

L. P. LOCKE.
 ELECTRIC SIGNALING APPARATUS.
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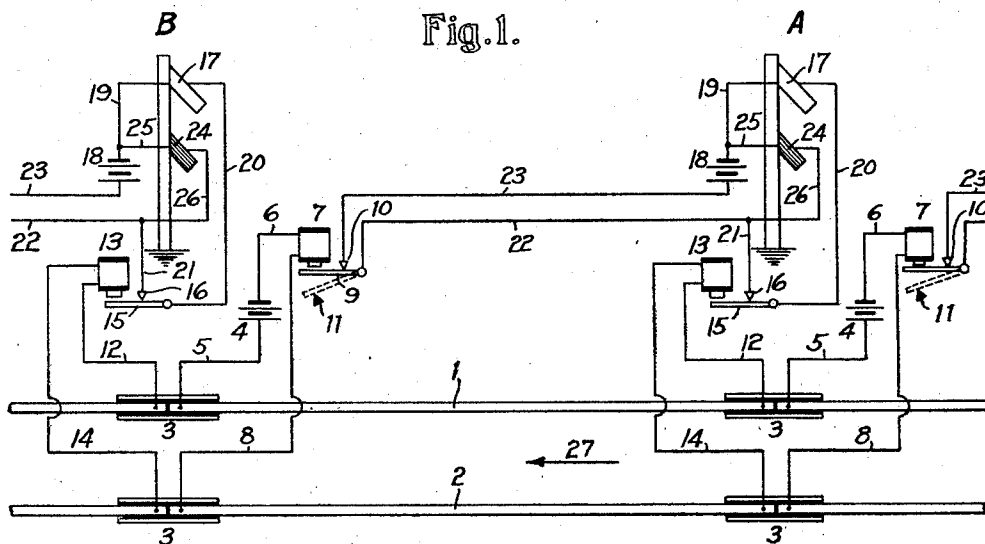
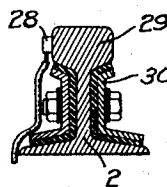
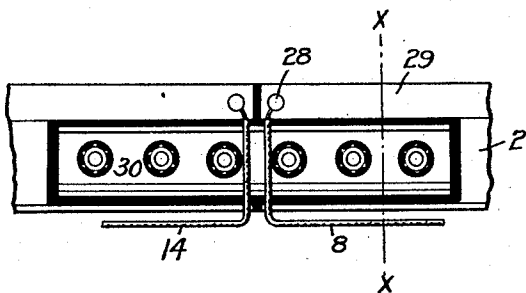


Fig. 2.

Fig. 3.



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UNITED STATES PATENT OFFICE.

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ELECTRIC SIGNALING APPARATUS.

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To all whom it may concern:

Be it known that I, LOUIS P. LOCKE, a citizen of the United States, and resident of Victor, in the county of Ontario and State of New York, have invented certain new and useful Improvements in Electric Signaling Apparatus, of which the following is a specification.

This invention relates to electric signaling apparatus for use in connection with rail-ways.

The object of the invention is to produce apparatus, for use either by itself or in connection with an electric signaling system of any kind, by which an infallible indication shall be given of a dangerous condition of the track arising from the breakage of a rail or a rail-joint.

More particularly the object of the invention is to produce apparatus of this character in which the danger indication, once given, shall be continued until the apparatus has been reset by means extraneous to itself, thereby insuring personal attention to the cause of the danger indication.

In electric signaling systems operated by means of track-circuits the signals are automatically set to danger when a track-rail is so broken as to interrupt the electrical continuity of the track-circuit. This danger indication is fortuitous, however, in the sense that it is not the primary object of the signaling system, and that no special provision is made to adapt the signaling apparatus to produce this result. This incidental indication of a break in the track-circuit is moreover incomplete and unreliable for two reasons. In the first place, after the track-circuit has been interrupted by the breakage of a rail it may be again closed by accidental electrical contact between the severed ends of the rail, such as may occur through mechanical causes or through the expansion of the rails by the action of heat, and in such a case the signaling apparatus will again resume its normal condition, and thus the signals may either fail entirely to indicate the broken rail to the engineer of an approaching train, or may vibrate between danger and clear indications as the broken ends of the rail are brought repeatedly into and out of electrical contact through vibrations or repeated expansion and contraction in the rail.

In my present invention I obviate the disadvantage just pointed out by so arranging

my signaling apparatus that when it has once given a danger indication, in consequence of an interruption in the track-circuit, it does not return again to normal condition, but continues such danger indication until reset by an operator, or by other means extraneous to the automatic signaling apparatus, thus preventing the reestablishment of the track-circuit, from causing a false safety indication.

