(No Model.) 2 Sheets—Sheet 1.

P. SCHWENKE.

ELECTRICAL SIGNALING APPARATUS FOR RAILWAYS.

No. 525,866 Patented Sept. 11, 1894.

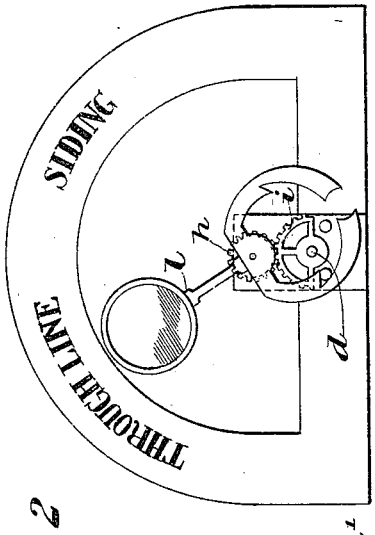

Fig. 2

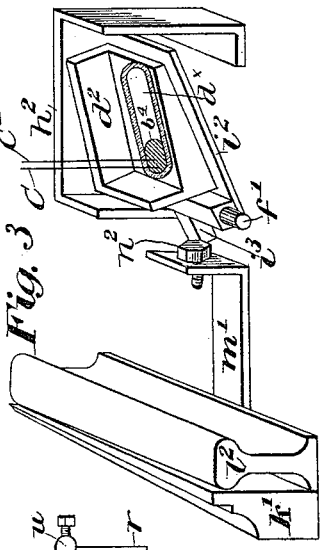

Fig. 3

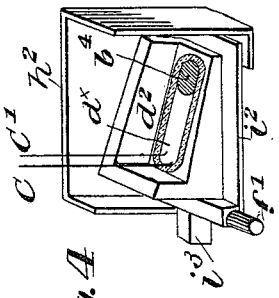

Fig. 4

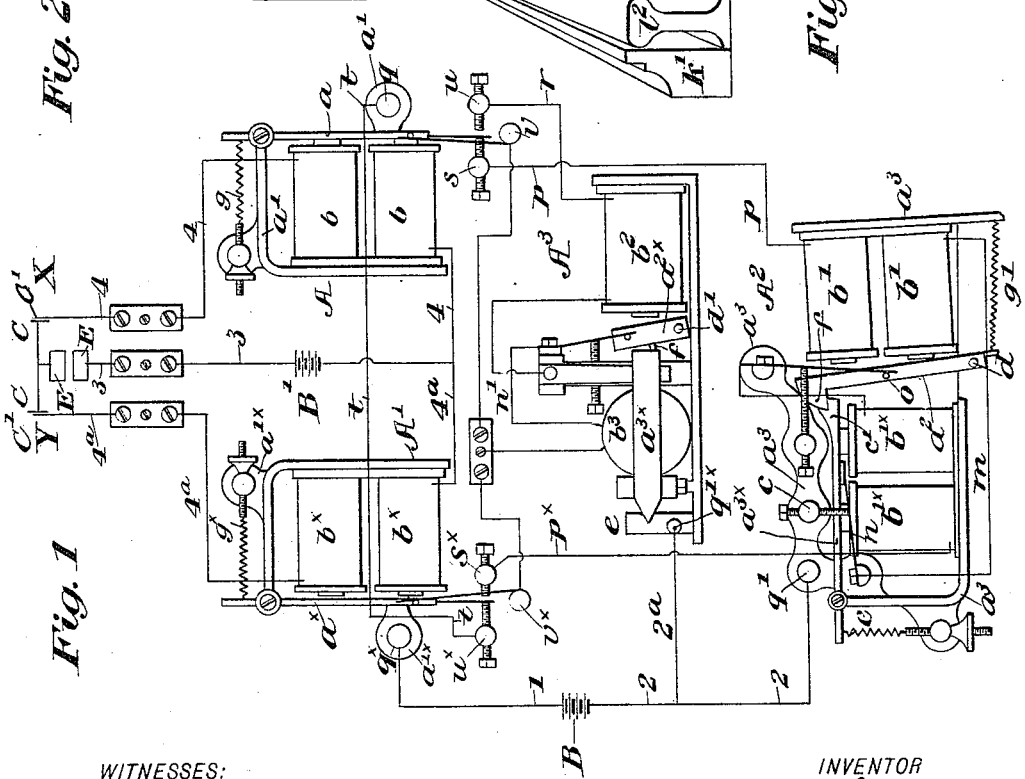

Fig. 1

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(No Model.) 2 Sheets—Sheet 2.

