roller 24. When the electro-magnet E is energized, armature 22 is attracted to move the rod 23 upwardly, thereby projecting the roller 24 beyond guides 24′. With the roller in projected position as shown in the drawing, it engages the confronting ends of a pair of dogs 25 pivoted on the arm A′, and thereby locks the arms A and A′ together so that if the motor M is then energized, rocking movement will be imparted to the arm A′ to cause oscillatory movement of the semaphore D. Should the electromagnet E become deenergized during oscillation of the semaphore or while in its obscured position, as shown in the drawing, roller 24 will gravitate to disengage from the dogs 25, whereby arms A and A′ will be disconnected. With arms A and A′ disconnected, pendulum *d* will naturally assume a vertical position to display the disk and lamp.

The signal S as a whole is adapted to be controlled, in this instance, by means of a train or car traversing an insulated section of railway track T. This section of railway track is provided with a track circuit including a relay R connected across the track rails adjacent the one end of the section, and a battery B for energizing such relay bridging the track rails adjacent the other end of

such section. The armature r of the relay R is biased by means of a spring 26 to engage a back contact 27 when the relay is de-energized to complete a main circuit including the motor M and a battery B′, which circuit is as follows: from positive side of battery B′, through wires 28 and 29, armature r, back contact 27, wires 30 and 31, motor M, wires 32 and 33 to battery B′. With the closure of this main motor circuit, a circuit for energizing the lamp 11 is also completed as follows: from wire 30, through wires 34 and 34ª, lamp 11, wires 35, 36 and 33 to battery B′. When the relay R is energized, as shown in the drawings, armature r engages a front contact 37 to complete a main circuit for energizing the magnet E, which circuit is from battery B′ through wires 28 and 29, armature r, front contact 37, wire 38, contact finger 39, back contact 40, wire 41, windings of magnets E, wires 42, 36 and 33 to battery B′. It will be noted that the circuit just traced is not only controlled by the relay R, but is also controlled by the contact finger 39. The contact finger 39 is biased to normally engage a contact 43 but when the arm A is in the normal position as shown in the drawings, a stud 44 of insulating material mounted on the arm A engages the contact finger to force the same out of engagement with the contact and into engagement with the contact 40. When the stud 44 moves out of engagement with the contact finger 39, magnet E is maintained energized through an auxiliary circuit which is controlled by a contact finger 45 actuated by a centrifuge X. Such auxiliary circuit is from battery B′ through wires 28 and 46, contact 47, contact finger 45, wires 48 and 41, windings of magnets E, wires 42, 36, and 33 to battery B′. The centrifuge X is of any suitable construction and as here shown is operated by the motor M to close the contacts 45—47 when rotating and to open such contact when at rest. Contact 43 is connected to the wire 34 by a wire 49 so that when contact finger 39 engages such contact an auxiliary circuit for the motor M is closed which is from battery B′ through wires 28 and 29, armature r, contact 37, wire 38, contact finger 39, contact 43, wires 49, 34 and 31, motor M, wires 32 and 33 to battery B′.

The operation of the signal is as follows: With the signal S in the normal or proceed position, as shown in the drawings, assume that a train or car enters section T. Relay R is immediately de-energized to release the armature r, thereby disrupting the main circuit for the magnet E and closing the main circuit for the motor M and the lamp circuit for the lamp 11. Thus the motor M is energized to rotate, and the lamp 11 is illuminated. With the motor energized, centrifuge X is rotated to move the contact finger 45 into engagement with the contact 47, thus closing the auxiliary magnet circuit to again energize the magnet E. Arm A is now being oscillated by the motor M through the intervening mechanism, and since magnet E is energized, arm A′ becomes locked to arm A for movement therewith. The rocking of arm A′ imparts oscillatory movement to the semaphore D, thereby giving the danger aspect of the signal, as has been explained. It will be noted that during the oscillation of the arm A, stud 44 moves contact finger 39 to alternately engage the contacts 40 and 43, and that owing to the location of the contact finger with respect to the arm A, the contact finger engages contact 43 during a major portion of the movement of such arm. This movement of the contact finger 39, however, in no way affects the magnet E or the motor M, so long as the relay is de-energized, hence the swinging movement of the semaphore D is maintained until the train or car leaves the section. Should the train or car leave the section at the instant the semaphore is in clear position with the contact finger 39 engaging contact 40, the energization of the relay would cause de-energization of the motor at such instant as to leave the operating mechanism in the normal position as shown in the drawings. The possibility of the train leaving the section at this instant, however, is remote, so that it is necessary to maintain the motor M energized after the relay R is energized, in order to return the semaphore to its normal obscured position when the train leaves the section with the semaphore in a position other than the proceed position. This is accomplished by means of the auxiliary circuit for the motor M which is closed when the contact finger 39 engages contact 43 as has been described, so that the motor is maintained energized until the semaphore reaches its proceed position whereupon stud 44 engages and moves the contact finger to disrupt the auxiliary motor circuit thus de-energizing the motor at such instant as to leave the semaphore in its proceed or obscured position. It will thus be seen that the returning of the signal to its proceed position is insured irrespective of the instant the train or car leaves the section.