A second feature in which the ordinary signaling system is deficient in the matter of indicating a breakage in the track results from the fact that the track-circuit, as ordinarily arranged, does not embrace the entire rail to the extremity of its head. The conductors by which the track-relays, or other electrical apparatus, are connected with the track-rails are usually attached to the rails outside of the portions of the rails embraced by the insulated joints by which the rails are divided into blocks or sections. For this reason a breakage occurring at or near the end of a rail, and between the ends of the fish-plates or other device embodied in the insulated joint, is not indicated, as it does not interrupt the track-circuit. This is a serious defect because breakages are particularly liable to occur at the extremities of the rails, where the head of the rail frequently breaks away, thereby producing a dangerous condition in the track, without entirely interrupting the track as in the case of a breakage extending through the rail at an intermediate point.

In my improved signaling apparatus I avoid the defect just pointed out by so arranging the track-circuit that it embraces the entire rails to the very extremities of their heads, and to this end I attach the conductors, by which the rails are connected with the other portions of the track-circuits, to such extremities, so that in case a breakage occurs such as that just referred to, the track-circuit shall be interrupted thereby and a danger indication given by the signal.

Other objects and features of the invention will be set forth in connection with the following description of the illustrated embodiment of the invention.

In the accompanying drawings: Figure 1 is a diagram illustrating the application of my improved signaling apparatus to a railroad-track; Fig. 2 is a side-elevation of one of the insulated rail-joints, showing the

manner of attachment of the conductors to the extremities of the rails; and Fig. 3 is a section on the line X—X in Fig. 2.

In Fig. 1 the invention is illustrated as applied in connection with a simple form of signaling system operated, in the usual manner, by means of a track-circuit, this system comprising blocks, each of which is provided with a two-position semaphore of ordinary form. The track-rails 1 and 2 are divided in the usual manner by insulated joints 3 so as to form blocks or sections, and the track-circuit embracing each section of rails is energized by the usual track-battery 4.

One terminal of the track-battery is connected, by means of a wire 5, with the rail 1. The other terminal of the track-battery is not connected directly with the rail 2, as is usual, but is connected, through a wire 6, with the winding of a relay 7, this relay being employed particularly in connection with the present invention. The other terminal of the relay-winding is connected, by a wire 8, with the end of the rail 2.

The relay 7 is what may be, and hereinafter is, designated as a "hold-open relay", that is to say, when once it has been de-energized and has opened the circuit which it controls, it holds the circuit open until the relay is reset by hand. Such a construction is indicated diagrammatically in Fig. 1. Here the contact-finger or armature 9 of the relay is normally held in raised position, against a fixed contact 10, by the action of the relay-magnet, but when the latter is deenergized the armature falls through a considerable distance, as indicated by the position of the stop 11 against which it comes to rest. When the magnet is again energized it does not raise the armature because the latter has moved so far from the magnet as not to be substantially influenced by the latter, and before the relay can again operate to maintain a closed circuit through its contact-points the armature must be raised by hand, to bring it near enough to the magnet to be held thereby.

The ends of the rail-sections at the entrance end of the block are connected, through wires 12 and 14, with the winding of an ordinary track-relay 13, in the usual manner. The contact-finger 15 and the fixed contact 16 of this relay control the electric operating mechanism of the semaphore 17, which is the ordinary semaphore hereinbefore referred to. The operating mechanism is not illustrated or described, as it may be of any ordinary or suitable form. This mechanism is controlled by current supplied by a battery 18, this battery being connected with the semaphore through a wire 19. The current, after passing through this wire and through the semaphore, passes

through a wire 20 to the contact-finger 15 and the fixed contact 16. From the fixed contact the current does not return, in the usual manner, directly to the battery, but it is conducted through a wire 21 to a line-wire 22, which terminates in the contact-finger 9 of the hold-open relay 7 at the next station in advance, this station being designated in Fig. 1 by the reference letter B, while the station in the rear is designated by A. The current, after passing through the line-wire 22 and the contact-finger 9, returns, through the fixed contact 10 and a second line-wire 23, to the battery 18. In the normal condition of the apparatus this current flows through the circuit just described, and the semaphore 17 is held in clear position as illustrated.

In addition to the semaphore 17 there is provided, at each station in the illustrated system, an auxiliary semaphore 24 which may be made smaller than the regular semaphore, or of a different color or form, so as to distinguish it from the latter. This auxiliary semaphore is employed solely to indicate a break in the track. Its operating mechanism, which may be of any ordinary or suitable form, is supplied with current from the battery 18 through the wire 25, and the current, after passing through the operating mechanism, is conducted through a wire 26 to the line-wire 22, whereby it passes through the contacts of the hold-open relay at station B and returns thence to the battery in the same manner as the current by which the semaphore 17 is normally held clear.

In the normal condition of the system above described, trains move along the track in the direction of the arrow 27. When a train enters the block A—B it thereby short-circuits the right-hand or entrance end of the track-circuit, through the conductive action of the wheels and axles of the train. By this action current is diverted from the winding of the track-relay 13 in the usual manner, so that this relay opens the circuit through which current flows from the battery 18 through the operating mechanism of the semaphore 17, and this semaphore, therefore, moves to danger position in response to its bias in the usual manner. At this time the auxiliary semaphore 24 does not move to danger position, however, since its controlling circuit does not pass through the contacts of the track-relay, but is controlled solely by the hold-open relay at station B. This latter relay still continues to maintain a closed circuit, for the reason that the short-circuiting action of the train extends only in the rear of the train, and current, therefore, continues to flow from the track-battery 4 at B through the winding of the relay 7. When the train leaves the block the flow of current through the track-relay 13 at A

is resumed, and this relay therefore again closes the controlling circuit of the semaphore 17 and the semaphore moves to clear position again.

