R. V. CHEATHAM.

ELECTRIC SIGNALING DEVICE.

APPLICATION FILED MAR. 31, 1908.

934,284.

Patented Sept. 14, 1909.

2 SHEETS—SHEET 1.

Fig. 2.

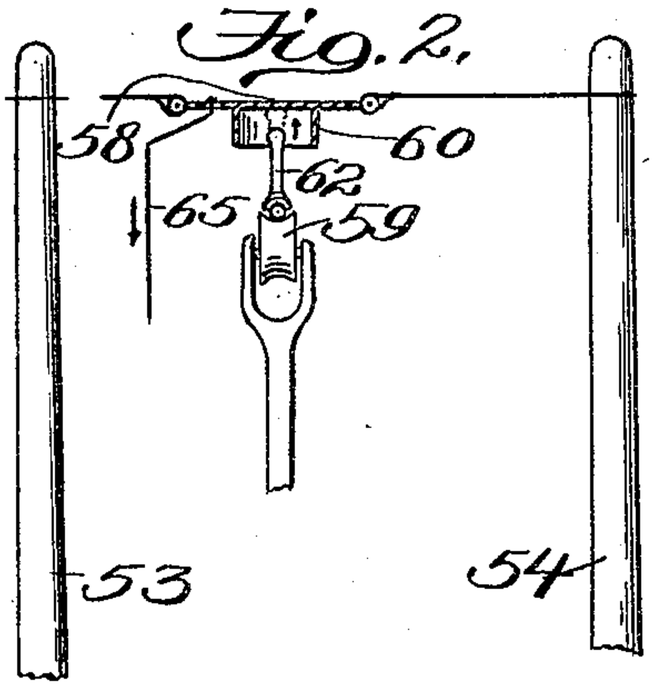

Fig. 3

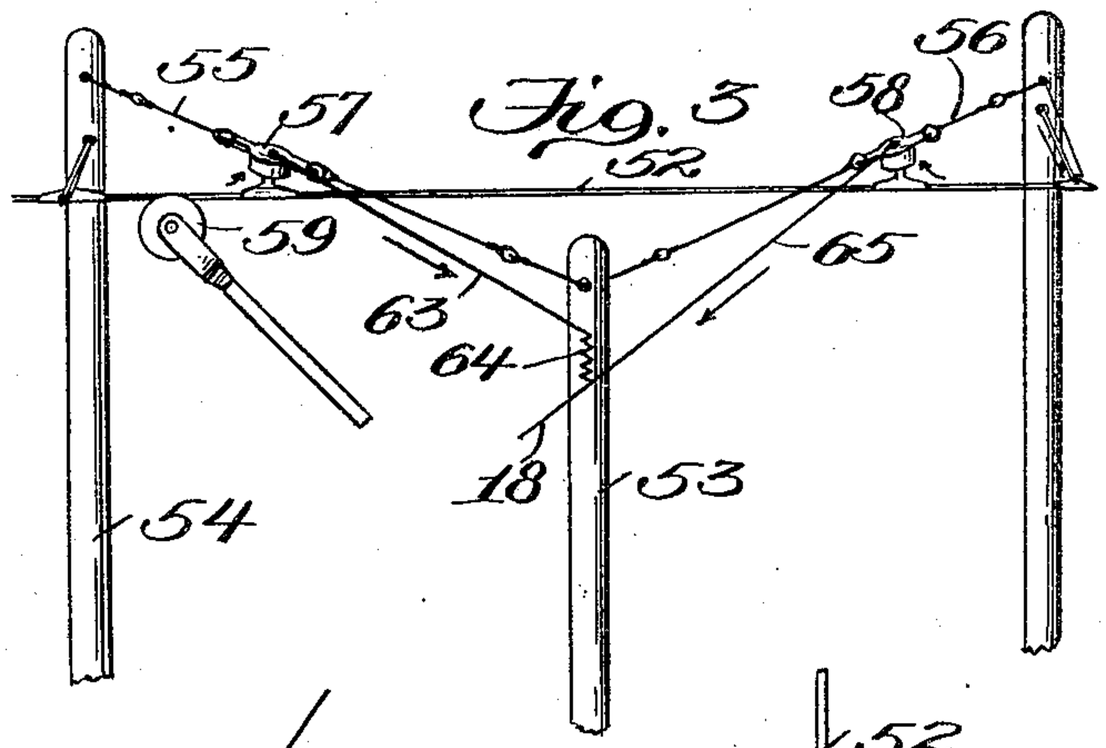

Fig. 5.