When the motor M is de-energized, centrifuge X moves the contact finger 45 to disrupt the auxiliary circuit for the magnet E, but the magnet is not de-energized because the main circuit for the magnet was previously closed through the energization of relay R. Thus the arm A continues to influence the arm A′ to retain the semaphore D in obscured position between the shields 12.

From the foregoing operation, it will be evident that the magnet E and the motor M are primarily controlled by the relay R, and that subsequent to the energization of the motor, the magnet is controlled by the

motor through the medium of the centrifuge X. Such control insures that in the event of failure of the motor during the time it is causing oscillation of the semaphore, the latter will drop by gravity to an exposed position even should such failure occur while the semaphore is momentarily obscured between the shields. That is, while relay R is de-energized, magnet E is controlled only by centrifuge contact 45—47, and should the motor stop, this contact will open and so cause magnet E to release its armature, thus allowing the semaphore to hang vertically in exposed position. Obviously, this eliminates any possibility of the semaphore being retained in the proceed or obscured position when the mechanism is deranged. As previously stated, should the magnet E for any reason become de-energized, the semaphore will drop to vertical or exposed position, which action, together with the above explained control of the magnet by the centrifuge, produces a crossing signal which is incapable of giving a false indication.

Having thus described our invention, what we claim is:

1. A signal comprising a pendulum semaphore mounted to oscillate, a motor, mechanism interposed between said motor and said semaphore for causing oscillation of the semaphore while the motor rotates continuously in one direction, said mechanism including a clutch for connecting the semaphore with and disconnecting it from the motor, and a speed-responsive device operated by said motor for controlling said clutch.

2. A signal comprising a pendulum semaphore mounted to oscillate, a motor, mechanism interposed between the motor and the semaphore for causing oscillation of the semaphore when the motor is running and for holding the semaphore in an inclined position when the motor is at rest, said mechanism including a clutch for connecting the semaphore with the motor, means controlled by said motor for rendering said clutch operative or inoperative according as the motor is running or it at rest, and auxiliary means independent of said motor controlled means for rendering the clutch operative when the semaphore is in said inclined position.

3. A signal comprising a pendulum semaphore mounted to oscillate, a motor, mechanism interposed between the motor and the semaphore for causing oscillation of the semaphore when the motor is running and for holding the semaphore in an inclined position when the motor is at rest, said mechanism including a clutch for connecting the semaphore with the motor, means for controlling the energization of said motor, means for continuing the energization of said motor, after said first means has been operated to cause de-energization thereof, until the semaphore reaches the said inclined position, means controlled by said motor for rendering said clutch operative or inoperative according as the motor is running or at rest, and auxiliary means independent of said motor controlled means for rendering the clutch operative when the semaphore occupies said inclined position.

4. A crossing signal comprising a pendulum semaphore, a motor for causing oscillation of the semaphore, a speed-responsive device operated by the motor, a contact controlled by said device and closed only when the motor is running, and means governed by said contact for connecting the semaphore with the motor only when the contact is closed.

5. A signal comprising a pendulum semaphore mounted to oscillate, a motor, mechanism interposed between the motor and the semaphore for causing oscillation of the semaphore when the motor is running and for holding the semaphore in an inclined position when the motor is at rest, said mechanism including a clutch for connecting the semaphore with the motor, a speed responsive device operated by said motor, a contact controlled by said device and closed only when the motor is running, an energizing circuit for said clutch controlled by said contact, and an auxiliary circuit for said clutch including a contact controlled by said mechanism and closed only when the semaphore occupies said inclined position.