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ELECTRICAL SIGNALING APPARATUS FOR RAILWAYS.

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Fig. 5

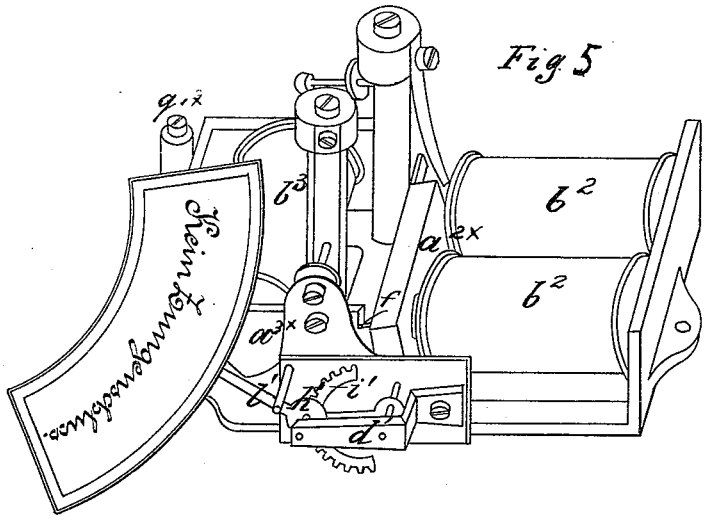
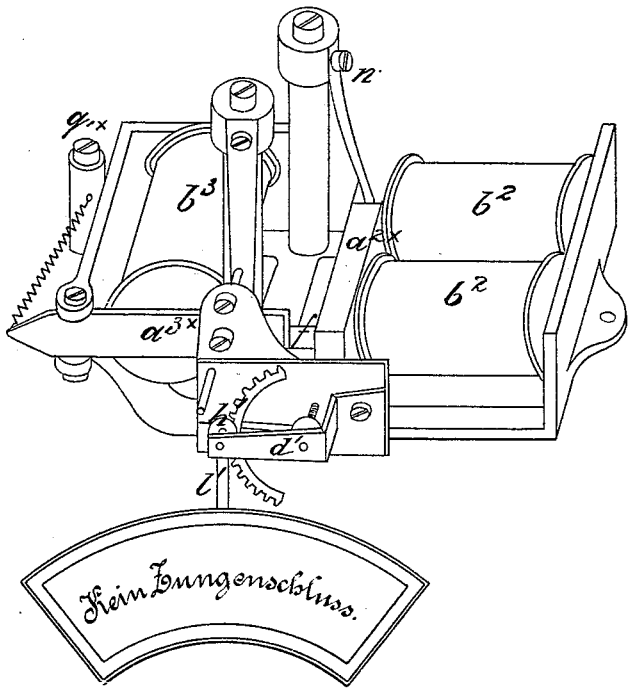


Fig. 6



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UNITED STATES PATENT OFFICE.

PAUL SCHWENKE, OF ZERBST, GERMANY.

ELECTRICAL SIGNALING APPARATUS FOR RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 525,866, dated September 11, 1894.

Application filed April 8, 1892. Serial No. 428,377. (No model.) Patented in Germany June 27, 1890, No. 59,375; in Belgium July 16, 1891, No. 95,657; in France July 18, 1891, No. 214,949, and in England February 12, 1892, No. 2,762.

To all whom it may concern:

Be it known that I, PAUL SCHWENKE, a subject of the Emperor of Germany, residing at Zerbst, in the German Empire, have invented new and useful Improvements in or Relating to Electrical Signal Apparatus for Indicating the Position of Railway Switches or Points, (for which patents have been granted in France, No. 214,949, dated July 18, 1891; in Belgium, No. 95,657, dated July 16, 1891; in England, No. 2,762, dated February 12, 1892, and in Germany, No. 59,375, dated June 27, 1890,) of which the following is a specification.

