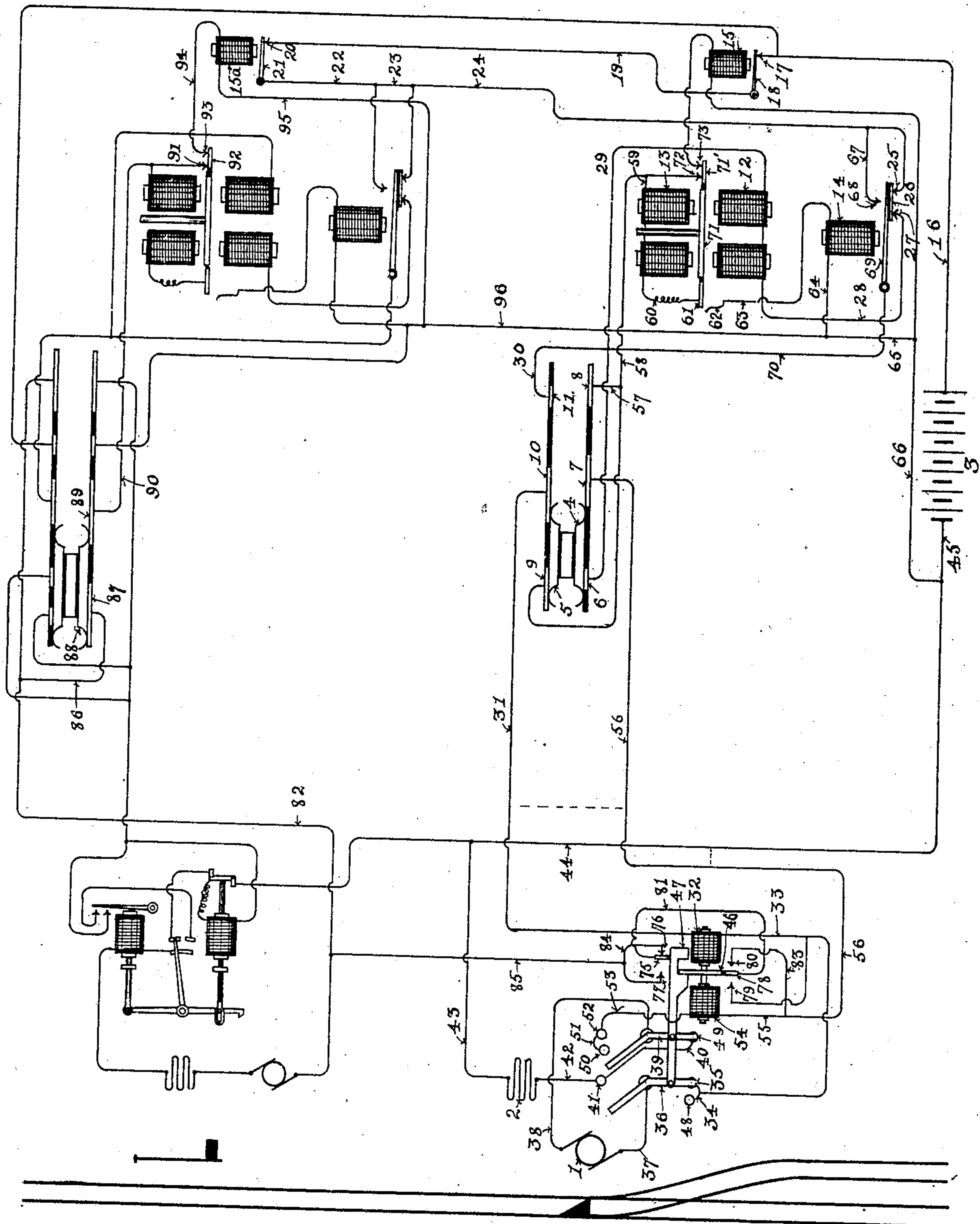


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W. MACOMBER.
RAILWAY SWITCHING APPARATUS.
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UNITED STATES PATENT OFFICE.