6. A crossing signal comprising a pendulum semaphore, a motor for causing said semaphore to oscillate, a clutch interposed between said motor and said semaphore, electromagnetic means for controlling said clutch, and means controlled by said motor for governing said electromagnetic means.

7. In combination, a track section, a track circuit therefor including a relay; a crossing signal comprising a pendulum semaphore, a motor for causing oscillation of said semaphore, an electrically controlled clutch between said motor and semaphore, a circuit for said clutch controlled by a front contact of said relay, a circuit for said motor controlled by a back contact of the relay, a branch around the relay contact in the said clutch circuit, and means controlled by said motor for closing or opening said branch according as the motor is running or at rest.

8. A crossing signal comprising a pendulum semaphore, a motor for causing said semaphore to oscillate, a circuit for energizing said motor, a contact for opening and closing said circuit, and a branch around said contact and including a second contact controlled by the motor for continuing the

operation of the motor after the first contact has been opened until the semaphore reaches a predetermined inclined position.

9. A crossing signal comprising a pendulum semaphore biased to a substantially vertical position, a motor for causing said semaphore to oscillate about said position, a clutch interposed between said semaphore and said motor, a circuit including a source of current for energizing said clutch, a circuit including said source of current for energizing said motor, a contact for opening and closing said motor circuit, and means operating after said contact has been closed and then opened to continue the energization of said motor until the semaphore reaches a predetermined inclined position, whereby in the event of failure of said source, clutch or the connections between the two the semaphore will remain in or return to its vertical position.

10. A signal comprising a pendulum semaphore, a motor, mechanism interposed between the semaphore and the motor for causing oscillation of the semaphore when the motor is running and for holding the semaphore in an inclined position when the motor is at rest, means for controlling the energization of said motor; and means for continuing the energization of the motor, after said first means has been operated to cause deenergization thereof, until the semaphore reaches the said inclined position.

11. A signal comprising a pendulum semaphore, a motor, mechanism interposed between the semaphore and the motor for causing oscillation of the semaphore when the motor is running and for holding the semaphore in an inclined position when the motor is at rest, a circuit for energizing said motor, including a contact for opening and closing the circuit, and a branch for said circuit around said contact and including a second contact controlled by said mechanism for continuing the operation of the motor after the first contact has been opened until the semaphore reaches the said inclined position.

12. A signal comprising a pendulum semaphore mounted to oscillate, a motor, mechanism interposed between the motor and the semaphore for causing oscillation of the semaphore when the motor is running and for holding the semaphore in an inclined position when the motor is at rest, said mechanism including a clutch for connecting the semaphore with the motor, means for controlling the energization of said motor, means for continuing the energization of the motor, after said first-mentioned means has been operated to cause deenergization thereof, until the semaphore reaches said inclined position, and means including a source of current for energizing said clutch.

13. A signal comprising a pendulum semaphore, a motor for causing said semaphore to oscillate, a circuit including a source of current for energizing said motor, a contact for opening and closing said circuit, a branch for said circuit around said contact and including a second contact controlled by said motor for continuing the operation of the motor after the first contact has been opened until the semaphore reaches a predetermined inclined position, and a clutch interposed between said motor and said semaphore and controlled by said source of current.

14. In a railway crossing signal, a swinging visible signal member so arranged that it may be moved by gravity when it is in its normal initial position; a normally inoperative electric motor; means including two independently movable members through which motion is transmitted from said motor to said signal member to thereby swing the same a plurality of times; electromagnetic means whereby said members may be magnetically connected together so as to move in unison; a holding circuit in which said electromagnetic means is included; a main circuit in which said motor is included and through which current is supplied thereto; a source of electricity adapted to supply current to said circuits; circuit controlling means adapted to control the flow of current in said circuits; means for preventing a flow of current through said driving circuit should said main circuit be broken; and means for operating said circuit controlling means.

