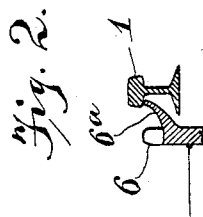
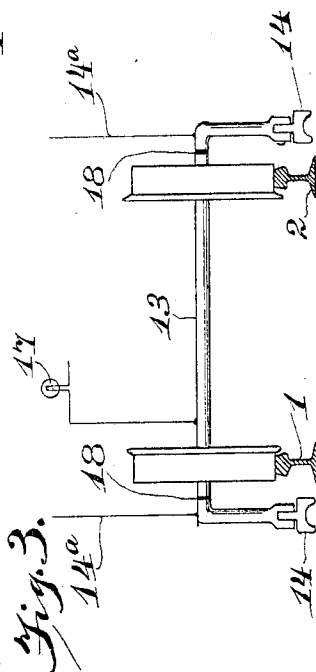
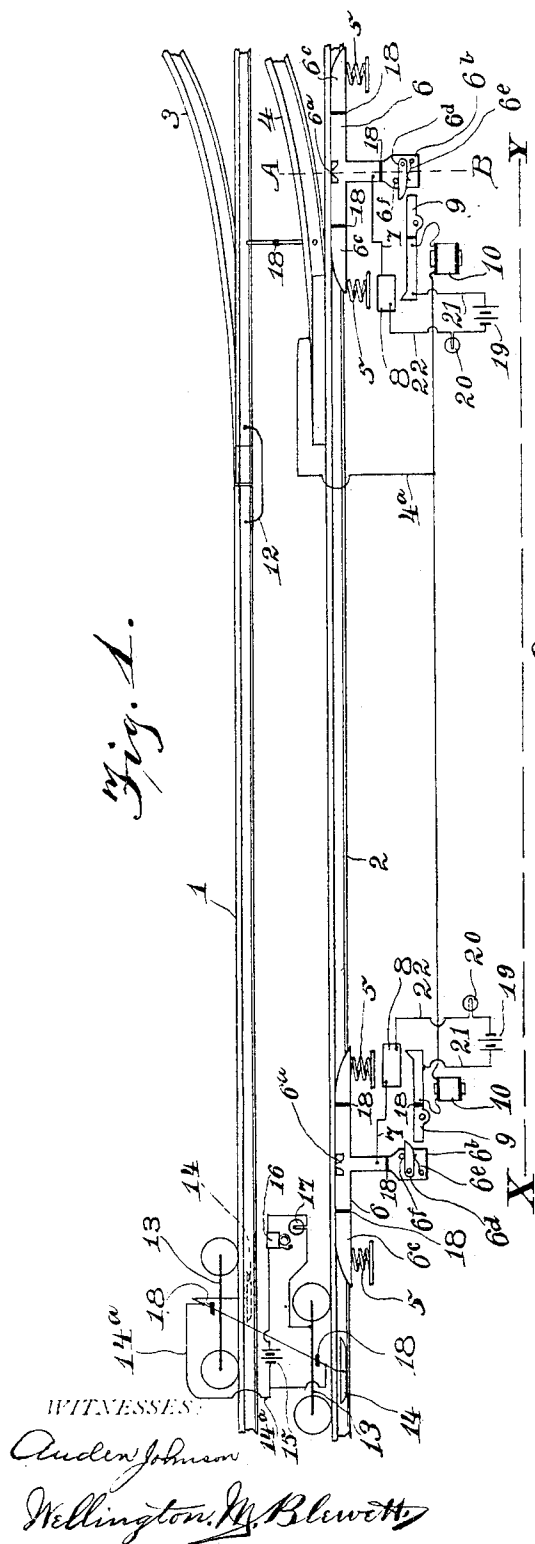


E. H. B. KNOWLTON.
ELECTRIC SIGNAL DEVICE FOR RAILROADS.
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ELECTRIC SIGNAL DEVICE FOR RAILROADS.

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To all whom it may concern:

Be it known that I, EPHRIAM H. B. KNOWLTON, a citizen of the United States, residing at Superior, in the county of Douglas and State of Wisconsin, have invented certain new and useful Improvements in Electric Signal Devices for Railroads; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to electric signal apparatus for railways, and has for its object the provision of electrically-operated means for operating a signal in the cab of the engine, whereby the engineer may be warned of an open switch or of another engine advancing toward him in the block which his own engine is about to enter.