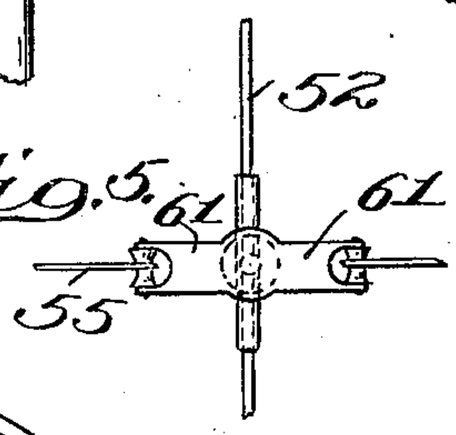

Fig. 1.

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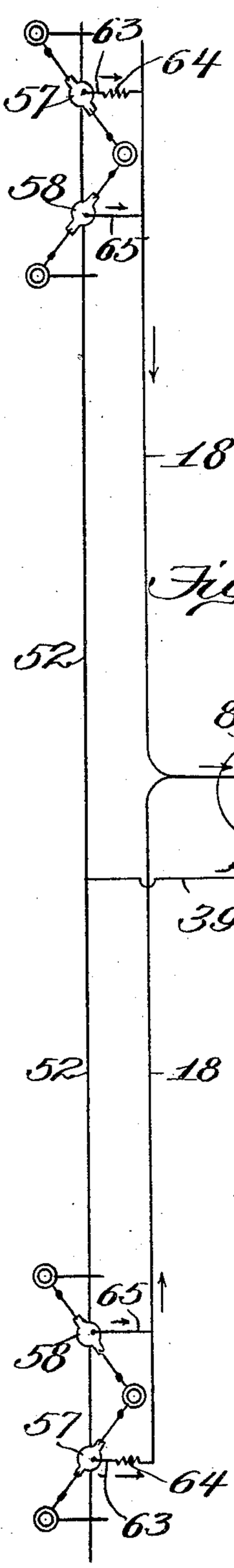


Fig. 6.