This invention relates to certain improvements in electric railway signals, such as are employed for indicating, usually by means of semaphores located along the track, the positions of the various switches, and the object is to provide a signal system of this character of a simple and inexpensive construction which shall automatically indicate by means of suitable signaling devices, the positions in which the various switches are set, whereby accidents may be prevented, all as will be hereinafter fully set forth.

The novel features of my invention will be carefully defined in the claims.

In order that my invention may be better understood I have illustrated in the accompanying drawings a signal system constructed in accordance therewith, in which drawings—

Figure 1 is a diagraphic view, showing the various mechanical elements employed in the system, together with the circuits. Fig. 2 is a detail view showing the semaphore employed for indicating the extreme positions of the switch tongue when the switch is set for the main line or the siding. Figs. 3 and 4 are detail views showing the circuit closer employed for making and breaking the circuit at the switch. Figs. 5 and 6 are views illustrating the semaphore employed for indicating the intermediate position of the switch tongue when the switch is open.

In the drawings B and B′ represent two batteries or other generators of electricity suitably placed along the line of the railway, and 1, 2, 3 and 4, represent the respective lead and return conductors for the currents generated by said batteries, which conductors are arranged along the line of the road and are properly insulated to prevent leakage. As will be presently set forth, one of these generators B′, is designed to furnish energy to set the signaling mechanisms in their proper positions to give the correct signal indicating to an approaching train the position of the switch and its conductors 3, 4 are therefore in circuit with suitable actuating devices located at the switches, while the generator B being designed to actuate the signaling mechanisms directly to give the signal when the switch has been set, its conductors 1 and 2 are connected with the signaling devices only and have no electrical connection with the actuating devices at the switches. This being thus, I have denominated the first mentioned generator and circuits the "line" or signal setting circuit and the last mentioned generator and circuits the secondary or signal actuating circuit.

I will first proceed with a general description of the signal setting circuits with especial reference to Figs. 1, 3 and 4.

Located adjacent to the free end of the switch tongue k' is a wooden box h^2 having a movable bottom i^2 pivoted at f' and provided with a nose i^3 arranged in the path of an adjusting screw n^2 set in a projection m' from one side of said tongue k'. Thus it will be seen that as the tongue k' is shifted toward or from the rail l^2 the screw n^2 by its engagement with nose i^3 tilts the bottom of the box h^2 from its normal horizontal position to the position seen in Fig. 3.

Mounted in the box h^2 and firmly connected to and moving with its bottom i^2 is a second box or case d^2 having an inclined bottom as clearly seen and in this case d^2 is arranged a glass tube $d^\times$ containing a small quantity of mercury (indicated at b^4) such glass tube being parallel with and firmly secured to the inclined bottom of the case d^2. The inclination of the bottom of case d^2 is such that when the parts are in their normal position as indicated in Fig. 4, the mercury in the glass tube will fall to one end thereof, but when the bottom i^2 of box h^2 is tilted by the shifting of the switch tongue, said mercury will fall to the opposite end of the tube, in which end are hermetically sealed the ends C, C′ of two platinum wires, forming terminals of the conduc-

tors 3, 4 of the line or signal setting circuit. Thus it will be seen that the said line circuit is closed at each shifting of the switch tongue, the shifting thereof in the opposite direction closing the circuit likewise through the medium of a device similar to that seen in Figs. 3 and 4, the platinum wires C, C′ of which (see Fig. 1) form the terminals of a shunt circuit including the conductors 3 and 4^a, the former of which is a common return and the latter a branch of the conductor 4. In lieu of a metallic conductor 3, the earth may be used as a return as indicated in Fig. 1 at E.

For purposes of explanation I have lettered the circuit closing device at the right in Fig. 1 as X, this representing the device which is actuated when the switch is set for the main or through line while the device at the left is lettered Y and is actuated when the switch is set for a branch line of track or siding.