15. In a railway crossing signal, a swinging signal member so arranged that it may be moved by gravity when it is in its normal initial position; means whereby said signal member is hidden from view when in its normal initial position; a normally inoperative electric motor; means including two independently movable members through which motion is transmitted from said motor to said signal member to thereby swing the same a plurality of times; electromagnetic means whereby said members may be magnetically connected together so as to move in unison; a holding circuit in which said electromagnetic means is included; a main circuit in which said motor is included and through which current is supplied thereto; a source of electricity adapted to supply current to said circuits; circuit controlling means adapted to control the flow of current in said circuits; means for preventing a flow of current through said driving circuit should said main circuit be broken; and means for operating said circuit controlling means.

16. In a railway crossing signal, a swinging visible signal member; means whereby said member is normally hidden from view; a normally inoperative electric motor adapted to swing said signal member a plurality of times; an oscillating operating member operated by said motor; an oscillating driving member operatively connected with said signal member; a driving coil carried by one of said members whereby said members may be magnetically connected with one another; a main circuit in which said motor is included; a driving circuit in which said driving coil is included; a source of electricity adapted to supply current to said circuits; and means adapted to control said circuits.

17. In a railway crossing signal, a swinging visible signal member; a normally inoperative electric motor adapted to swing said signal member a plurality of times; an oscillating operating member operated by said motor; an oscillating driving member operatively connected with said signal member; a driving coil carried by one of said members whereby said members may be magnetically connected with one another; a main circuit in which said motor is included; a driving circuit in which said driving coil is included; a source of electricity adapted to supply current to said circuits; means adapted to control said circuits; and a switch included in said driving circuit and controlled by the current flowing in said main circuit.

18. In a railway crossing signal, a swinging visible signal member; a normally inoperative electric motor adapted to swing said signal member a plurality of times; an oscillating operating member operated by said motor; an oscillating driving member operatively connected with said signal member; a driving coil carried by one of said members whereby said members may be magnetically connected with one another; a holding circuit in which said driving coil may be included; a main circuit in which said motor is included; a driving circuit in which said driving coil may also be included; means adapted when energized to close said holding and open said main and driving circuits, and when de-energized to open said holding and close said main and driving circuits; and a source of electricity for supplying current to said circuits.

19. In a railway crossing signal, a swinging visible signal member; a normally inoperative electric motor adapted to swing said signal member a plurality of times; an oscillating operating member operated by said motor; an oscillating driving member operatively connected with said signal member; a driving coil carried by one of said members whereby said members may be magnetically connected with one another; a holding circuit in which said driving coil may be included; a main circuit in which said motor is included; a driving circuit in which said driving coil may also be included; means adapted when energized to close said holding and open said main and driving circuits, and when de-energized to open said holding and close said main and driving circuits; a source of electricity for supplying current to said circuits; and a switch included in said driving circuit and controlled by the current flowing in said main circuit.

20. In a railway crossing signal, a swinging visible signal member; a normally inoperative electric motor adapted to swing said signal member a plurality of times; an oscillating operating member operated by said motor; an oscillating driving member operatively connected with said signal member; a driving coil carried by one of said members whereby said members may be magnetically connected with one another; a holding circuit in which said driving coil may be included; a main circuit in which said motor is included; a driving circuit in which said driving coil may also be included; means adapted when energized to close said holding and open said main and driving circuits, and when de-energized to open said holding and close said main and driving circuits; an auxiliary circuit so arranged as to be closed when said means is energized and through which current may flow to said motor to thereby continue the operation thereof after said means is energized; a source of electricity for supplying current to said circuits; and means for automatically breaking said auxiliary circuit when said signal member has been returned to its initial position.

21. In a railway crossing signal, a swinging visible signal member; a normally inoperative electric motor adapted to swing said signal member a plurality of times; an oscillating operating member operated by said motor; an oscillating driving member operatively connected with said signal member; a driving coil carried by one of said members whereby said members may be magnetically connected with one another; a holding circuit in which said driving coil may be included; a main circuit in which said motor is included; a driving circuit in which said driving coil may also be included; means adapted when energized to close said holding and open said main and driving circuits, and when de-energized to open said holding and close said main and driving circuits; a switch included in said driving circuit and controlled by the current flowing in said main circuit; an auxiliary circuit so arranged as to be closed when said means is energized and through which current may flow to said motor to thereby

continue the operation thereof after said means is energized; a source of electricity for supplying current to said circuits; and means for automatically breaking said auxiliary circuit when said signal member has been returned to its initial position.