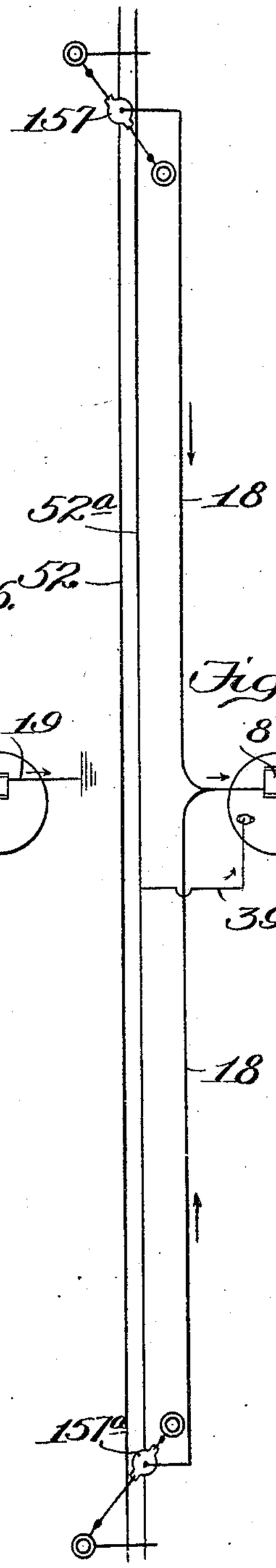
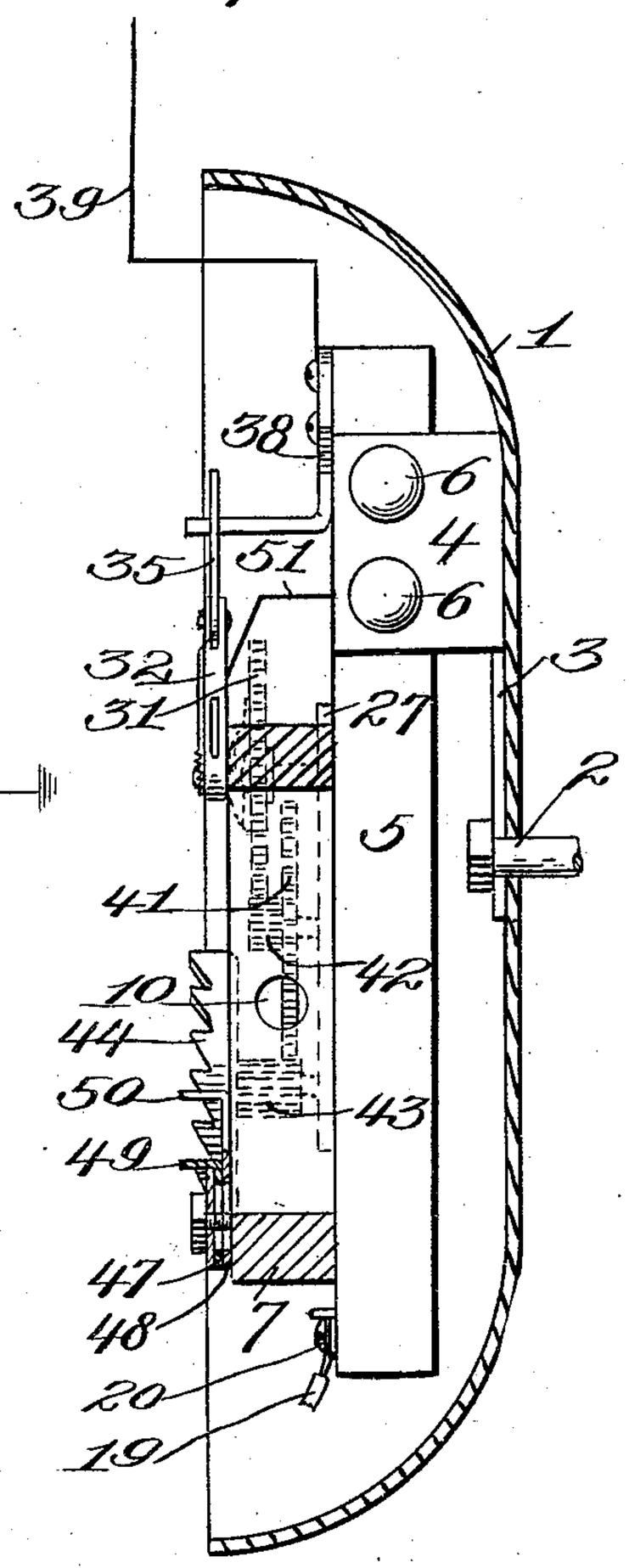


Fig. 7.

Fig. 4.



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UNITED STATES PATENT OFFICE.

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ELECTRIC SIGNALING DEVICE.

934,284. Specification of Letters Patent. Patented Sept. 14, 1909.

Application filed March 31, 1908. Serial No. 424,436.

To all whom it may concern:

Be it known that I, ROBERT V. CHEATHAM, a citizen of the United States, residing at St. Matthews, in the county of Jefferson and State of Kentucky, have invented new and useful Improvements in Electric Signaling Devices, of which the following is a specification.

My present invention relates to improvements in electric signaling devices for railways, and it has for its object primarily to provide a simple and improved signal of this character which is adapted to be placed at a high-way, railway or other crossing as a cautionary or warning device which is provided with contact mechanism arranged at a suitable point in advance of the crossing, which mechanism is adapted to be set into operation automatically by the passage of a train or vehicle, the signaling device at the crossing being thereby set into operation so as to give a signal, and this signaling device is provided with a time-controlled mechanism which serves to automatically reset the signaling device a predetermined period of time after the passage of the train or vehicle.

To these and other ends, the invention consists in certain improvements, and combinations and arrangements of parts, all as will be hereinafter more fully described, the novel features being pointed out particularly in the claims at the end of the specification.

In the accompanying drawing: Figure 1 is a detail view of a signaling device constructed in accordance with my present invention, the parts being shown in readiness for operation; Figs. 2 and 3 are diagrammatic views showing circuit-closing devices which are adapted to be arranged upon a trolley wire and to be connected electrically to the signaling device whereby the latter will be set into operation as a train or vehicle passes a given point; Fig. 4 represents a vertical section through the signaling device on the line 4—4 of Fig. 1, the magnet being omitted; Fig. 5 is a detail view of one of the devices through which the circuit is closed for setting the signaling device into operation; and Figs. 6 and 7 are diagrams showing the signaling system as applied respectively to single and double wire trolley roads.