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RAILWAY SWITCHING APPARATUS.

No. 832,138.

Specification of Letters Patent.

Patented Oct. 2, 1906.

Application filed February 20, 1905. Serial No. 246,536.

To all whom it may concern:

Be it known that I, WILLIAM MACOMBER, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Railway Switching Apparatus, of which the following is a specification.

My invention relates to railway switching apparatus, and more particularly to that class of apparatus in which the motive power is electricity and wherein a movement of the switch and the fact that it is home and locked is indicated by current from the battery shunted from the common return through the indicating-wire, as fully described in my pending application, Serial No. 198,220, filed March 15, 1904.

The object of my invention is to prevent a false indication due to a cross of the indicating-wire with any active wire, such cross occurring after the controller has been moved to cause a movement of the rail-switch and before actual and proper indication. In other words, in the apparatus of my pending application, Serial No. 198,220, if an active wire should become crossed with the indicating-wire after the safety-magnets had been energized and before the current is shunted through the indicating-wire by the throw of the pole-changing switch a false indication might be given if the cross were a metallic cross and the current of considerable energy, while an imperfect or weak cross or a cross with a wire-carrying a light current would not produce a false indication.

The purpose of this invention is to avoid danger from the remote possibility of a cross producing such false indication, thus rendering false indication at any time impossible.

In the accompanying drawing I have shown a rail-switch operated by the apparatus of my said patent and a signal operated by the apparatus of my pending application, Serial No. 198,220. In both switch and signal I have shown the cut-out disclosed in my pending application, Serial No. 246,534, filed February 20, 1905.

1 is the switch-motor armature, and 2 is the field for moving the rail-switch A.

3 is a source of electric energy.

4 and 5 are the brushes of the controller, and 6 7 8 and 9 10 11 are respectively the contacts bridged by said brushes.

12 represents the safety-magnets; 13, the indicating-magnets; 14, the cut-out magnet, and 15 is the magnet for breaking the operating-circuit in the event of a cross. 15^a is a similar magnet in connection with the signal.

I will first trace a normal movement of the switch; second, indicate how a false indication might be had except for my present invention, and, third, show how my present invention prevents such false indication.

Assume it to be desired to move the rail-switch A. The brushes 4 and 5 are moved on the controller to bridge 7 and 8 and 10 and 11, respectively. This closes a circuit of the battery 3, so that current flows through wire 16, contact 17, tongue 18, wire 19, contact 20, tongue 21, wires 22 23 24, contact 25, plate 26, contact 27, wire 28, safety-magnets 12, wires 29 30, contact 11, brush 5, contact 10, wire 31, magnet 32, wire 33, wire 34, contact 35, arm 36 of the pole-changing switch, wire 37, armature 1, wire 38, arm 39 of the pole-changing switch, contact 49, wire 40, contact 41, wire 42, field-coils 2, and wires 43 44 45 back to battery 3. This current energizes the safety-magnets 12 and produces the release movement of the controller, energizes the magnet 32, and draws its armature 46 against the core of the magnet 32 in readiness to engage the bar 47, and energizes the switch-motor. When the rail-switch is reversed, the pole-changing switch is half reversed, so that the arm 36 breaks connection with the contact 35 and makes connection with the contact 48, and the arm 39 breaks connection with the contact 49 and makes connection with the contact 50. This shunts the current from the common return, so that current flows through the path just described to the arm 39 of the pole-changing switch and from thence through arm 39, contact 50, wire 51, contact 52, wire 53, magnet 54, wires 55 56, contact 7, brush 4, contact 8, wires 57 58 59, indicating-magnets 13, flexible conductor 60, contact 61, brush 62, wire 63, cut-out magnet 14, and wires 64 65 66 45 back to battery. This energizes the indicating-magnets and also the cut-out magnet, and the cut-out magnet shunts the current around the safety-magnets, so that current flows from wire 24 through wire 67, contact 68, tongue 69, and wire 70. This deenergizes the safety-magnets 12 and allows the

indicating-magnets to cause the final movement of the controller. This describes in part the apparatus of my invention disclosed in my said pending applications, Serial Nos. 198,220 and 246,535.