22. In a railway crossing signal, a swinging visible signal member; means whereby said member is normally hidden from view; a source of electricity; an electric motor operated by current from said source and operatively connected with said signal member and adapted to move the same into a visible position a plurality of times; and means for causing said motor to operate said signal member.

23. In a railway crossing signal, a swinging visible signal member; means whereby said member is normally hidden from view; a source of electricity; an electric motor operated by current from said source and operatively connected with said signal member and adapted to move the same into a visible position a plurality of times; means for causing said motor to operate said signal member; and means whereby said signal member is caused to move into a visible position upon a failure of said source of electricity to supply current to the system.

24. In a railway crossing signal, a swinging visible signal member; means whereby said member is normally hidden from view; a source of electricity; an electric motor operated by current from said source and operatively connected with said signal member and adapted to move the same into a visible position a plurality of times; means for causing said motor to operate said signal member; and means whereby said signal member is caused to move into a visible position should the circuit through which current is supplied to said motor be broken.

25. In a railway crossing signal, a swinging visible signal member; means whereby said member is normally hidden from view; a source of electricity; a normally inoperative electric motor operated by current from said source and operatively connected with said signal member, and adapted to move the same into a visible position a plurality of times, and means for controlling the flow of electricity to said motor to operate the same.

26. In a railway crossing signal, a swinging visible signal member; means whereby said member is normally hidden from view; a source of electricity; a normally inoperative electric motor operated by current from said source and operatively connected with said signal member, and adapted to move the same into a visible position a plurality of times; means for controlling the flow of electricity to said motor to operate the same; and means whereby said signal member is caused to move into a visible position upon a failure of said source of electricity to supply current to the system.

27. In a railway crossing signal, a swinging visible signal member; means whereby said member is normally hidden from view; a source of electricity; a normally inoperative electric motor operated by current from said source and operatively connected with said signal member, and adapted to move the same into a visible position a plurality of times; means for controlling the flow of electricity to said motor to operate the same; and means whereby said signal member is caused to move into a visible position should the circuit through which current is supplied to said motor be broken.

28. In a railway crossing signal, a swinging visible signal member; means whereby said member is normally hidden from view; a normally inoperative electric motor operatively connected with said signal member and adapted to move the same into a visible position a plurality of times; a source of electricity; a main circuit in which said motor is included and through which current is supplied to said motor; circuit controlling means included in said main circuit; and electrically operated means for operating said circuit controlling means.

29. In a railway crossing signal, a swinging visible signal member; means whereby said member is normally hidden from view; a normally inoperative electric motor operatively connected with said signal member and adapted to move the same into a visible position a plurality of times; a source of electricity; a main circuit in which said motor is included and through which current is supplied to said motor; circuit controlling means included in said main circuit; electrically operated means for operating said circuit controlling means; and electromagnetic means energized by current derived from said source for holding said signal member in its normally hidden position.

30. In a railway crossing signal, a swinging visible signal member; means whereby said member is normally hidden from view; a normally inoperative electric motor operatively connected with said signal member and adapted to move the same into a visible position a plurality of times; a main circuit in which said motor is included and through which current is supplied thereto; an auxiliary circuit through which current may flow to said motor to thereby continue the operation thereof after said main circuit has been broken; circuit controlling means adapted to close said main circuit and open said auxiliary circuit, and to open said main circuit and close said auxiliary circuit; a source of electricity adapted to supply current to said circuits; means for

operating said circuit controlling means; and means for automatically breaking said auxiliary circuit when said signal member has been returned to its initial position.

31. In a railway crossing signal, a swinging visible signal member; a source of electricity; a normally inoperative electric motor operated by current from said source and operatively connected with said signal member and adapted to swing the same a plurality of times; electrically operated means for closing a circuit in which said motor is included to thereby operate said signal member; and means for moving said signal member into a position other than its normal initial position, should the circuit in which said motor is included be broken.

In testimony whereof we affix our signatures in presence of two witnesses.

JOHN P. COLEMAN.
PER UTNE.

Witnesses:
G. HERMAN WEGNER,
R. GEORGE RUDMAN.