Similar parts are designated by the same reference characters in the several views.

A signaling system constructed in accordance with my present invention is capable of use generally in connection with railways of various kinds, and it may be employed for the purpose of automatically giving a signal at a high-way, railway or other crossing upon the approach of a train, car or other vehicle, or it may be employed as a signal for block signal systems. In the present instance, I have shown the invention as applied to electric railways employing a trolley wire, but it will be understood that the invention is so illustrated merely as an example, and that various modifications in the construction and the relative arrangement of the parts may be made in applying the invention to various uses.

In the present instance, an audible signal is shown, although it will be understood, of course, that a visual or any other desired signal could be operated by the signaling mechanism with equal facility. In Fig. 1, the signaling device embodies a gong 1 which may be attached in vertical position to a post or other appropriate support by means of a bolt 2 which passes through the center of the gong. It is generally preferable to utilize the hollow chamber provided by the gong as a housing to contain and protect the signal-operating mechanism, this mechanism being attached to the gong in the present instance by means of a plate 3, the bottom of which may be secured to the gong by the bolt 2, and one of the lateral edges of this plate is upturned to form a flange 4. A base or support 5 for the operating mechanism is contained within the gong and abuts at one edge against the flange 4, this base being composed preferably of fiber or other appropriate insulating material and is secured to the flange 4 of the supporting plate by means of bolts 6. Resting upon the base 5 and projecting laterally from one of its edges is a yoke-shaped core 7 between the arms of which is mounted an electro-magnet 8 having a central core 9, one end of which is exposed and the opposite end is fitted into and secured within an opening 10 formed in an intermediate portion of the yoke-shaped core or field, the latter being firmly secured to the base 5 by means of bolts 11 and 12. In the free end of one of the arms of the yoke-shaped core or field 7 is pivoted a vibratory armature 13, a screw 14 serving as a pivot therefor, and this armature is pivoted to vibrate adjacent to the exposed end of the central core 9 of

the electro-magnet. This armature is normally held in retracted position by a tension spring 15, and the free end of the armature is provided at its outer side with a projection 16 which, when the armature is fully retracted, engages a coöperating projection 17 suitably secured to the rim of the gong, these projections 16 and 17 serving not only to sound the gong but also as electrical contacts for the armature 13 which serves as a vibratory circuit breaker. The winding of the electro-magnet 8 has one terminal connected, for instance, to the bolt 11 to which is connected a wire 18 leading from the circuit controlling devices which are operated by the passage of the car or train, the opposite terminal of the magnet being connected by a wire 19 to a binding screw 20 attached to the insulating base, and this binding screw is connected to a suitable ground wire. An auxiliary armature 21 is also mounted in coöperative relation with the upper arm of the pole piece 7, one end of this auxiliary armature being recessed to form a shoulder 22 and such end of this armature is supported by a link 23 the upper end of which is pivotally connected to a lever 24, the latter being pivoted at 25 upon a bracket suitably secured to the upper arm of the pole piece 7, and the free end of the lever 24 is provided with a counterweight 26 which is so adjusted upon the lever as to normally overbalance the weight of the auxiliary armature and thereby retain it in elevated or retracted position, an energizing of the electro-magnet, however, being sufficient to overcome the counterweight and to attract the auxiliary armature so as to bring the shoulder 22 thereon in the path of movement of the upper end of the main armature 13.