A cross of an active wire with an indicating-wire will be under ordinary circumstances detected and the battery-current cut off by the magnet 15 or 15^a, as fully described in my said application, Serial No. 198,220. A cross thus occurring will send current through the magnet 15 or 15^a, and the consequent movement of the tongue 18 or 21 will cut off the battery as soon as the controller is moved. Now suppose the controller to be moved as above described and that no cross exists at that time. The armature 71, common to the safety and indicating magnets, is at once moved, so that the plate 71' breaks connection with the contacts 72 and 73, so that current cannot flow through wire 74 to the magnet 15. Suppose now, due to the tendency of the electromotive force to break down insulation, a cross should become established between the wire 31 and the wire 56 or the wire 44 and the wire 56. If the cross be clean, current will immediately energize the indicating - magnets 13, and what would appear to be a normal indication would be given. This might result in leaving the rail-switch half moved. I prevent this possibility in the following manner: Secured to the bar 47, but insulated from it, is a contact-piece 75 capable of making electrical connection with the contact-points 76 or 77. Secured to the armature 46, but insulated from it, is a contact-piece 78 capable of making electrical connection with the contact 79 or 80. The contact-piece 75 is in permanent electrical connection with the contact-piece 78 through the wire 81. The wire 82 of the signal-circuit is always connected to battery when current is on the switch apparatus—that is to say, the signal will always be at the danger position when the switch is under movement, and when the signal is at "danger" this wire 82 will be connected, through the controller, to the opposite pole of the battery from which energy will be taken to operate the rail-switch. In the operation above described with reference to the switch it will be noted that substantially coincidentally with the movement of the armature 71 and the breaking of connection between the plate 71' and the contacts 72 and 73 the armature 46 of the magnet 32 is moved. The plate 78 is thereupon put in electrical connection with the contact 80. The plate 75 has been put in electrical connection with the contact 76 by the last preceding final movement of the pole-changing switch. Suppose a cross now to occur between the wires 31 and 56 or 44 and 56. Some current will flow through the normal path of indication above described; but since

it must pass through the indicating-magnets 13 and the cut-out magnet 14 the greater portion will take the easier path and flow from wire 56 to wire 83, contact 80, plate 78, wire 81, plate 75, contact 76, wires 84 85 82 86, contact 87, brush 88, contact 89, wire 90, contact 91, plate 92, contact 93, wire 94, magnet 15^a, and wires 95 96 65 66 45 to battery. This will at once energize the magnet 15^a and cause its tongue 21 to cut off battery-current from all apparatus. Since the energy required is so slight and the inertia so small in comparison with the motor or the indicating mechanism, the magnet 15^a will have performed its function before the motor can have unlocked the rail-switch and before the indicating-magnets can have acted to move the controller. This circuit is closed only while the rail-switch is in process of being moved. It is not established until the armature 46 is moved. It is broken immediately the switch is locked by the throw of the bar 47, which carries the plate 75 away from its contact, and upon final movement of the bar 47, putting the plate 75 in electrical connection with the other contact, as 77, the plate 78 is carried out of contact with either point and does not again make electrical connection until the beginning of the next movement, as above described. In like manner I may connect the wire 85 to the indicating-wire of an adjacent switch unit with like effect.

In cases where several switch mechanisms are in close proximity and in proximity to the source of power a single wire, as 85, may lead to a magnet like 15 or 15^a, cut into the common operating-wire 16, with like effect.