I will now proceed to a more minute description of the main line circuit, of which the conductors 3 and 4 form the line conductors. Said circuit includes a relay A having a metal frame a' of proper form, on which are mounted the electro-magnets b, b, in circuit with the conductor 4 and the pivoted armature a having a retracting spring g serving to hold the same normally away from said magnets. The free end of this armature is adapted to contact as the armature is drawn toward the magnet, with an insulated contact screw s and when the armature is retracted by spring g, with a similarly insulated screw u, as clearly seen in Fig. 1. Thus it will be seen that when the main line circuit is closed as represented in Fig. 1, the magnet b is excited and attracting armature a causes the same to contact with screw s, but when said circuit is open, as it will be when the switch is set for the branch line, said armature a will be retracted by its spring g and will contact with screw u. On the other hand, when the shunt or branch line circuit is closed through the branch conductor 4^a, the current from the generator B′ flows through a relay A′ similar to the relay A, attracting the armature $a^\times$ thereof and causing the same to contact with a screw $s^\times$. When this shunt circuit is open, a spring $g^\times$ retracts the armature, causing it to contact with a screw $u^\times$.

It will of course be understood that there are three different positions in which the switch can be set, first, for the main line, as indicated in Fig. 1, in which case, as stated, the main line circuit is closed and the relay A energized; second, for the branch line or siding, in which case the shunt circuit is closed and the relay A′ is energized, and third, the switch may be "open" or set midway between the branch and main lines, in which case neither of the line or signal setting circuits will be closed. In this last position of the parts it is obvious that neither of the relays will be energized and consequently both armatures a, and $a^\times$ will contact with screws u, $u^\times$, and in order that this position of the switch may be indicated to an approaching train, I have employed an auxiliary mechanism to be hereinafter described.

I will now proceed to describe the construction of the signaling devices and the manner in which the same are operated with especial reference to Figs. 1 and 2, premising that as seen in these figures the switch and signal actuating devices are set for the main line.

As stated, the generator B is comprised in the signal actuating or signaling circuit comprising conductors 1 and 2 the former of which leads to a binding screw $q^\times$ set in the frame $a'^\times$ of relay A′. Thence the current flows through said frame to armature $a^\times$ to contact screw $u^\times$ and thence through a wire t to a screw q set in the frame a' of relay A. Thence the current flows through said frame to and through armature a to contact screw s with which said armature is in contact. From screw s a wire p leads to the coils of an electro-magnet b', mounted on the frame a^3 of the signal device A^2 indicated near the bottom of Fig. 1. From said coils the current is led through wire m to a spring or brush n mounted on and insulated from the frame a^3 to a contact screw c with which said spring contacts to the frame a^3 and thence by the binding screw q' to a conductor 2 of the signaling circuit.

The current from generator B, flowing through the coils of the magnet b' of the signaling device A^2 energizes the same, attracting armature a^2, which is pivoted on a shaft or spindle d mounted in frame a^3 whereby said armature is drawn over to the right from the position indicated in Fig. 2. The armature a^2 has on its rear side a nose or projection f arranged in the path of a spring actuated locking bar or dog c' also pivoted to the frame a^3 and acting by its engagement with the nose f of armature a^2 to hold the same in the position in which it then stands.

As stated armature a^2 is mounted on a shaft d, rotatively mounted in the frame a^3 and on the end of this shaft d is mounted as seen in Fig. 2, a segmental rack i the teeth of which engage a pinion h fixed on the pivot pin of a semaphore l. Thus it will be seen that as the armature a^2 is moved the engagement of rack i and pinion h also serves to tilt the semaphore l. This semaphore is by preference provided with a colored disk or light and has two positions, indicative, respectively of the position of the switch, whether it be set for the main or through line or for the branch or siding.

I will now describe the operation of the signaling devices when the switch is in its second position or set for the branch line or siding.

As previously stated, the closing of the shunt or branch line circuit energizes the coils of magnet $b^\times$ of relay A′ and causes the armature thereof to contact with screw $s^\times$, the armature of relay A being simultaneously retracted so as to contact with screw u or in

other words the positions of the armatures of the relays are reversed. When in this position the current from generator B flows through wire l to screw $q^{\times}$, through the frame and armature of relay A′ to screw $s^{\times}$, thence by a wire $p^{\times}$ to the coils of a magnet $b'^{\times}$ mounted on the frame a^3 of the signal device A^2 in such a position as to attract the pivoted latch or dog c'. Thence the current flows through the frame a^3 to screw q' and thence through conductor 2 back to generator B. Thus the magnet $b'^{\times}$ is energized and draws down the pivoted latch or armature lever c' to the position seen in Fig. 1, after which the armature a^2 is free to move on its pivot d and is thrown by its spring g' to the position seen in Fig. 1, whereby the semaphore l is thrown over to its other position indicating that the switch is set for the branch line or siding.