In the present embodiment of my invention, the signaling device is set into operation automatically by the closing of an electric circuit as the car or train passes a given point on the track, and the signaling device remains in operative condition for a predetermined time at the expiration of which period the operation of the signaling device is interrupted and the signaling device is reset to normal position, preparatory to a subsequent operation. To accomplish this result, a suitable time movement is provided, and it will be understood, of course, that any appropriate time movement may be employed for this purpose, the operation of the time movement serving to interrupt the circuit which operates the signaling device. In the present instance, a train of gears is employed, the more rapidly moving one of which serves as an escapement, while the gear having the slowest movement serves to control the circuit. As an instance of such a movement, I have shown in the present embodiment of the invention a plate 27 which is secured suitably to the side of the insulating base and is provided with a set of spindles 28, 29 and 30 which are rigidly secured to the plate and project upwardly therefrom. Upon the spindle 28 is mounted a gear 31 and also an arm 32, the latter being composed preferably of insulating material. Both the gear 31 and the arm 32 are loosely mounted upon the spindle and have a frictional connection through the medium of a spring 33, this spring permitting a movement of the arm 32 without turning the gear, although this arm is caused to turn with the gear. This arm 32 is slotted and one end of the auxiliary armature 21 is pivotally connected thereto by a pin 34. The free end of this arm 32 is also slotted and the lower end of a link 35 is pivotally connected thereto by a pin 36, the upper end of this link being arranged to operate between a pair of stops 37 and 38, the latter being adjustable so as to vary the distance between them as well as to alter their position so as to insure a proper operation of the link, as will hereinafter appear. The stop 38 serves as a contact member, a wire 39 being connected thereto which leads from a suitable source of current supply, it being shown as leading from the generator 40 in the present instance which may be the same generator which supplies motive power to operate the electric railway. A gear and pinion 41 and 42, respectively, are revolubly mounted upon the spindle 29, the pinion coöperating with the gear 31 while the gear 41 coöperates with a pinion 43, the latter and an escapement wheel 44 being both connected and revolubly mounted upon the spindle 30, the ratio of the gearing causing the gear wheel 31 to revolve slowly during a more rapid rotation of the escapement wheel 44. In the present instance, the escapement wheel is provided with teeth of ratchet form which project laterally from one of its sides, and while any suitable means may be employed to operate this escapement whereby the period during which the signaling device operates may be determined, it is generally preferable to operate the time movement from the vibratory armature which sounds the gong, and in the present instance, a wire 45 which is preferably resilient is suitably attached to the armature 13 and it is provided with an arm, the free end of which is provided with a pallet 46, the latter being arranged to cooperate with the escapement wheel and to cause a step by step movement thereof during the vibratory movements of the main armature.

In order to vary the period during which the signaling device operates, I provide means for adjusting the throw of the pallet so that it may engage one or more teeth upon the escapement wheel as may be desired, the adjusting means shown in the present in-

stance consisting of a pair of plates 47 and 48 having upturned arms 49 and 50 which serve as stops between which the pallet operates, these plates being slotted so as to permit them to be adjusted so as to vary the distance between the stops and thus alter the throw of the pallet. The screw or bolt 12 which secures the field 7 of the magnet upon the insulating base may pass through these slotted plates and thereby secure them in the desired adjusted position.

The link 35 carried by the arm 32 is electrically connected to the gong by means of a flexible wire 51 one end of which is attached to the link and its opposite end is attached preferably to one of the bolts 6, an intermediate portion of this wire extending around the spindle 28 and may be coiled or otherwise bent so as to render it flexible.

The signaling device is set into operation, as previously stated, by the movement of a car or train past a predetermined point upon the track, and it will be understood that circuit controlling devices of any desired character may be employed for this purpose. In the present instance, I have shown circuit closing devices which are adapted for application to an electric railway employing the usual trolley wire 52, an additional pole 53 or other suitable support being arranged midway between the length of the usual trolley wire supporting poles 54, and between these poles are stretched a pair of supporting cables 55 and 56 which serve to support the contact devices 57 and 58, respectively, these contact devices being arranged along the trolley wire at a distance of ten or fifteen feet apart and at points between the brackets which support the wire, so that the lifting of the trolley wire due to the pressure of the trolley wheel 59 at its under side, will serve to control the circuit through these devices. These contact devices are in the present instance duplicates, each comprising a cup-shaped member 60 the opening of which is downturned and it is provided with a pair of oppositely extending arms 61 to which the supportng cables are attached. Upon the trolley wire beneath each cup is arranged a bracket having an upturned projection 62 which is adapted to enter the cup from the under side and to close the trolley circuit therethrough as the trolley wheel passes under it. The contact device 57 is connected to the wire 18 of the signaling device by means of a wire 63 which has a resistance 64 therein, which resistance is sufficient to reduce the strength of the current flowing through the electro-magnet of the signaling device through the contact 57 so that this magnet will be sufficiently strong to attract the auxiliary armature 21 although it will not attract the main armature. The contact device 58 is connected to the wire 18 by a wire 65, and as no resistance is interposed between the electro-magnet of the signaling device and the contact device 58, the electro-magnet will receive the full current strength through the contact device 58.