With this and other objects in view it consists of the constructions, circuits, and combinations and arrangements of parts hereinafter described and claimed.

In the drawings, Figure 1 is a diagrammatic view of a block of railway main track, including the end of a switch-track, and a locomotive conveyance on said main track, said track and locomotive being equipped with my said invention. Fig. 2 is a detail transverse section of the rail 2 and of the circuit-closer 6 on the line A B of Fig. 1. Fig. 3 is a detail front elevation of the truck of said locomotive and of portions of my signal apparatus carried thereby and of the supporting-rails of said track.

In the drawings, 1 and 2 are route-marking conductors of electricity, consisting of the main track-rails of a railway-track, and 3 and 4 are switch-rails thereof; but a wire or wires or other conductors of electricity may within the spirit and scope of my invention be substituted for one or more of said rails as a part of my signal apparatus. Yieldingly supported in any suitable manner, as by springs 5, adjacent to one or the other of the main track-rails of said track, at opposite ends of any predetermined portion thereof, which for convenience may be termed a "block," are levers comprising the circuit-closer 6, having the point 6^a formed thereon and electrically connected therewith, the foot 6^b, and the inclined approaches 6^c, insulated from the part 6. Said circuit-closers at each end of said block are respectively electrically connected, as by wires 7, with corresponding plates or contacts 8. Suitably mounted near

the feet 6^b of said levers, respectively, are armatures 9, each adapted to be struck and operated by a toe 6^d, pivotally mounted on the foot 6^b of the corresponding said lever and limited as to its pivotal movement in one direction by a suitable stop, as 6^e, and weakly supported in any suitable manner against pivotal movement in the opposite direction, as by a spring 6^f, in such manner as to move the opposite end of the armature into contact with the corresponding said plate, said toe yielding, if necessary, and passing said armature when said lever returns to normal position, thus leaving said armature in contact with said plate. An electromagnet 10 is placed in armature-retracting position near each of said armatures in such manner that when said magnets are energized they will be adapted to attract the respectively corresponding said armatures and retract them from said plates. One end of each coil of each of said electromagnets is electrically connected with the plate-contacting end of the relatively corresponding said armatures or with an equivalent contact carried thereby, and the opposite ends of said coils are united together. One or both of the lines of rails of said track or conductors, if not already continuous, is made electrically continuous in any suitable manner, as by the wires 12, joined thereto and extending around the joints thereof. If a switch occurs in said block, I electrically connect one of the otherwise-insulated switch-rails, as 4, in any suitable manner with the permanent electrical connection between said armatures—as, for example, by the wire 4^a, extending from said switch-rail to the connected ends of the coils of said electromagnet. A conveyance 13 is adapted to move on said track and is provided with trolleys or shoes 14, insulated therefrom and adapted at different times to ride upon said levers during the passage of said locomotive thereby and at such times to depress said levers in such manner as to move said rail-contacts 6^a out of contact with the rail or equivalent conductor and to cause said levers to move said armatures away or farther away from said electromagnet. Said trolleys or shoes are connected, as by the wires 14^a, with one pole of a source of electricity 15, carried by said conveyance. The opposite pole of said source is connected through any suitable signal, as an electric-bell mechanism 16 or a suitable incandescent light 17, or both, with any suitable rail-contact, as the truck of said conveyance or other elec-

tricity-conducting rail-contact carried by said conveyance. Thus the truck of the conveyance and said shoe and the electric devices and apparatus carried by said conveyance, as aforesaid, are adapted to form a transient bridging contact between said yielding circuit-closer 6 and the rail or trolley-wire.

While I have shown certain arrangements of parts, it is obvious that such arrangements may be modified in many particulars without essentially changing the construction or the circuits or features of my said invention, as especially by transposing connections or adopting equivalent mechanical devices. I do not, therefore, desire to be limited to the exact arrangement of parts as illustrated and described. Suitable insulating means are inserted or used wherever necessary or desirable, as at 18. It is further obvious that said switch 4 or either of said levers 9 may, if desired, be operated manually or by any suitable manually-operated means. (Not shown.)