I will now describe the operation of the auxiliary signal device for indicating to the approaching train that the switch is set to neither of the preceding positions, but is "open." As before stated in such a contingency neither of the line circuits is closed, and neither of the relays therein is energized, wherefore both armatures a and $a^{\times}$ contact with screws u, $u^{\times}$. The current from generator B flows through wire 1, frame $a'^{\times}$ and armature $a^{\times}$ of relay A′ to screw $u^{\times}$, thence through wire t to the frame a' and armature a of relay A, thence through said armature to screw u, thence through wire r to the coils of a magnet b^2 fixed to the frame of and forming part of the auxiliary signal device A^3. Thence the current flows by way of the screw $q'^{\times}$ to a wire 2^a branching from conductor 2 of the signaling circuit. The current in its passage excites the magnet b^2 and attracts the armature $a^{2\times}$ thereof which thereupon takes the position indicated in Fig. 6. When the armature $a^{2\times}$ has assumed this position a spring actuated detent $a^{3\times}$ engages with a nose f on its rear face whereby the parts are maintained in this position.

The armature $a^{2\times}$ is pivoted at d', and on the outer end of its pivot pin is secured a segmental rack i' (see Figs. 5 and 6) meshing with a pinion h', on the pivot pin of a semaphore l'. When said armature $a^{2\times}$ is rocked on its pivot, the semaphore l' is swung downward to the position seen in Fig. 6, whereby it is brought into view and indicates that the switch is open.

In order to release the armature $a^{2\times}$ after the position of the switch has been altered, I have provided a second magnet b^3 arranged in position to attract the armature lever or dog $a^{3\times}$ so as to draw the same out of engagement with said armature $a^{2\times}$. In order to energize said magnet its coils are included in a partial circuit one terminal of which connects with the screw u and the other of which connects with screws v, $v^{\times}$ arranged on the frames of the respective relays A, A′, and provided with springs or brushes adapted to contact with both armatures a and $a^{\times}$ in whatever position the same may be. By this arrangement a portion of the current from generator B will flow through said magnet b^3 and hold the armature lever $a^{3\times}$ up to magnet b^3 whenever either of the line or signal setting circuits is closed.

Having thus described my invention, I claim—

1. In an electric railway signal, the combination with a line circuit including a generator, a circuit breaker and a relay, of a signaling circuit, including a generator and the armature and contact point of said relay, an electro-magnet arranged in said signaling circuit, an armature pivotally arranged adjacent to said electro-magnet, a gear wheel mounted on the pivot of said armature and a pivoted semaphore, provided with a rack in engagement with said gear wheel, substantially as set forth.

2. In an electric railway signal, the combination with two line circuits each including a generator, a circuit breaker and a relay, of a signaling circuit including the armature and contact point of one of said relays, a generator and an electro-magnet, an armature arranged near said magnet and adapted to be attracted thereto, means for locking said armature in position when thus attracted, means for retracting said armature when the signaling circuit is broken, a signaling device and means for communicating the movement of said armature to said signaling device, substantially as set forth.

3. In an electric railway signal, the combination with two line circuits each including a generator, a circuit breaker and a relay, of a signaling circuit including the armature and contact point of one of said relays, a generator and an electro-magnet, an armature for said magnet, means for retracting said armature, a signaling device, means for communicating the movement of said armature to said signaling device, a shunt circuit from said signaling circuit, said shunt circuit including the armature and contact point of the other relay, and an electro-magnet, an armature for said magnet, and means for retracting said armature, the free end of said armature when in its retracted position engaging the rear side of the armature of the electro-magnet in the signaling circuit, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

PAUL SCHWENKE.

Witnesses:
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W. EGGELING.