The operation of the device is as follows: Assuming that the signaling device is arranged at a high-way, railway or other crossing or at any other desired point, and that a pair of contact devices 57 and 58 is arranged at a suitable point along the track in advance of the signaling device, it will be obvious that the passage of the trolley wheel along the under side of the trolley wire will cause the latter to be elevated between the brackets which support the trolley wire. The trolley wheel first passes beneath the contact device 57 and as the trolley circuit is closed through this contact device, a current of reduced strength will traverse the wire 63, resistance 64 and wire 18, the current thence passing through the electro-magnet 8 and through the wire 19, this current is returned by the ground circuit. By reason of the interposition of the resistance 64 in circuit with the contact device 57, the electro-magnet will not be energized with sufficient strength to attract the main armature 13, although the pole piece 7 will be energized sufficiently to attract the auxiliary armature causing it to overcome its counterweight, and its free end is depressed so as to bring the shoulder 22 thereon in the path of movement of the upper free end of the main armature. As the trolley wheel passes from beneath the contact device 57, the upward pressure of the trolley wire will maintain the circuit through this contact device, and as the trolley wheel proceeds, it will in turn cause the circuit of the trolley wire to be closed through the contact device 58, the current then flowing through the wire 65 and directly to the wire 18. As no resistance is interposed in the circuit through the contact device 58, the full strength of current will then flow through the electro-magnet, this current being grounded as before through the wire 19 and binding screw 20. The strength of the electro-magnet 8 at this time is sufficient to attract the main armature 13, and as the latter swings toward the magnet, its upper free end will strike the shoulder 22 upon the auxiliary armature, causing the latter to be shifted bodily toward the left in Fig. 1, and during this shifting movement, the arm 32 is shifted from the position shown in full lines to that indicated by the dotted lines, and as the arm 32 reverses its position beneath the stops 37 and 38, the shifting of the pivot pin 36 of the link 35 will cause the latter to swing out of engagement with the stop 37 and into engagement with the stop 38, the latter being connected to the trolley wire or to any other appropriate source of current supply through the wire 39. The movement of the arm 32 as just described

is permitted without rotating the gear 31 by reason of the spring 33 which forms a frictional connection between these parts. A circuit is then established from the source of current supply to the wire 39, the contact stop 38, the switch arm or link 35, wire 51 through the bolts 6 to the gong and from the latter to the contact projection 17. This circuit, however, will remain open while the main armature 13 is attracted by the magnet, but as soon as the trolley wheel passes from beneath both contact devices 57 and 58, the circuit through these contact devices will then be broken and the armature will be momentarily released. As the projection 16 upon the armature strikes the projection 17 upon the gong, it will sound the same and at the same time it will close the operating circuit for the gong, the main armature being successively attracted and released by the electro-magnet owing to the closing and opening of the circuit through the contact projections 16 and 17 during the vibratory movements of the armature. The successive energizing and deënergizing of the electro-magnet, however, during the vibratory movements of the main armature is not of sufficient duration to attract the supplemental or auxiliary armature, the inertia of the counterweight being sufficient to retain this supplemental armature in retracted position. During these movements of the main armature, the pallet 46 movable thereby cooperates with the teeth of the escapement wheel 44 causing a step by step rotation thereof in the direction indicated by the arrow, and through the gearing, a rotation in the same direction but at a lower speed is imparted to the gear wheel 31, and this movement of the gear wheel 31 is transmitted through the friction spring 33 to the arm 32 causing the upper end of the latter to slowly move toward the right carrying with it the auxiliary armature 21. After the signaling device has operated for a predetermined period of time, the arm 32 will have traveled sufficiently far to carry the pivot pin 36 of the switch arm or link 35 beneath the contact stop 38, and this switch arm or link will then swing by gravity from the contact stop 38 over the stop 37, thereby, interrupting the circuit through the electro-magnet and causing the operation of the signaling device to cease. The auxiliary armature 21 at this time will also rest in its initial position.

In Fig. 6 of the drawing, I have shown diagrammatically one method of applying the signaling system to a single track trolley system wherein cars pass in opposite directions upon the same track, the signaling device being arranged at a highway crossing or at any other desired point, and the contact devices for setting the signaling device into operation are arranged at suitable distances along the track at opposite sides of such crossing, the signaling device being thereby set into operation by a car or train approaching the crossing from either direction.