In operation when said conveyance passes said lever or circuit-closer at the end marked X of said block going in the direction X Y the trolley or shoe 14 will ride up on said lever or circuit-closer, depressing the same before said trolley reaches the circuit-closing part 6 of said lever. The depression of the lever will carry the point 6^a away from the rail, and the toe on the foot of the lever will strike the corresponding said armature and force one end of it into contact with the adjoining plate 8. The trolley will continue and contact with the part 6 of said lever; but no current will flow from said source 15 unless the armature at the opposite end of said block is also in contact with its adjoining plate 8 or unless said switch-rail 4 is in contact with the rail 2 of the main track or route-demarking conductor adjoining it. Assuming that the switch-rail is not in such contact and that the armature at the opposite end of the block is not in contact with its adjoining plate, no signal will be given on the conveyance, and it will therefore be assumed that no conveyance similarly equipped is approaching from the opposite end of said block. The trolley or shoe will continue and move off said lever or circuit-closer, which will then rise into contact with the adjoining rail or conductor. If now while said conveyance is on said block another conveyance approaching the first said conveyance and similarly equipped passes the lever at the end of the block marked Y, the trolley on said second conveyance will depress said lever, and thereby force the relatively corresponding armature into contact with its adjoining plate, thus establishing an electric circuit from the source of electricity on said second conveyance through the trolley thereon, thence through the part 6 of the corresponding lever, thence through the plate and armature and magnet at the same end of the block, thence through the magnet and

armature and plate and point 6^a at the first said end of the block, thence along the rail of the track to the truck of the second conveyance, thence through the signal mechanism on said second conveyance to the opposite pole of the source of electricity thereon, thus operating the signal on said second conveyance and warning the engineer of the occupancy of the block in front of him. At the same time said magnets are energized and retract said armatures from said plates, leaving the signal apparatus clear and the circuit open. If, however, no second conveyance thus approach, but said switch be open to receive a train, then while the trolley of the first conveyance is still in contact with said part 6 of the lever at the end marked X of said block a circuit will be established from the battery on the first said conveyance and through said bell and light to the rail of the main track, thence to the rail of the switch, thence through the magnet, armature, plate, and contact at the end marked X of said block, thence to the trolley on said first conveyance, and so to the opposite pole of the battery, thus operating the signal or signal devices on said conveyance and warning the engineer that said block is not clear. A similarly-equipped conveyance proceeding in the direction Y X would in a corresponding manner discover the open switch through the apparatus at the end Y of said block. Assuming the block, however, to be clear for said first conveyance, the first said conveyance would proceed to the end marked Y of the block and operate the apparatus at that end in the same manner that said second conveyance would have operated it, thus operating its own signal and at the same time clearing the block. The operation of its signal at the clearance end of the block will assure the engineer that the circuits are still in operation.

It will be observed that there is a similar trolley or shoe 14 on each side of the locomotive similarly connected with the signal apparatus on said locomotive, so that no matter which way the locomotive may be moving, and either forward or backward, one or the other of said trolleys is adapted to engage the levers supporting the circuit-closers 6. Said trolleys or shoes may therefore be properly regarded and are intended to be covered by the claims as one split trolley, and whichever part thereof contacts with the circuit-closers the operation will be the same. It is obvious also that said circuit-closers may, if desired, be placed at opposite sides of the rail or at opposite sides of a double line of rails or trolley-wires. Said parallel lines of main track-rails or trolley-wires may therefore for the purposes of the invention be regarded and are intended to be covered by the claims as one split line of rails, and whichever line or part thereof the electricity flows through the operation will be the same.

It is further obvious that the electromagnets instead of being connected permanently to the armatures may be connected permanently to the plates and the armatures permanently electrically connected to the circuit-closers 6^a instead of the plates being permanently connected thereto. This would be a mere transposition of connections not affecting the general operation and character of the devices. These minor alterations or modifications and others of similar nature are so entirely obvious to anyone skilled in the art that they seem to require no further description, and I regard them as clearly within the spirit and scope of my said invention and of my claims. In order to signal the occupancy of the block to a following conveyance, I employ a normally open local circuit containing a relatively local source of electricity, as a battery 19, and one or more signal devices of any suitable construction well known to the art—as, for example, a red-globe incandescent light 20. Said local circuit is adapted to be closed and opened in any suitable manner by the first-described mechanism, preferably by connecting one pole of said battery 19, as by the wire 21, with the corresponding armature 9, and by electrically connecting the other pole of said battery 19, as by the wire 22, through said signal device or light 20 with the corresponding plate. Thus while said armature contacts with the plate said light 20 will burn.