I need not describe a reverse movement of the rail-switch and the operation of my invention in such case, since the operation would be substantially the same. In such reverse movement the wire 31 would be the indicating-wire, the plate 75 would be in electrical connection with the contact 77, and the plate 78 would make electrical connection with the contact 79, which is connected to the wire 33, as soon as the magnet 54 is energized.

Having thus described my invention and its method of operation, what I claim, broadly, is—

1. In a railway switching apparatus, a source of electric energy, an operating and an indicating wire, a controller, a safety-magnet, an indicating-magnet, means for detecting a cross of the indicating-wire and any active wire, occurring after the indicating-magnet has been energized, comprising, an electric switch in said operating-wire, a magnet governing said switch, a wire including said last-mentioned magnet leading to battery, and an electromagnetic device connecting said last-mentioned wire with said indicating-wire while said safety-magnet is energized,

whereby current due to cross involving said indicating-wire will cause said magnet to open said electric switch in the operating-wire.

5 2. In combination with a source of electric energy, a motor, a controller, operating and indicating wires, a return-wire, a pole-changing switch, an indicating-magnet, a safety-magnet, an electric switch and a magnet governing said switch to open the operating-wire,
10 a wire connecting said switch-magnet with the battery, an electromagnetic device governed by the operating-current, a wire connecting said switch-magnet with said electromagnetic device, and contacts on said electromagnetic device for connecting said last-mentioned wire with the indicating-wire
15 when the safety-magnet is energized and disconnecting the same when said safety-magnet is deenergized.

3. In combination with a source of electric energy, a motor, a controller, operating and indicating wires, a common return-wire leading back from said motor and other units of
25 the system, a conductor common to all operating-wires, an electric switch cut into said operating common, a magnet governing said switch, a wire connecting said magnet with the pole of said battery of opposite sign to the operating-wire, an electromagnetic device governed by the operating-wire, a wire connecting said electromagnetic device with said magnet, a wire connecting said electromagnetic device with said indicating-wire, a
35 safety-magnet, an indicating-magnet, an armature common to said indicating-magnet and said safety-magnet, and means for closing said wire leading from said switch-magnet with the indicating-wire through said
40 electromagnetic device when said safety-magnet is energized, and means for breaking such connection when said safety-magnet is deenergized.

4. In combination with a source of electric
45 energy, motors, controllers, operating and indicating wires, a common return-wire, a conductor common to all operating-wires, electric switches cut into said operating common, magnets governing said switches, a common

wire connecting said magnets with the pole 50 of said battery of opposite sign to the operating common, indicating-magnets, safety-magnets, armatures common to said safety and indicating magnets, contacts and wires connecting said magnets governing said 55 switches with the indicating-wires of their respective units excepting when the safety-magnets are energized, and means for connecting the indicating-wire of a unit with a magnet governing an electric switch while 60 the safety-magnet of the unit is energized, comprising an electromagnetic device governed by the operating-current, a wire leading from said electromagnetic device to the indicating-wire of an adjacent unit, and an 65 electric switch for connecting said last-mentioned wire with the indicating-wire of the unit operated as soon as the indicating-magnet is energized and breaking such connection when said magnet is deenergized. 70

5. In combination with a source of electric energy, a switch-motor, a controller, operating and indicating wires, a common return-wire, a common operating-wire, safety-magnets, indicating-magnets, a signal, signal- 75 motor, controller, operating and indicating wires, an electric switch cut into the operating common, a magnet governing said switch and connected with the signal-indicating wire and the battery when the signal is at 80 danger, an electromagnetic device actuated by the operating-current when said safety-magnet is energized, a wire connecting said indicating-wire of said signal with said electromagnetic device and a switch actuated by 85 said electromagnetic device to connect said last-mentioned wire with the switch-indicating wire while current is on the safety-magnet, and actuated to disconnect said wires as soon as current is cut off from said safety- 90 magnet.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

WILLIAM MACOMBER.

Witnesses:

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E. F. BRANCH.