5 When a break occurs in the track the winding of the track-relay 13 is deenergized, just as in the case of a short-circuit due to the presence of a train in the block, and the semaphore 17 therefore goes to danger position. In this case, however, the auxiliary semaphore 24 also goes to danger position, for the reason that the break in the track-circuit interrupts entirely the flow of current from the track-battery, and therefore the hold-open relay 7 is also deenergized, thus breaking the circuit of both semaphores. Owing to the peculiar action of the hold-open relay hereinbefore described, both semaphores now remain in danger position, regardless of the track-circuit, until the hold-open relay has been reset by hand.

It will be obvious that if the auxiliary semaphore 24 be omitted the regular semaphore 17 will still operate to give a danger indication when the track is broken, and will also continue such indication until the hold-open relay has been reset. The auxiliary semaphore is not, therefore, indispensable, but it is a useful adjunct to the system, for the reason that it gives a definite indication of the nature of the danger, and thus prevents the delay to traffic which ordinarily occurs when a train-operator, confronted by a danger signal, is unaware that this signal is due to a break in the track and therefore waits in the expectation that the signal will clear after a due interval of time. It will also be apparent that the auxiliary semaphore 24 may be used independently of the regular semaphore, but where my novel apparatus is employed in conjunction with an ordinary signal system it is preferable to arrange both semaphores under the control of the hold-open relay, since otherwise a condition might occur in which the auxiliary semaphore might indicate danger, while the regular semaphore would indicate a clear track, and such an indication would not be as readily perceived as where both semaphores go together to danger position.

In order to render the protection against breakage complete it is necessary, as hereinbefore pointed out, that the track-circuit include every portion of the track-rails included in the block or section. In Figs. 2 and 3 is illustrated the manner in which such an arrangement is secured. Instead of connecting the wires 5, 8, 12 and 14 with the rails beyond the ends of the fish-plates by which the ends of the rails are joined, I attach these wires at the extremities of the heads of the rails. In the drawings this attachment is illustrated as comprising metal plugs 28 secured to the extremities of

the heads 29 of the rails in any well-known or convenient manner. Owing to this arrangement a breakage occurring near the extremity of a rail, and between the ends of the fish-plates 30, will cause an interruption in the track-circuit with the same certainty as a break extending entirely through a rail between the joints.

Although I have illustrated my invention as applied in connection with a simple signal system without overlap or other refinements, it will be understood that it is applicable in an analogous manner to any signal system involving the use of track-circuits, or that it may, in fact, be employed entirely independently of an ordinary signal system, special track-circuits being arranged for use solely in connection with the present invention.

I claim:—

1. Electric signaling apparatus comprising, in combination with a section of track-rails, connections between the rails at one end of the section, a source of current connected across the rails at the other end of the section, a signal, and electric controlling means for the signal, said controlling means being connected in series with said source of current, between the latter and the track-rails, so as to be unaffected by a short-circuit across the rails but to respond to an interruption in the current due to a break in the track-circuit and said means operating when deenergized by such break, to throw the signal to danger position, and being irresponsive to a renewal of the current so as to hold the signal in danger position until reset by extraneous means.

2. Electric signaling apparatus comprising a signal, a track-rail, a source of current, and a hold-open relay, the track-rail, the source of current and the relay being connected in circuit and the relay controlling the signal and being irresponsive, after having been once deenergized, to current in said circuit until reset by extraneous means.

3. Electric signaling apparatus, comprising, in combination with track-rails, a source of current, a signal, and an electric controlling device for the signal connected in series with at least one of said rails and with said source of current, said controlling device being interposed between the rail and the source of current so as to be deenergized only by a break in the circuit but not by a connection between the rails and being connected with the signal and operating when deenergized, to prevent clearing of the signal and being also unresponsive to current in said circuit, after having been once deenergized, until reset by extraneous means.

4. Electric signaling apparatus comprising a signal, a section of track-rails, a track-relay having a winding connected across the track-rails at the entrance end of the sec-

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tion, a source of current connected across the rails at the exit end of the section, a hold-open relay having its winding interposed in the track-circuit between the source
5 of current and the rails, and automatic signal-controlling apparatus comprising a controlling-circuit controlled by both said relays, said hold-open relay operating, after having been once deenergized, to break the
10 controlling circuit and to maintain said circuit open until reset by extraneous means.
5. Electric signaling apparatus comprising, in combination with a track-rail having an insulated joint, a signal, electric controlling devices for the signal, and connections
15 between said devices and said rail, said connections being attached to the rail at the extremity of its head so as to be broken by a failure in the rail occurring between the ends of the insulated joint.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."