In Fig. 7, I have shown diagrammatically a method of applying the signaling system to a single track road having two trolley wires 52 and 52ª, a contact device 157 being provided for the trolley wire 52 and a second contact device 157ª being provided for the trolley wire 52ª. In this form, it is possible to use but one contact device at each side of the highway, one being in operative relation to each trolley wire, this form of the invention being adapted for use upon roads where two trolley wires are used for each track. In this form of the invention, the counterweight 26 may be omitted from the supplemental armature so that the notched portion of the bar 21 may remain in lowered position or in the path of the upper end of the main armature 13. The moment a circuit is established through either of the contact devices, the main armature will be immediately attracted by the armature 8, and as the notched end of the bar 21 is in position to be engaged by the main armature, the signaling circuit will be thereby established. By using two trolley wires for each track as in this form of the invention, the trolley wheels will travel in one direction only on each trolley wire and consequently there is no liability of the signaling device being set into operation by a car after passing the highway.

A signaling system constructed in accordance with my present invention is comparatively simple in its construction so that it may be constructed cheaply and is not liable to get out of order, and in practice, a single electro-magnet is capable of closing the circuit so as to set the signaling device into operation and for interrupting the circuit to discontinue the operation of the signaling device after the expiration of a given period, and by providing a time movement which is operated by the vibratory armature of the electro-magnet, the signal-operating mechanism takes care of itself without requiring the attention of an attendant. Moreover, by providing contact devices through which the circuit is closed by the upward movement of the trolley wire due to the pressure of the trolley wheel, the signal circuit is closed only by the cars as they approach the signal, and the operation of the cars or trains at high speed will insure the proper operation of these contact devices without danger of injury thereto. Moreover, the novel arrangement of the contact devices prevents one car which is following another from interfering with the operation of the signal.

It will be understood, of course, that while I have shown the signaling system as em-

bodying a signal which gives an audible alarm, this signaling device may be one which will give a visual signal such, for instance, as lamps which are lighted by the passage of the current, and moreover, the invention is not limited in its application to highway or railway crossings, as it may be applied with equal facility as a block signal for controlling the operation of the cars or trains. By housing the mechanism of the signaling device within the gong, this mechanism is effectually sheltered from the weather, and by providing cup-shaped contact devices which are arranged with their open sides directed downwardly, these contact devices are also protected from rain and ice.

I claim as my invention:

1. An automatic electric signaling system comprising a signaling device embodying an operating magnet, a trolley wire, a pair of contact devices spaced along the trolley wire and adapted to receive current therefrom, a signal operating circuit adapted to be connected to the magnet of the signaling device, a primary controlling circuit connected to one of said contact devices and arranged to convey current of reduced strength from the trolley wire to said magnet to set the signaling device in condition to be operated, and a second controlling circuit connected to the other contact device for conducting a relatively stronger current from the trolley wire to said magnet to establish the operating circuit therethrough.

2. An automatic electric signaling system comprising an electrically operated signaling device embodying an operating magnet, a trolley wire, a pair of contact devices spaced along the trolley wire and controllable by a vehicle moving in one direction, a signal operating circuit adapted to be connected to the magnet of the signaling device, and a pair of circuits connected respectively to the contact devices and arranged to be closed successively therethrough by a vehicle moving in one direction, one of said circuits serving to prepare the signaling device for operation and the other circuit serving to complete the signal operating circuit through the signaling device.

3. An automatic electric signaling system comprising an electrically-operable signaling device embodying an electro-magnet, and main and supplemental armatures coöperative therewith, a trolley wire, and a pair of contact devices spaced longitudinally of the trolley wire and normally disconnected therefrom, one of the contact devices being connected to the signaling device through a circuit having a greater resistance than the other so as to cause an operation of the auxiliary armature preliminarily to the movement of the main armature.

4. An automatic electric signaling system comprising a signaling device having an electro-magnet and a signal operable thereby, a signal operating circuit adapted to be closed through said magnet, and a pair of controlling circuits also adapted to be closed successively through said magnet and serving to operate the latter to establish the operating circuit therethrough.

5. An automatic electric signaling system comprising a signaling device having an electro-magnet and a signal operable thereby, an operating circuit adapted to be closed through said magnet to operate the signaling device, a second circuit also adapted to be closed automatically through said magnet to complete the operating circuit therethrough, and a time movement for automatically interrupting the operating circuit.

6. An automatic electric signaling system comprising a signaling device having an electro-magnet and a signal operable thereby, and operating circuit adapted to be closed through said magnet, a second circuit also adapted to be closed through said magnet to complete the operating circuit therethrough, and a time movement for automatically interrupting the operating circuit and for resetting the signaling device.