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

1. In a signal apparatus, a normally open electric circuit including a portion of an electrically-continuous rail or route-demarking conductor of electricity, a source of electricity, an electrically-operated signal device, a traveling shoe, a yielding circuit-closer normally closed against said rail or conductor and adapted to contact with said shoe during the passage thereof and during the whole period of its contact with said shoe to be held thereby out of contact with said rail or conductor, a normally open contact, an electromagnet adapted when energized to open said normally open contact, a second electromagnet, a second normally open contact adapted to be opened by said second electromagnet when said electromagnet is energized, a second yielding circuit-closer normally closed against said rail and adapted to contact with said shoe during the passage of said shoe subsequent to the termination of the contact of said shoe with the first said circuit-closer, and during the whole period of its contact with said shoe to be held thereby out of contact with said rail or conductor, in combination with mechanically-operated means governed by said shoe and adapted to close the first said normally open contact prior to the contact of said shoe with the first

said circuit-closer, and mechanically-operated means governed by said shoe and adapted to close the said second normally open contact prior to the contact of said shoe with said second yielding circuit-closer, substantially as described.

2. In a signal apparatus, a normally open electric partial circuit comprising a route-demarking conductor of electricity, a yielding circuit-closer adapted to normally contact therewith, a normally open circuit-controlling contact and a second normally open circuit-controlling contact; a traveling bridging contact constituting a normally open electric circuit including a source of electricity and a signal device and adapted to intervene for a brief period during passage between said yielding circuit-closer and said conductor and at such time to be looped into said partial circuit; in combination with means adapted to be mechanically operated by said bridging contact to close the first said normally open contact.

3. A normally open electric circuit including a route-demarking conductor of electricity, a yielding circuit-closer adapted to normally contact therewith, a normally open circuit-controlling contact, a second normally open circuit-controlling contact, a second yielding circuit-closer adapted to normally contact with said conductor, a traveling bridging contact adapted during passage to close the circuit between one of said yielding circuit-closers and said conductor and after leaving said circuit-closer to subsequently close the circuit between the second said circuit-closer and said conductor, and while in contact with either of said yielding circuit-closers to hold the same out of direct contact with said conductor, a source of electricity and a signal device looped into said bridging contact and forming part thereof, and electromagnetic means adapted to reopen the first and second said normally open contacts after the same have been closed, in combination with mechanically-operated means governed by said bridging contact and adapted to close the first said normally open contact when said bridging contact is in contact with the first said circuit-closer and to close the second said normally open contact when said bridging contact is in contact with the second said circuit-closer.

4. A normally open electric partial circuit, comprising a route-demarking conductor of electricity, a yielding circuit-closer adapted to normally contact therewith, a normally open contact, and an electromagnet adapted to reopen said contact after the same has been closed, and a second normally open contact; in combination with yielding inclined approaches carrying or carried by and electrically insulated from said circuit-closer and together with said circuit-closer forming a lever, said lever being provided with a foot and toe, a second lever adapted to be operated in

one direction by said toe to close said normally open contact when the first said lever is operated, a traveling bridging contact constituting a normally open electric circuit including a source of electricity and a signal device and adapted while passing to operate the first said lever and to contact with said circuit-closer and to be thereupon temporarily looped into said partial circuit.

- 10 5. In a signal apparatus, a normally open electric partial circuit comprising a route-demarcating conductor of electricity, a yielding circuit-closer adapted to normally contact therewith, a normally open circuit-controlling
15 contact and a second normally open circuit-controlling contact; a traveling bridging contact constituting a normally open electric circuit including a source of electricity and a signal device adapted to intervene for a brief

period during passage between said yielding circuit-closer and said conductor and at such time to be looped into said partial circuit; in combination with means adapted to be mechanically operated by said bridging contact to close the first said normally open contact, 25 a second normally open electric circuit relatively independent of the first said circuit and comprising a source of electricity, a local signal device and a normally open circuit-controlling contact adapted to be governed by the said mechanically-operated means for closing 30 the first said normally open contact.

In testimony whereof I hereunto affix my signature in presence of two witnesses.

EPHRIAM H. B. KNOWLTON.

Witnesses:

JAMES T. WATSON,

WELLINGTON M. BLEWETT.