7. An automatic electric signaling system comprising a signaling device having an electro-magnet and a signal operable thereby, an operating circuit adapted to be closed through said magnet, a second circuit also adapted to be closed through said magnet to subsequently complete the operating circuit therethrough, and a time movement for automatically interrupting the signal operating circuit after the expiration of a predetermined period of time.

8. An automatic electric signaling system comprising a signaling device having an electro-magnet and a signal operable thereby, an operating circuit for said magnet, means for completing the operating circuit through the magnet to set the signaling device into operation, and a time movement actuated by the signaling device for automatically interrupting the operating circuit after the expiration of a predetermined period of time.

9. An automatic electric signaling system comprising a signaling device having an electro-magnet and a vibratory armature operable thereby, an operating circuit for said magnet, means for automatically completing the operating circuit through the magnet to set said armature into operation, a time movement provided with a switch for controlling the operating circuit and having an escapement, and a device actuated by the movement of said armature for operating the time movement to automatically interrupt the operating circuit after the expiration of a predetermined period of time.

10. An automatic electric signaling system

comprising a signaling device having an electro-magnet and an armature coöperative therewith, an operating circuit adapted to be completed through said magnet to operate the signaling device, a time movement having an escapement, a device operable by the movement of said armature for actuating said movement, an arm operable by the time movement, and a gravity-operated switch arm pivoted on said arm and arranged to interrupt the operating circuit after the signaling device has operated a predetermined period of time.

11. An automatic electric signaling system for railways comprising a signaling device having an electro-magnet, main and supplemental armatures coöperative therewith, a pair of contact devices arranged to be actuated successively by the movement of a vehicle, circuits connecting the contact devices with said electro-magnet, one of said circuits having a resistance greater than that of the other for effecting a preliminary movement of the supplemental armature and a subsequent movement of the main armature, a time movement having a switch operating arm thereon operatively connected to the auxiliary armature, a switch member connected to said arm, and an operating circuit adapted to be completed through said electro-magnet by said switch member after the same has been operated by a movement of the auxiliary or supplemental armature, the operation of the time movement serving to automatically interrupt the operating circuit and to reset the auxiliary armature after the expiration of a predetermined period of time.

12. An electric signaling device comprising an electro-magnet, a vibratory armature coöperative therewith, an operating circuit for said magnet, a time movement having an escapement, a device operable by said armature and coöperative with said escapement for actuating the time movement, a switch operable by the time movement for interrupting said operating circuit, and means for varying the degree of movement of the escapement actuating device.

13. An electric signaling device comprising a gong, an electro-magnet, an operating circuit therefor, an armature coöperative with the magnet and forming a portion of the operating circuit therefor, and projections arranged respectively on the armature and the gong for making and breaking the operating circuit through the electro-magnet and for imparting blows to sound the gong.

14. An electric signaling device comprising an electro-magnet, an operating circuit therefor, main and supplemental armatures coöperative with said magnet, the supplemental armature having a shoulder thereon which is normally out of the path of the main armature, a set of speed-reducing gears one of which is provided with an escapement wheel, a device operable by the vibratory movements of the main armature and cooperative with said escapement wheel for actuating the gears, a pivoted arm operatively connected to the supplemental armature and carrying a switch member for controlling the operating circuit, and a friction spring for connecting the switch arm to the said gears.

15. An electric signaling device comprising an electro-magnet, an operating circuit therefor, main and supplemental armatures coöperative with said magnet, circuit interrupting means for causing a vibratory movement of the main armature, a switch for controlling the operating circuit, said switch being operatively connected to the supplemental armature, and a counterbalancing lever for the supplemental armature the inertia of which serves to prevent movement of the supplemental armature during the vibratory movements of the main armature, the latter serving to actuate the supplemental armature when attracted by the magnet so as to operate the circuit controlling switch.

16. A signaling device comprising a gong, ringing mechanism therefor comprising an electro-magnet and a vibratory armature arranged to coöperate with the gong as a circuit closer for said magnet and also as a sounding device for the gong, and a signal operating circuit arranged to be connected to said magnet, armature and gong whereby the vibratory movements of said armature are produced by said magnet and are controlled by the opening and closing of the circuit between the armature and gong as a part of the signal operating circuit.

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